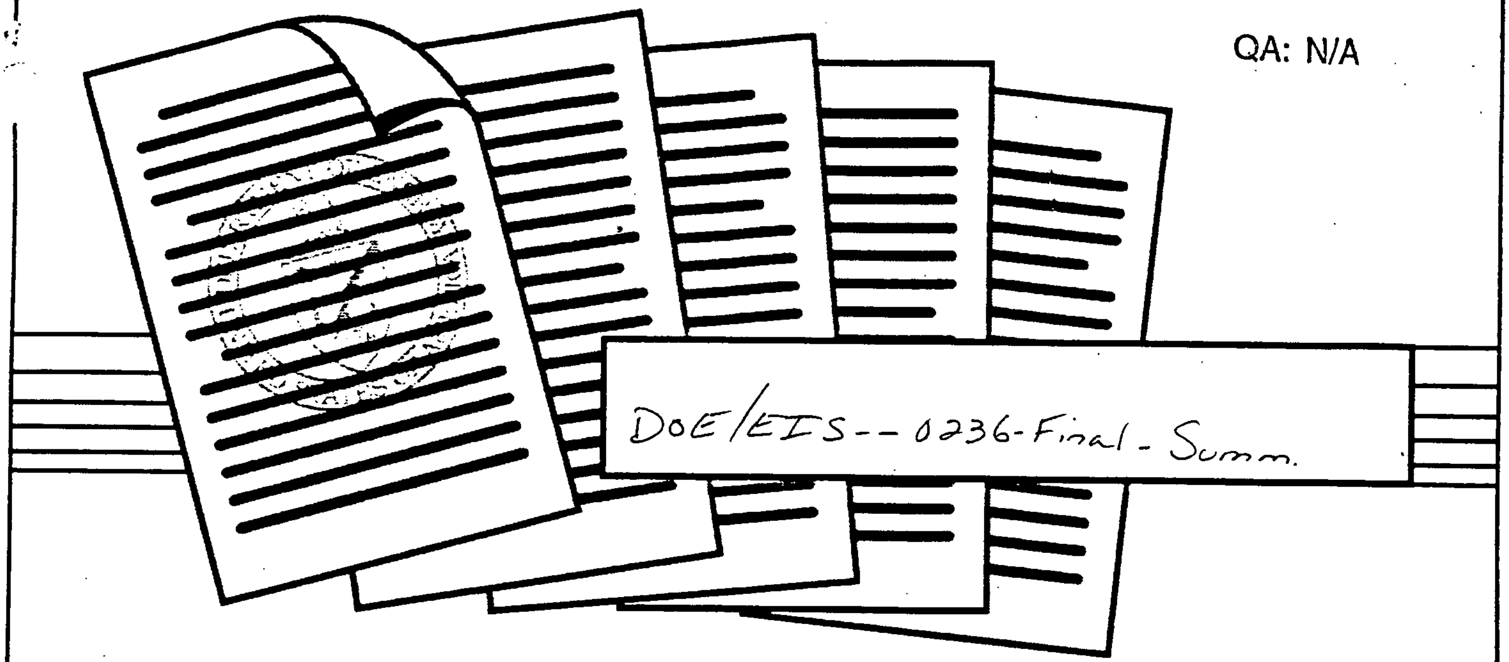

A Facsimile Report

DOE/EIS-0236
Summary

Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management

Summary

United States Department of Energy

September 1996

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September 1996

COVER SHEET

ESPONSIBLE AGENCY: U.S. Department of Energy

COOPERATING AGENCY: U.S. Environmental Protection Agency

TITLE: Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management (DOE/EIS-0236)

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ABSTRACT: In response to the end of the Cold War and changes in the world's political regimes, the United States is not producing new-design nuclear weapons. Instead, the emphasis of the U.S. nuclear weapons program is on reducing the size of the Nation's nuclear stockpile by dismantling existing nuclear weapons. The Department of Energy (DOE) has been directed by the President and Congress to maintain the safety and reliability of the reduced nuclear weapons stockpile in the absence of underground nuclear testing. In order to fulfill that responsibility, DOE has developed a Stockpile Stewardship and Management Program to provide a single highly integrated technical program for maintaining the continued safety and reliability of the nuclear stockpile. The Stockpile Stewardship and Management PEIS describes and analyzes alternative ways to mplement the proposed actions for the Stockpile Stewardship and Management Program.

Stockpile stewardship refers to activities associated with research, design, development and testing of nuclear weapons and the assessment and certification of the safety and reliability. The stockpile stewardship portion of the PEIS evaluates the potential impacts of three proposed facilities: the National Ignition Facility (NIF), the Contained Firing Facility (CFF), and the Atlas Facility. The stockpile stewardship alternatives involving these facilities could affect four sites: Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), Sandia National Laboratories (SNL), and Nevada Test Site (NTS).

Stockpile management refers to activities associated with the production, maintenance, surveillance, refurbishment, and dismantlement of the nuclear weapons stockpile. The stockpile management portion of this PEIS evaluates the potential impacts of carrying out stockpile management alternatives at eight sites: Oak Ridge Reservation (ORR), Savannah River Site (SRS), Kansas City Plant (KCP), Pantex Plant (Pantex), LANL, LLNL, SNL, and NTS. The stockpile management alternatives are assessed for nuclear weapons assembly/disassembly and for fabricating pits, secondaries and cases, high explosives, and nonnuclear components.

The Stockpile Stewardship and Management PEIS also evaluates the No Action alternative of relying on existing facilities and continuing the missions at current sites to achieve both the stockpile stewardship and management missions. The No Action alternative assesses the environmental impacts of the on-going Stockpile Stewardship and Management Program and provides a baseline against which alternatives can be evaluated.

DOE has identified the following preferred alternative for the Stockpile Stewardship and Management Program:

Stockpile Stewardship:
- Construct and operate NIF at LLNL
- Construct and operate CFF at LLNL
- Construct and operate the Atlas Facility at LANL

Stockpile Management:
- Secondary and Case Component Fabrication—downsize the Y-12 Plant at ORR
- Pit Component Fabrication—reestablish capability and appropriate capacity at LANL

- Assembly/Disassembly—downsize at Pantex
- High Explosives Fabrication—downsize at Pantex
- Nonnuclear Component Fabrication—downsize at KCP
- Based on the analyses performed to support this PEIS, the preferred alternatives for strategic reserve storage are as follows: (1) highly enriched uranium strategic reserve storage at Y-12; and (2) plutonium pit strategic reserve storage in Zone 12 at Pantex. The preferred alternatives for strategic reserve storage could change based upon decisions to be made in regard to the *Storage and Disposition of Weapons-Usable Fissile Materials Final PEIS*. Decisions on strategic storage will not be made in the upcoming ROD for the Stockpile Stewardship and Management Program. Storage decisions are not expected to be made until both the *Stockpile Stewardship and Management Final PEIS* and the *Storage and Disposition of Weapons-Usable Fissile Materials Final PEIS* are completed.

The preferred alternative for plutonium-242 oxide at SRS is to transport the material to LANL for storage.

Evaluation of impacts on land resources, site infrastructure, air quality, water resources, geology and soils, biotic resources, cultural and paleontological resources, socioeconomics, waste management, environmental justice, as well as radiological and hazardous chemical impacts during normal operation and accidents to workers and the public are included in the assessment. The PEIS presents unclassified information only. A classified appendix has also been prepared to support the PEIS.

PUBLIC COMMENTS: The public comment period on the Draft PEIS was conducted from March 8, 1996 to May 7, 1996. During the comment period, public hearings were held in Los Alamos, NM; Albuquerque, NM; Las Vegas, NV; Oak Ridge, TN; Kansas City, MO; Livermore, CA; Washington, DC; Amarillo, TX; Santa Fe, NM; and North Augusta, SC. The Draft PEIS was made available through mailings, requests to DOE's Office of Reconfiguration, and at DOE Public Reading Rooms. In preparing the Final PEIS, DOE considered comments received by mail, fax, handed in at hearings, transcribed from messages recorded by telephone, and those transcribed via Internet. In addition, comments and concerns identified during discussions at public hearings were considered.

In response to comments submitted after issuance of the Draft PEIS and due to additional technical details not available at the time of issuance of the Draft, Volumes I, II, and III of the Final PEIS contain revisions and changes. The revisions and changes made since the issuance of the Draft document are indicated by a double underline for minor word changes or by a sidebar in the margin for paragraph or larger changes. In addition, Volume I and each appendix in Volume III provide a unique reference list to enable the reader to further review and research selected topics. Volume IV (Comment Response Document) of the PEIS contains the comments received during public review of the Draft PEIS and the DOE responses to those comments. DOE has public reading rooms near each affected site and in Washington, DC where these referenced documents may be reviewed or obtained for review.

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ACRONYMS AND ABBREVIATIONS

A/D	assembly/disassembly
AHF	Advanced Hydrotest Facility
ARS (X-1)	Advanced Radiation Source
BEEF	Big Explosive Experimental Facility
CEQ	Council on Environmental Quality
CFF	Contained Firing Facility
Complex	Nuclear Weapons Complex
CTBT	Comprehensive Test Ban Treaty
DARHT	Dual-Axis Radiographic Hydrodynamic Test
D&D	decontamination and decommissioning
DOD	Department of Defense
DOE	Department of Energy
DP	DOE Office of the Assistant Secretary for Defense Programs
EIS	environmental impact statement
FXR	Flash X-Ray
HE	high explosives
HEPPF	High Explosive Pulsed Power Facility
HEU	highly enriched uranium
KCP	Kansas City Plant
LANL	Los Alamos National Laboratory
LLNL	Lawrence Livermore National Laboratory
NEPA	*National Environmental Policy Act*
NIF	National Ignition Facility
NLVF	North Las Vegas Facility
NPR	Nuclear Posture Review
NPT	Nuclear Nonproliferation Treaty
NTS	Nevada Test Site
NWSM	Nuclear Weapon Stockpile Memorandum
NWSP	Nuclear Weapon Stockpile Plan
ORR	Oak Ridge Reservation
Pantex	Pantex Plant
PDD	Presidential Decision Directive
PEIS	programmatic environmental impact statement
R&D	research and development
ROD	Record of Decision
SNL	Sandia National Laboratories/New Mexico
SRS	Savannah River Site
START	Strategic Arms Reduction Talks
Y-12	Y-12 Plant, Oak Ridge Reservation

SUMMARY

S.1 INTRODUCTION

The Department of Energy (DOE) is the Federal agency responsible for providing the Nation with nuclear weapons and ensuring that those weapons remain safe and reliable. This programmatic environmental impact statement (PEIS) analyzes the potential consequences to the environment if certain changes to the Nuclear Weapons Complex (Complex) are implemented to support DOE's Stockpile Stewardship and Management Program.

Stockpile stewardship and stockpile management describe DOE's management of the nuclear weapons program. While these terms are not new, DOE has recently redefined them in light of its current roles and responsibilities. Stockpile stewardship comprises the activities associated with research, design, development, and testing of nuclear weapons, and the assessment and certification of their safety and reliability. These activities have been performed at the three DOE weapons laboratories and the Nevada Test Site (NTS). Stockpile management comprises operations associated with producing, maintaining, refurbishing, surveilling, and dismantling the nuclear weapons stockpile. These activities have been performed at the DOE nuclear weapons industrial facilities (see figure S.1–1).

Since the inception of nuclear weapons in the 1940s, DOE and its predecessor agencies have been responsible for stewardship and management of the Nation's stockpile. In response to the end of the Cold War and changes in the world's political regimes, the emphasis of the U.S. nuclear weapons program has shifted dramatically over the past few years from developing and producing new weapons to dismantlement and maintenance of a smaller, enduring stockpile. Accordingly, the nuclear weapons stockpile is being significantly reduced, the United States is no longer manufacturing new-design nuclear weapons, and DOE has closed or consolidated some of its former weapons industrial facilities. Additionally, in 1992 the United States declared a moratorium on underground nuclear testing, and in 1995 President Clinton extended the moratorium and decided to pursue a "zero-yield" Comprehensive Test Ban Treaty (CTBT). Even with these significant changes, DOE's responsibilities for the nuclear weapons stockpile continue, and the President and Congress have directed DOE to continue to maintain the safety and reliability of the enduring nuclear weapons stockpile.

In response to direction from the President and Congress, DOE has developed its Stockpile Stewardship and Management Program to provide a single, highly integrated technical program for maintaining the continued safety and reliability of the nuclear weapons stockpile. It has evolved from predecessor programs that served this mission over previous decades. With no underground nuclear testing, and no new-design nuclear weapons production, DOE expects existing weapons to remain in the stockpile well into the next century. This means that the weapons will age beyond original expectations and an alternative to underground nuclear testing must be developed to verify the safety and reliability of weapons. To meet these new challenges, DOE's science-based Stockpile Stewardship and Management Program has been developed to increase understanding of the basic phenomena associated with nuclear weapons, to provide better predictive understanding of the safety and reliability of weapons, and to ensure a strong scientific and technical basis for future U.S. nuclear weapons policy objectives.

The size and composition of the U.S. nuclear weapons stockpile is determined annually by the President. The Department of Defense (DOD) prepares the Nuclear Weapon Stockpile Plan (NWSP) based on military requirements and coordinates the development of the plan with DOE concerning its ability to support the plan. The NWSP, which is classified, covers the current year and a 5-year planning period. It specifies the types and quantities of weapons required and sets limits on the size and nature of stockpile changes that can be made without additional approval by the President. The Secretaries of Defense and Energy jointly sign the Nuclear Weapon Stockpile Memorandum (NWSM), which includes the NWSP and a long-range planning assessment. As such, the NWSM is the basis for all DOE stockpile support planning.

The Stockpile Stewardship and Management PEIS discusses the relevant factors, such as treaties, that shape the NWSM. Also explained is the fact that

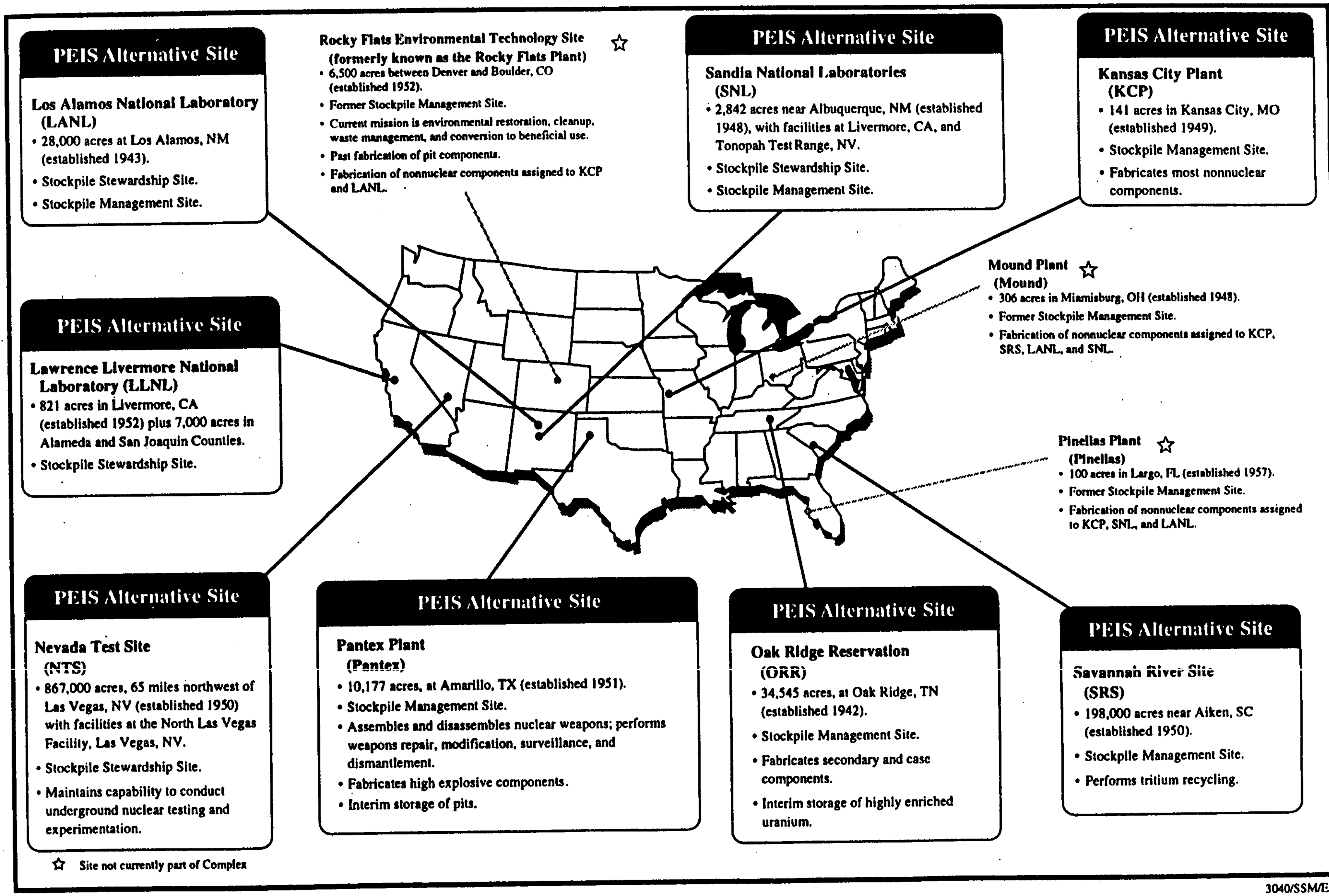


FIGURE S.1–1.—*Current Stockpile Stewardship and Management Sites (Includes Recent Consolidation of Three Former Sites)*.

potential variances in stockpile size, such as a Strategic Arms Reduction Talks (START) I Treaty-sized stockpile versus a START II protocol-sized stockpile, affect only the issue of manufacturing capacity required for the foreseeable future. National security policies in the post-Cold War era require that all the historical capabilities of the weapons laboratories, industrial plants, and NTS be maintained. Capability is the practical ability to perform a basic function or activity. Stockpile stewardship and management capabilities are independent of foreseeable future stockpile sizes. Stockpile management manufacturing capacities are examined in this PEIS, including those required to support a hypothetical low case stockpile size below START II. This was done to examine the sensitivity of potential decisions to transfer manufacturing activities to the weapons laboratories and NTS versus downsizing the industrial plants in place.

S.1.1 Background

A general understanding of nuclear weapons, including the components that make up a weapon and the physical processes involved, helps one understand the scope of the Stockpile Stewardship and Management PEIS and what is to be accomplished by the Stockpile Stewardship and Management Program. Figure S.1.1–1 presents a simplified diagram of a modern nuclear weapon. An actual nuclear weapon produced in the United States is much more complicated, consisting of many thousands of parts.

The nuclear weapon primary is composed of a central core called a pit, which is usually made of plutonium-239 and/or highly enriched uranium (HEU). This is surrounded by a layer of high explosives (HE), which when detonated, compresses the pit, initiating a nuclear reaction. This reaction is generally thought of as the nuclear fission "trigger," which activates the secondary assembly component to produce a thermonuclear fusion reaction. The remaining nonnuclear components consist of everything from arming and firing systems to batteries and parachutes. The production and assembly of many of these components is accomplished at dedicated industrial facilities. Assembly and disassembly (A/D) of nuclear weapons is done only at Pantex.

S.1.2 Alternatives Analyzed in this *Programmatic Environmental Impact Statement for Stockpile Stewardship and Management*

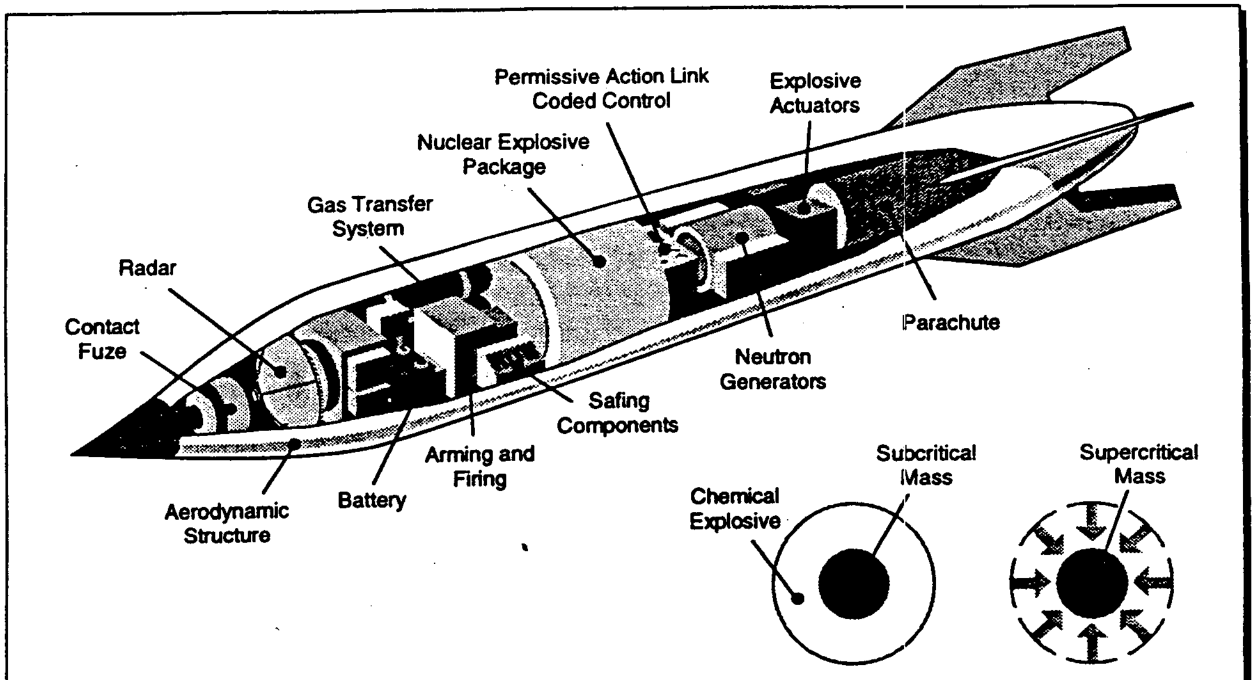
DOE must maintain a Complex with sufficient capability and capacity to meet current and future weapons requirements. For those activities associated with the ongoing stockpile stewardship program, DOE proposes to add enhanced capabilities to existing stockpile stewardship facilities to fulfill requirements. For those activities associated with the ongoing stockpile management program, DOE does not propose to construct any major new weapons industrial facilities. Rather, DOE proposes to "right-size" existing facilities or consolidate them to fulfill expected requirements for manufacture of repair or replacement components for an aging U.S. stockpile.

This PEIS addresses potential changes to the future missions of the three weapons laboratories, the four weapons industrial plants, and NTS. A No Action alternative is also described and analyzed. Figure S.1–1 shows the locations of the eight DOE sites comprising the current Complex. Tables S.3.2–1 and S.3.4–1 show the alternatives analyzed.

To estimate the potential environmental impacts from modifying/constructing and operating the facilities proposed for stockpile management, DOE assumes that facilities would be sized and operated to support a base case stockpile size consistent with the START II protocol. This PEIS also discusses impacts that would be expected for supporting a larger stockpile based on START I Treaty levels, and a hypothetical stockpile smaller than the START II protocol.

With regard to stockpile management facilities, potential environmental impacts from the base case are analyzed quantitatively in the greatest detail, while impacts from the high and low cases are discussed qualitatively. The facilities proposed for stockpile stewardship are independent of projected stockpile size.

The stockpile stewardship portion of this PEIS evaluates the potential environmental impacts of the proposed actions and the reasonable alternatives for carrying out the stockpile stewardship functions. As described in section S.2.4, the three independently



The diagram is a symbolic representation of the design elements of a nuclear weapon. None of the symbols represent actual designs.

Nuclear explosions are produced by initiating and sustaining nuclear chain reactions in highly compressed material which can undergo both fission and fusion reactions. Modern strategic, and most tactical, nuclear weapons use a nuclear explosive package with two assemblies: the primary assembly, which is used as the initial source of energy, and the secondary assembly, which provides additional explosive energy release. The primary assembly contains a central core, called the "pit", which is surrounded by a layer of high explosive. The "pit" is typically composed of plutonium–239 and/or highly enriched uranium (HEU), and other materials. HEU contains large fractions of the isotope uranium–235.

Primary Detonation

The primary nuclear explosion is initiated by detonating the layer of chemical high explosive that surrounds the "pit" which in turn drives the pit material into a compressed mass at the center of the primary assembly. This implosion process is illustrated in the inset of the diagram.

Boosting

In order to achieve higher explosive yields from primaries with relatively small quantities of pit material, a technique called "boosting" is used. Boosting is accomplished by injecting a mixture of tritium (T) and deuterium (D) gas into the pit. The deuterium and tritium are stored in reservoirs until the gas transfer system is initiated. The implosion of the pit along with the onset of the fissioning process heats the D-T mixture to the point that the D-T atoms undergo fusion. The fusion reaction produces large quantities of very high energy neutrons which flow through the compressed pit material and produce additional fission reactions.

Secondary Activation

The energy released by the primary explosion activates the secondary assembly. The secondary assembly is composed of lithium deuteride and other materials. As the secondary implodes, the lithium, in the isotopic form lithium–6, is converted to tritium by neutron interactions, and the tritium product in turn undergoes fusion with the deuterium to create the thermonuclear explosion.

Nonnuclear Components

Nonnuclear components include contact fuzes, radar components, aerodynamic structures, arming and firing systems, gas transfer system, permissive action link coded controls, neutron generators, explosive actuators, safing components, batteries, and parachutes.

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FIGURE S.1.1–1.—*Nuclear Weapons Design.*

justified proposed facilities include the National Ignition Facility (NIF), the Contained Firing Facility (CFF), and the Atlas Facility. Four sites (figure S.1–1) are potentially affected by the stockpile stewardship alternatives: Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), Sandia National Laboratories (SNL), and NTS (includes NLVF). This PEIS also assesses the No Action alternative of relying on existing experimental facilities and continuing the missions at these four sites to fulfill the stockpile stewardship mission.

The science-based stockpile stewardship program is expected to continuously evolve as better information becomes available and technological advances occur. Additional experimental facilities, such as the Advanced Hydrotest Facility (AHF), the High Explosives Pulsed Power Facility (HEPPF), the Advanced Radiation Source (ARS [X-1]), and the Jupiter Facility are considered to be next generation facilities that may be required in the future to support stockpile stewardship objectives. However, these facilities are not proposed actions in this PEIS because they have not reached the stage of development and definition that is necessary for evaluation and decisionmaking.

The stockpile management portion of this PEIS evaluates the potential environmental impacts of the reasonable alternatives for carrying out the stockpile management functions. Alternatives are assessed for nuclear weapons A/D and for fabricating pit, secondary and case, HE, and nonnuclear components. Eight sites (figure S.1–1) are potentially affected: Oak Ridge Reservation (ORR), Savannah River Site (SRS), Kansas City Plant (KCP), Pantex Plant (Pantex), LANL, LLNL, SNL, and NTS. This PEIS also assesses the No Action alternative of relying on existing facilities and continuing the missions at the current sites to fulfill the stockpile management mission.

S.1.3 *National Environmental Policy Act* Strategy for Stockpile Stewardship and Management

This PEIS has been prepared in accordance with section 102(2)(c) of the *National Environmental Policy Act* (NEPA) of 1969, as amended (42 U.S.C. 4321 et seq.), and implemented by regulations promulgated by the Council on Environmental Quality (CEQ) (40 CFR 1500-1508) and DOE regulations (10 CFR 1021). Under NEPA, Federal agencies, such as DOE, that propose major actions that could significantly affect the quality of the human environment are required to prepare an environmental impact statement (EIS) to ensure that environmental information is available to public officials and citizens before decisions are made and before actions are taken. For broad actions, such as the Stockpile Stewardship and Management Program, a PEIS is prepared.

DOE's NEPA compliance strategy for the Stockpile Stewardship and Management Program consists of two phases. The first phase includes the Stockpile Stewardship and Management PEIS and subsequent Records of Decision (ROD). Decisions will be based on relevant factors including economic and technical considerations, DOE statutory mission requirements, policy considerations, and environmental impacts. In addition to the analyses in this PEIS, engineering studies, cost, schedule, and technical feasibility analyses will be considered in the ROD. The ROD is expected to identify the effects of U.S. national security policy changes on Stockpile Stewardship and Management Program missions and determine the configuration (facility locations) necessary to accomplish the Program missions.

During the second phase of the NEPA strategy, which would follow the PEIS ROD, DOE would prepare any necessary project-specific NEPA documents to implement any programmatic decision. However, as explained below, this PEIS also includes project-specific environmental analyses for the experimental facilities proposed for stockpile stewardship.

For the three facilities in the proposed action for stockpile stewardship—NIF, CFF, and the Atlas Facility—the Stockpile Stewardship and Management PEIS is intended to include sufficient project-specific analyses to complete NEPA requirements for siting, construction, and operation, and thus, satisfy both phases of the NEPA compliance strategy. This PEIS supports the programmatic decisions on whether to proceed with the facility and, if so, where to site the facility. The project-specific analysis describes the detailed construction and operational impacts for each facility at the alternative sites. Each proposed facility's project-specific analysis can be found in Volume III of this PEIS.

S.1.4 Related Recently Completed *National Environmental Policy Act* Actions

Two other actions that DOE has already evaluated in separate EISs, in accordance with CEQ regulations for interim actions (40 CFR 1506.1), are within the scope of the Stockpile Stewardship and Management PEIS. These are the *Programmatic Environmental Impact Statement for Tritium Supply and Recycling* and the *Dual-Axis Radiographic Hydrodynamic Test* (DARHT) *Facility Environmental Impact Statement.*

The Tritium Supply and Recycling PEIS evaluated the potential environmental impacts associated with alternatives for siting, constructing, and operating tritium supply and recycling facilities. The purpose of the Tritium Supply and Recycling Program is to provide long-term, assured tritium supply and recycling to support the Nation's nuclear weapons stockpile. The Tritium Supply and Recycling Draft PEIS (DOE/EIS-0161) was issued in March 1995 and was followed by public hearings in April 1995. A Final PEIS was issued in October 1995, followed by the ROD published in the *Federal Register* (60 FR 63878) on December 12, 1995.

The DARHT Facility EIS analyzed the environmental consequences of alternative ways to accomplish enhanced high-resolution radiography for the purposes of performing hydrodynamic tests and dynamic experiments. These tests are used to obtain diagnostic information on the behavior of nuclear weapons primaries and to evaluate the effects of aging on nuclear weapons. The DARHT Facility's construction was about 34 percent complete when construction was halted under a U.S. District Court preliminary injunction issued on January 27, 1995, pending completion of the DARHT Facility EIS and issuance of the ROD. The DARHT Facility EIS evaluated the potential environmental impacts of six alternatives; the preferred approach entailed completing and operating the proposed DARHT Facility at LANL and implementing a phased enhanced containment strategy for testing at the DARHT Facility, so that most tests would be conducted inside steel vessels. The DARHT Facility Draft EIS (DOE/EIS-0228) was issued in May 1995 and was followed by public hearings in May and June 1995. A Final PEIS was issued in August 1995, followed by the ROD published in the *Federal Register* (60 FR 53588) on October 16, 1995.

In the ROD, DOE announced that it will complete and operate the DARHT Facility at LANL while implementing a program to conduct most tests inside steel vessels, with containment to be phased in over 10 years. Following the ROD, DOE filed a motion for dissolution of the injunction. On April 16, 1996, the U.S. District Court concluded that the purpose of the injunction had been satisfied, and therefore lifted the injunction and dismissed the case.

DOE will rely on hydrodynamic testing in the absence of underground nuclear testing to ensure the stockpile's safety and reliability. Under any course of action analyzed in this PEIS, DOE will still need to continue hydrodynamic testing and acquire near-term enhanced radiographic capability such as that provided by the DARHT Facility. DOE determined that implementing the DARHT Facility ROD will not prejudice any decisions in the Stockpile Stewardship and Management Program. The impacts of the DARHT Facility for each resource area are addressed in the No Action impact discussions for LANL in Volume I, section 4.6.3.

S.1.5 Other Department of Energy Ongoing *National Environmental Policy Act* Reviews

In addition to the two completed actions identified above, DOE is currently preparing other programmatic, project-specific, and site-wide NEPA documents. The following major documents have been determined to have potential cumulative effects for the sites being analyzed by this Stockpile Stewardship and Management PEIS, and are described in this PEIS and included in the analysis. This PEIS describes and includes in its analysis the ongoing alternatives being developed by the *Waste Management Programmatic Draft Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste*; the *Storage and Disposition of Weapons-Usable Fissile Materials Draft Programmatic Environmental Impact Statement*; the *Site-Wide Draft Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components*; the Site-Wide EIS for the Los Alamos National Laboratory; and the Site-Wide EIS for the Nevada Test Site.

In May 1994, when DOE announced its intention to prepare the Pantex Site-Wide EIS, DOE believed that the Pantex Site-Wide EIS ROD would precede decisionmaking on the long-term storage of pits by at least several years. Accordingly, the Draft Pantex Site-Wide EIS was scoped to address alternative locations for interim pit storage (i.e., until the long-term decisions were made and implemented).

Since May 1994, DOE has initiated two additional NEPA documents that address the storage of pits. This Stockpile Stewardship and Management PEIS will support decisions on the long-term storage of pits that will be needed for national security requirements (strategic reserve pits). The Storage and Disposition PEIS will support decisions on the long-term storage of all pits (strategic reserve and surplus) and the approach for dispositioning pits that are surplus to national security requirements.

Both of these PEISs have progressed to the point where they are scheduled to have their RODs issued by the Fall of 1996, at or about the same time as the ROD for the Pantex Site-Wide EIS, which is scheduled for November 1996. Therefore, DOE is proposing that so long as the RODs of both the PEISs and the Pantex Site-Wide EIS occur within a short period of time of one another, decisions on the long-term storage of pits would be made in the RODs of the PEISs. A decision relating to the interim storage of pits at Pantex would be made in the ROD of the Pantex Site-Wide EIS pending implementation of the selected long-term storage option.

However, if there is a significant delay in the RODs for either of the PEISs, or if DOE does not make a decision on the long-term storage of pits in those RODs, then there would be a need to make a decision on the location of interim storage of pits uninformed by a decision on long-term storage. In any event, the Pantex Site-Wide EIS will be completed with the analysis of interim storage alternatives, including addressing the issues and comments received from the public on that EIS, to support a decision relating to the storage of pits until a long-term storage decision has been made and implemented.

S.1.6 Public Participation

Public participation for this PEIS consisted of two primary activities: the scoping process and the public comment process. CEQ regulations require "an early and open process for determining the scope of issues to be addressed and for identifying the significant issues to be addressed and for identifying the significant issues related to a proposed action (40 CFR 1501.7)." This is usually called the public scoping process. Section 4.1 of the *Implementation Plan Stockpile Stewardship and Management Programmatic Environmental Impact Statement* (DOE/EIS-0236IP, December 1995) describes the scoping process. The following sections describe the public comment process on the Draft EIS.

S.1.6.1 *Public Comment Process on the Draft Programmatic Environmental Impact Statement*

In February 1996, DOE published the Stockpile Stewardship and Management Draft PEIS that evaluated the siting, construction, and operation of the proposed stockpile stewardship facilities and the modification/construction and operation of facilities proposed for stockpile management at eight alternative sites within the Complex. The 60-day public comment period for the Draft PEIS began on March 8, 1996, and ended on May 7, 1996. However, late comments were accepted to the extent practicable.

During the comment period, public hearings were held in Los Alamos, NM; Albuquerque, NM; Las Vegas, NV; Oak Ridge, TN; Kansas City, MO; Livermore, CA; Washington, DC; Amarillo, TX; Santa Fe, NM; and North Augusta, SC. Five of the public hearings were joint meetings to obtain comments on both the Stockpile Stewardship and Management PEIS and the Storage and Disposition PEIS. Two of the joint meetings (Pantex and SRS) also included the Pantex Site-Wide EIS. In addition, the public was encouraged to provide comments via mail, fax, electronic bulletin board (Internet), and telephone (toll-free 800 number). Figure S.1.6.1–1 shows the dates and locations of the hearings.

The public hearings held for the Draft PEIS were conducted using an interactive workshop-type format. The format chosen allowed for a two-way interaction between DOE and the public and encouraged informed public input and comments on the document. Neutral facilitators were present at the hearings to direct and clarify discussions and comments. Court reporters were also present to

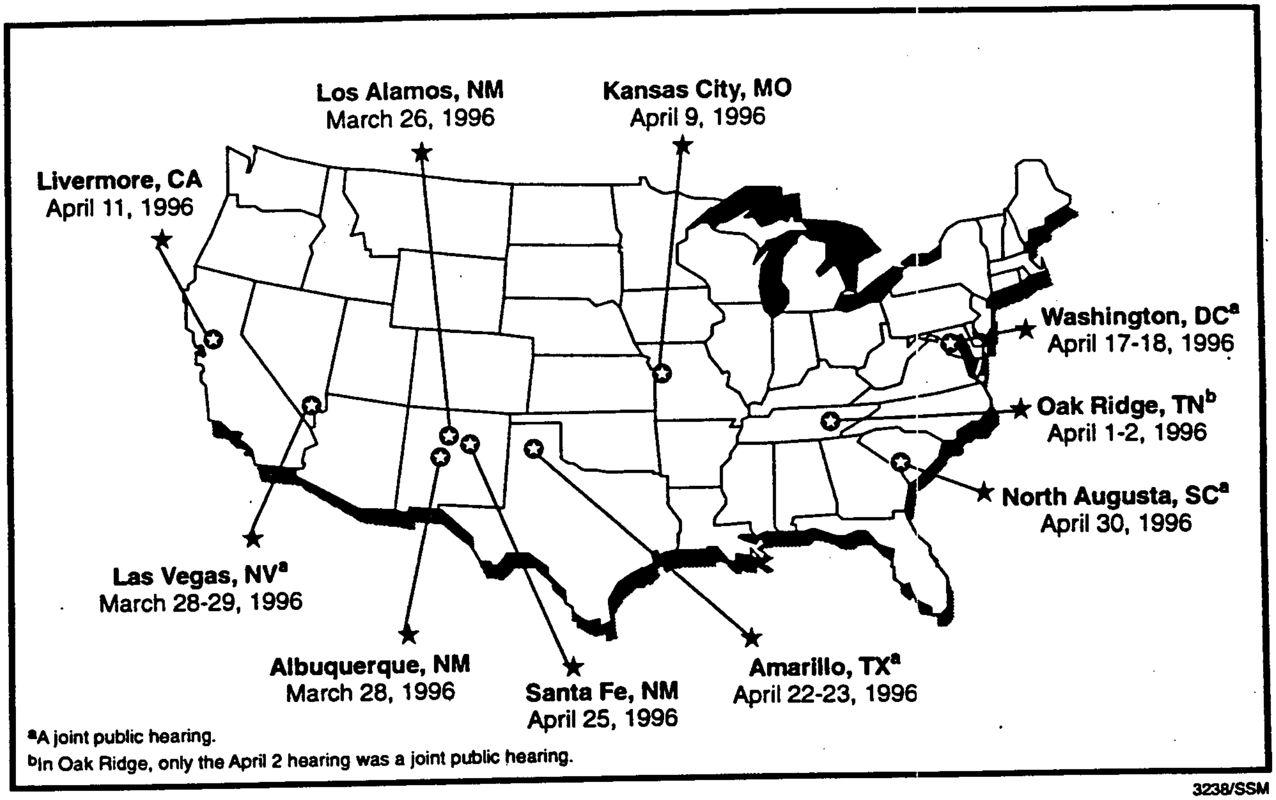


FIGURE S.1.6.1-1.—***Public Hearing Locations and Dates, 1996.***

provide a verbatim transcript of the proceedings and record any formal comments.

All public hearing comment summaries were combined with comments received by mail, fax, Internet, or telephone during the public comment period. Volume IV of this PEIS, the *Comment Response Document*, describes the public comment process in detail, presents comment summaries and responses, and provides copies of all comments received.

S.1.6.2 *Major Comments Received on the Draft Programmatic Environmental Impact Statement*

A large number of the comments received on the Draft PEIS related to concerns that the analysis of particular alternatives and/or alternative sites did not adequately consider such factors as cost and technical feasibility. Although these concerns made up the majority of the comments, many other comments related to the resources analyzed, NEPA and regulatory issues, and DOE and Federal policies as they related to the PEIS. The major issues identified by commentors include the following:

- The potential conflict between the Stockpile Stewardship and Management Program and the Nuclear Nonproliferation Treaty (NPT) goals, and the pursuit of a CTBT
- Using the funds allocated for the Stockpile Stewardship and Management Program for social programs and on research of alternative sources of energy
- The generation, storage, and disposal of radioactive and hazardous wastes and the associated risks
- The impacts of the alternatives on human health (both from radiation and hazardous chemicals) and how these risks were determined and evaluated
- The relationship of this PEIS to other DOE documents and programs, particu-

larly the Pantex and NTS Site-Wide EISs, the Waste Management and the Storage and Disposition PEISs, and the need to make decisions based on all associated programs and activities concurrently

- The need for decisions to be based on many different factors, including environmental, cost, and safety concerns
- The need for DOE to consider a zero-level stockpile, remanufacturing, and denuclearization as alternatives
- Maintaining deterrence with surveillance, curatorship, and remanufacturing without the need for the proposed facilities
- The need for DOE to adequately consider the ongoing stewardship programs
- The need for DOE to perform detailed analysis of future stockpile stewardship facilities.

All of the issues identified above are summarized and responded to in detail in chapter 3 of Volume IV. Substantial revisions to this PEIS resulting from public comments are discussed below.

Revisions in the Final PEIS include additional discussion and analysis in the following areas: alternatives considered but eliminated (section 3.1.2); the No Action alternative (appendix A "Stockpile Stewardship and Management Facilities," sections A.1.5, A.1.6, A.1.7, and A.1.8); socioeconomics at ORR, Pantex, and KCP; accident impacts at Pantex; normal operation impacts for radiological and chemical sections; cumulative impacts (section 4.13); and minor changes to LANL water resources section (4.6.2.4). A new section was also added to appendix F (section F.4, Secondary Impacts of Accidents). Each of these areas is discussed in more detail in the following section.

S.1.6.3 *Changes from the Draft Programmatic Environmental Impact Statement*

As a result of comments received on the Draft PEIS, several changes were incorporated into this PEIS. A brief discussion of the more significant changes is provided in the following paragraphs.

Alternatives Considered but Eliminated from Detailed Study and Related Issues. In response to public comments expressing a concern that DOE had not analyzed a reasonable range of alternatives, section 3.1.2 was expanded. The changes were in response to specific questions concerning compliance with treaties, stockpile size, maintenance and remanufacturing options, and the stockpile stewardship alternatives including No Action. The discussions in section 3.1.2 provide greater detail and more clarification on why alternatives were eliminated from detailed study in this PEIS. Together, chapter 2 and section 3.1.2 explain the framework and the constraints of national security policy that have shaped the proposed actions and reasonable alternatives for this PEIS.

No Action Alternative. Several commentors did not think that the No Action alternative was clearly explained in the Draft PEIS. More specifically, they were not sure which existing facilities at LANL, LLNL, SNL, and NTS were part of the ongoing stockpile stewardship program. As a result, the description of No Action was modified in appendix A to include a listing of major DOE Office of Defense Programs (DP) facilities at LANL, LLNL, SNL, and NTS. Additionally, the discussion of impacts of No Action at LANL (section 4.6.3) was revised as appropriate to include the effects of the DARHT Facility.

Socioeconomics at Oak Ridge Reservation, Kansas City Plant, and Pantex Plant. Based on public comments and revised workforce size estimates, the socioeconomic impact sections for the downsizing alternatives at ORR (section 4.2.3.8), KCP (section 4.4.3.8), and Pantex (section 4.5.3.8) have been revised. The analyses were also expanded to cover the base case single-shift options in greater detail. At these three sites, downsizing of existing facilities is the preferred alternative. For such downsizing, the base case single-shift scenario represents the bounding analysis for the workforce. The change in worker estimates did not cause any of the major indicators in the socioeconomic analysis to change in any significant manner.

Accident Impacts at Pantex Plant. The analyses of impacts due to an aircraft impact and the resulting release of plutonium by a fire or an explosion were modified to include more updated data on probability and source terms developed for the Pantex Site-Wide EIS. Section 4.5.3.9 and appendix sections F.2.1.1 and F.2.1.2 were revised to incorporate the new analytical results. Based on the updated data, the potential impacts and risks to the public from the composite accident presented in this PEIS would be less than previously reported in the Draft PEIS. This change was not significant.

Normal Operation Radiological/Chemical Impacts. The discussion of the normal operation radiological affected environment for LANL, section 4.6.2.9, has been updated to include the latest data from *Environmental Surveillance at Los Alamos During 1993* (LA-12973-ENV, October 1995). The normal operation radiological impact sections 4.2.3.9, 4.3.3.9, and 4.6.3.9 have also been revised to include the contribution of recent facilities at ORR, SRS, and the new environmental surveillance data for LANL. The chemical health effects, section 4.6.3.9 for LANL and section 4.7.3.9 for LLNL, were revised based on new analyses using updated dispersion rates. Tables in appendix section E.3.4 supporting these sections were also updated. The majority of these changes affected the No Action alternative analyses. None of the changes to these sections significantly changed the analysis of impacts for the "action" alternatives.

Cumulative Impacts. The cumulative impact section 4.13 has been modified to incorporate a discussion of normal operation radiological impacts and other changes based on more recent data from NEPA documents and RODs. The changes to this section did not have a meaningful effect on the analysis/comparative evaluation of alternatives.

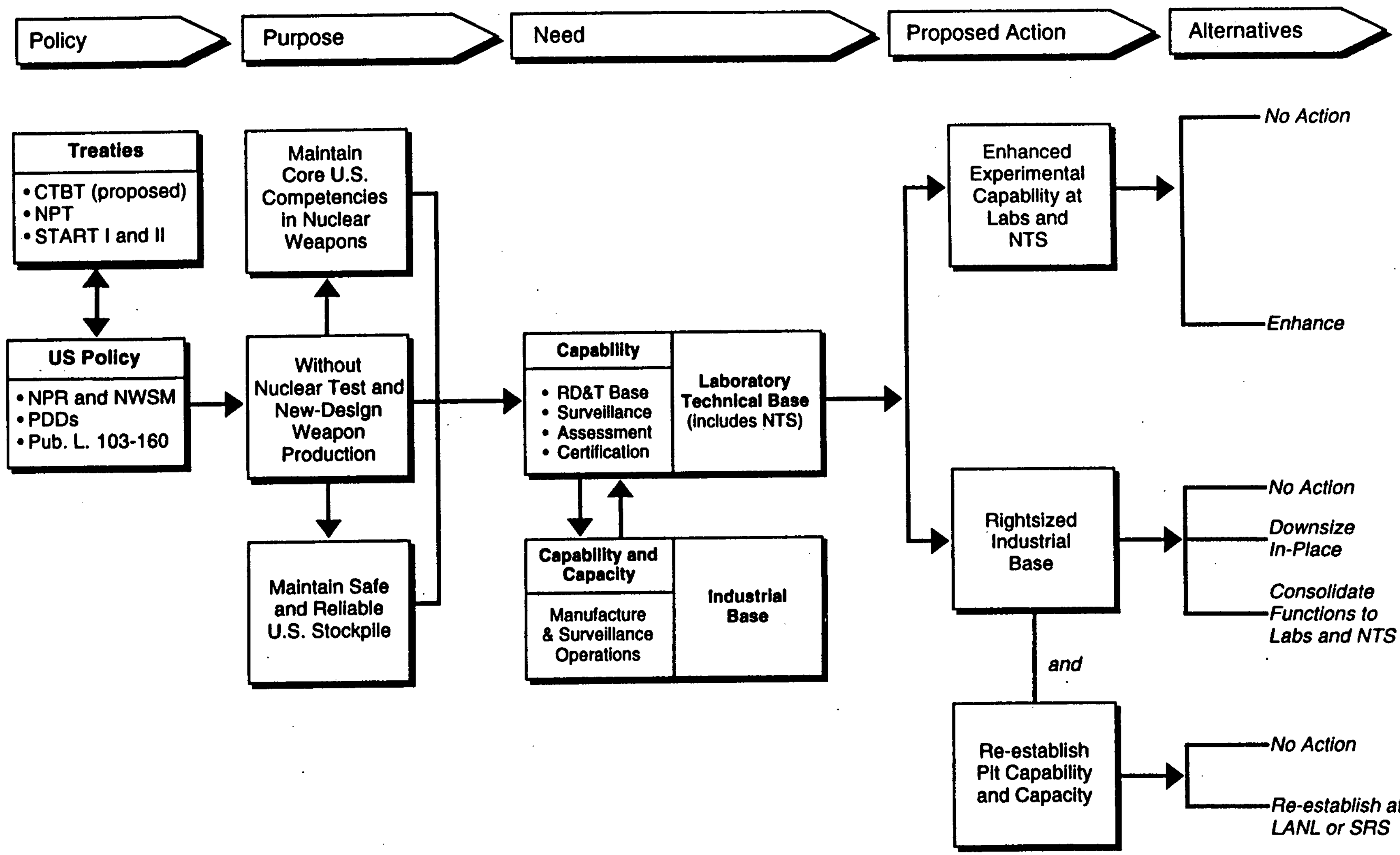
Los Alamos National Laboratory Water Resources. Changes were incorporated in section 4.6.2.4 (Water Resources) for LANL based on more recent water use and water quality data. The Draft PEIS had erroneously stated that the LANL water allotment would be fully used by about the year 2000. The Final PEIS correctly reports that this allotment would be fully used by about the year 2052. This change did not have a meaningful effect on the analysis/comparative evaluation of alternatives. Minor revisions reflecting the baseline changes, were also made to the LANL water resources impact section 4.6.3.4.

Health Effects Studies. Appendix section E.4, which outlines epidemiological studies at the alternative sites, was rewritten to provide more detail and incorporate more recent and other applicable studies. Although these epidemiology sections do not affect the environmental analysis of future stockpile stewardship and management missions, they do provide relevant information regarding potential health effects from past actions. These changes did not have a meaningful effect on the analysis/comparative evaluation of alternatives.

New Section. A new section has also been added to the Final PEIS (appendix section F.4, Secondary Impacts of Accidents). This section evaluates the secondary impacts of accidents that affect elements of the environment other than humans (e.g., farmland). The section was added because of public comments. The results of this analysis show that secondary impacts from accidents would generally not extend beyond site boundaries, except at Pantex and LLNL, where it is possible that some surface contamination could occur. This new analysis did not have a meaningful effect on the analysis/comparative evaluation of alternatives.

S.2 PURPOSE OF AND NEED FOR THE STOCKPILE STEWARDSHIP AND MANAGEMENT ACTION

The Stockpile Stewardship and Management Program is broad in scope and technically complex. The Program currently involves the integrated activities of three national laboratories, four industrial plants, and a nuclear test site. Further, the Program must be consistent with, and supportive of, U.S. national security policies, which have changed considerably since the end of the Cold War. Therefore, to better understand the Stockpile Stewardship and Management PEIS purpose, need, proposed action, and alternatives, it is useful to view the Program from two different perspectives. One perspective (see section S.2.1) is from the top level of national security policies for nuclear deterrence, arms control, and nonproliferation. These policies include ongoing responsibilities, strategies, and directives. The other perspective (see section S.2.2) focuses on the relevant technical efforts to maintain a safe and reliable U.S. nuclear weapons stockpile. Flow diagrams representing the logic of each perspective are included in figures S.2–1 and S.2–2.



Note: CTBT–Comprehensive Test Ban Treaty; NPR–Nuclear Posture Review; NPT–Nuclear Nonproliferation Treaty; NWSM–Nuclear Weapons Stockpile Memorandum; PDD–Presidential Decision Directive; RD&T–research, development, and testing.

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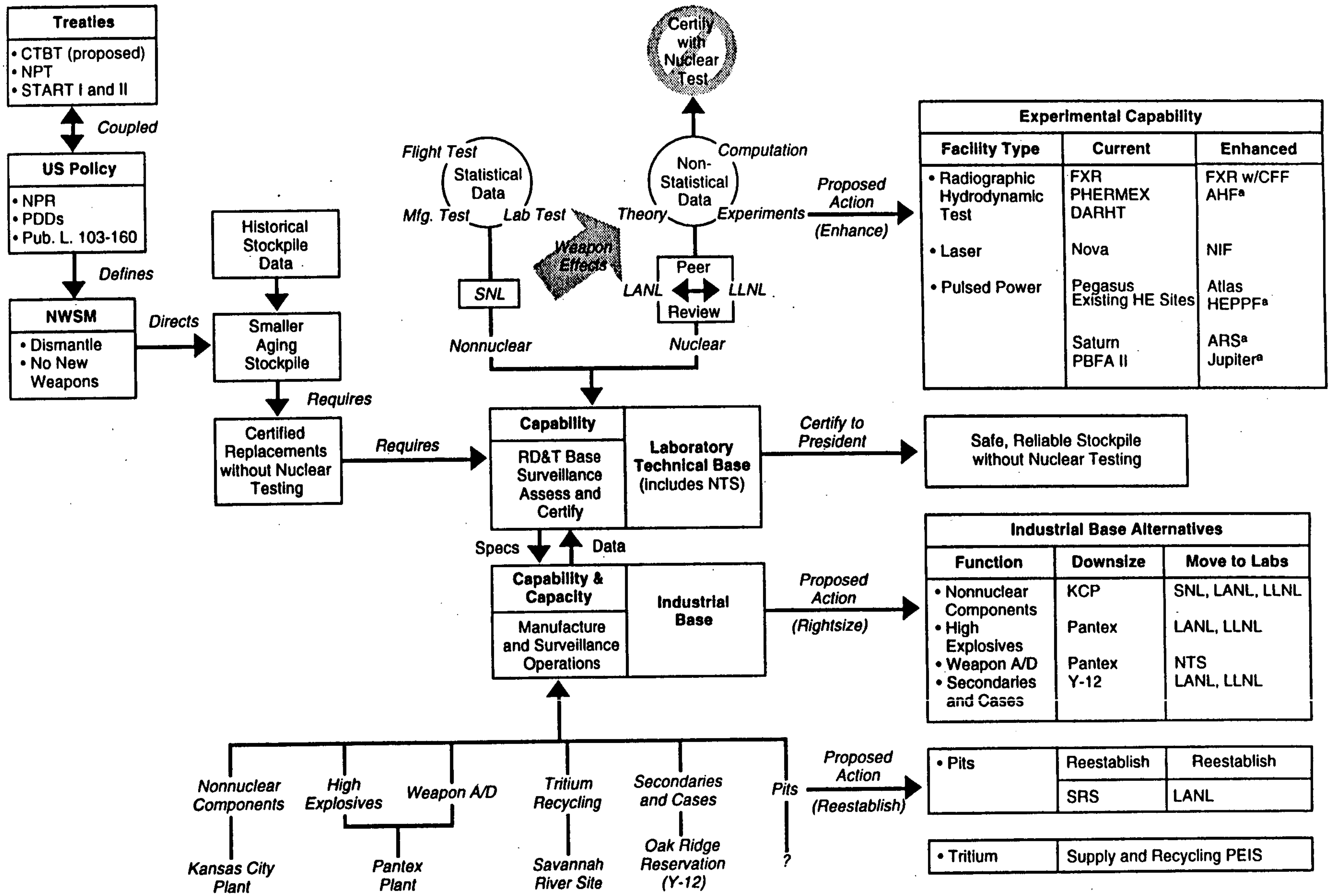
FIGURE S.2–1.—*Policy Perspective of the Stockpile Stewardship and Management Program.*



[a] Next generation, not proposed.

Note: A/D–Assembly/Disassembly; AHF–Advanced Hydrotest Facility; ARS–Advanced Radiation Source; CFF–Contained Firing Facility; CTBT–Comprehensive Test Ban Treaty; DARHT–Dual Axis Radiographic Hydrodynamic Test Facility; FXR–Flash X-Ray Facility; HE–High Explosives; HEPPF–High Explosive Pulsed Power Facility; NIF–National Ignition Facility; NPR–Nuclear Posture Review; NPT– Nuclear Nonproliferation Treaty; PBFA– Particle Beam Fusion Accelerator; PDD–Presidential Decision Directive; PHERMEX–Pulsed High-Energy Radiation Machine Emitting X-Rays (Facility); RD&T–Research, Development, and Testing.

FIGURE S.2–2.—*Stockpile Perspective of the Stockpile Stewardship and Management Program.*

S.2.1 National Security Policy Considerations

There are four principal national security policy overlays and four related treaties that define Program conditions for the reasonably foreseeable future. They are:

- Presidential Decision Directives (PDD)
- *National Defense Authorization Act of 1994* (Pub. L. 103-160)
- DOD Nuclear Posture Review (NPR)
- NWSM
- Proposed CTBT
- NPT
- START I Treaty
- START II protocol

Of the above, the START II protocol is the most useful in helping define a specific time period to bound the reasonably foreseeable future.

Nuclear Posture Review

Beginning in 1991, several Presidential policy decisions, some unilateral and some made in conjunction with international treaties, resulted in DOD conducting the comprehensive NPR, which was approved by the President in 1994. The NPR defines and integrates past and present U.S. policies for nuclear deterrence, arms control, and nonproliferation objectives. The unclassified NPR strategies that pertain to the Stockpile Stewardship and Management Program were presented at the eight public scoping meetings conducted in the summer of 1995. There was general public interest in understanding this complex issue, especially as it relates to treaties, policies, and stockpile size. A summary of how the post-Cold War treaties relate to the NPR strategies and the stockpile follows.

Strategic Arms Reduction Talks. The NPR assumes that the START I Treaty and START II protocol will be fully implemented. However, since the START I Treaty is not yet fully implemented and the START II protocol is not scheduled to be fully implemented until 2003, the NPR strategy protects the U.S. option to reconstitute the stockpile to START I levels should unfavorable events occur in the former Soviet Union. The treaties only control the number of strategic nuclear weapons that can be loaded on treaty-specified and -verified strategic missiles and bombers. These nuclear weapons are limited to 6,000 by the START I Treaty and 3,500 by the START II protocol. The treaties do not control the total stockpile size or the composition of strategic and nonstrategic nuclear weapons of either side. The U.S. stockpile will be larger than 6,000 under START I and 3,500 under START II since the stockpile also includes retaining weapons for nonstrategic nuclear forces, DOD operational spares, and spares to replace weapons attrited by DOE surveillance testing. In the START II case, the stockpile may also include retaining weapons to reconstitute to the START I level. However, the terms "START I-sized stockpile" and "START II-sized stockpile" are relevant to the Stockpile Stewardship and Management PEIS as explained in the discussion of the NWSM.

Comprehensive Test Ban Treaty. It is the declared policy of the United States to seek ratification of a "zero-yield" CTBT as soon as possible. The United States has been observing a moratorium on nuclear testing since 1992. The NPR strategy reflects this policy and the strategy has a significant effect on shaping the Stockpile Stewardship and Management Program. As explained in section S.2.2, it is anticipated that repairs or replacements to an aging U.S. stockpile will be needed. Assessment and certification of the safety and reliability of stockpile repairs or replacements without nuclear testing is a significant challenge to the Stockpile Stewardship and Management Program. In declaring the policy to seek a CTBT, the President also declared that the continued safety and reliability of the U.S. nuclear stockpile is a "supreme national interest" of the United States.

Nuclear Nonproliferation Treaty. Article VI of the NPT obligates the parties "to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control." However, the NPT does not provide any time period for achieving this goal. Even relatively simple bilateral treaties, such as START I and START II, require more than 10 years to implement, not counting the years of negotiations. In the words of Ambassador Thomas Graham, "Regrettably, none of us is clairvoyant, and so it is unwise to predict with any degree of precision the future international reality and consequently, the complete arms control agenda."[1] For the Stockpile Stewardship and Management PEIS, speculation on the terms and conditions of a "zero level" U.S. stockpile with international verification, as some have suggested during the scoping meetings, goes beyond the bounds of a reasonably foreseeable future. For the same reason, DOE has not chosen to speculate on a return of the nuclear arms race requiring a stockpile larger than START I size. However, in keeping with the NPT goals, the NPR strategy does express the U.S. intent to pursue further reductions in nuclear forces beyond START II. Therefore, the implications of further reductions below the START II-sized stockpile are discussed in this PEIS where they are relevant.

Nuclear Weapon Stockpile Memorandum

Although the NWSM is a classified document, its effect in shaping the Stockpile Stewardship and Management PEIS can be explained in an unclassified context. Without access to the classified NWSM, one might assume that the exact details of the projected stockpile size and composition under START I and START II could have a significant effect on the Stockpile Stewardship and Management PEIS. This is not the case for the following reasons:

- The stockpile composition (i.e., the number of different weapon types), does not vary significantly in either a START I- or START II-sized stockpile. All weapon types are tritium-boosted, thermonuclear weapons that could be affected by the same types of safety and reliability problems requiring repair, replacement, and certification in the absence of nuclear testing. The basic weapons laboratory and industrial capabilities required for the foreseeable future do not vary significantly from planned differences in size or composition of either a START I- or START II-sized stockpile.

- Industrial capacity is only indirectly affected by projected variances in stockpile size and composition. Stockpile size must be linked with historical stockpile data to arrive at estimates of average annual industrial capacity needed to produce components for repair or replacement. Even without the limitations on the use of historical stockpile data described in section S.2.2, this cannot be done with mathematical precision and therefore reasonable technical judgment must be applied. The result is to forecast a need for a smaller industrial base with capacities on a scale of hundreds of weapons per year versus the thousands of weapons per year that existed prior to the end of the Cold War. A range of annual requirements is considered for impact analysis in the Stockpile Stewardship and Management PEIS that bounds potential variances in the NWSM under the START II protocol. In addition, a qualitative sensitivity analysis is performed on the hypothetical low case that is well below the START II-sized stockpile projection and the high case associated with a START I-sized stockpile.

Presidential Decision Directives and Public Law

Over the past few years, there have been several publicly announced PDDs that have shaped the Stockpile Stewardship and Management Program. In the *National Defense Authorization Act of 1994* (Pub. L. 103-160), Congress acted to reinforce many of the same points. A summary of their effect in shaping the Stockpile Stewardship and Management PEIS follows:

- The continued maintenance of a safe and reliable nuclear weapons stockpile will remain a cornerstone of the U.S. nuclear deterrent for the foreseeable future.

- The core intellectual and technical competencies of the United States in nuclear weapons will be maintained. This includes competencies in research,

[1] From a January 1995 speech by Ambassador Graham, Special Representative of the President for Arms Control Non-Proliferation and Disarmament.

design, development, and testing (including nuclear testing); reliability assessment; certification; manufacturing; and surveillance capabilities.

- The United States will develop new ways to maintain a high level of confidence in the safety, reliability, and performance of its nuclear weapons stockpile in the absence of nuclear testing. The strategy for this action will be structured around the use of past nuclear test data in combination with enhanced computational modeling, experimental facilities, and simulators to further comprehensive understanding of the behavior of nuclear weapons and the effects of radiation on military systems.[2]

- The continued vitality of all three DOE nuclear weapons laboratories will be essential in addressing the challenges of maintaining a safe and reliable nuclear weapons stockpile without nuclear testing and without the production of new-design weapons.

S.2.2 Safety and Reliability of the United States Stockpile

This section focuses on the technical effects of national security policy decisions on shaping the purpose, need, proposed actions, and alternatives of the Stockpile Stewardship and Management Program. The stockpile is currently judged to be safe and reliable by DOE. National security policy changes will significantly change the characteristics of the future nuclear weapons stockpile and the manner in which it will need to be certified as safe and reliable.

Stockpile History

Since the beginning of the Cold War, the United States has maintained a nuclear deterrent force as safe and reliable as the evolution of military requirements and technology development would permit. A safe and reliable U.S. nuclear weapons stockpile has been a cornerstone of maintaining a credible nuclear deterrent. The size of the U.S. nuclear weapons stockpile peaked in the 1960s. In the 1970s, it was significantly reduced due to the easing of Cold War tensions with the former Soviet Union. In the late 1970s and through most of the 1980s, Cold War tensions with the former Soviet Union significantly increased and the U.S. nuclear deterrent force was modernized in response. However, the size of the U.S. nuclear weapons stockpile remained stable during the 1980s with the production of new-design weapons replacing dismantled weapons nearly one for one.

The beginning of the 1990s brought the collapse of the Warsaw Pact and the former Soviet Union and a significant effort to end the Cold War. During the first half of the 1990s, many changes occurred in U.S. policy and planning for its nuclear deterrent force. Much has already been accomplished, including the dismantlement, without replacement, of more than 8,000 U.S. nuclear weapons since the end of the Cold War; however, much more will need to be accomplished with the former Soviet Union over the next 10 years to stay the course. Large uncertainties remain concerning the nuclear weapons stockpile of the former Soviet Union, and it is the policy of the United States to protect its national security options for its nuclear deterrent, including the reconstitution of its nuclear forces. The following excerpt is from the President's national security strategy statement in July 1994:

> Even with the Cold War over, our Nation must maintain military forces that are sufficient to deter diverse threats ... We will retain strategic nuclear forces sufficient to deter any future hostile foreign leadership with access to strategic nuclear forces from acting against our vital interests and to convince it that seeking a nuclear advantage would be futile. Therefore we will continue to maintain nuclear forces of sufficient size and capability to hold at risk a broad range of assets valued by such political and military leaders.

Smaller, Aging Stockpile

Until recently there has been no reason to expect that weapons would remain in the stockpile longer than they have in the past. Continuous modernization to improve safety and reliability kept the stockpile

[2] The effects of radiation on nuclear weapons and military systems are referred to as "weapons effects" throughout this PEIS.

young as new-design weapon types replaced old ones. Now, with no new-design weapons being produced, the United States will have a steadily aging stockpile. The average age of the stockpile has never approached the typical lifetime specified in the weapon requirements (approximately 20 years for the most modern U.S. nuclear weapons). The average age of the stockpile is currently about 13 years. The NWSM forecasts the average age will now climb roughly 1 year per year and will reach the 20 year mark by 2005, at which time the oldest weapons will be about 35 years old.

Historical Stockpile Data

The following paragraphs describe the effects of historical stockpile data in shaping the Stockpile Stewardship and Management Program. This information was extracted from an unclassified report, *Stockpile Surveillance: Past and Future* (tri-laboratory report requested by DOE and issued as Sandia Laboratory Report, SAND 95-2751, September 1995), which was co-authored by the three weapons laboratories and is available to the public. The past role of nuclear testing is emphasized because such testing can no longer be relied on to provide unambiguous high confidence in the future safety and reliability of an aging stockpile.

Stockpile Evaluation Program.[3] Continuous evaluation of the safety and reliability of the stockpile has always been a major part of the U.S. nuclear weapons program. Since the introduction of sealed-pit weapons more than 35 years ago, a formal surveillance program of nonnuclear laboratory and flight testing has been in existence. More than 13,800 weapons have been evaluated in this program. The Stockpile Evaluation Program, with its reliance on functional testing, has provided information that can be used in the statistical analysis of nonnuclear component and subsystem reliability. This program has detected about 75 percent of all problems ultimately detected, and it has been the principal mechanism for discovering defects and initiating subsequent repairs and replacements. However, not all aspects of a nuclear weapon can be statistically assessed this way. Weapons research and development (R&D) at the three weapons laboratories and nuclear testing have played an important part in assessing the stockpile and in making corrective changes when needed.

Past Role of Nuclear Testing. Nuclear tests have been a critical part of the nuclear weapons program. They have contributed to a broad range of activities from development of new weapons to stockpile confidence tests to tests that either identified a concern or showed that remedial actions were not needed. However, the United States has not conducted a sufficient number of nuclear tests for any one weapon type to provide a statistical basis of reliability assessment for the nuclear explosive package. This is why the word "performance" instead of "reliability" is used when discussing a nuclear explosive package.

Although nuclear tests were never a part of the formal Stockpile Evaluation Program, they played an important role in maintaining the safety and performance of the weapons in the stockpile. Every advantage was taken of developmental nuclear tests to eliminate potential nuclear explosive problems. In some cases, nuclear testing during development of one weapon type uncovered a problem that was pertinent to a previous design already in the stockpile, which then had to be corrected. Nuclear tests identified certain classes of stockpile problems not observable in the surveillance program. Nuclear tests have been used to resolve issues raised by the Stockpile Evaluation Program, such as whether a particular corrosion problem affected the nuclear yield of a weapon. Nuclear tests have also been used to verify the efficacy of design changes. For example, the adequacy of certain mechanical safing techniques was determined through nuclear testing. In the case of a catastrophic defect, tests have been used to certify totally new designs to replace an existing design. Finally, in some cases, nuclear testing proved that a potential problem did not exist.

Beginning in the late 1970s, DOD and DOE agreed to a formal series of underground nuclear tests of weapons withdrawn from the stockpile. These tests were referred to as Stockpile Confidence Tests. They differed from developmental nuclear tests because the weapons were from actual production, had experienced stockpile conditions, and had minimal changes made to either nuclear or nonnuclear components prior to the test. There have been 17 such confidence tests since 1972, including 4 tests in the early 1970s that were not officially designated as Stockpile Confi-

[3] Other than in specific discussions, the word surveillance is used generically throughout this document in place of the Stockpile Evaluation Program.

dence Tests. Confidence tests have been conducted for each of the weapon types expected to remain in the stockpile well into the next century.

In addition to the 17 confidence tests, at least 51 additional underground nuclear tests have been conducted since 1972 involving nuclear components from the stockpile, components from the actual weapon production line, or components built according to stockpile design specifications and tested after system deployment. The objectives of these tests included weapon effects, weapons R&D, confirmation of a fix, or investigation of safety or performance concerns. Three of these tests (in addition to one confidence test) revealed or confirmed a problem that required corrective action. Four tests (in addition to three confidence tests) confirmed a fix to an identified problem. Additionally, five tests were performed to investigate safety concerns affecting three different weapon types. These five tests verified that a problem did not exist.

The confidence in the performance of the nuclear explosive package has been based on underground nuclear test data, aboveground experiments, computer simulations, surveillance data, and technical judgment. The directors of the three weapons laboratories must certify the nuclear performance of the weapons designed by their laboratory.

In a future without additional nuclear testing, the core capabilities of the weapons laboratories that were developed to eliminate potential problems in new weapon designs must now be employed to assess stockpile problems. However, in the absence of nuclear testing, the ability to assess nuclear components is more difficult; new methods of assessment, discussed later, will have to be developed to help compensate for this loss.

Stockpile Data Summary. The historical stockpile database includes more than 2,400 findings from more than 45 weapon types. Findings are any abnormal conditions pertaining to stockpile weapons, such as out-of-specification data. Findings are then investigated and assessed as to whether or not they are a problem. Excluding multiple occurrences of the same anomalous condition, table S.2.2–1 provides a summary of the distinct findings and actionable findings since 1958. Actionable findings are those that require some form of corrective action. All major components and subsystems have had problems that required corrective actions. The number of findings for nonnuclear components is much larger than that for nuclear components largely because there are so many more nonnuclear components in a nuclear weapon that require testing more frequently. However, the ratio of actionable findings to distinct findings is much greater for the nuclear components. Thus, when a finding has occurred for a nuclear component, it has generally been a serious one requiring corrective action. Often these corrective actions to nuclear components have required changes to all of the weapons comprising the weapon type affected.

For the nuclear explosive package, there were approximately 110 findings on 39 weapon types requiring some remediation either to the entire build of that design or to all weapons produced after the particular finding. In addition to rebuilds and changes in production procedures, other actions included imposing restrictions on the weapon, accepting a performance decrement, and in several cases, conducting a nuclear test to determine that the finding did not require any physical change. There have been other instances not counted as actionable where a material was chemically changing and the weapon was closely monitored to see if further action was necessary or it was an isolated case that did not require remediation.

Certified Repairs or Replacements will be Needed

Based on the age of the planned stockpile over the next 10 years, historical data would project an average of one to two actionable findings per year in

TABLE S.2.2–1.—*Summary of Distinct and Actionable Findings Since 1958*

Type of Components	Distinct Findings	Actionable Findings	
		Findings	Weapon Types
Nuclear	145	110	39
Nonnuclear	703	306	38

Source: SNL 1996a.

the planned stockpile and an average of one to two change proposals approved per year, with one of these resulting in a major change. Even with a START II-sized stockpile, one change can affect thousands of weapons. These projections are most likely minimum numbers. The stockpile they were derived from was, on average, younger than the planned stockpile will be in future years, and the number of components in the weapon types was less than the number of components in weapon types of the planned stockpile. Furthermore, the aging characteristics of some of the materials used in the weapon types remaining in the stockpile are not well understood.

The previous paragraphs describe how problems were identified in stockpile weapons during the period when nuclear testing and active weapons development were being conducted along with the Stockpile Evaluation Program. At the present time, with no anticipated new weapons and no nuclear testing, new approaches are needed to assess weapons for potential problems and anticipate aging concerns, especially in the nuclear explosive package. This is important because the smaller, less diverse U.S. stockpile will be more vulnerable to single-component and common-cause failures (i.e., failures or defects compromising the safety or reliability of, respectively, a single weapon system or several systems sharing a common design feature).

DOE will continue to rely on well-established methods while the weapons laboratories develop new methods of measurement and evaluation to address aging, safety, reliability, and performance issues. As the new methods mature for either nuclear or nonnuclear components, they will be incorporated into the Stockpile Evaluation Program. In the future, for example, DOE will rely on improved experimental capabilities, coupled with an improved computational capability, to address issues associated with the nuclear explosive package. These experimental capabilities, along with enhanced surveillance methods, are now crucial to help assess and predict the state of the stockpile and to provide long lead time information about incipient problems.

S.2.3 Purpose and Need

Broadly stated, changes to U.S. national security policies for nuclear deterrence now place two significant constraints on the way in which DOE has traditionally accomplished its statutory nuclear weapons mission:

- The United States has declared a moratorium on nuclear testing and will seek ratification of a "zero-yield" CTBT.
- The United States has stopped the development and production of new-design nuclear weapons.

With these constraints, U.S. national security policy directs DOE to:

- Maintain the core intellectual and technical competencies of the United States in nuclear weapons including:
  - Research, design, development, testing, reliability assessment, certification, manufacturing, and surveillance
  - All three nuclear weapons laboratories and the capability to resume nuclear testing if needed
- Maintain a safe and reliable U.S. nuclear weapons stockpile

The NPR, PDDs, and Pub. L. 103-160 all address the need to maintain the core competencies of the United States in nuclear weapons without nuclear testing. The NPR strategy adds the expectation of no new-design weapon production; therefore, the NWSM does not currently direct or forecast such a requirement.

The Stockpile Stewardship and Management Program must accomplish these fundamental purposes in a safe, efficient, and environmentally responsible manner. National security policies do not eliminate any of the current or historical core competencies and capabilities of the DOE weapons laboratories, industrial plants, or NTS. They are basic needs that must be maintained for the foreseeable future. These needs are summarized in a focused discussion of their relationship to the development of the PEIS proposed actions and alternatives. A classified appendix has also been prepared to support the PEIS.

Stockpile Stewardship—The Weapons Laboratories and Nevada Test Site

The three weapons laboratories possess most of the core intellectual and technical competencies of the United States in nuclear weapons. These competencies embody more than 50 years of weapons knowledge and experience that cannot be found anywhere else in the United States. Since the end of the Cold War, laboratory staffing in the weapons program has declined significantly due to the effects of policy changes on program and budget. Further significant reductions or consolidations of the weapons laboratories would counter efforts to maintain core competencies and to develop the new technologies necessary to ensure continued high confidence in a safe and reliable stockpile. Current stockpile activities in this regard, such as ongoing retrofits of enduring stockpile weapons and safe dismantlement of weapons no longer required, would also be hampered. For the foreseeable future it would be unreasonable to pursue an alternative course for the weapons laboratories. In addition, because there can be no absolute guarantee of complete success in the development of enhanced experimental and computational capabilities, the United States will maintain the capability to conduct nuclear tests under a "supreme national interest" provision in the anticipated CTBT. DOE will need to maintain the capability for nuclear testing and experimentation at NTS and the necessary technical capabilities at the weapons laboratories to design and conduct such tests.

The science and engineering technology base at the three weapons laboratories controls all DOE technical requirements for a U.S. nuclear weapon. The laboratories perform the basic research, design, system engineering, development testing, reliability assessment, and certification of nuclear performance. In addition, they provide or control all technical specifications that are used by the industrial base for manufacturing and surveillance operations and for maintenance operations conducted by DOD. Data from these operations are provided to the weapons laboratories for assessment and technical resolution of problems.

When stockpile problems develop, all of the core laboratory capabilities may come into play. The cause of the problem is identified and an assessment made of its impact on safety, reliability, or performance. If the problem is to be fixed, alternative solutions are developed. These can range from simple repair of a defective feature to complete redesign of the weapon component or subsystem.

The focus is always on the acquisition of relevant test data to make these judgments. Once a fix is determined, it must be designed, prototyped, and development tested by the laboratories before the design is released for manufacture. This generally includes weapon system-level laboratory and flight tests for nonnuclear features and, in the past, nuclear tests if the changes could affect the weapon's nuclear performance. If the fix is to be manufactured, the laboratories provide the quality assurance test specifications. For nonnuclear components, a significant amount of functional test data is acquired during manufacture and is used to begin building a statistical estimate of component reliability. Subsequent laboratory and flight testing in the surveillance program accumulates additional data that include the effects of aging and exposure to stockpile environments. Thus, over time, high confidence in the safety and statistical reliability of nonnuclear components and subsystems can be established.

The situation is not the same for nuclear components and the assessment of nuclear performance. Nuclear components cannot be functionally tested during manufacture or surveillance. The data acquired during manufacture only show that the component was manufactured as designed. Surveillance data indicate whether the component is changing as a result of aging or exposure to stockpile environments. Manufacturing and surveillance data can identify concerns, but these data do not provide all of the necessary information to assess nuclear performance. Assessment and certification of nuclear performance is a nonstatistical, technical judgment by the weapons laboratories based on scientific theory, experimental data, and computational modeling. The scientific practice of "peer review" has been fundamental to these judgments. Experts from the two nuclear design laboratories review each other's data and conclusions on important issues, thereby providing an independent check and balance.

In the past, nuclear testing filled the gaps in basic understanding of the complex physics phenomena; it provided high confidence in the certification of nuclear safety and performance. Without nuclear testing, science-based stockpile stewardship will focus on obtaining the more accurate scientific and experimental data that will be needed for more accurate computer simulations of nuclear performance. The new experimental data must also be validated against past nuclear test data. Assessment of stockpile problems and certification of repairs or replacements of nuclear components will have to rely on improvements to these tools. The existing tools were used in conjunction with nuclear testing and are inadequate if used alone.

From a broader national security perspective, the core intellectual and technical competencies of the weapons laboratories provide the technical basis for the pursuit of U.S. arms control and nuclear nonproliferation objectives. Their extensive core competencies have provided most of the nuclear weapons arms control technologies developed and employed by the United States. The weapons laboratories will have to continue to provide this essential service in the future. For the same reasons, the weapons laboratories also provide significant technical support for U.S. efforts on nuclear weapons nonproliferation and counter-proliferation programs.

Stockpile Management—The Industrial Base

None of the manufacturing and surveillance capabilities of the current industrial base can be eliminated on the basis of the post-Cold War changes in national security policies. The industrial base also possesses core competencies, such as manufacturing product, process, and quality control know-how. However, with a smaller stockpile and no new-design weapons production, industrial capacity can be reduced to meet anticipated manufacturing requirements for stockpile repair and replacement activities. A summary discussion of each of the major functions needed is provided in this section.

Broadly stated, there are six major manufacturing and surveillance functional areas in the weapons industrial base:

- Weapon A/D
- Pit components
- Secondary and case components
- HE components
- Nonnuclear components
- Tritium supply and recycling

As explained in section S.1.4, tritium supply and recycling was evaluated in a separate PEIS.

Weapon Assembly/Disassembly. Pantex is the only DOE site currently authorized to assemble or disassemble stockpile weapons. Special facilities built to explosives safety criteria are required; in addition, some facilities are designed to limit nuclear material dispersal in case of an HE accident. These facilities exist in large numbers at Pantex, and because they are relatively discrete structures, downsizing-in-place is a viable alternative. NTS has a much smaller set of these special structures that were constructed for use in assembling nuclear test devices. However, NTS has few of the support facilities required for volume assembly or disassembly of stockpile weapons. A major programmatic consideration is the cost of re-creating facilities that already exist at Pantex. Due to ongoing weapon dismantlement requirements, the alternative to transfer this function to NTS would be slow but achievable within a 10-year period.

Pit Components. These components are designed by LANL and LLNL and were formerly produced at the Rocky Flats Plant, which is no longer available for this function. The LLNL facility is not large enough to accommodate both stewardship and management activities; therefore, only LANL is considered to be a reasonable alternative if this function is reestablished at a weapons laboratory. Also, LANL has the more extensive and complete plutonium facility infrastructure. SRS is also considered a viable alternative for reestablishing this function because it has a plutonium processing infrastructure, although it does not have a precision component manufacturing capability. Other than the synergism with maintaining core competencies at the weapons laboratories, a major program consideration would be the scale of manufacturing capacity required for the foreseeable future.

The preceding discussion applies to new pit fabrication as well as both intrusive and nonintrusive modification pit reuse manufacturing capability and capacity. Intrusive modification pit reuse requires handling and processing of the plutonium internal to the pit. Nonintrusive modification pit reuse involves the external features of the pit and does not require an extensive plutonium infrastructure; the risk of contamination and the generation of radioactive waste is very low for nonintrusive modification activities. Therefore, the weapons A/D Facility is also an alternative for nonintrusive modification pit reuse.

Secondary and Case Components. The Y-12 Plant (Y-12) at ORR produces the secondary and case components. These components are designed by LANL and LLNL; therefore, each of those facilities would be reasonable alternative sites if this function is transferred to the weapons laboratories. Both of these laboratories have a uranium technology base and facility infrastructure, although they have only a very limited R&D manufacturing capability. Other than the synergism with maintaining core competencies at the weapons laboratories, a major program consideration would be the cost of transferring product technologies and the re-creation of capital facilities that already exist at Y-12. Due to the complicated nature of nuclear facilities and plans for retrofit of an enduring stockpile weapon involving these components, a transition to either LANL or LLNL would be slow but achievable within a 10-year period. Downsizing Y-12 is considered to be a reasonable alternative.

High Explosive Components. Pantex currently manufactures HE components in special facilities built to explosives safety criteria. Downsizing the facilities at Pantex is a reasonable alternative. Comparable facilities also exist at both LANL and LLNL, and either laboratory has sufficient capacity to meet estimated future manufacturing requirements. Costs for this function are relatively low in any case. If a decision is made to transfer this function to the weapons laboratories, it could be done more quickly than the transfer of other functions. However, Pantex would have to retain disposition and disposal capability for the HE inventories currently onsite and those expected from near-term weapon dismantlement. A major program consideration would be the synergism of this function in maintaining the core competencies of the weapons laboratories.

Nonnuclear Components. KCP currently manufactures the majority of the nonnuclear components. The KCP facilities are not unique in structural design and are amenable to downsizing in place. The manufacturing technologies are complex and varied due to the large number of component types and high reliability requirements. SNL designs most of the components that KCP manufactures; therefore, SNL would become the major nonnuclear component supplier if a decision is made to transfer this function to the weapons laboratories. Other than potential synergism with maintaining core competencies at the weapons laboratories, a major program consideration would be the cost of transferring product technologies and re-creating facilities that already exist at KCP. Requirements for ongoing support of the enduring stockpile would make this a slow transition, but it would be achievable within a 10-year period.

S.2.4 Proposed Action and Alternatives

All of the existing basic capabilities of the laboratory and industrial base continue to be needed even though there have been changes in national security policy since the end of the Cold War. These changes do not affect the standards for stockpile safety and reliability. Therefore, the proposed action concentrates on three major issues that result from the national security policies and constraints placed on the program. The three program elements of the proposed action are:

- Providing enhanced experimental capability
- Rightsizing the industrial base
- Reestablishing manufacturing capability and capacity for pit components

Reasonable alternatives for the proposed action are briefly discussed below. Section S.3 describes these alternatives in more detail.

Enhanced Experimental Capability

Understanding nuclear weapon performance requires knowledge of the performance of the individual elements: the primary (pit and HE), the secondary, and the functional interaction between the primary and the secondary inside the case. Computer model-based validation and certification will be the key to DOE's ability to determine, with confidence, many of the future safety and performance characteristics of the stockpile in the absence of nuclear testing. This requires two principal elements: advanced computational models and facilities to provide experimental data that can be used to adjust (normalize) the computational models in conjunction with past nuclear test data. DOE is proposing three facilities to complement the existing capabilities to provide these data. Two are new facilities and one is the upgrade of an existing facility.

NIF and the Atlas Facility are proposed new facilities. The Atlas Facility would be collocated in TA-35 with the existing Pegasus II Facility at LANL, and the two facilities would use common infrastructures and support facilities. CFF is a proposed environmental and diagnostic upgrade to the existing Flash X-Ray (FXR) Facility at LLNL. As described in section S.3.2, these three new facilities would perform separate functions and provide different types of experimental data. Thus, they are complementary in nature and are not alternatives to one another. In each case, the alternative to constructing and operating the facility is No Action (i.e., relying on existing facilities to provide data). In addition, site alternatives are evaluated for NIF, since it is not associated with an existing facility. Volume III of this PEIS contains project-specific analyses for each of these facilities.

The stockpile stewardship program is expected to continuously evolve as better information becomes available and technological advancements occur. DOE is in the early planning stages for a number of what can be described as "next generation" stewardship facilities. These facilities are discussed in section S.3.2. They will build on the knowledge gained from existing and proposed new facilities. Since these facilities are in the conceptual planning stages, they are not sufficiently defined to be analyzed in this PEIS. When these technologies reach the appropriate level so as to be ripe for decisionmaking, DOE would complete NEPA documentation for them.

Rightsizing the Industrial Base

One of the primary goals of stockpile management is to rightsize functions to provide an effective and efficient manufacturing capability for a smaller stockpile. Such rightsizing must be accomplished in a manner that preserves core competencies in manufacturing and surveillance. This PEIS analyzes two alternative approaches to rightsizing the stockpile management functions described in section S.2.3: (1) transfer manufacturing and surveillance activities from the industrial sites to the weapons laboratories and NTS and (2) downsize the industrial plants in place. Relocation alternatives were selected on the basis of existing technical and facility infrastructure at the laboratories and NTS. Section S.3.4 discusses these alternatives in more detail.

Reestablishing Manufacturing Capability and Capacity for Pit Components

Plutonium pit manufacturing is a special case among those stockpile management functions discussed in section S.2.3. In 1992, DOE ceased plutonium pit manufacturing operations at the Rocky Flats Plant due to concerns about the safety of the plant and national security policy decisions to cease the production of new-design nuclear weapons. Reestablishing pit manufacturing capability and capacity was to be part of the Reconfiguration PEIS. This function is now part of the proposed action in this Stockpile Stewardship and Management PEIS.

Pit manufacturing capability and capacity, like that of all other major weapons components and subsystems, is essential for protecting national security options with regard to the nuclear deterrent. In addition, repair or replacement of pits for existing stockpile weapons may be required in the future. Reasonable alternative sites for reestablishing this function were selected from sites that already possess some measure of the appropriate technical or facility infrastructure.

S.2.5 Nonproliferation

On August 11, 1995, the President announced his commitment to seek a "zero-yield" CTBT. He also established several safeguards that condition the U.S. entry into a CTBT. One of these safeguards is the conduct of science-based stewardship, including the conduct of experimental programs. This safeguard will enable the United States to enter into such a treaty while maintaining a safe and reliable nuclear weapons stockpile consistent with U.S. national security policies.

One benefit of science-based stockpile stewardship is to demonstrate the U.S. commitment to NPT goals; however, the U.S. nuclear posture is not the only factor that might affect whether or not other nations might develop nuclear weapons of their own. Some nations that are not declared nuclear states have the ability to develop nuclear weapons. Many of these nations rely on the U.S. nuclear deterrent for security assurance. The loss of confidence in the safety or reliability of the weapons in the U.S. stockpile could result in a corresponding loss of credibility of the U.S. nuclear deterrent and could provide an incentive to other nations to develop their own nuclear weapons programs.

The United States has halted the development and production of new-design nuclear weapons. The experimental testing program will be used to assess the safety and reliability of the nuclear weapons in the remaining stockpile. Much of this testing is classified and could not lead to proliferation without a breach of security. Use of classified data from past U.S. nuclear tests is also a vital part of the overall process for validation of new experimental data. Most of the component technology used for the proposed enhanced experimental capability is unclassified and is available in open literature, and many other nations have developed a considerable capability.

Proliferation drivers for other states, such as international competition or the desire to deter conventional armed forces, would remain unchanged regardless of whether DOE implemented the proposed action analyzed in this PEIS. In the NPT, the parties agree not to transfer nuclear weapons or other devices, or control over them, and not to assist, encourage, or induce nonnuclear states to acquire nuclear weapons. However, the treaty does not mandate stockpile reductions by nuclear states, and it does not address actions of nuclear states in maintaining their stockpiles.

S.3 ALTERNATIVES

S.3.1 Development of Stockpile Stewardship and Management Program Alternatives

This PEIS evaluates the direct, indirect, and cumulative impacts associated with the Stockpile Stewardship and Management Program alternatives which are summarized in figure S.3.1–1. For the various alternatives, this includes evaluating the applicable impacts of new facility construction or existing facility modification. Also assessed are the operational impacts of long-term stewardship and management activities in support of the base case nuclear weapons stockpile, including transportation of materials and components between sites. This PEIS also provides a sensitivity analysis of differences, when applicable, from the base case alternatives for the high and low case stockpile. However, since it is expected that the annual workload may vary above and below the base case capacity assumptions, the base case is analyzed in the greatest detail.

Planning Assumptions and Basis for Analysis

In the Stockpile Stewardship and Management Program and in this PEIS, DOE will:

- Emphasize compliance with applicable laws and regulations and accepted industrial and weapons safety practices that safeguard the health of workers and the general public, protect the environment, and ensure the security of nuclear material and weapons

- Analyze alternatives that are consistent with, and supportive of, national security policies

- Maximize efficiency and minimize cost and waste consistent with programmatic needs

- Minimize the use of hazardous materials and the number and volume of waste streams consistent with programmatic needs through active pollution prevention programs and measures

DOE is currently preparing site-wide EISs covering continued operations for some of the alternative sites evaluated in the Stockpile Stewardship and Management PEIS. Some of the existing activities covered by these site-specific, site-wide EISs are similar to those of the No Action alternative of the Stockpile Stewardship and Management PEIS. Although the near-term analytical periods for these site-wide EIS analyses are different from that of the Stockpile Stewardship and Management PEIS, which is focused on long-term activities, the preparation of these documents has been closely reviewed and coordinated. As work on these site-wide EISs proceeds, their analyses will continue to be reviewed to ensure consistency. To the extent that the site-wide EIS analyses provide better information, such information has been incorporated. In the preparation of the Stockpile Stewardship and Management Final PEIS, any updated information relating to the sites' affected environment was reviewed and appropriate changes

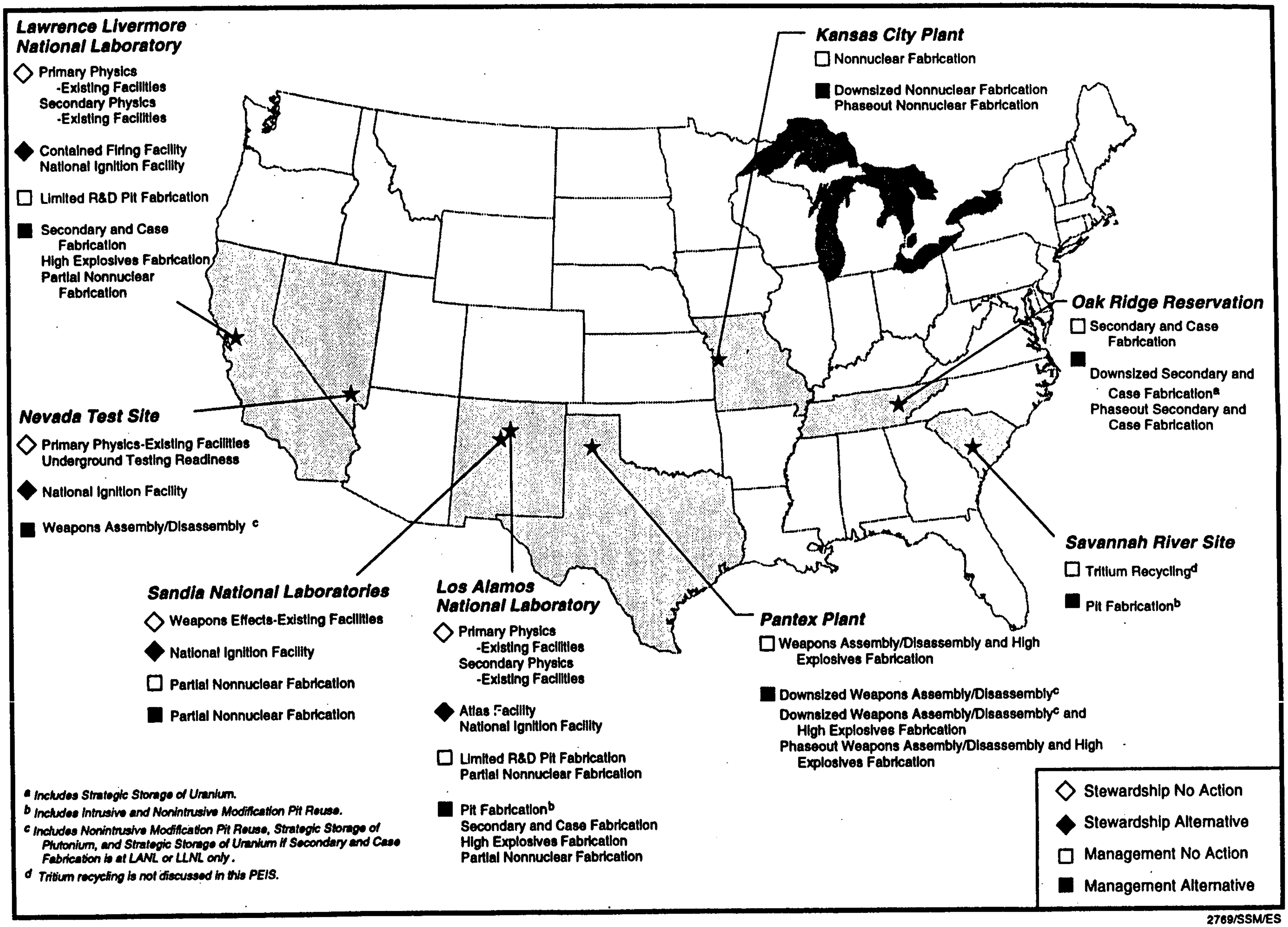


FIGURE S.3.1–1.—*Nuclear Weapons Complex Sites and Stockpile Stewardship and Management Alternatives.*

were made if new information could potentially change results of the impact analyses.

DOE has developed several planning assumptions as the basis of analyses presented in this PEIS. These considerations are summarized below.

No Action Alternative Assumptions

- The No Action alternative for this PEIS is defined in a way that takes into account the fact that DOE for decades has had in place a program for the stewardship and management of the nuclear weapons stockpile. Consistent with CEQ guidance, the No Action alternative consists of those facilities necessary to maintain the status quo in terms of DOE's current program direction. These consist primarily of existing facilities where DOE currently conducts weapons activities, including modifications to those facilities necessary to maintain their current mission capabilities. However, the No Action alternative also includes a small number of minor new facilities that will also be needed simply to maintain current mission capabilities at individual sites. Finally, the No Action alternative includes two major new facilities which are proceeding independent of this PEIS, and for which DOE has prepared separate EISs under the interim action provisions of the CEQ regulations. These EISs are the PEIS for Tritium Supply and Recycling (DOE/EIS-0161) and the EIS for the DARHT Facility (DOE/EIS-0228).

Stockpile Management Assumptions

- Base case stockpile size for the PEIS analysis is consistent with the START II protocol but larger than 3,500 weapons. This PEIS also analyzes a high and a low case stockpile size. The high case consists of maintaining the stockpile at a level consistent with the START I Treaty but larger than 6,000 weapons. The hypothetical low case is a stockpile of approximately 1,000 weapons.

- Impacts from construction, including modifying existing structures, and operation are evaluated. The period of construction or downsizing for each alternative varies; however, for analytical purposes, this PEIS assumes that operations would begin in 2005. A 25-year lifetime was evaluated for operations.

- For plutonium, strategic reserve storage is evaluated at Pantex and NTS. For HEU, strategic reserve storage is evaluated at ORR, Pantex, and NTS. (For purposes of this PEIS, DOE does not intend to move the strategic reserves of HEU to Pantex or NTS if ORR is chosen as the secondary and case fabrication site).

- This PEIS contains an analysis of low-consequence/high-probability accidents (evaluation basis) and high-consequence/low-probability accidents (beyond evaluation basis). A spectrum of both types of accidents is analyzed. For radiological accidents, impacts are evaluated for both the general population residing within an 80-kilometer (km) (50-mile [mi]) radius (including the maximally exposed individual) and for noninvolved workers in collocated facilities. The accident analyses in this PEIS are based upon facility conditions that are expected to exist in 2005. In some cases, facility conditions in 2005 may differ from current facility conditions due to design upgrades.

- Plutonium or uranium would not be introduced into a site that does not currently have a plutonium or uranium infrastructure because of the high cost of new facilities and the complexity of introducing plutonium or uranium operations to sites without current capabilities.

Stockpile Stewardship Assumptions

- The range of stockpile sizes used for analysis of manufacturing capacity-related issues for stockpile management functions is not applicable to stockpile stewardship functions. Capabilities are independent of stockpile size. Stockpile stewardship functions are basic capabilities.

- National security policy requires a safe and reliable stockpile without further nuclear testing and with an aggressive pursuit of enhanced experimental capabilities. Three stockpile stewardship facilities are proposed in this PEIS: NIF, CFF, and the Atlas Facility. These facilities are analyzed as supplements to the facilities and capabilities that currently exist for carrying out the stockpile stewardship mission. Each proposed facility is an independent component of the overall stockpile stewardship program, each has unique value, and, therefore, these proposed facilities are not competing alternatives.

- Assumptions regarding accident analysis are the same as described under stockpile management.

S.3.1.1 *Alternative Sites*

Eight locations (ORR, SRS, KCP, Pantex, LANL, LLNL, SNL, and NTS) are being considered as alternative sites for stockpile stewardship and management missions. All of these sites are currently performing DP activities.

Site Selection

One important strategy of the Stockpile Stewardship and Management Program is to maximize the use of existing infrastructure and facilities as the Complex transitions to be smaller and more efficient in the 21st century. Consequently, only those sites with existing infrastructure or facilities capable of supporting a given stockpile stewardship or stockpile management mission are considered reasonable site alternatives for detailed study in this PEIS. Sites without a technical infrastructure or facilities for a given mission would require significant new construction that would be costly and impractical compared to sites with existing infrastructure and facilities.

For stockpile stewardship, the three existing weapons laboratories (LANL, LLNL, and SNL) and NTS are being considered for new or upgraded stockpile stewardship facilities. This is because the weapons testing mission and stockpile stewardship have always been primary responsibilities of the weapons laboratories and NTS, and existing facilities and capabilities can be built upon to meet the stewardship mission.

Oak Ridge Reservation

ORR, located in Oak Ridge, TN, contains the Oak Ridge National Laboratory, Y-12, and the K-25 Site. DP assignments at ORR are performed at Y-12 and include maintaining the capability to produce secondaries and cases for nuclear weapons, storing and processing uranium and lithium materials and parts, dismantling nuclear weapon secondaries returned from the stockpile, and providing special production support to the DOE weapons laboratories and to other DOE programs.

Savannah River Site

SRS, located near Aiken, SC, contains fuel and target fabrication facilities, nuclear material production reactors, chemical separation plants used for recovery of plutonium and uranium isotopes, a uranium fuel processing area, and the Savannah River Technology Center. SRS is now conducting tritium-recycling operations in support of stockpile requirements using dismantled weapons as the tritium supply source.

Kansas City Plant

KCP, situated on the Bannister Federal Complex in Kansas City, MO, produces and procures nonnuclear electrical, electronic, electromechanical, mechanical, plastic, and nonfissionable metal components for the nuclear weapons program. KCP is currently the principal nonnuclear fabrication facility within the Complex.

Pantex Plant

Pantex, located northeast of Amarillo, TX, fabricates chemical HE for nuclear weapons, assembles and performs maintenance and surveillance of nuclear weapons in the stockpile, disassembles nuclear weapons being retired from the stockpile, and provides interim storage of plutonium components from dismantled weapons.

Los Alamos National Laboratory

LANL, located at Los Alamos, NM, is a multidisciplinary research facility engaged in a variety of programs for DOE and other Government agencies. Its primary mission is the nuclear weapons Stockpile Stewardship and Management Program and related emergency response, arms control, and nonproliferation and environmental activities. It conducts R&D activities including the basic sciences, mathematics and computing with applications to these mission areas and to a broad range of programs including: nonnuclear defense; nuclear and nonnuclear energy; atmospheric, space, and geosciences; bioscience and biotechnology; and the environment.

In regard to nuclear weapons, LANL is responsible for the design of the nuclear explosive package in certain U.S. weapons. In addition, since the end of the Cold War, LANL now conducts the pit surveillance program and some manufacturing of nonnuclear components due to termination of the nuclear weapons missions at the Mound, Pinellas, and Rocky Flats Plants.

Lawrence Livermore National Laboratory

LLNL, located at Livermore, CA, is a multidisciplinary research facility engaged in a variety of programs for DOE and other Government agencies. Its primary mission is the nuclear weapons stewardship program and related emergency response, arms control, and nonproliferation activities. It conducts R&D activities in the basic sciences, mathematics, and computing with applications to these mission areas and to a broad range of programs including: nonnuclear defense; nuclear and nonnuclear energy; atmospheric, space, and geosciences; bioscience and biotechnology; and the environment. In regard to nuclear weapons, LLNL is responsible for the design of the nuclear explosive package in certain U.S. weapons.

Sandia National Laboratories

SNL maintains facilities in three locations in the United States: Albuquerque, NM; Livermore, CA; and Tonopah, NV. The facilities discussed in this document refer only to the Albuquerque location which is located adjacent to the city of Albuquerque, NM. SNL is a multidisciplinary research and engineering facility engaged in a variety of programs for DOE and other Government agencies. Its primary mission is the nuclear weapons Stockpile Stewardship and Management Program and related emergency response, arms control, and nonproliferation activities. In addition, it conducts R&D activities in advanced manufacturing, electronics, information, pulsed power, energy, environment, transportation, and biomedical technologies.

In regard to nuclear weapons, SNL is responsible for the design of nonnuclear components and related system engineering. In addition, since the end of the Cold War, SNL now performs some nonnuclear manufacturing functions due to termination of the nuclear weapons mission at the Mound and Pinellas Plants.

Nevada Test Site

NTS occupies approximately 351,000 hectares (ha) (867,000 acres) in the southeastern part of Nye County in southern Nevada. NTS, located about 104 km (65 mi) northwest of Las Vegas, is a remote, secure facility that maintains the capability for conducting underground testing of nuclear weapons and evaluating the effects of nuclear weapons on military communications systems, electronics, satellites, sensors, and other materials.

North Las Vegas Facility. The North Las Vegas Facility (NLVF), located in the city of North Las Vegas, NV, supports DOE Nevada Operations Office and LANL, LLNL, and SNL weapons test programs, and is considered an adjunct to NTS.

S.3.2 Stockpile Stewardship

Historically, nuclear testing has provided unambiguous high confidence in the safety and reliability of weapons in the stockpile. Without additional underground nuclear testing, DOE must rely on experimental and computational capabilities, especially in weapons physics, to predict the consequences of the complex problems that are likely to occur in an aging stockpile. Without these enhanced capabilities, DOE will lack the ability to evaluate some safety and reliability issues, which could significantly affect the stockpile. It is also possible that, without these enhanced capabilities, DOE could not certify the acceptability of weapons components repaired or modified to address future safety or reliability issues. The nuclear weapons phenomena involved in enhanced experimental capability can be broadly grouped into three categories: physics of nuclear weapons primaries, physics of nuclear weapons secondaries, and weapons effects. Each of these categories are described below, as well as alternatives that are assessed in this PEIS. Table S.3.2–1 depicts the proposed alternatives and facilities under consideration for stockpile stewardship.

TABLE S.3.2–1.—*Stockpile Stewardship Enhanced Experimental Capability Alternatives*

Capability	LANL	LLNL	SNL	NTS
Physics of Nuclear Weapons Primaries				
No Action	X	X		X
Contained Firing Facility[a]		X		
Physics of Nuclear Weapons Secondaries[b]				
No Action	X	X		
National Ignition Facility[a]	X	X	X	X
Atlas Facility[a]	X			
Weapons Effects				
No Action[c]			X	

[a] Proposed facilities. Stockpile Stewardship and Management PEIS includes both a programmatic assessment and a project-specific analysis of these potential experimental facilities.
[b] Facilities used to investigate the physics of nuclear weapons secondaries may also be used to investigate some physics phenomena related to nuclear weapons primaries and weapons effects.
[c] No new facilities solely to investigate weapons effects phenomena are being proposed at this time.

Physics of Nuclear Weapons Primaries

With respect to the physics phenomena from the implosion of the primary, the experimental facilities provide physics validation, material behavior information, improved understanding of the implosion and the ability to assess age related defects. Proposed new facilities and site alternatives under consideration, along with the existing facilities which are part of the No Action alternative, are discussed below.

No Action. The principal diagnostic tools DOE currently uses to study nuclear weapons primaries are hydrodynamic tests and dynamic experiments. Under the No Action alternative, DOE would continue to use the hydrodynamic testing facilities currently available at LANL, LLNL, and NTS, and a new facility planned for LANL. The FXR Facility at LLNL Site 300 uses linear induction accelerator technology for high-speed radiography. The Pulsed High-Energy Radiation Machine Emitting X-Rays Facility has been in continuous operation at LANL since 1963, and uses a radio-frequency accelerator designed for high-speed radiography.

The DARHT Facility at LANL will consist of a new accelerator building with two accelerator halls to provide two perpendicular lines-of-sight which will enable two radiographic images to be captured simultaneously or sequentially and will provide a capability to perform three dimensional diagnostics of a simulated nuclear weapon primary. For the purposes of this PEIS, DOE includes the DARHT Facility in No Action as an existing facility at LANL because DOE has reached an independent decision to construct and operate the facility.

Besides LANL and LLNL, NTS has some hydrodynamic testing facilities in place (e.g., Big Explosive Experimental Facility [BEEF]). BEEF is used to study hydrodynamic motion associated with HE detonations.

Proposed Contained Firing Facility. Both LANL and LLNL are considered necessary for the continued development of a science-based stockpile stewardship program. In this regard, both laboratories will continue to utilize and improve radiographic hydrodynamic testing capability. The proposed CFF would augment and be collocated with the existing FXR Facility at LLNL Site 300. The containment enclosure would provide for containment of hydrodynamic tests and reduce the environmental, safety, and health impacts of current outdoor testing. The enclosure will also improve the quality of diagnostics data derived from testing by better controlling experimental conditions.

Physics of Nuclear Weapons Secondaries

The energy released by the fission of the nuclear weapons primary activates the secondary assembly, creating a thermonuclear (fusion) explosion. With respect to the phenomena of the physics from the thermonuclear explosion of the secondary, the experimental facilities provide improved understanding of thermonuclear ignition, secondary physics validation, and material behavior information. The proposed physics facilities and site alternatives under consideration are discussed below. Some of the facilities may also be useful for investigating physics phenomena related to nuclear weapons primaries and weapon effects. The capabilities that would be provided by the proposed NIF and the Atlas Facility are independent components needed to improve the understanding of the physics of nuclear weapons secondaries. Each proposed facility responds to a different diagnostic need related to nuclear weapons secondaries and they are not competing alternatives.

No Action. Few methods are currently available to study the physics of nuclear weapons secondaries. The principal facilities currently available are the Nova Facility at LLNL and the Pegasus II Facility at LANL. Without improvements to these capabilities, as proposed by the NIF and the Atlas Facility, DOE would lack the ability to evaluate some significant nuclear performance issues, which could adversely affect confidence in the Nation's nuclear deterrent.

Proposed National Ignition Facility. The proposed NIF would make it possible to study radiation physics in the laboratory close to the conditions which would approach that of a thermonuclear detonation. NIF would achieve higher temperatures and pressures, albeit in a very small volume, than any other existing or proposed stockpile stewardship facility. This facility could be located at either LANL, LLNL, SNL, or NTS.

Proposed Atlas Facility. The proposed Atlas Facility at LANL would be used for experiments that would contribute to the development of predictive capabilities related to the aging and performance of secondaries. This facility would build on existing special equipment at LANL.

Weapons Effects

One of the reasons for past underground nuclear testing has been to determine the effects of nuclear weapon radiation outputs of x rays, gamma rays, and neutrons on nuclear weapon subsystems and components. Existing facilities at SNL, such as the Saturn Facility or the Particle Beam Fusion Accelerator Facility, provide a limited capability to investigate these effects, and would continue to operate under No Action. No alternatives for new facilities designed principally for weapons effects testing are being proposed in this PEIS.

Next Generation Stockpile Stewardship Facilities

The science-based stockpile stewardship program will build upon existing information and capabilities. Thus, the program is expected to continuously evolve as better information becomes available and technological advancements occur. In fact, evolution is expected to be an integral part of the science-based stockpile stewardship program. While the proposed NIF, CFF, and Atlas Facility would provide improvements over existing capabilities, and are expected to be important components of science-based stewardship, they do not represent the entire science-based stewardship program that is envisioned for all time.

The next generation of stockpile stewardship facilities have not been defined to the degree necessary for decisionmaking. These anticipated facilities are AHF, HEPPF, ARS (X-1), and the Jupiter Facility. AHF would be a next generation radiographic hydrodynamic test facility featuring multiple pulse and multiple view diagnostic capability. HEPPF would provide experimental capabilities for studying secondary physics at shock pressures and velocities approaching those of actual weapons conditions. ARS (X-1) and Jupiter Facilities would be advanced pulsed-power x-ray sources that would provide enhanced experimental capabilities in the areas of weapons physics and weapons effects.

S.3.2.1 *Stockpile Stewardship Comparison of Alternatives*

To aid the reader in understanding the differences in environmental impacts among the various PEIS stewardship alternatives, this section presents comparisons of the alternatives, concentrating on the major resources assessed in this PEIS.

Proposed National Ignition Facility

The following comparisons have been summarized from the more-detailed comparisons for the NIF alternatives found in Volume III, appendix section I.3.5. The NIF project-specific analysis addresses the impacts of constructing and operating NIF at four alternative sites: LLNL (preferred), LANL, SNL, and NTS (includes NLVF). A No Action alternative is also assessed.

Under No Action, DOE would rely on existing aboveground experimental facilities, predominantly the

Nova Facility at LLNL, to study the physics of nuclear weapons secondaries. No construction impacts are associated with the No Action alternative and the operational impacts of the Nova Facility have been accounted for in the overall environmental baseline presented for LLNL.

For the action alternative, the analysis indicates that there would be few significant differences in environmental impacts at the candidate sites. The maximum 24-hour concentration of particulate matter 10 microns or smaller (PM_{10}) in the air during site clearing would exceed applicable standards at LLNL and NLVF. However, the ambient air quality impacts would be localized and of short duration. Uncommitted land requirements would be greatest at NTS (18.2 ha [45.0 acres]), although this acreage is less than 1 percent of the uncommitted land at NTS. Conversely, the least amount of uncommitted land that would be required for NIF would be 3.2 ha (7.9 acres) at NLVF. However, this acreage represents the largest percentage of uncommitted land at a candidate site (56 percent). Of greater significance would be the quality of the habitat of the uncommitted land that would be affected by NIF construction. The highest-quality habitats that would be affected would be forest (4.0 ha [9.9 acres]) at LANL or desert (18.2 ha [45 acres]) at NTS. At the other candidate sites, habitat disturbance would occur to grassland (LLNL and SNL) or to an area of sparse vegetation (NLVF). No significant biotic or cultural impacts are expected at any of the NIF alternative sites.

At each NIF alternative site, beneficial socioeconomic impacts associated with construction and operation would occur. During construction, 270 to 470 direct new jobs would be created in the peak year of activity. These direct jobs would create indirect jobs such that the total jobs during the peak year would be: 2,870 at LLNL; 1,130 at LANL; 1,640 at NTS; and 1,770 at SNL. Once operations begin, NIF would employ 330 direct workers. The total number of jobs (direct plus indirect) during operation would be 890 at LLNL, 600 at LANL, 620 at NTS, and 670 at SNL.

Over the 30-year operational life of NIF, the public would be exposed to a very small dose of radiation. No cancer fatalities would be expected to occur from exposures associated with routine NIF operations under either the Conceptual Design or Enhanced options. A radiological accident at NIF would not cause any cancer fatalities to the public except possibly at NLVF and SNL. Under postulated accident conditions, radiological impacts to the public and workers would be minor. The highest calculated radiation dose is 4,900 person-rem. At most, two cancer fatalities could occur if an accidental release occurred. Because of the extremely low accidental release frequency ($2x10^{-8}$/yr), the risk of radiation-caused cancer fatalities from the postulated accident at any site is essentially zero. The cancer fatality risk associated with radiological exposure from an accident involving the transport of NIF tritium targets would range from $1x10^{-8}$ to $8x10^{-10}$ fatalities per year, whereas the nonradiological fatality risks associated with vehicular emissions and accidents would be in the range of 10^{-3} to 10^{-4} fatalities per year.

Although each candidate site would implement waste minimization practices, the generation of additional wastes would be unavoidable. All candidate sites have current or planned capacity to handle wastes associated with construction and operation of NIF; however, this would entail offsite shipment of some of the wastes for all sites except LANL.

NIF would comply with all applicable Federal, state, and local environmental regulatory requirements, including the *California Environmental Quality Act* if NIF is sited in the state of California. Such compliance functions as a general form of mitigation. The candidate sites have also established several mitigative measures for construction actions that would also be applicable to NIF construction. While each of these mitigative measures may be minor, in combination they could significantly reduce impacts to the environmental resources of the selected site.

With regard to unavoidable impacts, land clearing and construction activities for NIF would eliminate habitat and destroy or displace wildlife. Construction of new facilities could result in short-term disturbances of previously undisturbed biological habitats. These disturbances could cause long-term reductions in the biological productivity of an area. Construction of NIF would replace natural habitat with areas of pavement and buildings. Depending upon the candidate site selected, this conversion could extend the influence of urbanized/industrial habitats into natural areas, increase fragmentation of natural habitat, and cause minor loss of habitat used by rare species. However, no critical habitat for Federal threatened or endangered species would be affected.

Radiological doses to the general public from NIF operation would be no more than 20 percent of the dose from all other candidate site operations and no more than one-millionth of the dose to the population from normal background radiation. NIF would be considered a low-hazard, radiological facility. Such a facility uses radionuclides (for nonreactor purposes) and has other hazards (such as chemicals needed at the facility). Low hazard implies that there are minor onsite and negligible offsite consequences.

Cumulative impacts would result from the addition of the incremental effects of the construction and operation of NIF to the effects of other past, present, and reasonably foreseeable future actions at the selected site. Fugitive dust emissions from construction of NIF would be an incremental addition to the already existing environmental impact of dust emissions to the atmosphere. Minor changes in stormwater runoff are expected due to removal of grass cover during NIF construction and increased runoff from pavement during facility operation.

Proposed Contained Firing Facility

The following comparisons have been summarized from the more-detailed information for CFF found in Volume III, appendix J.

Under No Action, DOE would rely on existing aboveground experimental facilities, predominantly the existing hydrotest facilities at LLNL, LANL, and NTS to study the physics of nuclear weapons primaries. No construction impacts are associated with those existing facilities, and the operational impacts of those facilities have been accounted for in the overall environmental baseline presented for LLNL, LANL, and NTS.

Because the proposal for CFF involves modification to the existing FXR Facility, construction impacts are expected to be small. Very little land would be disturbed and the construction activities would largely involve internal modifications to the existing facility. Wastes and socioeconomic impacts from construction would be negligible.

Impacts associated with operation would also be negligible. CFF would not utilize any significant quantities of resources, would not cause any significant socioeconomic changes at LLNL, and would not generate large quantities of hazardous or low-level wastes. LLNL has adequate existing waste management facilities to treat, store, and/or dispose of wastes that would be generated by CFF. Impacts to human health from CFF operation are expected to be extremely small and within regulatory limits.

Proposed Atlas Facility

The following comparisons have been summarized from the more-detailed information for the Atlas Facility found in Volume III, appendix K.

Under No Action, DOE would rely on existing aboveground experimental facilities, predominantly the Pegasus Facility at TA-35 at LANL, to study the physics of nuclear weapon secondaries. No construction impacts are associated with that facility, and the operational impacts from Pegasus have been accounted for in the overall environmental baseline presented for LANL.

Because the proposal for the Atlas Facility involves modification to the existing facilities within TA-35, construction impacts are expected to be small. Very little land would be disturbed and the construction activities would largely involve internal modifications to the existing facility. Wastes and socioeconomic impacts from modification activities would be negligible.

Impacts associated with operations would also be negligible. The Atlas Facility would not utilize any significant quantities of resources, would not cause any significant socioeconomic changes at LANL, and would not generate large quantities of hazardous or low-level wastes. LANL has adequate existing waste management facilities to treat, store, and/or dispose of wastes that would be generated by the Atlas Facility. Impacts to human health from Atlas Facility operations are expected to be small and within regulatory limits.

S.3.3 Underground Nuclear Testing

One of the primary purposes of the Stockpile Stewardship and Management PEIS is to evaluate ways of maintaining a continued safe and reliable nuclear deterrent in the absence of nuclear testing. Thus, the proposal described in this PEIS does not include nuclear testing. However, because it is possible—although not probable—that the United States might one day exercise its "supreme national interests" rights and conduct underground nuclear testing to certify the safety and reliability of its nuclear weapons, this PEIS and the NTS Site-Wide EIS include an analysis of the environmental impacts of underground nuclear testing at NTS.

S.3.4 Stockpile Management

Stockpile management comprises operations associated with producing, maintaining, refurbishing, surveilling, and dismantling the nuclear weapons stockpile. The individual stockpile management functions can be grouped into five major categories: weapons A/D, nonnuclear components fabrication, pit fabrication, secondary and case fabrication, and HE fabrication. Specific alternatives that would enable DOE to maintain its stockpile management responsibilities are shown in table S.3.4–1 and are discussed below.

Weapons Assembly/Disassembly Alternatives

Weapons A/D provides the capability to dismantle retired weapons, assemble nuclear and nonnuclear components into nuclear weapons, and perform weapons surveillance. In addition, the capability to conduct nonintrusive modification pit reuse would be a mission of the weapons A/D Facility. This alternative also includes an option to store strategic reserves of nuclear components (pits and secondaries).

The alternatives for A/D are: 1) to continue in current facilities at Pantex with only those changes that are currently scheduled and budgeted (No Action), 2) to downsize and consolidate facilities and operations at Pantex, or 3) to relocate operations to NTS.

No Action. The No Action alternative for these activities, except nonintrusive modification pit reuse, is presently located at Pantex. Current plutonium R&D

TABLE S.3.4–1.—*Stockpile Management Alternatives*

Capability[a]	Y-12	SRS	KCP	Pantex	LANL	LLNL	SNL	NTS
Weapons Assembly/Disassembly[b]								
No Action				X				
Downsize existing capability				X				
Relocate capability								X
Nonnuclear Fabrication								
No Action			X		X		X	
Downsize existing capability			X					
Relocate capability					X[c]	X[c]	X[c]	
Pit Fabrication and Intrusive Modification Pit Reuse[d]								
No Action[e]					X	X		
Reestablish capability		X			X			
Secondary and Case Fabrication[d]								
No Action	X[f]							
Downsize existing capability	X[f]							
Relocate capability					X	X		
High Explosives Fabrication								
No Action				X				
Downsize existing capability				X				
Relocate capability					X	X		

[a] Surveillance is included in all capabilities.
[b] Includes nonintrusive modification pit reuse and the option of strategic reserve storage of plutonium and HEU.
[c] KCP functions would be distributed among two or three of the laboratories.
[d] Staging and storage of working inventories of nuclear materials and components are included.
[e] Research and development capability only.
[f] Includes strategic storage of HEU reserve.

facilities at LANL and LLNL have limited capability and capacity to perform nonintrusive modification pit reuse.

Downsize at Pantex Plant. This alternative would downsize and consolidate facilities and operations including strategic reserve storage at Pantex. Downsizing of the A/D operation at Pantex could consist of an in-place decrease in facility footprint and relocation into modern, existing facilities, mostly within Zone 12. No new construction would be required at Pantex; however, relocation and reinstallation of equipment would be required.

Relocate to Nevada Test Site. This alternative is based on the use of the current Device Assembly Facility and balance of plant infrastructure available and required to maintain the capability for underground nuclear testing. Additional new construction would be required and would be designed and sized to meet the specific needs of the reduced program.

Nonnuclear Fabrication

Nonnuclear fabrication consists of the following general functions:

- Fabrication of electrical, electronic, electro-mechanical, and mechanical components (plastics, metals, and composites) and assembly of arming, fuzing, and firing systems
- Surveillance inspection and testing of nonnuclear components

The alternatives considered for nonnuclear fabrication include the No Action alternative of continuing in current facilities, downsizing and consolidating existing facilities at KCP, or closing KCP and sharing nonnuclear fabrication functions among LANL, SNL, and/or LLNL.

No Action. The No Action alternative for these activities is presently located at KCP, SNL, and LANL. KCP manufactures nonnuclear weapon components and conducts surveillance testing on and makes repairs to nonnuclear weapons components. SNL conducts system engineering of nuclear weapons, designs and develops nonnuclear components, conducts field and laboratory nonnuclear testing, manufactures some nonnuclear weapons components, and provides safety and reliability assessments of the stockpile. LANL also manufactures a few nonnuclear weapons components and conducts surveillance on certain nonnuclear weapons components.

Downsize at Kansas City Plant. The downsized nonnuclear fabrication alternative consists of three major factory segments designed around electronics, mechanical, and engineered materials product lines, procuring some components from outside sources, and reducing the KCP footprint for DP activities about 45 percent. This alternative consists of downsizing and consolidating existing facilities and would require facility modification but no new construction.

Relocate to Los Alamos National Laboratory. The basis for this alternative would be to use the existing infrastructure at LANL to provide for production requirements of the Complex. Nonnuclear fabrication missions considered for transfer to LANL include plastics, which might also be transferred to LLNL; detonator inert components and pilot plant; and reservoirs and valves, which might also be transferred to SNL.

Relocate to Lawrence Livermore National Laboratory. This alternative calls for LLNL to provide support for nuclear system plastic components that might also go to LANL. This alternative would build on LLNL's established plastics fabrication mission with no new facility construction required.

Relocate to Sandia National Laboratories. This alternative would transfer the majority of current KCP missions to the Albuquerque, NM facility of SNL, except for nuclear system plastic components which would go to either LANL or LLNL and high energy detonator inert components, which would go to LANL. In addition, there is the option of moving the reservoir mission to either LANL or SNL. This alternative would require construction of a new stand-alone production site at SNL, directly east of Technical Area I consisting of six new buildings and renovations or minor modifications to some existing buildings.

Pit Fabrication and Intrusive Modification Pit Reuse Alternatives

This capability, hereafter referred to as pit fabrication, includes all activities necessary to fabricate new pits, to modify the internal features of existing pits (intrusive modification), and to recertify or requalify pits. There are two alternative sites for pit fabrication: SRS and LANL. Nonintrusive modification pit reuse, which is an inherent capability of the Pit Fabrication Facility, includes the processes and systems necessary to make modifications to the external features of a pit, if necessary, and to recertify the pit for reuse in a weapon.

No Action. Under the No Action alternative, DOE would continue to use existing R&D capabilities at LANL and LLNL. LANL maintains a limited capability to fabricate plutonium components using its plutonium R&D facility and performs surveillance operations on plutonium components returned from the stockpile. In addition, less extensive capabilities would continue at LLNL to support material and process technology development.

Reestablish at Los Alamos National Laboratory. This alternative would reconfigure the Plutonium Facility at LANL to fulfill the pit fabrication mission and the intrusive modification pit reuse mission. This alternative would locate pit manufacturing in existing facilities within five technical areas. Existing equipment would be retained as much as possible, but some equipment would be upgraded.

Reestablish at Savannah River Site. This alternative would establish a pit fabrication and reuse facility at SRS within existing hardened facilities, but with new equipment and systems. Facilities are available at the SRS separation areas, F- and H-Area, which could house all the process functions required for the manufacture of plutonium pits. Pit fabrication would be located in Building 232-H and plutonium processing would be located in the F-Canyon facilities. New equipment and systems would be required for the Pit Fabrication Facility.

Secondary and Case Fabrication

The secondary and case fabrication mission includes all activities to support fabrication, surveillance, inspection, and testing of secondaries and components. Functional capabilities for these services include operations to physically and chemically process, machine, inspect, assemble, and disassemble secondary and case materials. Materials include depleted uranium, enriched uranium, uranium alloys, isotopically enriched lithium hydride and lithium deuteride, and other materials. Alternative sites considered for stockpile management secondary activities are ORR, LANL, and LLNL.

No Action. Under No Action, ORR would continue secondary and case fabrication. Y-12 maintains the capability to produce and assemble secondaries, cases, and related nonnuclear weapon components.

Downsize at Oak Ridge Reservation. This alternative would be based on downsizing the existing secondary and case fabrication facilities at Y-12 on ORR. The downsized facilities would only require approximately 14 percent of the existing Y-12 floor space and there would be no new facility construction at Y-12 to support the secondary and case fabrication mission. Modifications to the existing buildings would be required for implementation of the alternative secondary and case fabrication mission and to upgrade the buildings to meet natural phenomena requirements.

Relocate to Los Alamos National Laboratory. This alternative would establish a secondary and case fabrication capability using the processes proven at Y-12 and would use facilities in 11 existing buildings. Modifications to the LANL facilities would be required to perform the stockpile management secondary and case fabrication mission.

Relocate to Lawrence Livermore National Laboratory. This alternative would establish a secondary and case fabrication capability using the processes proven at Y-12, and would use facilities in existing buildings. The secondary and case fabrication facilities at LLNL would principally involve minor modifications to six buildings at the Livermore Site.

High Explosives Fabrication

The HE fabrication mission is described in two functional areas: HE main charge fabrication and small HE component fabrication. The HE fabrication mission includes activities needed to provide HE, binders, main charge formulations, initiation HE, and mock HE formulations.

The HE fabrication mission supports the production aspect of stockpile management and also supports HE surveillance and some stockpile stewardship activities.

No Action. Under No Action, Pantex would continue fabrication and surveillance of HE components for nuclear weapons. LANL and LLNL would continue to perform weapons HE R&D, surveillance, and HE safety studies.

Downsize at Pantex Plant. The Pantex HE fabrication alternative would downsize and consolidate current HE operations and facilities. Only minor modifications to existing facilities within Zones 11 and 12 would be required. This alternative would be considered only in conjunction with maintaining the weapons A/D mission at Pantex.

Relocate to Los Alamos National Laboratory. This alternative would transfer HE operations from Pantex to LANL. This alternative would use existing LANL R&D facilities, which have sufficient capacity for stockpile management requirements. There would be no new building construction and no significant modifications required.

Relocate to Lawrence Livermore National Laboratory. The LLNL HE fabrication alternative would transition HE fabrication activities from Pantex. The LLNL HE fabrication alternative would require construction of 1 new facility for storage of HE and would use 23 existing buildings, 66 existing magazines, and various utilities and services at Site 300.

Relocate to both Los Alamos National Laboratory and Lawrence Livermore National Laboratory. This option would involve splitting the mission between the two laboratories. Since its impact is bounded by the previous two options, this option is not analyzed further.

S.3.4.1 *Stockpile Management Comparison of Alternatives*

To aid the reader in understanding the differences in environmental impacts among the various PEIS management alternatives, this section presents comparisons of the alternatives, concentrating on the major resources assessed in this PEIS.

Assembly/Disassembly

In addition to the No Action alternative, two alternatives are being considered that would meet the needs of the Program: (1) downsizing the existing A/D facilities at Pantex and (2) transferring the A/D mission to NTS by expanding the Device Assembly Facility. Under No Action, the A/D mission would remain at Pantex. No downsizing or modification of facilities would occur, and there would be no construction impacts. Downsizing existing facilities at Pantex would involve internal modifications to the existing facility. Transferring the A/D mission to NTS would entail upgrading and expanding the Device Assembly Facility.

Socioeconomic Impacts. Because of the reduced workload associated with completing the weapon dismantlement backlog, significant employment reductions will occur at Pantex for all alternatives. There would be a decrease from the current total of 3,437 workers to about 1,644 workers. Of the current workforce, 3,002 are associated with A/D operations. Under No Action only 915 A/D workers would be required. The downsized Pantex facility would be optimally configured for the reduced future workload, and would operate more efficiently than the No Action Pantex facility. The downsized Pantex facility would require 800 workers for single-shift operation. To perform operations in the downsized Pantex facility in a three-shift mode, 1,266 workers would be required.

If the A/D mission were transferred to NTS, 1,093 direct jobs (based on three-shift operation) would be created at that site, along with 1,160 indirect jobs. The 2,253 total new jobs would cause the regional economic area unemployment rate to decrease by approximately 0.1 percent. Housing/rental vacancies and public finance expenditures/revenues would change by less than 1 percent. If the A/D mission were transferred to NTS, there would be socioeconomic impacts associated with phasing out the A/D mission at Pantex. The phaseout would result in 1,644 direct jobs lost at the Pantex site, and another 1,905 indirect jobs would be lost in the regional economic area. The loss of 3,549 total jobs would cause the regional economic area unemployment rate to increase from 4.8 to 6.2 percent. Housing/rental vacancies and public finance expenditures/revenues would change by less than 1 percent.

Socioeconomic impacts at NTS associated with a peak construction workforce of 662 would produce small positive economic benefits. The 662 direct workers would also generate 622 indirect jobs. The 1,284 total new jobs during peak construction would cause no change in the regional economic area unemployment rate. Housing rental vacancies and public finance expenditures/revenues would change by less than 1 percent.

Resource Impacts. Due to the reduced workload expected in the future at Pantex, impacts from operations are expected to be less than current impacts. Air quality would remain within regulatory limits, and water requirements would be met without increased aquifer drawdowns. In addition, downsizing existing facilities at Pantex would involve internal modifications to the existing facility. No land would be disturbed.

Transferring the A/D mission to NTS would entail upgrading and expanding the Device Assembly Facility, with associated increases in land disturbance. An estimated 7.5 ha (18.5 acres) of additional land would be disturbed, which is less than 1 percent of the land available at NTS for development. This land disturbance would increase the potential to impact cultural and biotic resources; however, the impact to cultural resources is not expected to be significant because the proposed A/D site has been previously disturbed during construction activities associated with the Device Assembly Facility. Impacts to biotic resources are expected to be minor; however, the presence of the desert tortoise at NTS would require a site survey to determine any impacts. With mitigation measures already in place at NTS to minimize impacts to the Federal-listed desert tortoise, significant impacts due to the proposed project are not expected.

Because both alternatives would utilize similar facilities, procedures, resources, and numbers of workers during operation, both alternatives would produce similar operational environmental impacts for most resource areas. Impacts to air quality were modeled, and results indicate minimal impacts for both alternatives. Water use for the NTS alternative is projected to be less than for the Pantex alternative because continued operations at Pantex would rely on existing, older, site-wide infrastructure. At both sites, water requirements could be adequately met without substantial aquifer drawdown. At Pantex, downsizing would reduce groundwater withdrawals by 21 percent compared to No Action. At NTS, water requirements to support the A/D mission would be approximately 4 percent more than projected usage. Groundwater withdrawals at NTS would be less than the recharge rates for the aquifer.

Radiation and Waste Management Impacts. The average radiological dose to workers at Pantex would not be expected to change, although the total worker dose would change due to the reduced number of workers associated with a reduction in workload. Worker exposure to radiation is expected to be about equal (approximately 10 mrem/year) for both alternatives and well within regulatory limits. Because of the small difference in the workforce for this mission at the two sites, this would result in a total worker dose of 3.0 person-rem/year at Pantex and 2.6 person-rem/year at NTS. The added risk to the workforce due to these levels of radiation exposure is extremely small.

Radiation exposure to the public from normal operation would be well within regulatory limits at both sites. At Pantex, the incremental dose to the population within 80 km (50 mi) would be $4.0x10^{-4}$ person-rem/year. At NTS, the incremental dose to the public within 80 km (50 mi) resulting from operation of the A/D Facility would be $3.1x10^{-6}$ person-rem/year. The added risk to the public due to these levels of radiation exposure is extremely small.

Both sites have adequate waste management facilities to treat, store, and/or dispose of wastes from the A/D mission, although LLW at Pantex would continue to be shipped offsite to NTS. The impacts of transporting LLW are similar to the impacts of transporting nonradiological materials, which are small. Transferring the A/D mission to NTS would eliminate the need to ship LLW from Pantex to NTS. Transferring the A/D mission to NTS by expanding the Device Assembly Facility would also increase the overall amount of eventual decontamination and decommissioning (D&D) activities and wastes.

Accident Impacts. Potential impacts from accidents would not be expected to change significantly due to reduced workload. Accident impacts were determined using computer modeling. For the composite accident, less than one fatal cancer would be expected for the surrounding 80-km (50-mi) population at either Pantex or NTS. Based on a weighted averaging of the postulated accidents, at Pantex there would be a statistical risk that one fatal cancer to a member of the public would result approximately every 43,000 years from accidents. At NTS, there would be a statistical risk that one fatal cancer to a member of the public would result approximately every 500,000 years from accidents.

Other. The A/D mission also includes an option to store strategic reserves of plutonium and/or uranium. At Pantex, which presently stores both strategic reserves and surplus quantities of plutonium, no additional facilities would be needed, and no significant new environmental impacts or risks would result. Storing the strategic reserve would not produce any additional air emissions, require any additional water withdrawals, generate any wastes, or require additional workers. At NTS, however, the Device Assembly Facility would be further expanded to accomplish the strategic reserve storage. The additional construction would have smaller impacts (less than 10 percent) than the construction associated with the Device Assembly Facility upgrade for the A/D mission. Radiation exposure to the public in the event of an accident would be significantly less than for the A/D mission for either alternative.

Pit Fabrication

For pit fabrication, a capability that no longer exists due to the closure of the Rocky Flats Plant, two alternatives are being considered that would reestablish this mission and meet the needs of the Program: (1) upgrading the existing plutonium R&D fabrication capability at LANL and (2) upgrading existing H-Area and F-Canyon facilities at SRS. Both alternatives involve relatively minor (though costly) upgrades to existing facilities. Under the No Action alternative, DOE would not reestablish this mission, but would rely on the existing R&D capabilities at LANL and LLNL.

Socioeconomic Impacts. During operation, both alternatives would have small positive socioeconomic impacts. Based on the socioeconomic modeling, impacts would be higher at SRS because of the indirect jobs that would be created due to this mission. Modeling results indicate no indirect jobs for this mission at LANL. At SRS, up to 813 direct jobs would be created for surge operations, along with 1,594 indirect jobs. These 2,407 total new jobs would cause the regional economic area unemployment rate to decrease from 6.7 to 6.0 percent. Housing/rental vacancies and public finance expenditures/revenues would change by less than 1 percent. At LANL, up to 260 new direct jobs would be created for surge operations, but no indirect jobs would be created. The 260 total new jobs would cause the regional economic area unemployment rate to decrease from 6.2 to 6.0 percent. Housing/rental vacancies and public finance expenditures/revenues would change by less than 1 percent. Because the SRS alternative has less of an infrastructure in place for plutonium fabrication, the SRS alternative would require more direct workers (288 versus 138) during construction. At both sites, however, the socioeconomic impacts during construction would not cause any socioeconomic indicator to change by more than 1 percent.

Resource Impacts. Construction activities would involve internal modifications to existing facilities, no land would be disturbed, and thus, no impacts to cultural and biotic resources would result. Because both alternatives would utilize similar facilities, procedures, resources, and numbers of workers during operation, both alternatives would result in similar operational environmental impacts for most resource areas. Impacts to air quality were modeled, and results indicate minimal impacts to air quality for both alternatives. Water requirements at SRS would be provided from surface water, which is plentiful, and no adverse impacts would be expected. At LANL, groundwater would be used. Water requirements for this mission, which would be less than 1 percent of projected No Action uses, could be adequately met without exceeding the groundwater allotment at LANL.

Radiation and Waste Management Impacts. Worker exposure to radiation is expected to be about equal for both alternatives and well within regulatory limits. At either SRS or LANL, the average workforce dose from this mission would be approximately 380 mrem/year. Because of a difference in workforce for this mission at the two sites, this would result in a total worker dose of 156 person-rem/year at SRS and 55 person-rem/year at LANL. Statistically, this would equate to one fatal cancer every 16 years at SRS, and every 45 years at LANL, from operation of the Pit Fabrication Facility. Radiation exposure to the public from normal operation would be well within regulatory limits at both sites. At SRS and LANL, the incremental dose to the public within 80 km (50 mi) would be 5.9×10^{-4} person-rem/year and 8.6x10^{-5} person-rem/year, respectively. The added risk to the public due to these levels of radiation exposure is extremely small. Both site alternatives have adequate existing waste management facilities to treat, store, and/or dispose of wastes that would be generated by this mission.

Accident Impacts. Potential impacts from accidents were determined using computer modeling. For the composite accident, less than one fatal cancer would be expected for the surrounding 80-km (50-mi) population at both SRS and LANL. Based on a weighted averaging of the postulated accidents, at SRS there would be a statistical risk that one fatal cancer to a member of the public would result approximately every 360,000 years from accidents. At LANL, there would be a statistical risk that one fatal cancer to a member of the public would result approximately every 160,000 years from accidents.

Secondary and Case Fabrication

In addition to the No Action alternative, three alternatives being considered would meet the needs of the Program: (1) downsizing facilities that presently perform this mission at ORR, (2) transferring the secondary and case fabrication mission to LANL by upgrading the existing R&D secondary and case fabrication capabilities of LANL, and (3) transferring the secondary and case fabrication mission to LLNL by upgrading the existing R&D secondary and case fabrication capabilities of LLNL. Under No Action, the secondary and case fabrication mission would remain at Y-12 at ORR, and no downsizing or modification of facilities would occur.

Socioeconomic Impacts. Under No Action, there would be a decrease in the number of workers at Y-12 from the current total of 5,152 workers to 4,721 workers. Of the 5,152 workers, 3,126 workers are currently associated with the core stockpile management mission. Under No Action, only 2,741 core stockpile management workers would be required. The downsized Y-12 would be optimally configured for the reduced future workload, operate more efficiently, and require 784 workers for single-shift operation, a reduction of 1,957 workers. To perform operations in the downsized Y-12 in a three-shift mode, 1,376 core stockpile management workers would be required, a reduction of 1,365 workers. A reduction of 1,365 direct jobs represents approximately 9 percent of the projected No Action workforce at the entire ORR site, and less than 1 percent of the regional economic area. Another 3,490 indirect jobs would also be lost.

Mitigating the workforce reductions would be the fact that downsizing would require 1,152 new jobs associated with landlord activities in preparation for D&D activities. Another 1,600 indirect jobs would be created by these D&D jobs. The net effect for the three-shift mode of operation would be a loss of a total of 213 direct jobs at Y-12, which would represent less than 1 percent of the projected No Action workforce at ORR.

Transferring the secondary and case fabrication mission to either LANL or LLNL would have small positive socioeconomic impacts at those sites, and negative socioeconomic impacts at ORR due to the phaseout of this mission. At LANL, 321 direct jobs (based on three-shift operation) would be created, but no indirect jobs would be created for this industry. The 321 new jobs would cause the regional economic area unemployment rate to decrease from 6.2 to 6.0 percent. Housing/rental vacancies and public finance expenditures/revenues would change by less than 1 percent. At LLNL, 290 new direct jobs (based on three-shift operation) would be created, along with 722 indirect jobs. The 1,012 new jobs would cause the regional economic area unemployment rate to decrease by less than 1 percent. Housing/rental vacancies and public finance expenditures/revenues would change by less than 1 percent.

Transferring the secondary and case fabrication mission from ORR to either LANL or LLNL would result in the loss of 3,336 jobs projected for this mission under No Action at Y-12, and the closure and D&D of the Y-12 facilities previously involved in this mission. Another 10,134 indirect jobs could also be lost. It is expected that 1,385 new jobs would be created by a direct transfer of responsibilities from DP to the DOE Office of Environmental Management. Additionally, because the D&D of facilities at ORR would be a relatively long-term process, any initial negative socioeconomic impacts resulting from the transfer of the secondary and case fabrication mission to LANL or LLNL would be minimized by the additional workforce associated with D&D activities at ORR. These 1,385 new D&D jobs would also create 1,937 new indirect jobs. The net effect would be a loss of a total of 13,470 total jobs (direct plus indirect) in the ORR regional economic area. This would cause the regional economic area unemployment rate to increase from 4.9 to 7.4 percent. Housing/rental vacancies and public finance expenditures/revenues would change by less than 1 percent.

During construction activities, socioeconomic impacts would result, but would be small. The number of peak workers would be 14 at ORR, 55 at LANL, and 130 at LLNL, which has the least extensive existing infrastructure for secondary and case fabrication. At all three sites, the socioeconomic impacts during construction would not cause any socioeconomic indicator to change by more than 1 percent.

Resource Impacts. Impacts from continued operation at Y-12 are expected to be similar to current impacts. Air quality would remain within regulatory limits and water requirements would be adequately met by surface water withdrawals. For the three "action" alternatives, no previously undisturbed land would be disturbed, and thus, no impacts to biotic resources would result. Minimal impacts to cultural resources may result from building modifications to facilities eligible for the National Register of Historic Places. Because each of the alternatives would utilize similar facilities, procedures, resources, and numbers of workers during operation, each of the alternatives would produce similar operational environmental impacts for most resource areas. Impacts to air quality were modeled for each alternative and results indicate minimal impacts to air quality for each of the alternatives. Water requirements at ORR would be met from surface water, which is plentiful, and no adverse impacts would be expected. At LANL, groundwater would be used. Groundwater withdrawals would increase by less than 1 percent over projected No Action water requirements, and LANL's groundwater allotment would not be exceeded. At LLNL, public water supply would be used, and usage would be approximately 20-percent higher than projected No Action water requirements. No adverse impacts to water resources are expected.

Radiation and Waste Management Impacts. Radiation worker exposure to radiation is expected to be about equal for all three alternatives and well within regulatory limits. At each of the three sites, the average workforce dose from this mission would be approximately 2.2 mrem/year. Because of differences in projected workforces, this would result in a total worker dose of 0.38 person-rem/year at ORR, 0.33 person-rem/year at LANL, and 0.55 person-rem/year at LLNL. The added risk to the workforce due to these levels of radiation exposure is extremely small. Radiation exposure to the public from normal operation would be well within regulatory limits at these sites. At ORR, the incremental dose to the population within 80 km (50 mi) would be 0.6 person rem/year. The probability of a member of the public dying from cancer would be $3x10^{-4}$/year. At LANL, the incremental dose to the population within 80 km (50 mi) would be 0.5 person-rem/year. The probability of a member of the public dying from cancer would be $2.5x10^{-4}$/year. At LLNL, the incremental dose to the population within 80 km (50 mi) would be 0.84 person-rem/year. The probability of a member of the public dying from cancer would be $4.2x10^{-4}$/year. The added risk to the public due to these levels of radiation exposure is extremely small. All three site alternatives have adequate existing waste management facilities to treat, store, and/or dispose of wastes that would be generated by this mission.

Accident Impacts. Potential impacts from accidents were determined using computer modeling. For all postulated accidents, less than one fatal cancer would be expected for the surrounding 80-km (50-mi) population at each of the sites. Based on a weighted averaging of the postulated accidents, at ORR and LANL there would be a statistical risk that one fatal cancer to a member of the public would result approximately every 830,000 years from accidents. At LLNL, there would be a statistical risk that one fatal cancer to a member of the public would result approximately every 260,000 years from accidents.

Other. If the secondary and case fabrication mission were transferred from ORR, storage of the strategic reserves of HEU would be transferred to the A/D Facility (or a consolidated storage facility being assessed in the Storage and Disposition PEIS). The potential impacts associated with the one-time transfer of the strategic reserves of HEU to the A/D Facility are expected to be minor, even in the event of an accident, due to the robust shipping containers.

High Explosives Fabrication

In addition to the No Action alternative, three alternatives are being considered that would meet the needs of the Program: (1) downsizing facilities that presently perform this mission at Pantex, (2) transferring the HE fabrication mission to LANL by upgrading the existing R&D HE fabrication capabilities of LANL, and/or (3) transferring the HE fabrication mission to LLNL by upgrading the existing R&D HE fabrication capabilities of LLNL. Transferring the HE fabrication from Pantex to LANL and/or LLNL would result in the closure and D&D of Pantex facilities previously involved in this activity. Under No Action, the HE fabrication mission would remain at Pantex. No downsizing or modification of facilities would occur.

Socioeconomic Impacts. Downsizing the HE fabrication mission at Pantex would reduce the number of direct workers associated with this mission to 37, compared to 105 for No Action. Transferring the HE fabrication mission to either LANL or LLNL would create small positive socioeconomic impacts at either of those sites, and small negative socioeconomic impacts at Pantex, due to the phaseout of this mission. For surge operations at LANL, 67 new direct jobs would be created, but no indirect jobs would be created by this industry. The 67 new jobs would cause the regional economic area unemployment rate to decrease from 6.2 to 6.1 percent. Housing/rental vacancies and public finance expenditures/revenues would change by less than 1 percent. For surge operations at LLNL, 100 new direct jobs would be created, along with 155 indirect jobs. The 255 total new jobs would cause the regional economic area unemployment rate to decrease by less than 1 percent. Housing/rental vacancies and public finance expenditures/revenues would change by less than 1 percent. Phasing out the HE fabrication mission at Pantex would cause the loss of 105 direct jobs, which would be approximately 3 percent of the projected No Action workforce at Pantex. The direct plus indirect jobs lost would cause no observable change to the Pantex regional economic area unemployment rate, housing/rental vacancies, and public finance expenditures/revenues.

During construction activities, socioeconomic impacts would result, but they would be small. The number of peak workers would be 29 at Pantex, 46 at LANL, and 19 at LLNL. At all three sites, the socioeconomic impacts during construction would not cause any socioeconomic indicator to change by more than 1 percent.

Resource Impacts. For the three "action" alternatives, construction impacts are expected to be minor and would involve internal modifications to existing facilities. No land would be disturbed at Pantex or LANL, and thus, no impacts to cultural or biotic resources would result. At LLNL, a small area of land (less than 1 ha) would be disturbed to construct an HE and parts storage building, but impacts to biotic and cultural resources are not expected.

Because each of the alternatives would utilize similar facilities, procedures, resources, and numbers of workers during operation, each of the alternatives would result in similar operational environmental impacts for most resource areas. Impacts to air quality were modeled for each alternative, and results indicate minimal impacts to air quality for each of the alternatives. At all sites, water requirements would be met from groundwater. At Pantex, this alternative applies only in conjunction with the downsize A/D alternative at Pantex discussed earlier. Downsizing both missions would reduce groundwater withdrawals by 16 percent compared to No Action. At LANL, groundwater withdrawals would increase by less than 1 percent over projected No Action water requirements, and LANL's groundwater allotment would not be exceeded. At LLNL, groundwater and/or the public water supply could be used to support the HE fabrication mission. If public water were used, it would require approximately 21 percent of the design capacity of the public water tap line. If groundwater were used, withdrawals would increase by approximately 65 percent from No Action, but they would not have any adverse impacts to aquifer levels.

Radiation and Waste Management Impacts. There are no radiological risks to workers or the public associated with the HE fabrication mission and no adverse impacts associated with normal operation. All three site alternatives have adequate existing waste management facilities to treat, store, and/or dispose of wastes that would be generated by this mission.

Accident Impacts. Potential impacts from chemical accidents or explosions were determined using modeling. Impacts from these types of accidents could include death or bodily damage. Due to proximity, workers would be most susceptible to any potential impacts. For all postulated accidents, impacts to the public were much less than to workers. In the event of an accident involving HE fabrication, due to the higher population surrounding LLNL, public impacts could be higher at LLNL compared to LANL and Pantex. Transferring the HE fabrication mission from Pantex to LANL and/or LLNL would require HE components to be shipped from the fabrication site to the A/D Facility. HE is a nonradioactive, hazardous material. There are no impacts associated with the incident-free transportation of HE. In the event of an accident, HE transportation impacts would be no greater than those encountered by the public from industry's transportation of similar explosives. Potential accidents could include both explosive and nonexplosive roadway accidents, with potential impacts of death, lesser bodily injury, and property damage.

Nonnuclear Fabrication

In addition to the No Action alternative, two alternatives are being considered that would meet the needs of the Program: (1) downsizing the facilities that presently perform this mission at KCP and (2) transferring the KCP nonnuclear fabrication mission to LANL, LLNL, and SNL by upgrading existing nonnuclear fabrication capabilities at LANL and LLNL, and constructing new nonnuclear fabrication facilities at SNL. Under No Action, the nonnuclear fabrication mission would remain at current locations; primarily at KCP, with small workloads at LANL and SNL.

Socioeconomic Impacts. At KCP, workforce downsizing consistent with a reduced workload has already taken place; therefore, the projected No Action workforce (3,179 workers) is equal to the current workforce. Of these 3,179 workers, 2,508 workers perform core stockpile management missions. The downsized KCP facility would be optimally configured for the reduced future workload, would operate more efficiently, and would require 1,669 core stockpile management workers for single-shift operation. To perform operations in the downsized KCP facility in a three-shift mode, 2,257 workers would be required. This is 251 workers less than the No Action single-shift number of workers. Another 443 indirect jobs would also be lost. The loss of a total of 694 jobs (direct plus indirect jobs) would not cause the regional economic area unemployment rate to change.

Transferring the nonnuclear fabrication mission to the laboratories would create small positive socioeconomic impacts at both LANL and LLNL, with increases of 240 and 131 total (direct plus indirect) jobs, respectively. At each of these sites, socioeconomic indicators would change by less than 1 percent. At SNL, 1,160 direct jobs would be created, along with 1,350 indirect jobs. The 2,510 new jobs would cause the regional economic area unemployment rate to decrease from 5.7 to 5.2 percent. Housing/rental vacancies and public finance expenditures/revenues would change by less than 1 percent. Phasing out the nonnuclear fabrication mission from KCP would cause the loss of 3,179 direct jobs and the loss of 5,609 indirect jobs in the regional economic area. The loss of 8,788 total jobs from KCP would cause the regional economic area unemployment rate to increase from 4.9 to 5.6 percent. Housing/rental vacancies and public finance expenditures/revenues would change by less than 1 percent. Some socioeconomic impacts could be mitigated by employing personnel for D&D of the KCP facility, although that is not expected to last more than 5 years.

During construction activities, socioeconomic impacts would result, but would be small. At KCP, 187 direct jobs would be created during downsizing activities, plus another 262 indirect jobs. The 449 total jobs created during construction at KCP would represent less than a 1 percent increase in the regional economic area, and would cause no observable change to the regional economic area unemployment rate, housing/rental vacancies, and public finance expenditures/revenues. If the nonnuclear fabrication mission is transferred to the three laboratories, no observable socioeconomic impacts would occur at LANL or LLNL. At SNL, 379 direct jobs would be created during construction activities, plus another 421 indirect jobs. The 800 total jobs created during construction at SNL would represent less than a 1 percent increase in employment in the regional economic area, and would not cause any socioeconomic indicator to change by more than 1 percent.

Resource Impacts. Due to the reduced workload expected in the future, impacts from operations are expected to be less than current impacts. Air quality would remain within regulatory limits at each of the sites, and water requirements would be adequately met.

For the alternative that would downsize KCP, the construction activities would involve internal modifications to the existing facility. No land would be disturbed. For the alternative that would transfer the KCP mission to the laboratories, construction impacts would involve internal facility modifications at LANL and LLNL. At SNL, approximately 9 ha (22 acres) of land would be disturbed to construct a new facility. This represents approximately 6 percent of the undisturbed land at SNL. Potential impacts to cultural and biotic resources would exist, but they would be mitigated to the extent practicable during follow-on, site-specific studies.

Because each of the alternatives would utilize similar facilities, procedures, resources, and numbers of workers during operation, each of the alternatives would result in similar operational environmental impacts for most resource areas. Impacts to air quality were modeled for each alternative. Modeling results indicate minimal impacts to air quality for each of the alternatives. Water requirements for nonnuclear fabrication are relatively minor at each of the sites. At KCP, water requirements, which are publicly provided, would be reduced by approximately 31 percent compared to No Action. At LANL, groundwater withdrawals would increase by less than 1 percent over projected No Action water requirements, and LANL's groundwater allotment would not be exceeded. At LLNL, there would also be a less than 1 percent increase in water requirements to support nonnuclear fabrication. At SNL, groundwater would be used. Groundwater withdrawals would increase by approximately 64 percent over projected No Action withdrawals, but would still represent only 29 percent of the Kirtland Air Force Base groundwater rights. Thus, no adverse impacts are expected.

Radiation, Waste Management, and Accident Impacts. There are no radiological risks to workers or the public associated with the nonnuclear fabrication mission, and there are no adverse impacts associated with normal operation. Accident profiles at the sites would not change as a result of downsizing KCP or transferring the nonnuclear fabrication mission to the laboratories. Phaseout of the nonnuclear mission from KCP would eliminate any potential accidents at that site. All three site alternatives have adequate existing waste management facilities to treat, store, and/or dispose of wastes that would be generated by this mission.

Stockpile Management Top-Level Comparison

Based upon the reasonable alternatives for the five major missions that make up the stockpile management program, one could construct a matrix with a large number of discrete alternatives for the entire Complex. Analyzing such a large number of alternatives is neither practical nor useful. What is useful, however, is to look at the two extreme configurations for the entire Complex in order to compare environmental impacts for a bounding case analysis. Based on the alternatives that are reasonable for the individual missions, the bounding configurations and environmental impacts for the Complex are a relatively unconsolidated Complex that is downsized/rightsized in place or a relatively consolidated Complex that is rightsized by upsizing the laboratories and NTS.

For the first configuration (referred to as Downsize/Rightsize-in-Place), the Complex would consist of A/D at Pantex, HE fabrication at Pantex, pit fabrication at LANL (or SRS), secondary and case fabrication at ORR, and nonnuclear fabrication at KCP. This is essentially the preferred alternative for stockpile management. For the second configuration (referred to as Maximum Consolidation), the Complex would consist of A/D at NTS, HE fabrication at LANL (or LLNL), pit fabrication at LANL, secondary and case fabrication at LANL (or LLNL), and nonnuclear fabrication at SNL, LANL, and LLNL. Major differences in environmental impacts between these two configurations are presented below.

Socioeconomic Impacts. It is worthy to note that some of the reductions in workforce at the various stockpile management facilities are associated with reduced workloads expected in the future, while additional reductions in workforce could occur due to the physical downsizing of facilities. For the A/D and HE missions at Pantex, under No Action, the core stockpile management workforce would be reduced from the current level of 3,107 workers (3,002 for A/D and 105 for HE) to 1,020 workers (915 for A/D and 105 for HE) for single-shift operation. The physical downsizing of the facility would also improve efficiency such that the workforce could be reduced even further, to 831 workers for single-shift operation (800 for A/D and 31 for HE). Three-shift operation of the downsized Pantex facility would require 1,303 core stockpile management workers (1266 for A/D and 37 for HE).

For the secondary and case fabrication mission at ORR, under No Action, the workforce would be reduced from the current level of 3,126 core stockpile management workers to 2,741 workers for single-shift operation. The physical downsizing of Y-12 (essentially an 86-percent reduction in facility size) would also improve efficiency such that the core stockpile management workforce could be reduced even further, to 784 workers for single-shift operation. Three-shift operation of the downsized Y-12 facility would require 1,376 core stockpile management workers. The adverse socioeconomic impacts associated with the Y-12 downsizing would be mitigated by the creation of 1,152 new jobs associated with landlord activities in preparation for the D&D of the facilities no longer needed.

At KCP, workforce reductions consistent with a reduced workload have already taken place; therefore, the projected No Action workforce (2,508 core stockpile management workers) is equal to the current workforce. Downsizing the KCP facility would improve efficiency such that the workforce could be reduced to 1,669 workers for single-shift operation. Three-shift operation of the downsized KCP facility would require 2,257 workers.

Overall, socioeconomic impacts from construction for the Maximum Consolidation configuration would be minimal, except at NTS and SNL. Socioeconomic impacts from construction for the Downsize/Rightsize-in-Place configuration would also be minimal.

Resource Impacts. Construction impacts associated with the Downsize/Rightsize-in-Place configuration would be minimal. All construction activities would be modifications to existing facilities, with no new construction. Consequently, no significant land disturbance at any sites would result, and no potential impacts to biota or cultural resources would occur.

Construction impacts associated with the Maximum Consolidation configuration would be small overall; only the Device Assembly Facility upgrade at NTS and the Nonnuclear Facility at SNL involve any land disturbance greater than 1 ha (2.47 acres). Most construction activities would be modifications to existing facilities, with no significant land disturbance, and no potential impacts to biota or cultural resources.

During operation, because each of the two configurations would utilize similar facilities, procedures, resources, and numbers of workers, each would result in similar operational environmental impacts for most resource areas. For the Maximum Consolidation configuration, the greatest potential for any significant environmental impacts would occur at LANL, which would be the site for pit fabrication, secondary and case fabrication, HE fabrication, and a portion of nonnuclear fabrication. For each of the resources evaluated in this PEIS, no significant impacts are expected from such consolidation. Modeling results for air quality indicate minimal impacts to air quality. Water requirements would increase at LANL by 2.5 percent, but would still be less than the LANL allotment.

Radiation, Waste Management, and Accident Impacts. Cumulative doses to the population from normal operation would be less than regulatory limits. Impacts from accidents are independent of other missions (e.g., accident risks are additive, not multiplicative). Thus, the potential accident would be the sum of the risks from each mission. For maximum consolidation at LANL, there would be a statistical risk that one fatal cancer to a member of the public would result approximately every 135,000 years from accidents. LANL would have adequate existing waste management facilities to treat, store, and/or dispose of wastes that would be generated by these missions.

A difference in the operation of the Downsize/Rightsize-in-Place configuration and the Maximum Consolidation configuration would involve the transportation of nuclear and hazardous materials. The Downsize/Rightsize-in-Place configuration would result in transporting plutonium components between LANL (or SRS) and Pantex, and transporting secondary and case components between ORR and Pantex. Incident-free impacts associated with this transportation are small, while accident impacts are minor. The Maximum Consolidation configuration would also result in transporting plutonium components and secondary and case components.

Transportation would occur between LANL and NTS. Relative to the Downsize/Rightsize-in-Place configuration, any transportation impacts would be less due to shorter distances and less populated roadways. The Maximum Consolidation configuration would also result in transporting HE components between LANL and NTS, but no significant impacts are expected.

S.3.5 Alternatives Considered but Eliminated from Detailed Study and Related Issues

This section of the PEIS has been revised in response to comments received on the Draft PEIS concerning its scope and the alternatives considered. To begin, it is important to review the basic logic used in constructing this PEIS and to restate the nature of the decisions expected to be made based on the contents of the PEIS.

Section S.2 describes the national security policy framework that defines the purpose and need for DOE's nuclear weapons mission for the foreseeable future. It also describes the development of proposed actions and reasonable alternatives in response to recent changes in national security policy. Section S.2 also puts those changes in broad technical perspective. Successive levels of technical detail are provided in chapters 3 and 4 of Volume I, and in Volumes II and III. The discussions that follow refer to the appropriate sections of this PEIS to avoid unnecessary repetition.

As stated in the Notice of Intent (60 FR 31291) published on June 14, 1995, DOE intends that the ROD on this PEIS will:

- Identify the future missions of the Stockpile Stewardship and Management Program; and
- Determine the configuration (facility locations) of the Complex necessary to accomplish the Program missions

While the terms "stockpile stewardship" and "stockpile management" are relatively new, the Program is not new when considered in terms of its substructure capabilities (section S.1). What the terms are meant to convey is a change in Program focus away from large-scale development and production of new-design nuclear weapons with nuclear testing, to one that focuses on the safety and reliability of a smaller, aging stockpile without nuclear testing. Even with this change in focus, however, national security policies require DOE to maintain the capabilities of the ongoing Program. The proposed actions flow logically from the mission purpose and need, given the policy constraints placed on the Program. Enhanced experimental capability is proposed because it is the surrogate source of experimental data that are needed to continually assess and certify a safe and reliable stockpile constrained by the absence of nuclear testing. Rightsizing manufacturing capacities is proposed in direct response to the reduced requirements of a smaller, aging stockpile constrained by the absence of new-design weapon production. Reestablishing pit manufacturing capability is proposed because it restores a required capability of the Program that was temporarily lost as a consequence of the closure of the Rocky Flats Plant.

In developing this PEIS, DOE judged the above three proposed actions to be significant at the programmatic level. Some additional strategies of the Stockpile Stewardship and Management Program, such as enhanced computational capability, were judged not to have significance for this PEIS because they did not have the potential for significant environmental impacts relative to the ongoing Program at a site, nor was the mission capability being considered for transfer to another site. The programmatic level environmental impacts of the ongoing Program at each of the eight sites in the Complex are described in chapter 4 of Volume I. Projects and facilities to support the ongoing Program are subject to site-specific NEPA review.

The issue of Stockpile Stewardship and Management Program alternatives is complex because nuclear weapons require a complete integrated set of technical capabilities and an appropriately sized manufacturing capacity. The technical capabilities are generally characterized as research, design, development, and testing; reliability assessment and certification; and manufacturing and surveillance operations (section S.2.1 and figure S.2–2). From a technical point of view, none of these capabilities can be deleted if DOE is to maintain a safe and reliable stockpile (section S.2.3). In addition, DOE has been directed to maintain these capabilities by national security policy from the President and Congress (section S.2.3).

S.3.5.1 *Alternatives in General*

Commentors questioned the different treatment of stewardship and management alternatives, mainly the lack of stewardship alternatives. Stewardship and management alternatives are treated differently in the PEIS because they address fundamentally different problems. Stockpile stewardship capabilities form the basis of U.S. judgments about the safety, reliability, and performance of U.S. nuclear weapons, and in a larger context, U.S. judgments about the nuclear weapons capabilities of others (section S.2.3). DOE did not consider it reasonable to propose stewardship alternatives that would diminish stewardship capabilities, particularly given the fact that historic confidence in the safety and performance of the stockpile was derived from nuclear testing that is no longer part of the ongoing stewardship program. National security policy requires DOE to maintain, and in some areas enhance, the stewardship capabilities of the three weapons laboratories and NTS (section S.2.1). The PEIS also explains the basis for this in a technical context, including the need for two independent nuclear design laboratories (section S.2.3). Therefore, this PEIS has no proposed actions that transfer ongoing stockpile stewardship missions from one site to another, or that would otherwise diminish ongoing stewardship missions.

National security policy also requires DOE to maintain stockpile management capabilities and appropriate manufacturing capacity for a smaller stockpile. Unlike stockpile stewardship capabilities, the smaller stockpile does permit some reasonable siting alternatives for stockpile management capabilities and capacities to accomplish the mission purpose and need within the current national security policy framework (section S.2.3).

S.3.5.2 *Enhanced Experimental Capability*

DOE has considered that there are differing opinions on the technical merit of DOE's proposed actions with regard to enhanced experimental capability. Nuclear weapons design information, including the complex physics of nuclear weapon explosions, is classified for reasons of national security and nonproliferation. Even if this information were unclassified, the physics problems remain daunting; hence, the reason why nuclear testing was so important to the past program. Both the classification of information and technical complexity of the issues form natural barriers to public communication. The technical complexity alone engenders significant debate among qualified experts, especially in the area of high energy density physics. This PEIS attempts to explain the weapon physics issues in an unclassified, comprehensible manner regarding its relation to mission purpose and need (section S.2), proposed actions and alternatives (section 3.3 of Volume I), and project-specific technical detail (Volume III). In the absence of nuclear testing, there are two basic alternatives: (1) rely on existing facilities as sources of experimental data described by the No Action alternative, and (2) pursue the enhanced capability of the proposed facilities to provide the sources of experimental data needed.

Role of Existing Experimental Facilities. In DOE's technical judgment, the existing facilities described by the No Action alternative are inadequate to meet the challenge of assessing and certifying a safe and reliable stockpile over the longer term. It is also DOE's technical judgment that it is impossible to speculate at this time whether any of the existing facilities could be retired, because they would be obsolete or redundant, as a result of a decision to construct and operate any or all of the three proposed new stewardship facilities. The uncertainties inherent in the R&D nature of the stewardship program would make that kind of exercise essentially guesswork. The development of machines to simulate the intricacies of a nuclear detonation requires a highly sophisticated scientific R&D program. It very likely will take 5 to 10 years to begin obtaining reliable data from the new facilities. Until those facilities are operational, DOE cannot reliably predict how the additional capabilities they provide will mesh with the capabilities of previously existing machines to further the goals of the Program. It is only through incremental advances in the state of the science that decisions can eventually be made regarding the retirement of obsolete or redundant facilities.

DOE is committed to making maximum efficient use of the stewardship capabilities at its disposal. However, it is not reasonable to speculate at this time about how future stewardship requirements might affect existing facilities and capabilities.

Next Generation Experimental Facilities. Commentors suggested that potential next generation experimental facilities be analyzed as part of the proposed action. This PEIS includes a discussion of potential next-generation experimental facilities and the reasons why they are not proposed actions or alternatives (section S.2.4 and section 3.3.4 of Volume I). These facilities, while contemplated on the basis of anticipated technical need, have not reached the stage of design maturity through R&D for DOE to include a decisionmaking analysis at this time. However, this PEIS does broadly describe, in general terms or by reference, what is known today about their potential environmental impacts. The environmental impacts from these facilities as contemplated today would not be significantly different from existing "similar" facilities. By characterizing the potential impacts in this way, the decisionmaker will be aware of the potential program-level cummulative impacts of the next-generation facilities when deciding whether to pursue a program of enhanced experimental capability. If DOE proposes to construct and operate such facilities in the future, appropriate NEPA review will be performed.

New Weapon Design. Commentors have suggested that the proposal for enhanced experimental capabilities is directed more at the capability to design new weapons in the absence of nuclear testing than at maintaining the safety and reliability of the existing stockpile and that stewardship alternatives could be different if the facilities were directed only at maintaining the existing stockpile. This PEIS explains why these capabilities are needed to maintain the safety and reliability of a smaller, aging stockpile in the absence of nuclear testing (section S.2). The existing U.S. stockpile of nuclear weapons is highly engineered and technically sophisticated in its design for safety, reliability, and performance. The stewardship capabilities required to make technical judgments about the existing stockpile are likewise technically sophisticated; therefore, it would be unreasonable to say that these stewardship capabilities could not be applied to the design of new weapons, albeit with less confidence than if new weapons could be nuclear tested.

However, the development of new weapon designs requires integrated nuclear testing such as occurs in nuclear explosive tests. Short of nuclear testing, no single stockpile stewardship activity, nor any combination of activities, could confirm that a new-design weapon would work. In fact, a key effect of a "zero-yield" CTBT would be to prevent the confident development of new-design weapons. National security policy requires DOE to maintain the capability to design and develop new weapons, and it will be a national security policy decision to use or not use that capability. Choosing not to use enhanced experimental capability for new weapons designs would not change the technical issues for the existing stockpile and, therefore, the stewardship alternatives would not change.

The issue of new-design weapons is separate from DOE's need to perform modifications to existing weapons that require research, design, development, and testing. The phrase used in this PEIS, "without the development and production of new-design weapons," is meant to convey the fact that the historical continuous cycle of large scale development and production of new weapons designs replacing older weapon designs has been halted. For example, during the 1980s, about a dozen new-design weapons were in full-scale development or production. Over the decade, production of new-design weapons replaced dismantled weapons nearly one for one. Today, only modifications to parts of existing weapons are being performed or planned; dismantlement has continued. This results in a smaller, aging stockpile that must be assessed and certified without nuclear testing. This is now the primary focus of the stewardship program.

Nonproliferation. Commentors have suggested that enhanced experimental capability is a proliferation risk. The national security policy framework discussed in this PEIS seeks a new balance between U.S. arms control and nonproliferation objectives and U.S. national security requirements for nuclear deterrence while pursuing these objectives (section S.2.1). In addition, a discussion is provided on some of the more difficult issues that must be considered in determining the balance, including a discussion of experimental capability (section S.2.5). In particular, the issue of nonproliferation and the proposed NIF was studied in detail. The study, prepared by the DOE Office of Arms Control and Nonproliferation, has been the subject of extensive public involvement, interagency review, and review by outside experts. The study concluded that the technical proliferation concerns of NIF are manageable and can therefore be made acceptable and that NIF can contribute positively to U.S. arms control and nonproliferation policy goals (appendix section I.2.1 of Volume III). NIF is a proliferation concern because of its broader scientific applications and expected frequent use by researchers worldwide, and, like the other proposed enhanced experimental facilities because of its possible relevance to the development of new weapon designs. However, the development of new weapon designs requires integrated testing. None of the proposed facilities, either alone or together, could perform such integrated testing of new concepts, and therefore cannot replace nuclear testing for the development of new weapon designs. The role of these facilities will be to help assess and certify the safety and reliability of the nuclear weapons remaining in the stockpile in the absence of nuclear testing. The national security policy framework and the technical issues that drive the proposed action for enhanced experimental capability remain the same.

Subcritical Experiments. With regard to the treatment of ongoing stewardship activities or enhanced experimental capability, subcritical experiments are an example of how changes in terminology have caused some confusion about what is evaluated in this PEIS under the No Action alternative. Subcritical experiments have been conducted at NTS over many years. Historically, operations at NTS have included tests or experiments that included both HE and special nuclear materials that were intended to produce no nuclear yield or negligible nuclear energy releases. These experiments frequently remained subcritical (i.e., they did not achieve self-sustaining fission chain reactions). The term "subcritical experiments" does not define a new form of activity or mission. It is intended to underscore the fact that in the future such experiments will be configured to ensure that the condition of criticality cannot be achieved. This issue has been clarified in the NTS Site-Wide EIS.

S.3.5.3 *Safe and Reliable Stockpile*

Some commentors have suggested that nuclear weapon reliability is not important in the post-Cold War era. National security policy as established by the President and Congress requires a safe and reliable stockpile. In order for the nuclear deterrent to be credible within the current national security policy framework, it must be reliable in a militarily effective way. A program designed to ensure the safety but not the reliability of the stockpile would require DOE to speculate on an alternate concept of nuclear deterrence and a national security policy framework to support it. See also the discussion of denuclearization in section S.3.5.4.

Commentors have also suggested acceptance of lower standards of reliability as an alternative to enhanced stewardship capabilities. This PEIS explains how the assessment and certification of nuclear performance is carried out, and how this process differs from the more conventional statistical methods used for assessing reliability of the nonnuclear portion of the weapon. Assessment and certification of nuclear performance is a technical judgment by the weapons laboratories based on scientific theory, experimental data, and computational modeling (sections S.2.2 and S.2.3). The question is not whether to accept a lower standard of nuclear performance (less nuclear explosive yield), but whether or not there is a technical basis to confidently know how well the weapon will perform at all. Enhanced stewardship capability is focused on the technical ability to confidently judge nuclear safety and performance in the absence of nuclear testing.

Aside from being inconsistent with national security policy, attempting to separate weapon safety and reliability is more technically complex than it sounds. A modern nuclear weapon is highly integrated in its design for safety, reliability, and performance. It contains electrical energy sources and many explosive energy sources in addition to the main charge HE. The principal safety concern is accidental detonation of the HE causing dispersal of radioactive materials (plutonium and uranium). Modern weapons are designed and system-engineered to provide a predictable response in accident environments (e.g., fire, crush, or drop). However, because of the technical complexity of potential accident scenarios (i.e., combined environments) and the fact that complete nuclear weapons cannot be used for experimental data, assessment of the design and the effect of changes that might be occurring due to stockpile environments must rely on other sources of experimental data and complex computer modeling. Enhanced experimental capability specifically related to the weapon secondary is a nuclear performance concern. Enhanced computational capability in general, and enhanced experimental capability related to the weapon primary in particular, are both nuclear safety and performance concerns.

S.3.5.4 *Description of Alternative Approaches*

Commentors have suggested that DOE consider alternative forms of stewardship. While their comments are responded to in Volume IV, this section discusses DOE's consideration of the broad range of views on this issue. The Congressional Research Service report, *Nuclear Weapons Stockpile Stewardship: Alternatives for Congress*, December 14, 1995, provides a reasonable description of the various viewpoints on alternatives and a framework for discussion. (The report uses the term stockpile stewardship generically to describe the Stockpile Stewardship and Management Program.) The following discussion of alternative approaches is taken from the summary of that report.

> **Denuclearizers** would eliminate nuclear weapons worldwide in the foreseeable future, perhaps one to two decades. Until then, they would have a minimal U.S. stewardship program whose personnel, as curators of weapons knowledge, would monitor weapons. **Restorers** would maintain nuclear weapons with the only proven method, an ongoing program of research, development, design, testing, and production, downsized to meet post-Cold War needs. Three intermediate positions seek to maintain weapons indefinitely without nuclear testing. **Remanufacturers** believe that since current weapons have been tested and certified as meeting military requirements, this Nation can maintain them indefinitely by "remanufacturing"—reproducing them to the exact specifications of the originals. Remanufacturers would go to great lengths to do so in order to avoid risks that even slight changes to warheads might introduce. **Enhancers**, who take the Administration's position on stewardship, see identical remanufacture as impossible. They believe some changes in design, process, and materials are unavoidable and others are desirable. A robust science program, they hold, is the best that can be done without testing to monitor warheads, anticipate problems, modify warheads when problems arise, and revalidate stockpile effectiveness on an ongoing basis. They would have a small manufacturing program. **Maintainers** fall between remanufacturers and enhancers. They focus on how to maintain warheads. They prefer to avoid changes to warheads but would not go to great lengths to do so. They view a strong science program as essential, but only to the extent that its elements connect directly to maintaining weapons. They emphasize manufacturing as the ultimate guarantor of U.S. ability to solve warhead problems. They, along with enhancers, favor some link to testing if confidence cannot be maintained in any other way.

Beyond the broad overview of alternative approaches to stockpile stewardship and management, the main text of the report discusses variations within each of the five points of view. Given the political and technical complexity of the Program, many approaches can appear to be distinct or reasonable alternatives for detailed study. In fact, while the enhancer's viewpoint as described above most closely resembles the Program described in this PEIS, the Program actually embraces elements of all five viewpoints. The following discussion illustrates this point and focuses on the main issue(s) that, in DOE's view, eliminate the other approaches as distinct or reasonable alternatives for this PEIS.

Denuclearization. This approach is reflected in this PEIS to the extent that national security policy is pointed toward the goals of denuclearization. Since the end of the Cold War, more than 8,000 U.S. nuclear weapons have been dismantled, no new-design weapons are being produced, three former nuclear weapons industrial plants have been closed, and the United States is observing a nuclear test moratorium and seeking a "zero-yield" CTBT. Maintenance of a safe and reliable stockpile is not inconsistent with working toward the NPT goal of eliminating nuclear weapons worldwide at some unspecified time in the future. However, denuclearization is not a reasonable alternative for this PEIS because it is not feasible based on current national security policy.

The main issue discussed in this section is consideration of an alternative with a very small (10s or 100s) or zero stockpile. Two of the stockpile sizes analyzed in this PEIS, a START I Treaty- and START II protocol-sized stockpile, are the only ones currently defined and directed by national security policy. The PEIS also analyzes a hypothetical 1,000 weapon stockpile for the purpose of a sensitivity analysis for manufacturing capacity decisions. The NWSM specifies the types of weapons and quantities of each weapon type by year (section S.1). The NWSM is developed based on DOD force structure requirements necessary to maintain nuclear deterrence and comply with existing arms control treaties while pursuing further arms control reductions. This PEIS explains the complexity of this process and why DOE does not believe it reasonable to speculate using a large number of arbitrary assumptions (section S.2.1). DOE has considered that a future national security policy framework could define a path to a smaller stockpile. However, DOE has the following perspective on this issue.

Stockpile stewardship capabilities are currently viewed by the United States as a means to further U.S. nonproliferation objectives in seeking a "zero-yield" CTBT. Likewise, it would be reasonable to assume that U.S. confidence in its stewardship capabilities would remain as important, if not more important, in future arms control negotiations to reduce its stockpile further. The path to a very small (10s or 100s) or zero stockpile would require the negotiation of complex international treaties, most likely with provisions that require intrusive international verification inspections of nuclear weapons related facilities. Therefore, DOE believes it reasonable to assume that complex treaty negotiations, when coupled with complex implementation provisions, would likely stretch over several decades. On a gradual path to a very small or zero stockpile, stockpile size alone would not change the purpose and need, proposed actions, and alternatives in this PEIS as they relate to stewardship capabilities. The issues of maintaining the core competencies of the United States in nuclear weapons, and the technical problems of a smaller, aging stockpile in the absence of nuclear testing, remain the same.

On a gradual path to a very small or zero stockpile, this PEIS evaluates reasonable approaches to stockpile management capability and capacity. At some point on this path, further downsizing of existing industrial plants or the alternative of consolidating manufacturing functions at stewardship sites would become more attractive as manufacturing capacity becomes a less important consideration. However, in the near term, the preferred alternative of downsizing the existing industrial plants would still be a reasonable action because the projected downsizing investment pays back within a few years through reduced operating expense; in addition, the downsizing actions are consistent with potential future decisions regarding plant closures. In regard to the proposed action of reestablishing pit manufacturing capability, DOE does not propose to establish higher manufacturing capacities than are inherent in the reestablishment of the basic manufacturing capability. In developing the criteria for reasonable stockpile management alternatives, DOE was careful not to propose the introduction of significant new types of environmental hazards to any prospective site. On a gradual path to a very small or zero stockpile, stockpile size alone would not change the purpose and need, proposed actions, and alternatives in this PEIS with regard to stockpile management capabilities and capacities.

To achieve eventual denuclearization, some commentors have asserted that DOE should adopt a passive curatorship approach to maintaining the declining nuclear weapons stockpile. The concept of curatorship is already being implemented at the existing sites in the form of knowledge preservation programs. While not necessary in an era of continuous development and production of new-design weapons and nuclear testing, knowledge preservation is now part of DOE's overall effort to maintain core competency in the weapons complex. However, as an inherently imperfect reconstruction, this effort can never ensure completeness of information nor relevance to future stockpile problems. More importantly, knowledge preservation does not address the fundamental issue of confidence in future technical judgments about issues that are yet to arise regarding the safety and performance of the stockpile. In highly technical matters, confidence arises from having appropriate data to support conclusions. In the absence of nuclear testing, the science-based approach to stockpile stewardship is focused on achieving the capability to acquire appropriate data.

From an environmental impact point of view, this PEIS displays the environmental impacts of each site's ongoing Program operations on an annual basis. The impacts of alternatives for proposed actions are displayed individually on the same basis. If one assumes that denuclearization leads to eventual site closure, then this PEIS, together with the Tritium Supply and Recycling PEIS, presents the environmental impacts of closing the four remaining industrial plants. While this PEIS does not directly consider the closure of the weapons laboratories and NTS, it is not at all clear what nuclear weapons capabilities the U.S. would retain even if it decided on a zero stockpile. However, the environmental impacts of the ongoing Program (No Action alternative) are essentially what would be phased out, with or without the proposed actions. DOE does not believe that speculative combinations of this data on speculative time lines provides any useful information for decisionmaking.

Restoration. The restorer's point of view is reflected in this PEIS to the extent that current national security policy requires DOE to maintain all the historical capabilities of the Program, including the capability for new-design weapons and nuclear testing. However, restoration is not a reasonable alternative for this PEIS because it requires a national security policy decision to reverse the constraints placed on the Program, namely, by resuming nuclear testing and new-design weapons production.

The environmental impacts of the restoration approach would be the same as those described in this PEIS to the extent that such a decision did not require manufacturing capacities higher than analyzed in this PEIS. In addition, this PEIS includes a brief description of the environmental impacts of nuclear testing (section 4.12 of Volume I); the Site-Wide EIS for NTS contains detailed information.

Remanufacturing. The remanufacturer's point of view is reflected in this PEIS by the fact that remanufacturing to specification will be attempted when possible and when appropriate to the problem being solved. With more than a half dozen different weapon types projected to remain in the stockpile, and with each weapon type containing thousands of parts, remanufacturing will undoubtedly occur for a significant number of repair and replacement activities. However, remanufacturing is not reasonable as a distinct exclusive alternative to the ongoing stockpile stewardship program or the proposed action of enhanced experimental capability for the technical reasons discussed below. In addition, it would not be a reasonable alternative because it does not fully support national security policies that require the conduct of a science-based stockpile stewardship and maintenance of the capability to design and produce new weapons.

Remanufacturing weapon components to their original specification, or maintaining weapons to their original design specifications, would superficially appear to be a reasonable approach to maintaining the safety and reliability of the stockpile in the absence of nuclear testing. Precise replication, however, is often not possible. Subtle changes in materials, processing, and fabrication techniques are an ever-present problem. In some cases, specialty materials and components become unavailable for commercial or environmental reasons. Implicit in the remanufacturing assumption is that the design blueprint, manufacturing process, and the materials used are specified in exact detail in every way. However, there is an unwritten element of "know how" that knowledgeable and experienced personnel contribute to any complicated manufacturing process (for this reason, controlling the acquisition of "know-how" is a major nuclear weapons nonproliferation objective). Materials and processes are not always specified in important ways because, at the time, they were not known to be important. The problem is illustrated by the following hypothetical example:

A material produced for a critical weld has a specification for a trace impurity; the manufacturing process consistently produced the material with a trace impurity less than the maximum allowed and the welds were satisfactory; the manufacturing process is changed for some reason, such as cost or environmental concerns; the material is now being produced with less trace impurity than before the process was changed; the material is still within specification; however, the welds are no longer satisfactory; it was unknown at the time that the higher level of the trace impurity was necessary to produce a satisfactory weld.

While remanufacturing sounds simple in principle, it is likely in fact to present complex issues of design, manufacturing process, and material variables. A simplified view of remanufacturing cannot serve as a "stand alone" manufacturing approach, let alone an alternative approach to enhanced stewardship capability. In the absence of underground nuclear testing, nuclear components (pits and secondaries) cannot be functionally tested. Stewardship capabilities provide the analytical tools (experimental and computational) to assess the significance of a problem observed during surveillance and to decide if the problem should be fixed; and if fixed, to certify that the fix will work (section S.2.3). In the past, the decision to fix or not fix an observed problem could be made with nuclear testing (section S.2.2). Stockpile stewardship strategies focus on the basic material science and the enhanced experimental and computational tools necessary to better predict age-related defects and to make sound technical judgments on nuclear safety and performance in the absence of nuclear testing.

The DARHT EIS (DOE/EIS-0228, section 2.3.2) provides an additional discussion of the limitations of a remanufacturing-to-specification approach. It discusses, as an example, the actions taken to evaluate and resolve unanticipated deterioration of HE in the now-retired W68 warhead for a submarine-launched ballistic missile. In that case it was necessary to replace the HE with a more chemically stable formulation. In addition, some other materials were no longer commercially available, requiring changes in the rebuilt weapons. Nuclear testing was ultimately used to verify that the necessary changes were acceptable. DOE does not consider it feasible to maintain all potentially obsolescent commercial sources and processes used for materials in existing weapons; aging would still occur in stored reserves of such materials.

With regard to stockpile management, remanufacturing without enhanced stewardship capability would also have notable drawbacks. DOE plans to maintain the capability to produce secondaries, and proposes to reestablish the capability to produce pits, by producing small quantities (10s) of each annually to maintain capability. This capacity should be sufficient to replace components attrited from the stockpile by surveillance testing. Remanufacturing these components, without the enhanced stewardship analytical capability to determine if and when replacement is necessary, is likely to require higher levels of production than DOE believes necessary to maintain production capability. Also, remanufacturing a nuclear component to the original specifications will not prevent age-related problems related to those specifications from recurring. Since these components use plutonium and uranium, radiation exposure to personnel and generation of radioactive waste would also be higher than necessary. If repeated remanufacturing were required, further unnecessary risks would result from additional weapon A/D operations and additional transport of nuclear components between sites.

From an environmental impact point of view, the remanufacturing concept would have greater impacts for the proposed action of reestablishing pit capability because DOE proposes to use a cleaner, less waste-generating process than was used at the Rocky Flats Plant. All other environmental impacts would not be distinguishable from those described in this PEIS because existing manufacturing processes form the Program baseline.

Maintenance. The maintainer's point of view is reflected in this PEIS to the extent that it is consistent with the No Action alternative. Under this approach, weapons maintenance would be the focus of stockpile stewardship. This approach would rely on enhanced surveillance and dual revalidation, whereby the weapons laboratories would conduct independent technical examinations of weapons to validate their safety and reliability. Any problems that arose would be solved through either remanufacture or "fixes" proposed by the weapons laboratories. These attributes are all part of the ongoing Program that will continue into the future. The principal difference between the Program as presented in this PEIS and this point of view is differing judgment on how much enhanced experimental capability would be needed to assess and certify a safe and reliable stockpile over the long term. The maintainers believe that less (or no) additional experimental capability would be required if DOE placed more emphasis on enhanced surveillance and dual revalidation.

DOE believes that this approach would not provide a sufficient basis for assessing and certifying the safety and reliability of the stockpile. Although enhanced surveillance will play an important role in the future of the Program, it serves a limited purpose. Surveillance activities identify stockpile problems through the examination and analysis of weapons sampled from the stockpile. An enhanced surveillance program would serve to identify problems with greater confidence and increased warning time. However, it would not provide a sole basis for assessing the significance of the problem or determining its solution. The ability of the laboratories to validate that the problem has been corrected, in the absence of nuclear testing, depends on their experimental and computational capabilities. In DOE's judgment, as explained in section S.2.3, those capabilities are inadequate. Therefore, to the extent that maintainance would not provide sufficient enhanced experimental capability, it is not a reasonable alternative.

From an environmental impact point of view, the maintenance concept is not distinguishable from the impacts of the No Action alternative for stockpile stewardship and the proposed actions for stockpile management.

S.4 PREFERRED ALTERNATIVE

CEQ regulations require an agency to identify its preferred alternative(s) in the Final EIS (40 CFR 1502.14[e]). The preferred alternative is the alternative that the agency believes would best fulfill its statutory mission, considering environmental, economic, technical, and other factors. This PEIS provides information on the environmental impacts. Cost, schedule, and technical analyses have also been prepared and are presented in the *Analysis of Stockpile Management Alternatives* report and the *Stockpile Management Preferred Alternatives Report*, which are available in the appropriate DOE Public Reading Rooms for public review.

DOE has identified the following preferred alternatives of the Stockpile Stewardship and Management Program:

Stockpile Stewardship:

- Construct and operate NIF at LLNL
- Construct and operate CFF at LLNL
- Construct and operate the Atlas Facility at LANL

Stockpile Management:

- Secondary and Case Component Fabrication—downsize the Y-12 Plant at ORR
- Pit Component Fabrication—reestablish capability and appropriate capacity at LANL
- A/D—downsize at Pantex
- HE Fabrication—downsize at Pantex
- Nonnuclear Component Fabrication—downsize at KCP
- Based on the analyses performed to support this PEIS, the preferred alternatives for strategic reserve storage are as follows: (1) HEU strategic reserve storage at Y-12 and (2) plutonium pit strategic reserve storage in Zone 12 at Pantex. The preferred alternatives for strategic reserve storage could change based upon decisions to be made in regard to the Storage and Disposition PEIS. Decisions on strategic reserve storage will not be made in the upcoming ROD for the Stockpile Stewardship and Management Program. Storage decisions are not expected to be made until both the Stockpile Stewardship and Management PEIS and the Storage and Disposition PEIS are completed.

The preferred alternative for plutonium-242 oxide at SRS is to transport the material to LANL for storage.

The preferred PEIS alternatives do not represent decisions by DOE. Rather, they reflect DOE's current preferences based on existing information. The ROD, when issued, will describe DOE's decisions for the Stockpile Stewardship and Management PEIS proposed actions.

DOE/EIS-0236
Vol. 1 of 4

Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management

Volume I

United States Department of Energy

September 1996

DISCLAIMER

DISCLAIMER

COVER SHEET

RESPONSIBLE AGENCY: U.S. Department of Energy

COOPERATING AGENCY: U.S. Environmental Protection Agency

TITLE: Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management (DOE/EIS-0236)

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ABSTRACT: In response to the end of the Cold War and changes in the world's political regimes, the United States is not producing new-design nuclear weapons. Instead, the emphasis of the U.S. nuclear weapons program is on reducing the size of the Nation's nuclear stockpile by dismantling existing nuclear weapons. The Department of Energy (DOE) has been directed by the President and Congress to maintain the safety and reliability of the reduced nuclear weapons stockpile in the absence of underground nuclear testing. In order to fulfill that responsibility, DOE has developed a Stockpile Stewardship and Management Program to provide a single highly integrated technical program for maintaining the continued safety and reliability of the nuclear stockpile. The Stockpile Stewardship and Management PEIS describes and analyzes alternative ways to implement the proposed actions for the Stockpile Stewardship and Management Program.

Stockpile stewardship refers to activities associated with research, design, development and testing of nuclear weapons and the assessment and certification of the safety and reliability. The stockpile stewardship portion of the PEIS evaluates the potential impacts of three proposed facilities: the National Ignition Facility (NIF), the Contained Firing Facility (CFF), and the Atlas Facility. The stockpile stewardship alternatives involving these facilities could affect four sites: Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), Sandia National Laboratories (SNL), and Nevada Test Site (NTS).

Stockpile management refers to activities associated with the production, maintenance, surveillance, refurbishment, and dismantlement of the nuclear weapons stockpile. The stockpile management portion of this PEIS evaluates the potential impacts of carrying out stockpile management alternatives at eight sites: Oak Ridge Reservation (ORR), Savannah River Site (SRS), Kansas City Plant (KCP), Pantex Plant (Pantex), LANL, LLNL, SNL, and NTS. The stockpile management alternatives are assessed for nuclear weapons assembly/disassembly and for fabricating pits, secondaries and cases, high explosives, and nonnuclear components.

The Stockpile Stewardship and Management PEIS also evaluates the No Action alternative of relying on existing facilities and continuing the missions at current sites to achieve both the stockpile stewardship and management missions. The No Action alternative assesses the environmental impacts of the on-going Stockpile Stewardship and Management Program and provides a baseline against which alternatives can be evaluated.

DOE has identified the following preferred alternative for the Stockpile Stewardship and Management Program:

Stockpile Stewardship:
- Construct and operate NIF at LLNL
- Construct and operate CFF at LLNL
- Construct and operate the Atlas Facility at LANL

Stockpile Management:
- Secondary and Case Component Fabrication—downsize the Y-12 Plant at ORR
- Pit Component Fabrication—reestablish capability and appropriate capacity at LANL

- Assembly/Disassembly—downsize at Pantex
- High Explosives Fabrication—downsize at Pantex
- Nonnuclear Component Fabrication—downsize at KCP
- Based on the analyses performed to support this PEIS, the preferred alternatives for strategic reserve storage are as follows: (1) highly enriched uranium strategic reserve storage at Y-12; and (2) plutonium pit strategic reserve storage in Zone 12 at Pantex. The preferred alternatives for strategic reserve storage could change based upon decisions to be made in regard to the *Storage and Disposition of Weapons-Usable Fissile Materials Final PEIS*. Decisions on strategic storage will not be made in the upcoming ROD for the Stockpile Stewardship and Management Program. Storage decisions are not expected to be made until both the *Stockpile Stewardship and Management Final PEIS* and the *Storage and Disposition of Weapons-Usable Fissile Materials Final PEIS* are completed.

The preferred alternative for plutonium-242 oxide at SRS is to transport the material to LANL for storage.

Evaluation of impacts on land resources, site infrastructure, air quality, water resources, geology and soils, biotic resources, cultural and paleontological resources, socioeconomics, waste management, environmental justice, as well as radiological and hazardous chemical impacts during normal operation and accidents to workers and the public are included in the assessment. The PEIS presents unclassified information only. A classified appendix has also been prepared to support the PEIS.

PUBLIC COMMENTS: The public comment period on the Draft PEIS was conducted from March 8, 1996 to May 7, 1996. During the comment period, public hearings were held in Los Alamos, NM; Albuquerque, NM; Las Vegas, NV; Oak Ridge, TN; Kansas City, MO; Livermore, CA; Washington, DC; Amarillo, TX; Santa Fe, NM; and North Augusta, SC. The Draft PEIS was made available through mailings, requests to DOE's Office of Reconfiguration, and at DOE Public Reading Rooms. In preparing the Final PEIS, DOE considered comments received by mail, fax, handed in at hearings, transcribed from messages recorded by telephone, and those transcribed via Internet. In addition, comments and concerns identified during discussions at public hearings were considered.

In response to comments submitted after issuance of the Draft PEIS and due to additional technical details not available at the time of issuance of the Draft, Volumes I, II, and III of the Final PEIS contain revisions and changes. The revisions and changes made since the issuance of the Draft document are indicated by a double underline for minor word changes or by a sidebar in the margin for paragraph or larger changes. In addition, Volume I and each appendix in Volume III provide a unique reference list to enable the reader to further review and research selected topics. Volume IV (Comment Response Document) of the PEIS contains the comments received during public review of the Draft PEIS and the DOE responses to those comments. DOE has public reading rooms near each affected site and in Washington, DC where these referenced documents may be reviewed or obtained for review.

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Acronyms, Abbreviations, and Conversion Charts

ACRONYMS AND ABBREVIATIONS

A/D	assembly/disassembly
AEC	Atomic Energy Commission
AHF	Advanced Hydrotest Facility
AQCR	Air Quality Control Region
ARS	Advanced Radiation Source
BEBA	beyond evaluation basis accident
BEEF	Big Explosives Experimental Facility
BEIR	biological effects of ionizing radiation
CAA	*Clean Air Act*
CEQ	Council on Environmental Quality
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act*
CFF	Contained Firing Facility
CFR	Code of Federal Regulations
Complex	Nuclear Weapons Complex
CTBT	*Comprehensive Test Ban Treaty*
CWA	*Clean Water Act*
DARHT	Dual Axis Radiographic Hydrodynamic Test (Facility)
D&D	decontamination and decommissioning
DOD	Department of Defense
DOE	Department of Energy
DOT	Department of Transportation
DP	DOE Office of the Assistant Secretary for Defense Programs
EA	environmental assessment
EBA	evaluation basis accident
EIS	environmental impact statement
EM	DOE Office of the Assistant Secretary for Environmental Management
EPA	Environmental Protection Agency
ES&H	environment, safety, and health
FONSI	Finding of No Significant Impact
FXR	Flash X-Ray (Facility)
HAP	hazardous air pollutants
HE	high explosives
HEPA	high efficiency particulate air (filter)
HEPPF	High Explosive Pulsed Power Facility
HEU	highly enriched uranium
HI	hazard index
HLW	high-level waste
HQ	hazard quotient
ICRP	International Commission on Radiological Protection
INEL	Idaho National Engineering Laboratory
IP	implementation plan
ISCST	Industrial Source Complex Short-Term (model)
K-25	K-25 Site, Oak Ridge Reservation
KCP	Kansas City Plant
LANL	Los Alamos National Laboratory
LLNL	Lawrence Livermore National Laboratory
LLW	low-level waste

NAAQS	National Ambient Air Quality Standards
NEPA	*National Environmental Policy Act*
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NIF	National Ignition Facility
NLVF	North Las Vegas Facility
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPR	Nuclear Posture Review
NPT	Nuclear Nonproliferation Treaty
NRC	Nuclear Regulatory Commission
NRHP	National Register of Historic Places
NTS	Nevada Test Site
NWSM	Nuclear Weapon Stockpile Memorandum
NWSP	Nuclear Weapon Stockpile Plan
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
OSHA	Occupational Safety and Health Administration
Pantex	Pantex Plant
PBFA II	Particle Beam Fusion Accelerator
PDD	Presidential Decision Directive
PEIS	programmatic environmental impact statement
PHERMEX	Pulsed High Energy Radiation Machine Emitting X-Rays (Facility)
PL	Public Law
R&D	research and development
RCRA	*Resource Conservation and Recovery Act*
RD&T	research, development, and testing
RIMS	Regional Input-Output Modeling System
ROD	Record of Decision
ROI	region of influence
SAR	Safety Analysis Report
SARA	*Superfund Amendments and Reauthorization Act*
SDWA	*Safe Drinking Water Act*
SHPO	State Historic Preservation Officer
SNL	Sandia National Laboratories/New Mexico
SRS	Savannah River Site
START	Strategic Arms Reduction Talks
TA	technical area
TLV-TWA	threshold limit value-time weighted average
TRU	transuranic
TSCA	*Toxic Substances Control Act*
TSP	total suspended particulates
USFWS	U.S. Fish and Wildlife Service
VOCs	volatile organic compounds
Y-12	Y-12 Plant, Oak Ridge Reservation
WIPP	Waste Isolation Pilot Plant

CHEMICALS AND UNITS OF MEASURE

Bq	Becquerel
C	Celsius
Ci	curie
CCl_4	carbon tetrachloride
cm	centimeters
CFC	chlorofluorocarbons
CO	carbon monoxide
dB	decibel
dBA	decibel A-weighted
DCE	1, 2-dichloroethylene
F	Fahrenheit
ft	feet
ft^2	square feet
ft^3	cubic feet
ft^3/s	cubic feet per second
g	grams
G	acceleration due to gravity
gal	gallons
GPD	gallons per day
gpm	gallons per minute
GPY	gallons per year
ha	hectares
hr	hour
in	inches
kg	kilograms
km	kilometers
km^2	square kilometers
kV	kilovolts
kVA	kilovolt-ampere
kW	kilowatts
kWh	kilowatt hours
L	liters
lb	pounds
Li	lithium
m	meters
m^2	square meters
m^3	cubic meters
m/s	meters per second
mCi	millicuries (one-thousandth of a curie)
mCi/ml	millicuries per milliliter
mg	milligram (one-thousandth of a gram)
mg/L	milligrams per liter
MGD	million gallons per day
MGY	million gallons per year
mi	miles

mi^2	square miles
MLY	million liters per year
mph	miles per hour
mrem	millirem (one-thousandth of a rem)
MVA	megavolt-ampere
MW	megawatt
MWe	megawatt electric
MWh	megawatt hour
MWt	megawatt thermal
nCi	nanocurie (one-billionth of a curie)
nCi/g	nanocuries per gram
NO_2	nitrogen dioxide
NO_X	nitrogen oxides
O_3	ozone
Pb	lead
PCB	polychlorinated biphenyl
pCi	picocurie (one-trillionth of a curie)
pCi/l	picocuries per liter
PM_{10}	particulate matter (less than 10 microns in diameter)
ppb	parts per billion
ppm	parts per million
rem	roentgen equivalent man
s	seconds
SO_2	sulfur dioxide
t	metric tons
TATB	triaminotrinitrobenzene
TCA	1, 1, 1-trichloroethane
TCE	trichloroethylene
TNT	trinitrotoluene
yd^3	cubic yards
yr	year
μCi	microcurie (one-millionth of a curie)
μCi/g	microcuries per gram
μg	microgram (one-millionth of a gram)
μg/kg	micrograms per kilogram
μg/L	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter
μ	micron or micrometer (one-millionth of a meter)

METRIC CONVERSION CHART

To Convert Into Metric			To Convert Out of Metric		
If You Know	**Multiply By**	**To Get**	**If You Know**	**Multiply By**	**To Get**
Length					
inches	2.54	centimeters	centimeters	0.3937	inches
feet	30.48	centimeters	centimeters	0.0328	feet
feet	0.3048	meters	meters	3.281	feet
yards	0.9144	meters	meters	1.0936	yards
miles	1.60934	kilometers	kilometers	0.6214	miles
Area					
square inches	6.4516	square centimeters	square centimeters	0.155	square inches
square feet	0.092903	square meters	square meters	10.7639	square feet
square yards	0.8361	square meters	square meters	1.196	square yards
acres	0.40469	hectares	hectares	2.471	acres
square miles	2.58999	square kilometers	square kilometers	0.3861	square miles
Volume					
fluid ounces	29.574	milliliters	milliliters	0.0338	fluid ounces
gallons	3.7854	liters	liters	0.26417	gallons
cubic feet	0.028317	cubic meters	cubic meters	35.315	cubic feet
cubic yards	0.76455	cubic meters	cubic meters	1.308	cubic yards
Weight					
ounces	28.3495	grams	grams	0.03527	ounces
pounds	0.45360	kilograms	kilograms	2.2046	pounds
short tons	0.90718	metric tons	metric tons	1.1023	short tons
Force					
dynes	0.00001	newtons	newtons	100,000	dynes
Temperature					
Fahrenheit	Subtract 32 then multiply by 5/9ths	Celsius	Celsius	Multiply by 9/5ths, then add 32	Fahrenheit

METRIC PREFIXES

Prefix	Symbol	Multiplication Factor
exa-	E	1 000 000 000 000 000 000 = 10^{18}
peta-	P	1 000 000 000 000 000 = 10^{15}
tera-	T	1 000 000 000 000 = 10^{12}
giga-	G	1 000 000 000 = 10^{9}
mega-	M	1 000 000 = 10^{6}
kilo-	k	1 000 = 10^{3}
hecto-	h	100 = 10^{2}
deka-	da	10 = 10^{1}
deci-	d	0.1 = 10^{-1}
centi-	c	0.01 = 10^{-2}
milli-	m	0.001 = 10^{-3}
micro-	μ	0.000 001 = 10^{-6}
nano-	n	0.000 000 001 = 10^{-9}
pico-	p	0.000 000 000 001 = 10^{-12}
femto-	f	0.000 000 000 000 001 = 10^{-15}
atto-	a	0.000 000 000 000 000 001 = 10^{-18}

CHAPTER 1

Chapter 1

CHAPTER 1: INTRODUCTION

Chapter 1 begins with an overview of the Stockpile Stewardship and Management Program and the Department of Energy's roles and responsibilities. This chapter also includes a discussion of the background of the Program, a brief description of the organization of the document, and the Department of Energy's National Environmental Policy Act *of 1969 strategy for stockpile stewardship and management. Chapter 1 concludes with a discussion of related* National Environmental Policy Act *actions and other programmatic, project-specific, and site-wide reviews that are currently being prepared.*

1.1 OVERVIEW

The Department of Energy (DOE) is the Federal agency responsible for providing the Nation with nuclear weapons and ensuring that those weapons remain safe and reliable. This programmatic environmental impact statement (PEIS) analyzes the potential consequences to the environment if certain changes to the Nuclear Weapons Complex (Complex) are implemented to support DOE's Stockpile Stewardship and Management Program.

Stockpile stewardship and stockpile management describe DOE's management of the nuclear weapons program. While these terms are not new, DOE has recently redefined them in light of its current roles and responsibilities. Stockpile stewardship comprises the activities associated with research, design, development, and testing of nuclear weapons, and the assessment and certification of their safety and reliability. These activities have been performed at the three DOE weapons laboratories and the Nevada Test Site (NTS). Stockpile management comprises operations associated with producing, maintaining, refurbishing, surveilling, and dismantling the nuclear weapons stockpile. These activities have been performed at the DOE nuclear weapons industrial facilities.

Since the inception of nuclear weapons in the 1940s, DOE and its predecessor agencies have been responsible for stewardship and management of the Nation's stockpile. In response to the end of the Cold War and changes in the world's political regimes, the emphasis of the U.S. nuclear weapons program has shifted dramatically over the past few years from developing and producing new weapons to dismantlement and maintenance of a smaller, enduring stockpile. Accordingly, the nuclear weapons stockpile is being significantly reduced, the United States is no longer manufacturing new-design nuclear weapons, and DOE has closed or consolidated some of its former weapons industrial facilities. Additionally, in 1992 the United States declared a moratorium on underground nuclear testing, and in 1995 President Clinton extended the moratorium and decided to pursue a "zero yield" Comprehensive Test Ban Treaty (CTBT). Even with these significant changes, DOE's responsibilities for the nuclear weapons stockpile continue, and the President and Congress have directed DOE to continue to maintain the safety and reliability of the enduring nuclear weapons stockpile.

In response to direction from the President and Congress, DOE has developed its Stockpile Stewardship and Management Program to provide a single, highly integrated technical program for maintaining the continued safety and reliability of the nuclear weapons stockpile. It has evolved from predecessor programs that served this mission over previous decades. With no underground nuclear testing, and no new-design nuclear weapons production, DOE expects existing weapons to remain in the stockpile well into the next century. This means that the weapons will age beyond original expectations and an alternative to underground nuclear testing must be developed to verify the safety and reliability of weapons. To meet these new challenges, DOE's science-based Stockpile Stewardship and Management Program has been developed to increase understanding of the basic phenomena associated with nuclear weapons, to provide better predictive understanding of the safety and reliability of weapons, and to ensure a strong scientific and technical basis for future U.S. nuclear weapons policy objectives.

The size and composition of the U.S. nuclear weapons stockpile is determined annually by the President. The Department of Defense prepares the Nuclear Weapon Stockpile Plan (NWSP) based on military requirements and coordinates the development of the plan with DOE concerning its ability to support the plan. The NWSP, which is classified, covers the current year and a 5-year planning period. It specifies the types and quantities of weapons required and sets limits on the size and nature of stockpile changes that can be made without additional approval by the President. The Secretaries of Defense and Energy jointly sign the Nuclear Weapon Stockpile Memorandum (NWSM), which includes the NWSP and a long-range planning assessment. As such, the NWSM is the basis for all DOE stockpile support planning. Figure 1.1–1 depicts the NWSM process.

Chapter 2 discusses the relevant factors, such as treaties, that shape the NWSM. Also explained is the fact that potential variances in stockpile size, such as a Strategic Arms Reduction Talks (START) I Treaty-sized stockpile versus a START II protocol-sized stockpile, affect only the issue of manufacturing capacity required for the foreseeable future. National security policies in the post-Cold War era require that all the historical capabilities of the weapons laboratories, industrial plants, and NTS be maintained. Capability is the practical ability to perform a basic function or activity. Stockpile stewardship and management capabilities are independent of foreseeable future stockpile sizes. Stockpile management manufacturing capacities are examined in this PEIS, including those required to support a hypothetical low case stockpile size below START II. This was done to examine the sensitivity of potential decisions to transfer manufacturing activities to the weapons laboratories and NTS versus downsizing the industrial plants in place.

DOE must maintain a Complex with sufficient capability and capacity to meet current and future weapons requirements. For those activities associated with the ongoing stockpile stewardship program, DOE proposes to add enhanced capabilities to existing stockpile stewardship facilities to fulfill requirements. For those activities associated with the ongoing stockpile management program, DOE does not propose to construct any major new weapons industrial facilities. Rather, DOE proposes to "right-size" existing facilities or consolidate them to fulfill expected requirements for manufacture of repair or replacement components for an aging U.S. stockpile.

This *Programmatic Environmental Impact Statement for Stockpile Stewardship and Management* addresses potential changes to the future missions of the three weapons laboratories, the four weapons industrial plants, and NTS. A No Action alternative is also described and analyzed. Figure 1.1–2 shows the locations of the eight DOE sites comprising the current Complex.

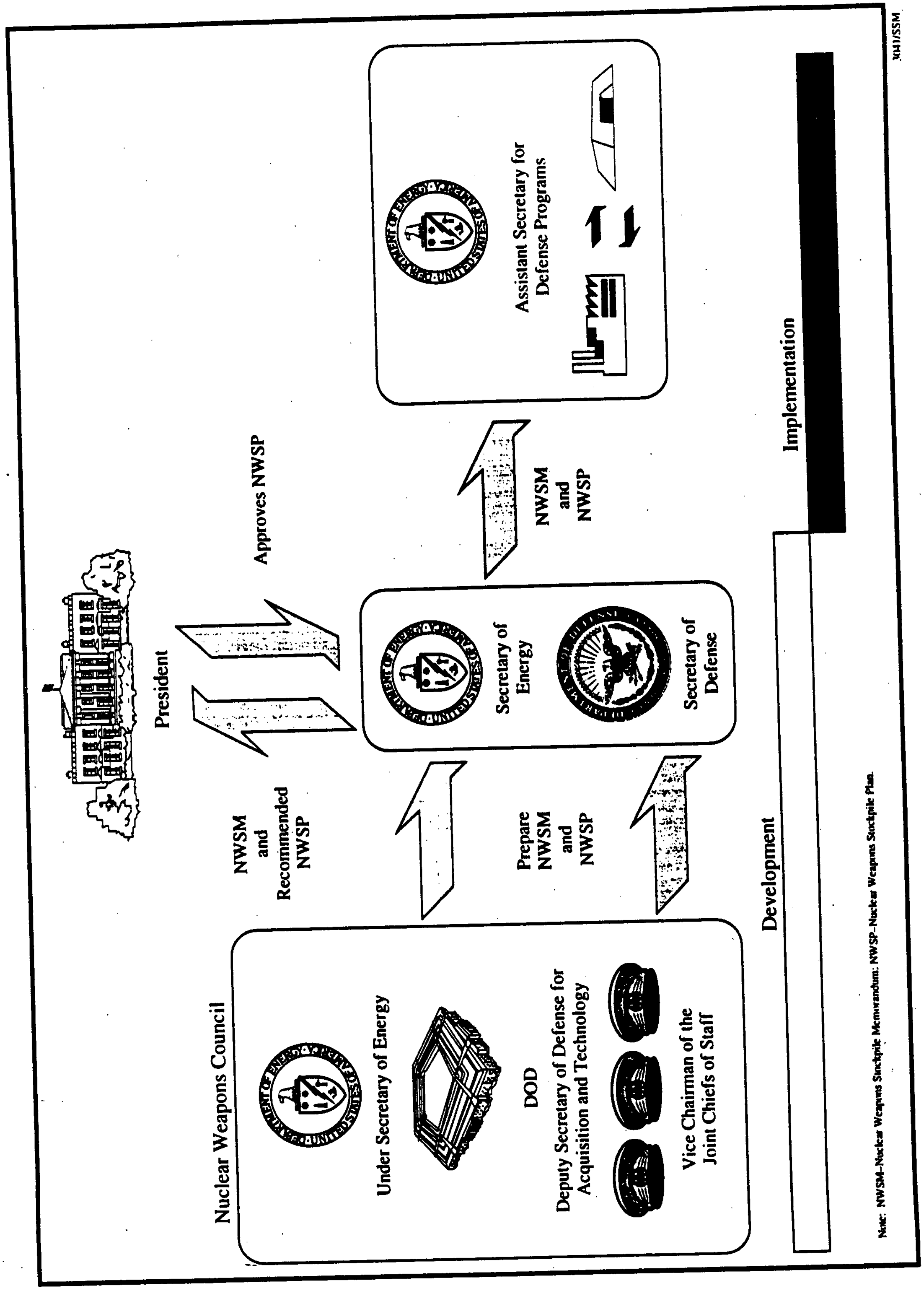
To estimate the potential environmental impacts from modifying/constructing and operating the facilities proposed for stockpile management, DOE assumes that facilities would be sized and operated to support a base case stockpile size consistent with the START II protocol. This PEIS also discusses impacts that would be expected for supporting a larger stockpile based on START I Treaty levels, and a hypothetical stockpile smaller than the START II protocol.

With regard to stockpile management facilities, potential environmental impacts from the base case are analyzed quantitatively in the greatest detail, while impacts from the high and low cases are discussed qualitatively. The facilities proposed for stockpile stewardship are independent of projected stockpile size.

1.2 ALTERNATIVES ANALYZED IN THE *PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT FOR STOCKPILE STEWARDSHIP AND MANAGEMENT*

The alternatives analyzed in this PEIS are described in detail in chapter 3 and summarized in this section. Alternatives are analyzed for both stockpile stewardship and stockpile management.

The stockpile stewardship portion of this PEIS evaluates the potential environmental impacts of the proposed actions and the reasonable alternatives for carrying out the stockpile stewardship functions. As described in section 3.3, the three independently justified proposed facilities include: the National Ignition Facility (NIF), the Contained Firing Facility (CFF), and the Atlas Facility. Four sites (figure 1.1–2) are potentially affected by the stockpile stewardship alternatives: Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), Sandia National Laboratories (SNL), and NTS (includes NLVF). This PEIS also assesses the No



Note: NWSM–Nuclear Weapons Stockpile Memorandum; NWSP–Nuclear Weapons Stockpile Plan.

FIGURE 1.1-1.—*Nuclear Weapons Stockpile Memorandum Process.*

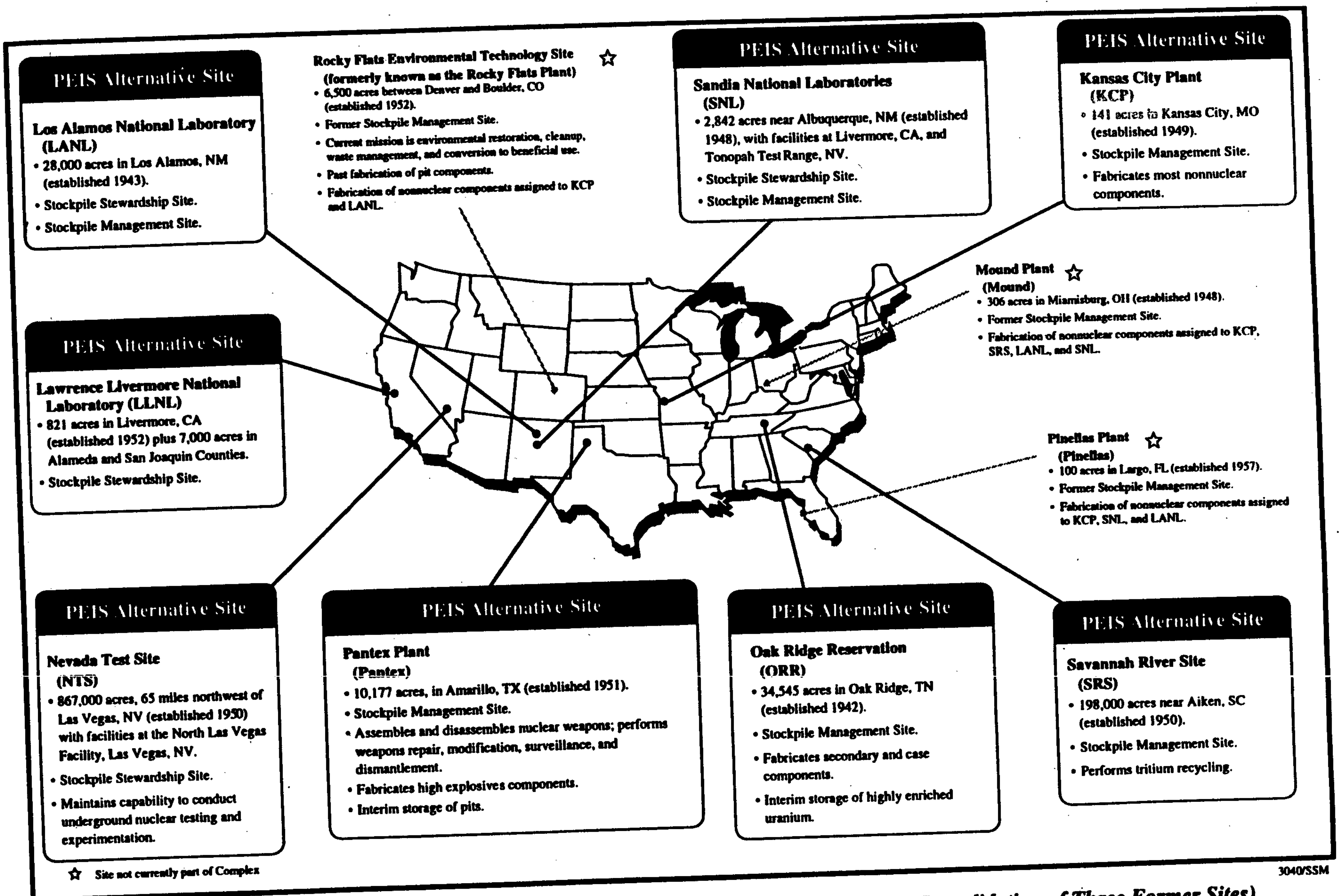


FIGURE 1.1–2.—*Current Stockpile Stewardship and Management Sites (Includes Recent Consolidation of Three Former Sites).*

Action alternative of relying on existing experimental facilities and continuing the missions at these four sites to fulfill the stockpile stewardship mission.

The science-based stockpile stewardship program is expected to continuously evolve as better information becomes available and technological advancements occur. Additional experimental facilities, such as the Advanced Hydrotest Facility, the High Explosives Pulsed Power Facility, the Advanced Radiation Source, and the Jupiter Facility, are considered to be next generation facilities (see section 3.3.4) that may be required in the future to support stockpile stewardship objectives. However, these facilities are not proposed actions in this PEIS because they have not reached the stage of development and definition that is necessary for evaluation and decisionmaking.

The stockpile management portion of this PEIS evaluates the potential environmental impacts of the reasonable alternatives for carrying out the stockpile management functions. As described in section 3.4, alternatives are assessed for nuclear weapons assembly/disassembly (A/D) and for fabricating pit, secondary and case, high explosives (HE), and nonnuclear components. Eight sites (figure 1.1–2) are potentially affected: Oak Ridge Reservation (ORR), Savannah River Site (SRS), Kansas City Plant (KCP), Pantex Plant (Pantex), LANL, LLNL, SNL, and NTS. This PEIS also assesses the No Action alternative of relying on existing facilities and continuing the missions at the current sites to fulfill the stockpile management mission.

1.3 BACKGROUND

To aid the reader's understanding of this PEIS, background information on the evolution of this PEIS and an unclassified description of a nuclear weapon follow.

1.3.1 Evolution of the *Programmatic Environmental Impact Statement for Stockpile Stewardship and Management*

Stockpile stewardship and management responsibilities have been ongoing for decades and the Program now reflects the cumulative effects of relatively recent U.S. national security policy changes. This PEIS experienced three general stages of evolution.

The first stage of evolution began in January 1991, when the Secretary of Energy announced that DOE would prepare a PEIS examining alternatives for reconfiguring the Complex. The framework for the Reconfiguration PEIS was described in the January 1991 *Nuclear Weapons Complex Reconfiguration Study* (DOE/DP–0083), a detailed examination of alternatives for the future Complex. This Reconfiguration Study contemplated large, stand-alone replacement facilities for the plutonium fabrication capability of the Rocky Flats Plant, as well as possible replacement and relocation of other Complex missions.

During the 1992 through 1994 timeframe, the second stage of the evolution reflected changes in DOE's thinking due to the reduction in weapons resulting from the end of the Cold War, unilateral stockpile reductions, and the START II protocol. Because of the planned significant stockpile reductions, the scope of the Reconfiguration Study changed to reflect a smaller and more integrated Complex than previously envisioned. Additionally, DOE placed increased importance on the stewardship of special nuclear materials that were determined to be in excess of the Nation's weapons needs.

DOE concluded in October 1994 that the framework described in the Reconfiguration Study no longer fit current circumstances or supported any realistic proposal for reconfiguring the Complex. Contributing factors to that conclusion included public comments from Reconfiguration Study scoping meetings, the fact that production of new-design nuclear weapons was not required for the foreseeable future, and DOE's decision to prepare a separate *Storage and Disposition of Weapons-Usable Fissile Materials Programmatic Environmental Impact Statement* (DOE/EIS–0229-D, draft published in February 1996).

As a result of these changed circumstances, the third stage evolved, whereby DOE separated the previously planned Reconfiguration PEIS into two new PEISs: the *Programmatic Environmental Impact Statement for Tritium Supply and Recycling* and this Stockpile Stewardship and Management PEIS. As explained in section 1.6, the Tritium Supply and Recycling PEIS has been completed and this Stockpile Stewardship and Management PEIS has been revised to better reflect current and expected Program requirements.

1.3.2 Nuclear Weapons

A general understanding of nuclear weapons, including the components that make up a weapon and the physical processes involved, helps one understand the scope of the Stockpile Stewardship and Management PEIS and what is to be accomplished by the Program. Figure 1.3.2–1 presents a simplified diagram of a modern nuclear weapon. An actual nuclear weapon produced in the United States is much more complicated, consisting of many thousands of parts.

The nuclear weapon primary is composed of a central core called a pit, which is usually made of plutonium-239 and/or highly enriched uranium (HEU). This is surrounded by a layer of HE, which when detonated, compresses the pit, initiating a nuclear reaction. This reaction is generally thought of as the nuclear fission "trigger," which activates the secondary assembly component to produce a thermonuclear fusion reaction. The remaining nonnuclear components consist of everything from arming and firing systems to batteries and parachutes. The production and assembly of many of these components is accomplished at dedicated industrial facilities. The A/D of nuclear weapons is done only at Pantex.

1.4 Organization of this Programmatic Environmental Impact Statement

This PEIS consists of four volumes. Volume I contains the main text; Volume II contains technical appendixes that support the analyses in Volume I and additional project information; and Volume III contains the project-specific environmental analyses for the proposed NIF, CFF, and Atlas Facility. Volume IV contains the comments received on the Draft PEIS during the public review period and the DOE responses. The Summary is a separate publication.

Volume I contains 10 chapters, which include the following information:

Chapter 1—Introduction. Stockpile Stewardship and Management Program background and the environmental analysis process.

Chapter 2—Purpose and Need. Reasons why DOE needs to take action and the objectives DOE proposes to achieve.

Chapter 3—Proposed Action and Alternatives. How DOE proposes to meet the specified need and achieve the objectives. This chapter also includes a summary comparison of the potential environmental impacts of the PEIS alternatives.

Chapter 4—Affected Environment and Environmental Impacts. Aspects of the environment (i.e., natural, built, and social) that might be affected by the PEIS alternatives and analyses of the potential impacts on the environment. Impacts are compared to the projected environmental conditions that would be expected to support the base case if no action were taken (the No Action alternative).

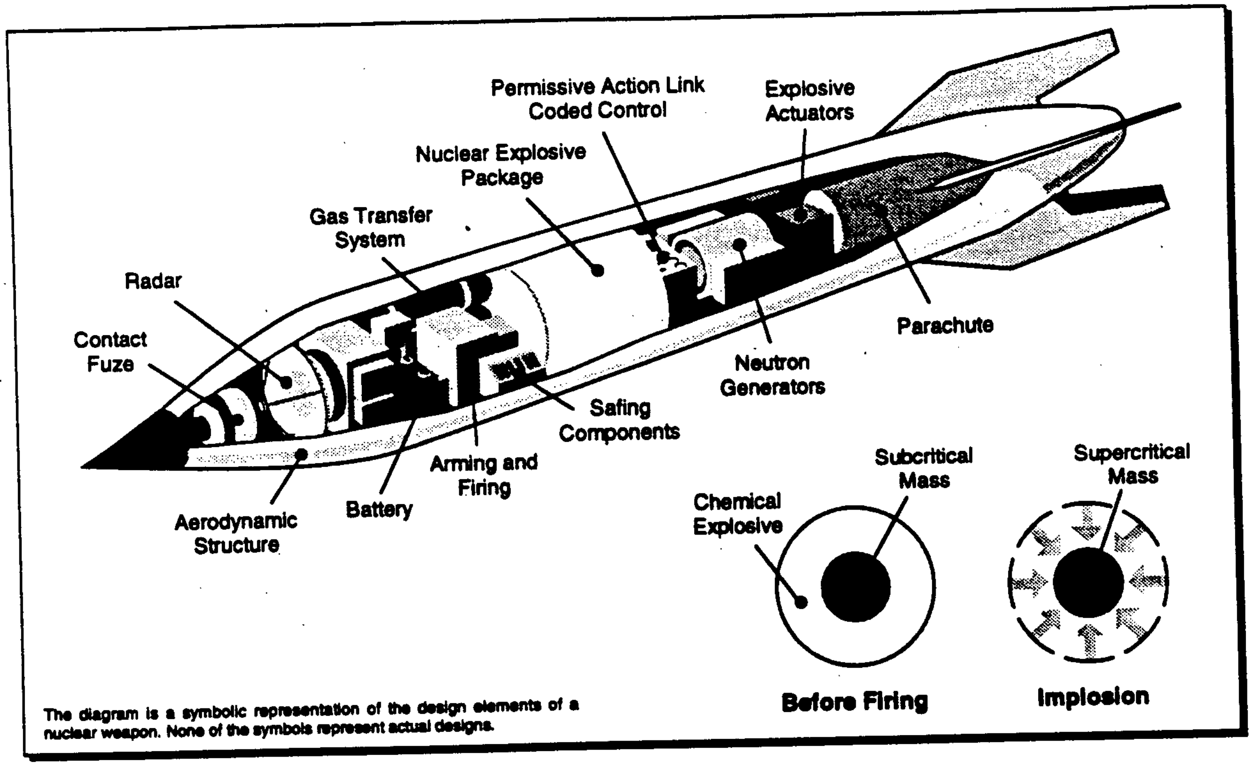
Chapter 5—Regulatory Requirements. Environmental, safety, and health regulations that would apply to the PEIS alternatives and agencies consulted for their expertise.

Chapters 6 through 10. A list of references; a list of preparers; a list of agencies, organizations, and persons to whom copies of this PEIS were sent; a glossary; and an index.

Volume II contains eight appendixes of technical information supporting the environmental analyses presented in Volume I. These appendixes contain the following information: Stockpile Stewardship and Management Program facilities; air quality; threatened, endangered, and special status species; socioeconomics; human health; facility accidents; intersite transportation; and environmental management.

Volume III contains three appendixes that comprise the project-specific environmental analyses for the NIF, CFF, and Atlas Facility proposed actions.

Volume IV (Comment Response Document) contains a description of the public hearing process, information on the document's organization and instructions for its use, a brief summary of changes to the Draft PEIS, and all comments received and DOE responses.



Nuclear explosions are produced by initiating and sustaining nuclear chain reactions in highly compressed material which can undergo both fission and fusion reactions. Modern strategic, and most tactical, nuclear weapons use a nuclear explosive package with two assemblies: the primary assembly, which is used as the initial source of energy, and the secondary assembly, which provides additional explosive energy release. The primary assembly contains a central core, called the "pit", which is surrounded by a layer of high explosives. The "pit" is typically composed of plutonium–239 and/or highly enriched uranium (HEU), and other materials. HEU contains large fractions of the isotope uranium–235.

Primary Detonation

The primary nuclear explosion is initiated by detonating the layer of chemical high explosive that surrounds the "pit" which in turn drives the pit material into a compressed mass at the center of the primary assembly. This implosion process is illustrated in the inset of the diagram.

Boosting

In order to achieve higher explosive yields from primaries with relatively small quantities of pit material, a technique called "boosting" is used. Boosting is accomplished by injecting a mixture of tritium (T) and deuterium (D) gas into the pit. The deuterium and tritium are stored in reservoirs until the gas transfer system is initiated. The implosion of the pit along with the onset of the fissioning process heats the D-T mixture to the point that the D-T atoms undergo fusion. The fusion reaction produces large quantities of very high energy neutrons which flow through the compressed pit material and produce additional fission reactions.

Secondary Activation

The energy released by the primary explosion activates the secondary assembly. The secondary assembly is composed of lithium deuteride and other materials. As the secondary implodes, the lithium, in the isotopic form lithium–6, is converted to tritium by neutron interactions, and the tritium product in turn undergoes fusion with the deuterium to create the thermonuclear explosion.

Nonnuclear Components

Nonnuclear components include contact fuzes, radar components, aerodynamic structures, arming and firing systems, a gas transfer system, permissive action link coded controls, neutron generators, explosive actuators, safing components, batteries, and parachutes.

2070/SSM

FIGURE 1.3.2–1.—*Nuclear Weapons Design.*

1.5 NATIONAL ENVIRONMENTAL POLICY ACT STRATEGY FOR STOCKPILE STEWARDSHIP AND MANAGEMENT

This PEIS has been prepared in accordance with Section 102(2)(c) of the *National Environmental Policy Act* (NEPA) of 1969, as amended (42 U.S.C. 4321 et seq.), and implemented by regulations promulgated by the Council on Environmental Quality (CEQ) (40 CFR 1500-1508) and DOE regulations (10 CFR 1021). Under NEPA, Federal agencies, such as DOE, that propose major actions that could significantly affect the quality of the human environment are required to prepare an environmental impact statement (EIS) to ensure that environmental information is available to public officials and citizens before decisions are made and before actions are taken. For broad actions, such as the Stockpile Stewardship and Management Program, a PEIS is prepared.

DOE's NEPA compliance strategy for the Stockpile Stewardship and Management Program consists of two phases. The first phase includes the Stockpile Stewardship and Management PEIS and subsequent Record(s) of Decision (ROD). Decisions will be based on relevant factors including economic and technical considerations, DOE statutory mission requirements, policy considerations, and environmental impacts. In addition to the analyses in this PEIS, engineering studies, cost, schedule, and technical feasibility analyses will be considered in the ROD. The ROD is expected to identify the effects of U.S. national security policy changes on Program missions and determine the configuration (facility locations) necessary to accomplish the Program missions.

During the second phase of the NEPA strategy, which would follow this PEIS ROD, DOE would prepare any necessary project-specific NEPA documents to implement any programmatic decision. However, as explained below, this PEIS also includes project-specific environmental analyses for the experimental facilities proposed for stockpile stewardship.

For the three facilities in the proposed action for stockpile stewardship—NIF, CFF, and the Atlas Facility—the Stockpile Stewardship and Management PEIS is intended to include sufficient project-specific analyses to complete NEPA requirements for siting, construction, and operation, and thus, satisfy both phases of the NEPA compliance strategy. This PEIS supports the programmatic decisions on whether to proceed with the facility and, if so, where to site the facility. The project-specific analysis describes the detailed construction and operational impacts for each facility at the alternate sites. Each proposed facility's project-specific analysis can be found in Volume III of this PEIS.

1.6 RELATED RECENTLY COMPLETED *NATIONAL ENVIRONMENTAL POLICY ACT* ACTIONS

Two other actions that DOE has already evaluated in separate EISs, in accordance with CEQ regulations for interim actions (40 CFR 1506.1), are within the scope of the Stockpile Stewardship and Management PEIS. These are the Tritium Supply and Recycling PEIS and the *Dual Axis Radiographic Hydrodynamic Test* (DARHT) *Facility Environmental Impact Statement*. These two actions, and their relationship to the Stockpile Stewardship and Management PEIS, are described below.

1.6.1 *Programmatic Environmental Impact Statement for Tritium Supply and Recycling*

The Tritium Supply and Recycling PEIS evaluated the potential environmental impacts associated with alternatives for siting, constructing, and operating tritium supply and recycling facilities. The purpose of the Tritium Supply and Recycling Program is to provide long-term, assured tritium supply and recycling to support the Nation's nuclear weapons stockpile. The Tritium Supply and Recycling Draft PEIS (DOE/EIS–0161) was issued in March 1995 and was followed by public hearings in April 1995. A Final PEIS was issued in October 1995, followed by the ROD, published in the *Federal Register* (60 FR 63878), on December 12, 1995.

In the ROD, DOE announced that it will embark on a dual track strategy for acquiring a new tritium production capability that involves the use of existing commercial light water reactors via the purchase of a reactor or purchase of irradiation services (with the option to purchase the reactor), and the development of a linear accelerator. DOE will seek to fully prove the feasibility of both approaches over the next 3 years, then implement the most promising approach, while completing the design and necessary procedures (e.g., regulatory approval) for the other path to allow it to serve as a backup to the preferred path. If an accelerator is built, it will be located at SRS.

Tritium, a radioactive gas that decays at a rate of more than 5 percent per year, is a necessary component of every nuclear weapon in the existing stockpile and must be replenished periodically in order for the weapons to operate as designed. No new tritium has been produced since 1988, when the last of the DOE's tritium production reactors at SRS was shut down. Currently, tritium recycled from weapons retired from the stockpile is used to meet stockpile requirements. However, based on a START II protocol stockpile size, even with tritium recycling, new tritium will be needed by 2011. Because it could take up to 15 years for a tritium source, once selected, to begin producing tritium, it was necessary for DOE to make a decision on tritium supply in advance of this Stockpile Stewardship and Management PEIS. The decision resulting from the Tritium Supply and Recycling PEIS is accounted for in the No Action alternative of this PEIS.

1.6.2 *Dual Axis Radiographic Hydrodynamic Test Facility Environmental Impact Statement*

The DARHT Facility EIS analyzed the environmental consequences of alternative ways to accomplish enhanced high-resolution radiography for the purposes of performing hydrodynamic tests and dynamic experiments. These tests are used to obtain diagnostic information on the behavior of nuclear weapons primaries and to evaluate the effects of aging on nuclear weapons. The DARHT Facility's construction was about 34 percent complete when construction was halted under a U.S. District Court preliminary injunction issued on January 27, 1995, pending completion of the DARHT Facility EIS and issuance of the ROD. The DARHT Facility EIS evaluated the potential environmental impacts of six alternatives; the preferred approach entailed completing and operating the proposed DARHT Facility at LANL and implementing a phased enhanced containment strategy for testing at the DARHT Facility, so that most tests would be conducted inside steel vessels. The DARHT Facility Draft EIS (DOE/EIS-0228) was issued in May 1995 and was followed by public hearings in May and June 1995. A Final PEIS was issued in August 1995, followed by the ROD, published in the *Federal Register* (60 FR 53588) on October 16, 1995.

In the ROD, DOE announced that it will complete and operate the DARHT Facility at LANL while implementing a program to conduct most tests inside steel vessels, with containment to be phased in over 10 years. Following the ROD, DOE filed a motion for dissolution of the injunction. On April 16, 1996, the U.S. District Court concluded that the purpose of the injunction has been satisfied, and therefore lifted the injunction and dismissed the case.

DOE will rely on hydrodynamic testing in the absence of underground nuclear testing to ensure the stockpile's safety and reliability. Under any course of action analyzed in this Stockpile Stewardship and Management PEIS, DOE will still need to continue hydrodynamic testing and acquire near-term enhanced radiographic capability such as that provided by the DARHT Facility. DOE determined that implementing the DARHT Facility ROD will not prejudice any decisions in the Stockpile Stewardship and Management Program. The impacts of the DARHT Facility for each resource area are addressed in the No Action impact discussions for LANL in section 4.6.3.

1.7 OTHER *NATIONAL ENVIRONMENTAL POLICY ACT* REVIEWS

In addition to the two interim actions identified above, DOE is currently preparing other programmatic, project-specific, and site-wide NEPA documents. These documents, and their relationship to the Stockpile Stewardship and Management PEIS, are discussed below.

1.7.1 Waste Management Programmatic Environmental Impact Statement

Alternatives for managing radioactive, hazardous, and mixed (radioactive and hazardous) wastes are analyzed in the *Waste Management Programmatic Draft Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (DOE/EIS-0200-D), issued in August 1995. When completed, the Waste Management PEIS will support DOE decisions on the management of, and facilities for, the treatment, storage, and/or disposal of radioactive, hazardous, and mixed wastes.

Wastes would be generated by the Stockpile Stewardship and Management Program. Although there may be changes from site to site, for the Complex as a whole, the wastes will be similar in form and quantity to wastes currently generated by DOE facilities and analyzed in the Waste Management PEIS. Wastes generated by the Program would be managed in accordance with decisions made as a result of the Waste Management PEIS. Nonetheless, for the purposes of thoroughly analyzing the impacts of the proposed action, the treatment, storage, and/or disposal of these wastes in existing facilities is analyzed in the Stockpile Stewardship and Management PEIS.

Both the Stockpile Stewardship and Management PEIS and the Waste Management PEIS consider national strategies. The Waste Management PEIS considers alternatives that include local, regional, and/or consolidated waste management facilities. This Stockpile Stewardship and Management PEIS addresses alternatives that could result in the relocation of current missions and/or closure of existing sites. These two strategies are mutually consistent; however, the RODs will require coordination.

1.7.2 *Storage and Disposition of Weapons-Usable Fissile Materials Programmatic Environmental Impact Statement*

The Storage and Disposition PEIS will analyze alternatives for the long-term storage of all weapons-usable fissile materials, primarily HEU and plutonium, and the disposition of weapons-usable fissile materials, primarily plutonium the President has declared to be surplus to national defense needs. The *Implementation Plan for the Storage and Disposition of Weapons-Usable Fissile Materials Programmatic Environmental Impact Statement* was issued in March 1995, and the Draft PEIS was issued in February 1996.

Both this Stockpile Stewardship and Management PEIS and the Storage and Disposition PEIS analyze reasonable alternatives for the long-term storage of strategic reserves of plutonium and HEU. Because the overall scope of each PEIS is significantly different, different long-term strategic reserve storage alternatives are reasonable for each PEIS. For example, the Stockpile Stewardship and Management PEIS evaluates alternatives for strategic reserve storage (in the form of pits and secondaries) at the weapons A/D Facility, which is where these strategic reserves might be first used. The Storage and Disposition PEIS has a relatively broader scope regarding fissile material storage, which will include the storage of all surplus material, naval reactor fuel, and naval reactor fuel feed stock, as well as nonweapons research and development materials. It analyzes alternatives, among others, that would collocate strategic reserves with surplus fissile materials.

Preparation of these two PEISs is being closely coordinated to ensure that all reasonable alternatives for long-term strategic reserve storage are assessed. Decisions on strategic storage will not be made in the upcoming ROD for the Stockpile Stewardship and Management Program. Storage decisions are not expected to be made until both the Stockpile Stewardship and Management Final PEIS and the Storage and Disposition Final PEIS are completed.

1.7.3 *Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components*

The *Draft Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components* (Pantex Site-Wide EIS) (DOE/EIS-0225D), which was issued in March 1996, analyzes the alternatives and environmental impacts associated with conducting nuclear weapons operations at Pantex for approximately the next 5 to 10 years. Included in the Pantex Site-Wide Draft EIS is an analysis of a plan to increase the interim storage of plutonium pits from 12,000 to 20,000 pits. The EIS also analyzes alternative locations to Pantex for interim pit storage operations.

In May 1994, when DOE announced its intention to prepare the Pantex Site-Wide EIS, DOE believed that the Pantex Site-Wide EIS ROD would precede decisionmaking on the long-term storage of pits by at least several years. Accordingly, the Pantex Site-Wide Draft EIS was scoped to address alternative locations for interim pit storage (i.e., until the long-term decisions were made and implemented).

Since May 1994, DOE has initiated two additional NEPA documents that address the storage of pits. This Stockpile Stewardship and Management PEIS will support decisions on the long-term storage of pits that will be needed for national security requirements (strategic reserve pits). As discussed above, the Storage and Disposition PEIS will support decisions on the long-term storage of all pits (strategic reserve and surplus) and the approach for dispositioning pits that are surplus to national security requirements.

Both of these PEISs have progressed to the point where they are scheduled to have their RODs issued by the fall of 1996, at or about the same time as the ROD for the Pantex Site-Wide EIS, which is scheduled for November 1996. Therefore, DOE is proposing that as long as the RODs of both PEISs and the Pantex Site-Wide EIS occur within a short period of time of one another, decisions on the long-term storage of pits would be made in the RODs of the PEISs. A decision relating to the interim storage of pits at Pantex would be made in the ROD of the Pantex Site-Wide EIS pending implementation of the selected long-term storage option.

However, if there is a significant delay in the RODs for either of the PEISs, or if DOE does not make a decision on the long-term storage of pits in those RODs, then there would be a need to make a decision on the location of interim storage of pits uninformed by a decision on long-term storage. In any event, the Pantex Site-Wide EIS will be completed with the analysis of interim storage alternatives, including addressing the issues and comments received from the public on that EIS, to support a decision relating to the storage of pits until a long-term storage decision has been made and implemented.

This PEIS includes Pantex as an alternative site for the following stockpile management missions: HE fabrication, weapons A/D, and strategic reserve storage. Programmatic decisions on these alternatives will be identified in the ROD for this PEIS; however, a decision on storage may occur later than decisions on the other two missions.

1.7.4 *Site-Wide Environmental Impact Statement for the Los Alamos National Laboratory*

The LANL Site-Wide Draft EIS is currently being prepared and analyzes alternatives for LANL's operation over the next 5 to 10 years. The Stockpile Stewardship and Management PEIS includes LANL as an alternative site for two stockpile stewardship facilities (NIF and Atlas) and the following stockpile management missions: pit fabrication, secondary and case fabrication, HE fabrication, and nonnuclear fabrication. Programmatic decisions on these alternatives will be identified in the ROD for this PEIS.

1.7.5 *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada*

The NTS Site-Wide EIS (DOE/EIS 0243), analyzes alternatives for NTS's operation over the next 5 to 10 years. The Stockpile Stewardship and Management PEIS includes NTS as an alternative site for both a stockpile stewardship facility (NIF) and two stockpile management missions: weapons A/D and strategic reserve storage. Programmatic decisions on these alternatives will be identified in the ROD for this PEIS; however, a decision on storage may occur later than a decision on weapons A/D.

1.8 PUBLIC PARTICIPATION

Public participation for the PEIS consisted of two primary activities: the scoping process and the public comment process. CEQ regulations require "an early and open process for determining the scope of issues to be addressed and for identifying the significant issues to be addressed and for identifying the significant issues related to a Proposed Action (40 CFR 1501.7)." This is usually called the public scoping process. Section 4.1 of the *Implementation Plan Stockpile Stewardship and Management Programmatic Environmental Impact Statement* (DOE–EIS–0236IP, December 1995) describes the scoping process. The following sections describe the public comment process on the Draft PEIS.

1.8.1 Public Comment Process on the Draft Programmatic Environmental Impact Statement

In February 1996, DOE published the Stockpile Stewardship and Management Draft PEIS that evaluated the siting, construction, and operation of the proposed stockpile stewardship facilities and the modification/construction and operation of facilities proposed for stockpile management at eight alternative sites within the Complex. The 60-day public comment period for the Draft PEIS began on March 8, 1996, and ended on May 7, 1996. However, late comments were considered to the extent practical.

During the comment period, public hearings were held in Los Alamos, NM; Albuquerque, NM; Las Vegas, NV; Oak Ridge, TN; Kansas City, MO; Livermore, CA; Washington, DC; Amarillo, TX; Santa Fe, NM; and North Augusta, SC. Five of the public hearings were joint meetings to obtain comments on both the Stockpile Stewardship and Management PEIS and the Storage and Disposition PEIS. Two of the joint meetings (Pantex and SRS) also included the Pantex Site-Wide EIS. In addition, the public was encouraged to provide comments via mail, fax, electronic bulletin board (Internet), and telephone (toll-free 800 number). Figure 1.8.1–1 shows the dates and locations of the hearings.

The public hearings held for the Draft PEIS were conducted using an interactive workshop-type format. The format chosen allowed for a two-way interaction between DOE and the public and encouraged informed public input and comments on the document. Neutral facilitators were present at the hearings to direct and clarify discussions and comments. Court reporters were also present to provide a verbatim transcript of the proceedings and record any formal comments.

All public hearing comment summaries were combined with comments received by mail, fax, Internet, or telephone during the public comment period. Volume IV of this PEIS, the Comment Response Document, describes the public comment process in detail, presents comment summaries and responses, and provides copies of all comments received.

1.8.2 Major Comments Received on the Draft Programmatic Environmental Impact Statement

A large number of the comments received on the Draft PEIS related to concerns that the analysis of particular alternatives and/or alternative sites did not adequately consider such factors as cost and technical feasibility. Although these concerns made up the majority of the comments, many other comments related to the resources analyzed, NEPA and regula-

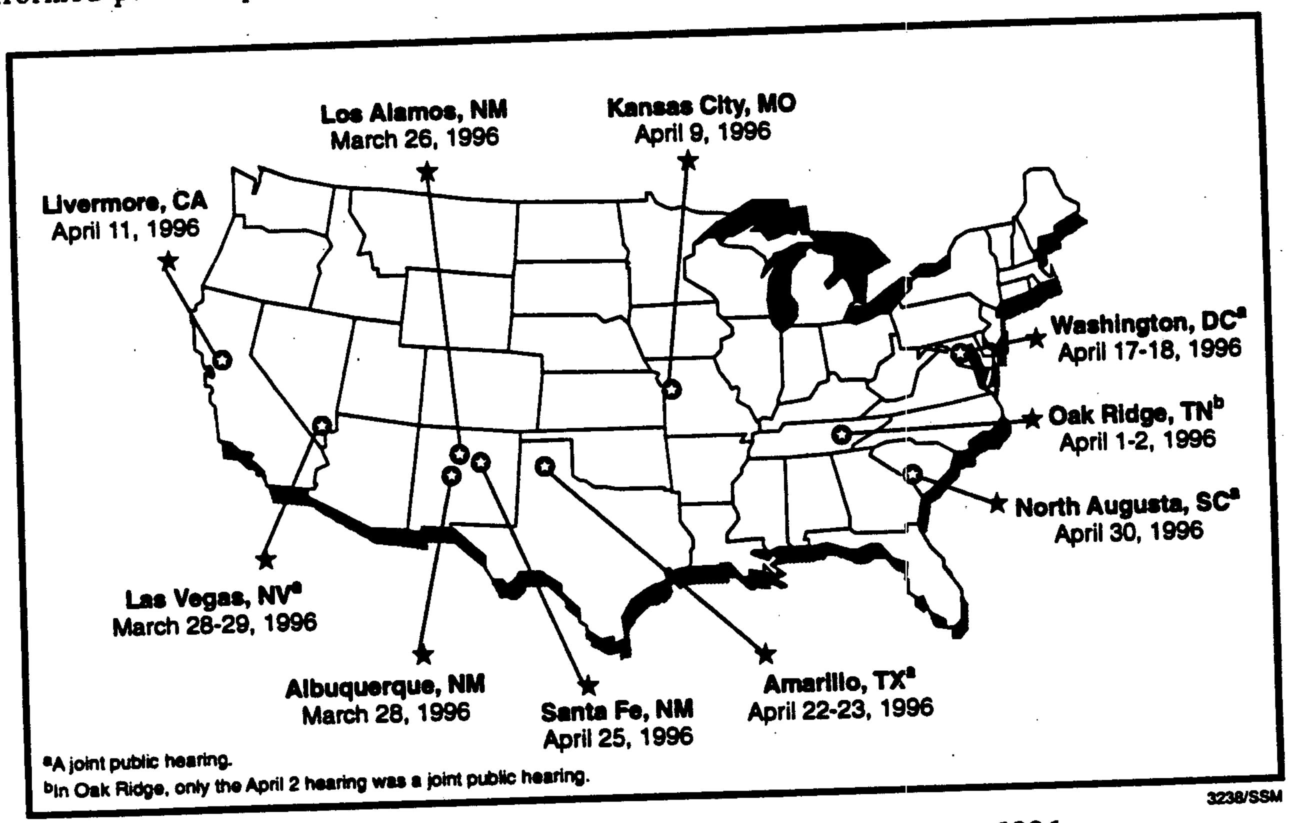


FIGURE 1.8.1–1.—*Public Hearing Locations and Dates, 1996.*

tory issues, and DOE and Federal policies as they related to this PEIS. The major issues identified by commentors include the following:

- The potential conflict between the Stockpile Stewardship and Management Program and the Nuclear Nonproliferation Treaty goals, and the pursuit of a CTBT
- Using the funds allocated for the Stockpile Stewardship and Management Program for social programs and on research of alternative sources of energy
- The generation, storage, and disposal of radioactive and hazardous wastes and the associated risks
- The impacts of the alternatives on human health (both from radiation and hazardous chemicals) and how these risks were determined and evaluated
- The relationship of this PEIS to other DOE documents and programs, particularly the Pantex and NTS Site-Wide EISs, the Waste Management and the Storage and Disposition PEISs, and the need to make decisions based on all associated programs and activities concurrently
- The need for decisions to be based on many different factors, including environmental, cost, and safety concerns
- The need for DOE to consider a zero-level stockpile, remanufacturing, and denuclearization as alternatives
- Maintaining deterrence with surveillance, curatorship, and remanufacturing without the need for the proposed facilities
- The need for DOE to adequately consider the ongoing stewardship program
- The need for DOE to perform detailed analysis of future stockpile stewardship facilities

All of the issues identified above are summarized and responded to in detail in chapter 3 of Volume IV. Substantial revisions to this PEIS resulting from public comments are discussed below.

Revisions in the Final PEIS include additional discussion and analysis in the following areas: alternatives considered but eliminated (section 3.1.2); the No Action alternative (appendix A, Stockpile Stewardship and Management Facilities, sections A.1.5, A.1.6, A.1.7, and A.1.8); socioeconomics at ORR, Pantex, and KCP; accident impacts at Pantex; normal operation impacts for radiological and chemical sections; cumulative impacts (section 4.13); and minor changes to LANL water resources section (section 4.6.2.4). A new section was also added to appendix F (section F.4, Secondary Impacts of Accidents). Each of these areas is discussed in more detail in the following section.

1.8.3 Changes from the Draft Programmatic Environmental Impact Statement

In response to comments submitted after issuance of the Draft PEIS and due to additional technical details not available at the time of issuance of the Draft, Volumes I, II, and III of the Final PEIS contain revisions and changes. The revisions and changes made since the issuance of the Draft PEIS are indicated by a double underline for minor word changes or by a sidebar in the margin for paragraph or larger changes. In addition, Volume I and each appendix in Volume III provide a unique reference list to enable the reader to further review and research selected topics. Volume IV (Comment Response Document) of the PEIS contains the comments received during public review of the Draft PEIS and the DOE responses to those comments. DOE has public reading rooms near each affected site and in Washington, DC, where these referenced documents may be reviewed or obtained for review. A brief discussion of the more significant changes is provided in the following paragraphs.

Alternatives Considered but Eliminated from Detailed Study and Related Issues. In response to public comments expressing a concern that DOE had not analyzed a reasonable range of alternatives, section 3.1.2 was expanded. The changes were in response to specific questions concerning compliance with treaties, stockpile size, maintenance and remanufacturing options, and the stockpile stewardship alternatives including No Action. The discussions in section 3.1.2 provide greater detail and more clarification on why alternatives were eliminated from detailed study in this PEIS. Together, chapter 2 and section 3.1.2 explain the framework and the constraints of national security policy that have shaped the proposed actions and reasonable alternatives for this PEIS.

No Action Alternative. Several commentors did not think that the No Action alternative was clearly explained in the Draft PEIS. More specifically, they were not sure which existing facilities at LANL, LLNL, SNL, and NTS were part of the ongoing stockpile stewardship program. As a result, the description of No Action was modified in appendix A to include a listing of major DOE Office of Defense Programs function facilities at LANL, LLNL, SNL, and NTS. Additionally, the discussion of impacts of No Action at LANL (section 4.6.3) was revised as appropriate to include the effects of the DARHT Facility.

Socioeconomics at Oak Ridge Reservation, Kansas City Plant, and Pantex Plant. Based on public comments and revised workforce size estimates, the socioeconomic impact sections for the downsizing alternatives at ORR (section 4.2.3.8), KCP (section 4.4.3.8), and Pantex (section 4.5.3.8) have been revised. The analyses were also expanded to cover the base case single-shift option in greater detail. At these three sites, downsizing of existing facilities is the preferred alternative. For such downsizing, the base case single-shift scenario represents the bounding analysis for the workforce. The change in worker estimates did not cause any of the major indicators in the socioeconomic analysis to change in any significant manner.

Accident Impacts at Pantex Plant. The analyses of impacts due to an aircraft impact and resulting release of plutonium by a fire or an explosion were modified to include more updated data on probability and source terms developed for the Pantex Site-Wide EIS. Section 4.5.3.9 and appendix sections F.2.1.1 and F.2.1.2 were revised to incorporate the new analytical results. Based on the updated data, the potential impacts and risks to the public from the composite accident presented in this PEIS would be less than previously reported in the Draft PEIS. This change was not significant.

Normal Operation Radiological/Chemical Impacts. The discussion of the normal operation radiological affected environment for LANL, section 4.6.2.9, has been updated to include the latest data from *Environmental Surveillance at Los Alamos During 1993 (LA-12973-ENV, October 1995)*. The normal operation radiological impact sections 4.2.3.9, 4.3.3.9, and 4.6.3.9 have also been revised to include the contribution of recent facilities at ORR, SRS, and the new environmental surveillance data for LANL. The chemical health effects, section 4.6.3.9 for LANL and section 4.7.3.9 for LLNL, were revised based on new analyses using updated dispersion rates. Tables in appendix section E.3.4 supporting these sections were also updated. The majority of these changes affected the No Action alternative analyses. None of the changes to these sections significantly changed the analysis of impacts for the "action" alternatives.

Cumulative Impacts. The cumulative impact section, 4.13, has been modified to incorporate a discussion of normal operation radiological impacts and other changes based on more recent data from NEPA documents and RODs. The changes to this section did not have a meaningful effect on the analysis/comparative evaluation of alternatives.

Los Alamos National Laboratory Water Resources. Changes were incorporated in section 4.6.2.4 (Water Resources) for LANL based on more recent water use and water quality data. The Draft PEIS had erroneously stated that the LANL water allotment would be fully used by about 2000. The Final PEIS correctly reports that this allotment would be fully used by about 2052. This change did not have a meaningful effect on the analysis/comparative evaluation of alternatives. Minor revisions reflecting the baseline changes were also made to the LANL water resources impact section, 4.6.3.4.

Health Effects Studies. Appendix section E.4, which outlines epidemiological studies at the alternative sites, was rewritten to provide more detail and incorporate more recent and other applicable studies. Although these epidemiology sections do not affect the environmental analysis of future stockpile stewardship and management missions, they do provide relevant information regarding potential health effects from past actions. These changes did not have a meaningful effect on the analysis/comparative evaluation of alternatives.

New Section. A new section has also been added to the Final PEIS (appendix section F.4, Secondary Impacts of Accidents). This section evaluates the secondary impacts of accidents that affect elements of the environment other than humans (e.g., farmland). The section was added because of public comments. The results of this analysis show that secondary impacts from accidents would generally not extend beyond site boundaries, except at Pantex and LLNL, where it is possible that some surface contamination could occur. This new analysis did not have a meaningful effect on the analysis/comparative evaluation of alternatives.

CHAPTER 2

Chapter 2

CHAPTER 2: PURPOSE OF AND NEED FOR THE STOCKPILE STEWARDSHIP AND MANAGEMENT ACTION

Chapter 2 describes the purpose of and need for the Stockpile Stewardship and Management Program. It includes a discussion of national security policy considerations and the technical effects of national security policy on shaping the Program's purpose and need. The proposed action and alternatives are also discussed. The final section summarizes the chapter and introduces the logic flow diagrams that depict the framework of the Program from national policy and stockpile perspectives.

2.1 INTRODUCTION

The Stockpile Stewardship and Management Program is broad in scope and technically complex. The Program currently involves the integrated activities of three national laboratories, four industrial plants, and a nuclear test site. Further, the Program must be consistent with, and supportive of, U.S. national security policies, which have changed considerably since the end of the Cold War. Therefore, to better understand the *Programmatic Environmental Impact Statement* (PEIS) *for Stockpile Stewardship and Management* purpose, need, proposed action, and alternatives, it is useful to view the Program from two different perspectives. One perspective (see section 2.2) is from the top level of national security policies for nuclear deterrence, arms control, and nonproliferation. These policies include ongoing responsibilities, strategies, and directives. The other perspective (see section 2.3) focuses on the relevant technical efforts to maintain a safe and reliable U.S. nuclear weapons stockpile. Flow diagrams representing the logic of each perspective are referenced in the chapter summary (see section 2.7) and appear at the end of chapter 2.

2.2 NATIONAL SECURITY POLICY CONSIDERATIONS

There are four principal national security policy overlays and four related treaties that define Program conditions for the reasonably foreseeable future. They are:

- Presidential Decision Directives (PDDs)
- *National Defense Authorization Act of 1994* (Pub. L. 103-160)
- The Department of Defense (DOD) Nuclear Posture Review (NPR)
- Nuclear Weapon Stockpile Memorandum (NWSM)
- Proposed Comprehensive Test Ban Treaty (CTBT)
- Nuclear Nonproliferation Treaty (NPT)
- Strategic Arms Reduction Talks (START) I Treaty
- START II protocol

Of the above, the START II protocol is the most useful in helping define a specific time period to bound the reasonably foreseeable future.

2.2.1 Nuclear Posture Review

Beginning in 1991, several Presidential policy decisions, some unilateral and some made in conjunction with international treaties, resulted in DOD conducting the comprehensive NPR, which was approved by the President in 1994. The NPR defines and integrates past and present U.S. policies for nuclear deterrence, arms control, and nonproliferation objectives. The unclassified NPR strategies that pertain to the Stockpile Stewardship and Management Program were presented at the eight public scoping meetings conducted in the summer of 1995. There was general public interest in understanding this complex issue, especially as it relates to treaties, policies, and stockpile size. A summary of how the post-Cold War treaties relate to the NPR strategies and the stockpile follows.

Strategic Arms Reduction Talks. The NPR assumes that the START I Treaty and START II protocol will be fully implemented. However, since the START I Treaty is not yet fully implemented and the START II protocol is not scheduled to be fully implemented until 2003, the NPR strategy protects the U.S. option to reconstitute the stockpile to START I levels should unfavorable events occur in the former Soviet Union. The treaties only control the number of strategic nuclear weapons that can be loaded on treaty-specified and -verified strategic missiles and bombers. These nuclear weapons are limited to 6,000 by the START I Treaty and 3,500 by the START II protocol. The treaties do not control the total stockpile size or the composition of strategic and nonstrategic nuclear weapons of either side. The U.S. stockpile will be larger than 6,000 under START I and 3,500 under START II since the stockpile also includes weapons retained for nonstrategic nuclear forces, DOD operational spares, and spares to replace weapons attrited by Department of Energy (DOE) surveillance testing. In the START II case, the stockpile may also include weapons retained to reconstitute to the START I level. However, the terms "START I-sized stockpile" and "START II-sized stockpile" are relevant to the Stockpile Stewardship and Management PEIS as explained in section 2.2.2 and chapter 3.

Comprehensive Test Ban Treaty. It is the declared policy of the United States to seek ratification of a "zero yield" CTBT as soon as possible. The United States has been observing a moratorium on nuclear testing since 1992. The NPR strategy reflects this policy and the strategy has a significant effect on shaping the Stockpile Stewardship and Management Program. As explained in section 2.3.4, it is anticipated that repairs or replacements to an aging U.S. stockpile will be needed. Assessment and certification of the safety and reliability of stockpile repairs or replacements without nuclear testing is a significant challenge to the Program. In declaring the policy to seek a CTBT, the President also declared that the continued safety and reliability of the U.S. nuclear stockpile is a "supreme national interest" of the United States.

Nuclear Nonproliferation Treaty. Article VI of the NPT obligates the parties "to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control." However, the NPT does not provide any time period for achieving this goal. Even relatively simple bilateral treaties, such as START I and START II, require more than 10 years to implement, not counting the years of negotiations. In the words of Ambassador Thomas Graham, "Regrettably, none of us is clairvoyant, and so it is unwise to predict with any degree of precision the future international reality and consequently, the complete arms control agenda."[1] For the Stockpile Stewardship and Management PEIS, speculation on the terms and conditions of a "zero level" U.S. stockpile with international verification, as some have suggested during the scoping meetings, goes beyond the bounds of the reasonably foreseeable future. For the same reason, DOE has chosen not to speculate on a return of the nuclear arms race requiring a stockpile larger than START I size. However, in keeping with the NPT goals, the NPR strategy does express the U.S. intent to pursue further reductions in nuclear forces beyond START II. Therefore, the implications of further reductions below the START II-sized stockpile are discussed in this PEIS where they are relevant.

2.2.2 Nuclear Weapon Stockpile Memorandum

Although the NWSM is a classified document, its effect in shaping the Stockpile Stewardship and Management PEIS can be explained in an unclassified context. Without access to the classified NWSM, one might assume that the exact details of the projected stockpile size and composition under START I and START II could have a significant effect on the Stockpile Stewardship and Management PEIS. This is not the case for the following reasons:

- The stockpile composition (i.e., the number of different weapon types), does not vary significantly in either a START I- or START II-sized stockpile. All weapon types are tritium-boosted, thermonuclear weapons that could be affected by the same types of safety and reliability problems requiring repair, replacement, and certification in the absence of nuclear testing. The basic weapons laboratory and industrial capa-

[1]From a January 1995 speech by Ambassador Graham, Special Representative of the President for Arms Control Non-Proliferation and Disarmament.

bilities required for the foreseeable future do not vary significantly from planned differences in size or composition of either a START I- or START II-sized stockpile.

- Industrial capacity is only indirectly affected by projected variances in stockpile size and composition. Stockpile size must be linked with historical stockpile data to arrive at estimates of average annual industrial capacity needed to produce components for repair or replacement. Even without the limitations on the use of historical stockpile data described in section 2.3.3, this cannot be done with mathematical precision and, therefore, reasonable technical judgment must be applied. The result is to forecast a need for a smaller industrial base with capacities on a scale of hundreds of weapons per year versus the thousands of weapons per year that existed prior to the end of the Cold War. A range of annual requirements is considered for impact analysis in the Stockpile Stewardship and Management PEIS that bounds potential variances in the NWSM under the START II protocol. In addition, a qualitative sensitivity analysis is performed on the hypothetical low case that is well below the START II-sized stockpile projection and the high case associated with a START I-sized stockpile (see section 3.1.1.2).

2.2.3 Presidential Decision Directives and Public Law

Over the past few years, there have been several publicly announced PDDs that have shaped the Stockpile Stewardship and Management Program. In the *National Defense Authorization Act of 1994* (Pub. L. 103-160), Congress acted to reinforce many of the same points. A summary of their effect in shaping the Stockpile Stewardship and Management PEIS follows:

- The continued maintenance of a safe and reliable nuclear weapons stockpile will remain a cornerstone of the U.S. nuclear deterrent for the foreseeable future.

- The core intellectual and technical competencies of the United States in nuclear weapons will be maintained. This includes competencies in research, design, development, and testing (including nuclear testing); reliability assessment; certification; manufacturing; and surveillance capabilities.

- The United States will develop new ways to maintain a high level of confidence in the safety, reliability, and performance of the U.S. nuclear weapons stockpile in the absence of nuclear testing. The strategy for this action will be structured around the use of past nuclear test data in combination with enhanced computational modeling, experimental facilities, and simulators to further comprehensive understanding of the behavior of nuclear weapons and the effects of radiation on military systems.[2]

- The continued vitality of all three DOE nuclear weapons laboratories will be essential in addressing the challenges of maintaining a safe and reliable nuclear weapons stockpile without nuclear testing and without the production of new-design weapons.

2.3 Safety and Reliability of the United States Stockpile

This section focuses on the technical effects of national security policy decisions on shaping the purpose, need, proposed actions, and alternatives of the Stockpile Stewardship and Management Program. The stockpile is currently judged to be safe and reliable by DOE. National security policy changes will significantly change the characteristics of the future nuclear weapons stockpile and the manner in which it will need to be certified as safe and reliable.

2.3.1 Stockpile History

Since the beginning of the Cold War, the United States has maintained a nuclear deterrent force as safe and

[2]The effects of radiation on nuclear weapons and military systems are referred to as "weapon effects" throughout this PEIS.

reliable as the evolution of military requirements and technology development would permit. A safe and reliable U.S. nuclear weapons stockpile has been a cornerstone of maintaining a credible nuclear deterrent. The size of the U.S. nuclear weapons stockpile peaked in the 1960s. In the 1970s, it was significantly reduced due to the easing of Cold War tensions with the former Soviet Union. In the late 1970s and through most of the 1980s, Cold War tensions with the former Soviet Union significantly increased and the U.S. nuclear deterrent force was modernized in response. However, the size of the U.S. nuclear weapons stockpile remained stable during the 1980s with the production of new-design weapons replacing dismantled weapons nearly one for one.

The beginning of the 1990s brought the collapse of the Warsaw Pact and the former Soviet Union and a significant effort to end the Cold War. During the first half of the 1990s, many changes occurred in U.S. policy and planning for its nuclear deterrent force. Much has already been accomplished, including the dismantlement, without replacement, of more than 8,000 U.S. nuclear weapons since the end of the Cold War; however, much more will need to be accomplished with the former Soviet Union over the next 10 years to stay the course. Large uncertainties remain concerning the nuclear weapons stockpile of the former Soviet Union, and it is the policy of the United States to protect its national security options for its nuclear deterrent, including the reconstitution of its nuclear forces. The following excerpt is from the President's national security strategy statement in July 1994:

> Even with the Cold War over, our Nation must maintain military forces that are sufficient to deter diverse threats. . . . We will retain strategic nuclear forces sufficient to deter any future hostile foreign leadership with access to strategic nuclear forces from acting against our vital interests and to convince it that seeking a nuclear advantage would be futile. Therefore we will continue to maintain nuclear forces of sufficient size and capability to hold at risk a broad range of assets valued by such political and military leaders.

2.3.2 Smaller, Aging Stockpile

Until recently there has been no reason to expect that weapons would remain in the stockpile longer than they have in the past. Continuous modernization to improve safety and reliability kept the stockpile young as new-design weapon types replaced old ones. Now, with no new-design weapons being produced, the United States will have a steadily aging stockpile. The average age of the stockpile has never approached the typical lifetime specified in the weapon requirements (approximately 20 years for the most modern U.S. nuclear weapons). The average age of the stockpile is currently about 13 years. The NWSM forecasts the average age will now climb roughly 1 year per year and will reach the 20 year mark by 2005, at which time the oldest weapons will be about 35 years old.

2.3.3 Historical Stockpile Data

The following paragraphs describe the effects of historical stockpile data in shaping the Stockpile Stewardship and Management Program. This information was extracted from an unclassified report, *Stockpile Surveillance: Past and Future* (tri-laboratory report requested by DOE and issued as Sandia Laboratory Report, SAND 95-2751, September 1995), which was co-authored by the three weapons laboratories and is available to the public. The past role of nuclear testing is emphasized because such testing can no longer be relied on to provide unambiguous high confidence in the future safety and reliability of an aging stockpile.

Stockpile Evaluation Program.[3] Continuous evaluation of the safety and reliability of the stockpile has always been a major part of the U.S. nuclear weapons program. Since the introduction of sealed-pit weapons more than 35 years ago, a formal surveillance program of nonnuclear laboratory and flight testing has been in existence. More than 13,800 weapons have been evaluated in this program. The Stockpile Evaluation Program, with its reliance on functional testing, has provided information that can be used in the statistical analysis of nonnuclear component and subsystem reliability. This program has detected about 75 percent of all problems ultimately detected, and has been the principal

[3]Other than in specific discussions, the word surveillance is used generically throughout this document in place of the Stockpile Evaluation Program.

mechanism for discovering defects and initiating subsequent repairs and replacements. However, not all aspects of a nuclear weapon can be statistically assessed this way. Weapons research and development (R&D) at the three weapons laboratories and nuclear testing have played an important part in assessing the stockpile and in making corrective changes when needed.

Past Role of Nuclear Testing. Nuclear tests have been a critical part of the nuclear weapons program. They have contributed to a broad range of activities from development of new weapons to stockpile confidence tests to tests that either identified a concern or showed that remedial actions were not needed. However, the United States has not conducted a sufficient number of nuclear tests for any one weapon type to provide a statistical basis of reliability assessment for the nuclear explosive package. This is why the word "performance" instead of "reliability" is used when discussing a nuclear explosive package.

Although nuclear tests were never a part of the formal Stockpile Evaluation Program, they played an important role in maintaining the safety and performance of the weapons in the stockpile. Every advantage was taken of developmental nuclear tests to eliminate potential nuclear explosive problems. In some cases, nuclear testing during development of one weapon type uncovered a problem that was pertinent to a previous design already in the stockpile, which then had to be corrected. Nuclear tests identified certain classes of stockpile problems not observable in the surveillance program. Nuclear tests have been used to resolve issues raised by the Stockpile Evaluation Program, such as whether a particular corrosion problem affected the nuclear yield of a weapon. Nuclear tests have also been used to verify the efficacy of design changes. For example, the adequacy of certain mechanical safing techniques was determined through nuclear testing. In the case of a catastrophic defect, tests have been used to certify totally new designs to replace an existing design. Finally, in some cases, nuclear testing proved that a potential problem did not exist.

Beginning in the late 1970s, DOD and DOE agreed to a formal series of underground nuclear tests of weapons withdrawn from the stockpile. These tests were referred to as Stockpile Confidence Tests. They differed from developmental nuclear tests because the weapons were from actual production, had experienced stockpile conditions, and had minimal changes made to either nuclear or nonnuclear components prior to the test. There have been 17 such confidence tests since 1972, including 4 tests in the early 1970s that were not officially designated as Stockpile Confidence Tests. Confidence tests have been conducted for each of the weapon types expected to remain in the stockpile well into the next century.

In addition to the 17 confidence tests, at least 51 additional underground nuclear tests have been conducted since 1972 involving nuclear components from the stockpile, components from the actual weapon production line, or components built according to stockpile design specifications and tested after system deployment. The objectives of these tests included weapon effects, weapons R&D, confirmation of a fix, or investigation of safety or performance concerns. Three of these tests (in addition to one confidence test) revealed or confirmed a problem that required corrective action. Four tests (in addition to three confidence tests) confirmed a fix to an identified problem. Additionally, five tests were performed to investigate safety concerns affecting three different weapon types. These five tests verified that a problem did not exist.

The confidence in the performance of the nuclear explosive package has been based on underground nuclear test data, aboveground experiments, computer simulations, surveillance data, and technical judgment. The directors of the three weapons laboratories must certify the nuclear performance of the weapons designed by their laboratory.

In a future without additional nuclear testing, the core capabilities of the weapons laboratories that were developed to eliminate potential problems in new weapon designs must now be employed to assess stockpile problems. However, in the absence of nuclear testing, the ability to assess nuclear components is more difficult; new methods of assessment, discussed later, will have to be developed to help compensate for this loss.

Stockpile Data Summary. The historical stockpile database includes more than 2,400 findings from more than 45 weapon types. Findings are any abnormal conditions pertaining to stockpile weapons, such as out-of-specification data. Findings are then investigated and assessed as to whether or not they are a problem. Excluding multiple occurrences of the

TABLE 2.3.3–1.—*Summary of Distinct and Actionable Findings Since 1958*

Type of Components	Distinct Findings	Actionable Findings	
		Findings	Weapon Types
Nuclear	145	110	39
Nonnuclear	703	306	38

Source: SNL 1996a.

same anomalous condition, table 2.3.3–1 provides a summary of the distinct findings and actionable findings since 1958. Actionable findings are those that require some form of corrective action. All major components and subsystems have had problems that required corrective actions. The number of findings for nonnuclear components is much larger than that for nuclear components largely because there are so many more nonnuclear components in a nuclear weapon that require testing more frequently. However, the ratio of actionable findings to distinct findings is much greater for the nuclear components. Thus, when a finding has occurred for a nuclear component, it has generally been a serious one requiring corrective action. Often these corrective actions to nuclear components have required changes to all of the weapons comprising the weapon type affected.

For the nuclear explosive package, there were approximately 110 findings on 39 weapon types requiring some remediation either to the entire build of that design or to all weapons produced after the particular finding. In addition to rebuilds and changes in production procedures, other actions included imposing restrictions on the weapon, accepting a performance decrement, and in several cases, conducting a nuclear test to determine that the finding did not require any physical change. There have been other instances not counted as actionable where a material was chemically changing and the weapon was closely monitored to see if further action was necessary or it was an isolated case that did not require remediation.

2.3.4 Certified Repairs or Replacements Will be Needed

Based on the age of the planned stockpile over the next 10 years, historical data would project an average of one to two actionable findings per year in the planned stockpile and an average of one to two change proposals approved per year, with one of these resulting in a major change. Even with a START II-sized stockpile, one change can affect thousands of weapons. These projections are most likely minimum numbers. The stockpile they were derived from was, on average, younger than the planned stockpile will be in future years, and the number of components in the weapon types was less than the number of components in weapon types of the planned stockpile. Furthermore, the aging characteristics of some of the materials used in the weapon types remaining in the stockpile are not well understood.

The previous paragraphs describe how problems were identified in stockpile weapons during the period when nuclear testing and active weapons development were being conducted along with the Stockpile Evaluation Program. At the present time, with no anticipated new weapons and no nuclear testing, new approaches are needed to assess weapons for potential problems and anticipate aging concerns, especially in the nuclear explosive package. This is important because the smaller, less diverse U.S. stockpile will be more vulnerable to single-component and common-cause failures (i.e., failures or defects compromising the safety or reliability of, respectively, a single weapon system or several systems sharing a common design feature).

DOE will continue to rely on well-established methods while the weapons laboratories develop new methods of measurement and evaluation to address aging, safety, reliability, and performance issues. As the new methods mature for either nuclear or nonnuclear components, they will be incorporated into the Stockpile Evaluation Program. In the future, for example, DOE will rely on improved experimental capabilities, coupled with an improved computational capability, to address issues associated with the nuclear explosive package. These experimental capabilities, along with enhanced surveillance methods, are now crucial to help assess and predict the state of the stockpile and to provide long lead time information about incipient problems.

2.4 Purpose and Need

Broadly stated, changes to U.S. national security policies for nuclear deterrence now place two significant constraints on the way in which DOE has traditionally accomplished its statutory nuclear weapons mission:

- The United States has declared a moratorium on nuclear testing and will seek ratification of a "zero yield" CTBT.
- The United States has stopped the development and production of new-design nuclear weapons.

With these constraints, U.S. national security policy directs DOE to:

- Maintain the core intellectual and technical competencies of the United States in nuclear weapons including:
  - Research, design, development, testing, reliability assessment, certification, manufacturing, and surveillance
  - All three nuclear weapons laboratories and the capability to resume nuclear testing if needed
- Maintain a safe and reliable U.S. nuclear weapons stockpile

The NPR, PDDs, and Pub. L. 103-160 all address the need to maintain the core competencies of the United States in nuclear weapons without nuclear testing. The NPR strategy adds the expectation of no new-design weapon production; therefore, the NWSM does not currently direct or forecast such a requirement.

The Stockpile Stewardship and Management Program must accomplish these fundamental purposes in a safe, efficient, and environmentally responsible manner. National security policies do not eliminate any of the current or historical core competencies and capabilities of the DOE weapons laboratories, industrial plants, or the Nevada Test Site (NTS). They are basic needs that must be maintained for the foreseeable future. These needs are summarized in a focused discussion of their relationship to the development of the PEIS proposed actions and alternatives. A classified appendix has also been prepared to support this PEIS.

2.4.1 Stockpile Stewardship—The Weapons Laboratories and Nevada Test Site

The three weapons laboratories possess most of the core intellectual and technical competencies of the United States in nuclear weapons. These competencies embody more than 50 years of weapons knowledge and experience that cannot be found anywhere in the United States. Since the end of the Cold War, laboratory staffing in the weapons program has declined significantly due to the effects of policy changes on program and budget. Further significant reductions or consolidations of the weapons laboratories would counter efforts to maintain core competencies and to develop the new technologies necessary to ensure continued high confidence in a safe and reliable stockpile. Current stockpile activities in this regard, such as ongoing retrofits of enduring stockpile weapons and safe dismantlement of weapons no longer required, would also be hampered. For the foreseeable future it would be unreasonable to pursue an alternative course for the weapons laboratories. In addition, because there can be no absolute guarantee of complete success in the development of enhanced experimental and computational capabilities, the United States will maintain the capability to conduct nuclear tests under a "supreme national interest" provision in the anticipated CTBT. DOE will need to maintain the capability for nuclear testing and experimentation at NTS and the necessary technical capabilities at the weapons laboratories to design and conduct such tests.

The science and engineering technology base at the three weapons laboratories controls all DOE technical requirements for a U.S. nuclear weapon. The laboratories perform the basic research, design, system engineering, development testing, reliability assessment, and certification of nuclear performance. In addition, they provide or control all technical specifications that are used by the industrial base for manufacturing and surveillance operations and for maintenance operations conducted by DOD. Data from these operations are provided to the weapons laboratories for assessment and technical resolution of problems.

When stockpile problems develop, all of the core laboratory capabilities may come into play. The cause of the problem is identified and an assessment made of its impact on safety, reliability, or performance. If the problem is to be fixed, alternative solutions are developed. These can range from simple repair of a defective feature to complete redesign of the weapon component or subsystem.

The focus is always on the acquisition of relevant test data to make these judgments. Once a fix is determined, it must be designed, prototyped, and development tested by the laboratories before the design is released for manufacture. This generally includes weapon system-level laboratory and flight tests for nonnuclear features and, in the past, nuclear tests if the changes could affect the weapon's nuclear performance. If the fix is to be manufactured, the laboratories provide the quality assurance test specifications. For nonnuclear components, a significant amount of functional test data is acquired during manufacture and is used to begin building a statistical estimate of component reliability. Subsequent laboratory and flight testing in the surveillance program accumulates additional data that include the effects of aging and exposure to stockpile environments. Thus, over time, high confidence in the safety and statistical reliability of nonnuclear components and subsystems can be established.

The situation is not the same for nuclear components and the assessment of nuclear performance. Nuclear components cannot be functionally tested during manufacture or surveillance. The data acquired during manufacture only show that the component was manufactured as designed. Surveillance data indicate whether the component is changing as a result of aging or exposure to stockpile environments. Manufacturing and surveillance data can identify concerns, but these data do not provide all of the necessary information to assess nuclear performance. Assessment and certification of nuclear performance is a nonstatistical, technical judgment by the weapons laboratories based on scientific theory, experimental data, and computational modeling. The scientific practice of "peer review" has been fundamental to these judgments. Experts from the two nuclear design laboratories review each other's data and conclusions on important issues, thereby providing an independent check and balance.

In the past, nuclear testing filled the gaps in basic understanding of the complex physics phenomena; it provided high confidence in the certification of nuclear safety and performance. Without nuclear testing, science-based stockpile stewardship will focus on obtaining the more accurate scientific and experimental data that will be needed for more accurate computer simulations of nuclear performance. The new experimental data must also be validated against past nuclear test data. Assessment of stockpile problems and certification of repairs or replacements of nuclear components will have to rely on improvements to these tools. The existing tools were used in conjunction with nuclear testing and are inadequate if used alone.

From a broader national security perspective, the core intellectual and technical competencies of the weapons laboratories provide the technical basis for the pursuit of U.S. arms control and nuclear nonproliferation objectives. Their extensive core competencies have provided most of the nuclear weapons arms control technologies developed and employed by the United States. The weapons laboratories will have to continue to provide this essential service in the future. For the same reasons, the weapons laboratories also provide significant technical support for U.S. efforts on nuclear weapons nonproliferation and counter-proliferation programs.

2.4.2 Stockpile Management—The Industrial Base

None of the manufacturing and surveillance capabilities of the current industrial base can be eliminated on the basis of the post-Cold War changes in national security policies. The industrial base also possesses core competencies, such as manufacturing product, process, and quality control know-how. However, with a smaller stockpile and no new-design weapons production, industrial capacity can be reduced to meet anticipated manufacturing requirements for stockpile repair and replacement activities. A summary discussion of each of the major functions needed is provided in this section. A more detailed discussion can be found in section 3.4.

Broadly stated, there are six major manufacturing and surveillance functional areas in the weapons industrial base:

- Weapons assembly/disassembly (A/D)
- Pit components
- Secondary and case components
- High explosives (HE) components
- Nonnuclear components
- Tritium supply and recycling

As explained in chapter 1, tritium supply and recycling was evaluated in a separate PEIS.

Weapons Assembly/Disassembly. The Pantex Plant (Pantex) is the only DOE site currently authorized to assemble or disassemble stockpile weapons. Special facilities built to explosives safety criteria are required; in addition, some facilities are designed to limit nuclear material dispersal in case of an HE accident. These facilities exist in large numbers at Pantex, and because they are relatively discrete structures, downsizing-in-place is a viable alternative. NTS has a much smaller set of these special structures that were constructed for use in assembling nuclear test devices. However, NTS has few of the support facilities required for volume assembly or disassembly of stockpile weapons. A major programmatic consideration is the cost of re-creating facilities that already exist at Pantex. Due to ongoing weapon dismantlement requirements, the alternative to transfer this function to NTS would be slow but achievable within a 10-year period.

Pit Components. These components are designed by Los Alamos National Laboratory (LANL) and Lawrence Livermore National Laboratory (LLNL) and were formerly produced at the Rocky Flats Plant, which is no longer available for this function. The LLNL facility is not large enough to accommodate both stewardship and management activities; therefore, only LANL is considered to be a reasonable alternative if this function is reestablished at a weapons laboratory. Also, LANL has the more extensive and complete plutonium facility infrastructure. Savannah River Site is also considered a viable alternative for reestablishing this function because it has a plutonium processing infrastructure, although it does not have a precision component manufacturing capability. Other than the synergism with maintaining core competencies at the weapons laboratories, a major program consideration would be the scale of manufacturing capacity required for the foreseeable future.

The preceding discussion applies to new pit fabrication as well as both intrusive and nonintrusive modification pit reuse manufacturing capability and capacity. Intrusive modification pit reuse requires handling and processing of the plutonium internal to the pit. Nonintrusive modification pit reuse involves the external features of the pit and does not require an extensive plutonium infrastructure; the risk of contamination and the generation of radioactive waste is very low for nonintrusive modification activities. Therefore, the weapons A/D Facility is also an alternative for nonintrusive modification pit reuse.

Secondary and Case Components. The Y-12 Plant (Y-12) at the Oak Ridge Reservation produces the secondary and case components. These components are designed by LANL and LLNL; therefore, each of those facilities would be reasonable alternative sites if this function is transferred to the weapons laboratories. Both of these laboratories have a uranium technology base and facility infrastructure, although they have only a very limited R&D manufacturing capability. Other than the synergism with maintaining core competencies at the weapons laboratories, a major Program consideration would be the cost of transferring product technologies and the re-creation of capital facilities that already exist at Y-12. Due to the complicated nature of nuclear facilities and plans for retrofit of an enduring stockpile weapon involving these components, a transition to either LANL or LLNL would be slow but achievable within a 10-year period. Downsizing Y-12 is considered to be a reasonable alternative.

High Explosives Components. Pantex currently manufactures HE components in special facilities built to explosives safety criteria. Downsizing the facilities at Pantex is a reasonable alternative. Comparable facilities also exist at both LANL and LLNL, and either laboratory has sufficient capacity to meet estimated future manufacturing requirements. Costs for this function are relatively low in any case. If a decision is made to transfer this function to the weapons laboratories, it could be done more quickly than the transfer of other functions. However, Pantex would have to retain disposition and disposal capability for the HE inventories currently onsite and those expected from near-term weapon dismantlement. A major Program consideration would be the synergism of this function in maintaining the core competencies of the weapons laboratories.

Nonnuclear Components. Kansas City Plant (KCP) currently manufactures the majority of the nonnuclear components. The KCP facilities are not unique in structural design and are amenable to downsizing in place. The manufacturing technologies are complex and varied due to the large number of component types and high reliability requirements. Sandia National Laboratories (SNL) designs most of the components that KCP manufactures; therefore, SNL would become the major nonnuclear component supplier if a decision is made to transfer this function to the weapons laboratories. Other than potential synergism with maintaining core competencies at the weapons laboratories, a major program consideration would be the cost of transferring product technologies and re-creating facilities that already exist at KCP. Requirements for ongoing support of the enduring stockpile would make this a slow transition, but it would be achievable within a 10-year period.

2.5 Proposed Action and Alternatives

All of the existing basic capabilities of the laboratory and industrial base continue to be needed even though there have been changes in national security policy since the end of the Cold War. These changes do not affect the standards for stockpile safety and reliability. Therefore, the proposed action concentrates on three major issues that result from the national security policies and constraints placed on the Program. The three program elements of the proposed action are:

- Providing enhanced experimental capability
- Rightsizing the industrial base
- Reestablishing manufacturing capability and capacity for pit components

Reasonable alternatives for the proposed action are briefly discussed below. Chapter 3 describes these alternatives in more detail.

2.5.1 Providing Enhanced Experimental Capability

Understanding nuclear weapon performance requires knowledge of the performance of the individual elements: the primary (pit and HE), the secondary, and the functional interaction between the primary and the secondary inside the case. Computer model-based validation and certification will be the key to DOE's ability to determine, with confidence, many of the future safety and performance characteristics of the stockpile in the absence of nuclear testing. This requires two principal elements: advanced computational models and facilities to provide experimental data that can be used to adjust (normalize) the computational models in conjunction with past nuclear test data. DOE is proposing three facilities to complement the existing capabilities to provide these data. Two are new facilities and one is the upgrade of an existing facility.

The National Ignition Facility (NIF) and the Atlas Facility are proposed new facilities. The Atlas Facility would be collocated in TA-35 with the existing Pegasus II Facility at LANL, and the two facilities would use common infrastructures and support facilities. The Contained Firing Facility is a proposed environmental and diagnostic upgrade to the existing Flash X-Ray Facility at LLNL. As described in section 3.3, these three new facilities would perform separate functions and provide different types of experimental data. Thus, they are complementary in nature and are not alternatives to one another. In each case, the alternative to constructing and operating the facility is No Action (i.e., relying on existing facilities to provide data). In addition, site alternatives are evaluated for NIF, since it is not associated with an existing facility. Volume III of this PEIS contains project-specific analyses for each of these facilities.

The stockpile stewardship program is expected to continuously evolve as better information becomes available and technological advancements occur. DOE is in the early planning stages for a number of what can be described as "next generation" stewardship facilities. These facilities are discussed in section 3.3.4. They will build on the knowledge gained from existing and proposed new facilities. Since these facilities are in the conceptual planning stages, they are not sufficiently well defined to be analyzed in this PEIS. When these technologies reach the appropriate level so as to be ripe for decisionmaking, DOE would complete *National Environmental Policy Act* (NEPA) documentation for them.

2.5.2 Rightsizing the Industrial Base

One of the primary goals of stockpile management is to rightsize functions to provide an effective and efficient manufacturing capability for a smaller stockpile. Such rightsizing must be accomplished in a manner that preserves core competencies in manufacturing and surveillance. This PEIS analyzes two alternative approaches to rightsizing the stockpile management functions described in section 2.4.2: (1) transfer manufacturing and surveillance activities from the industrial sites to the weapons laboratories and NTS and (2) downsize the industrial plants in place. Relocation alternatives were selected on the basis of existing technical and facility infrastructure at the laboratories and NTS. Section 3.4 discusses these alternatives in detail.

2.5.3 Reestablishing Manufacturing Capability and Capacity for Pit Components

Plutonium pit manufacturing is a special case among those stockpile management functions discussed in section 2.4.2. In 1992, DOE ceased plutonium pit manufacturing operations at the Rocky Flats Plant due to concerns about the safety of the plant and national security policy decisions to cease the production of new-design nuclear weapons. Reestablishing pit manufacturing capability and capacity was to be part of the Reconfiguration PEIS discussed in chapter 1. This function is now part of the proposed action in this Stockpile Stewardship and Management PEIS.

Pit manufacturing capability and capacity, like that of all other major weapons components and subsystems, is essential for protecting national security options with regard to the nuclear deterrent. In addition, repair or replacement of pits for existing stockpile weapons may be required in the future. Reasonable alternative sites for reestablishing this function were selected from sites that already possess some measure of the appropriate technical or facility infrastructure.

2.6 NONPROLIFERATION

On August 11, 1995, the President announced his commitment to seek a "zero yield" CTBT. He also established several safeguards that condition U.S. entry into a CTBT. One of these safeguards is the conduct of science-based stewardship, including the conduct of experimental programs. This safeguard will enable the United States to enter into such a treaty while maintaining a safe and reliable nuclear weapons stockpile consistent with U.S. national security policies.

One benefit of science-based stockpile stewardship is to demonstrate U.S. commitment to NPT goals; however, the U.S. nuclear posture is not the only factor that might affect whether or not other nations might develop nuclear weapons of their own. Some nations that are not declared nuclear states have the ability to develop nuclear weapons. Many of these nations rely on the U.S. nuclear deterrent for security assurance. The loss of confidence in the safety or reliability of the weapons in the U.S. stockpile could result in a corresponding loss of credibility of the U.S. nuclear deterrent and could provide an incentive to other nations to develop their own nuclear weapons programs.

The United States has halted the development and production of new-design nuclear weapons. The experimental testing program will be used to assess the safety and reliability of the nuclear weapons in the remaining stockpile. Much of this testing is classified and could not lead to proliferation without a breach of security. Use of classified data from past U.S. nuclear tests is also a vital part of the overall process for validation of new experimental data. Most of the component technology used for the proposed enhanced experimental capability is unclassified and is available in open literature, and many other nations have developed a considerable capability.

Proliferation drivers for other states, such as international competition or the desire to deter conventional armed forces, would remain unchanged regardless of whether DOE implemented the proposed action analyzed in this PEIS. In the NPT, the parties agree not to transfer nuclear weapons or other devices, or control over them, and not to assist, encourage, or induce nonnuclear states to acquire nuclear weapons. However, the treaty does not mandate stockpile reductions by nuclear states, and it does not address actions of nuclear states in maintaining their stockpiles.

2.7 SUMMARY

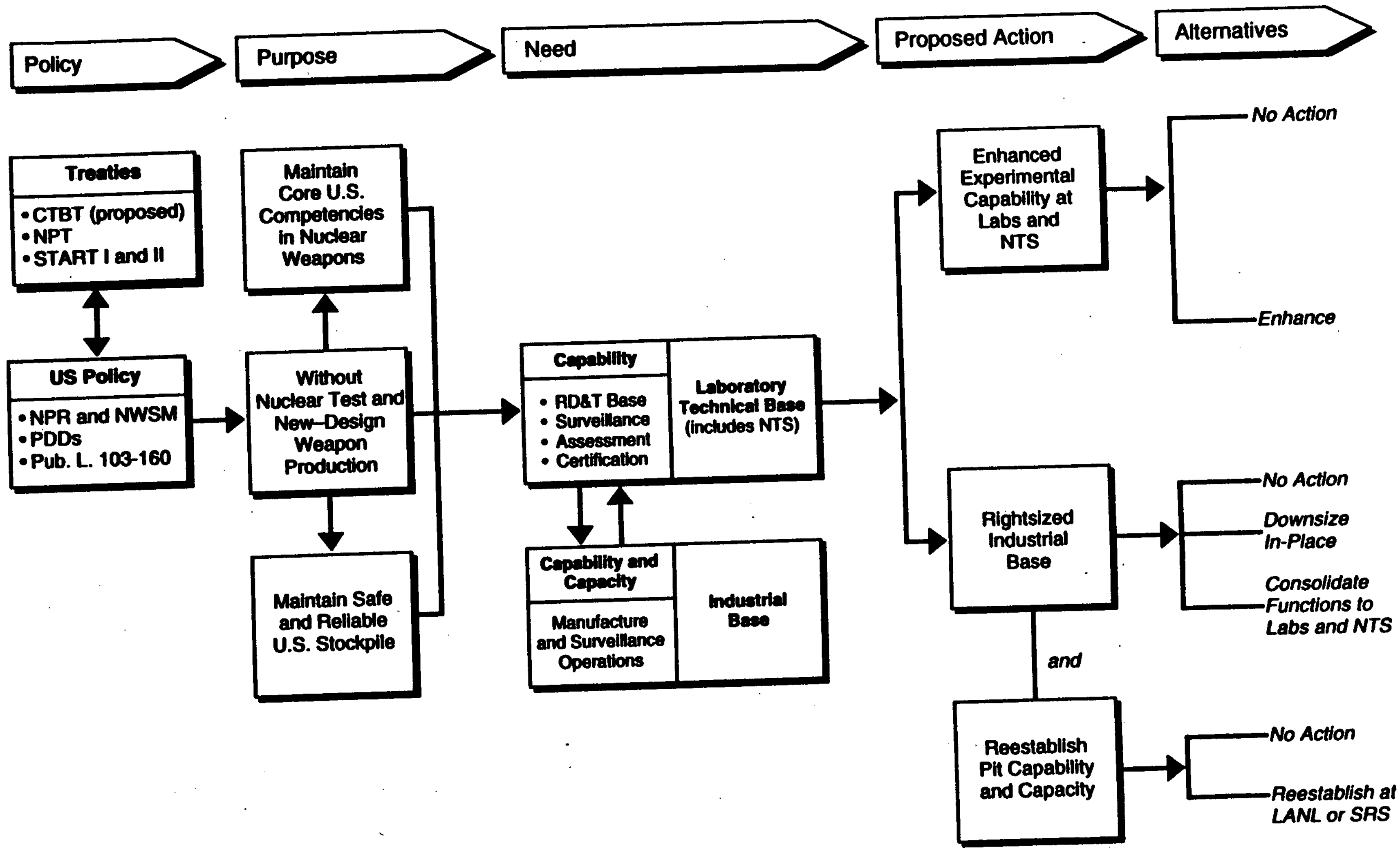
National security policies require DOE to maintain the historical nuclear weapon competencies and capabilities of three weapons laboratories, the industrial plants, and NTS. In addition, DOE must maintain an appropriately sized industrial capacity to manufacture repair and replacement components for weapons that remain in the stockpile. The environmental impacts of maintaining these historical capabilities will be established by the No Action characterization of the sites. With this baseline, the proposed actions and alternatives are analyzed incrementally for each relevant site. In this manner, the broad cumulative impact of the Program and the specific impacts of the proposed actions and alternatives can be displayed and discussed.

In preparation for the Stockpile Stewardship and Management PEIS public scoping process, DOE published a document entitled *The Stockpile Stewardship and Management Program* in May 1995. This document supplements this chapter with a broader discussion of Program strategies to address the major issues and policy constraints placed on the Program. There are five strategies discussed:

- Enhanced experimental and computational capabilities
- Enhanced weapon and materials surveillance technologies
- Effective and efficient production complex
- Long-range stockpile support
- Tritium production

In developing the Stockpile Stewardship and Management PEIS proposed actions, the significant aspects of "enhanced experimental capability" and "effective and efficient production complex" are directly addressed. As explained in chapter 1, the enhanced experimental capability of the Dual Axis Radiographic Hydrodynamic Test Facility and tritium production are addressed as related interim actions in separate environmental impact statements. The remaining elements of these strategies are primarily a redirection of R&D efforts at the weapons laboratories away from the design of new weapons toward the development of appropriate technologies to address the needs of a safe, reliable, and smaller, aging stockpile. As such, they are not judged to be significant NEPA issues and do not have broad environmental impacts beyond what is analyzed in this PEIS.

Figure 2.7–1 presents the framework used for discussing the Stockpile Stewardship and Management Program from a U.S. national security policy perspective. Figure 2.7–2 presents a view of the complete Stockpile Stewardship and Management Program from a stockpile perspective, integrating all aspects of the proposed action.



Note: CTBT–Comprehensive Test Ban Treaty; NPR–Nuclear Posture Review; NPT–Nuclear Nonproliferation Treaty; NWSM–Nuclear Weapons Stockpile Memorandum; PDD–Presidential Decision Directive; RD&T–research, development, and testing.

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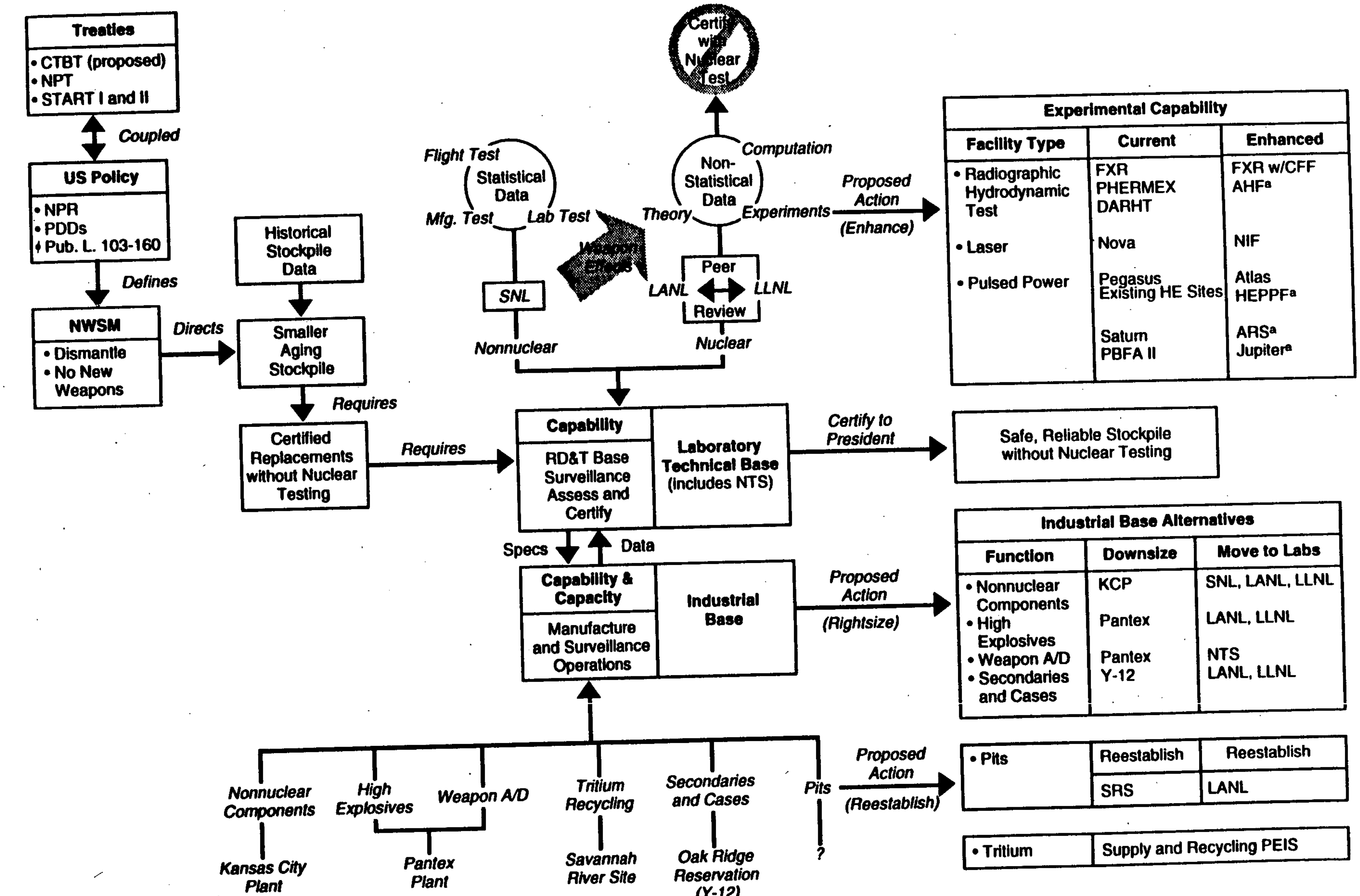
FIGURE 2.7–1.—*Policy Perspective of the Stockpile Stewardship and Management Program.*



a Next generation, not proposed.
Note: A/D–Assembly/Disassembly; AHF–Advanced Hydrotest Facility; ARS–Advanced Radiation Source; CFF–Contained Firing Facility; CTBT–Comprehensive Test Ban Treaty; DARHT–Dual Axis Radiographic Hydrodynamic Test Facility; FXR–Flash X-Ray Facility; HE–High Explosives; HEPPF–High Explosive Pulsed Power Facility; NIF–National Ignition Facility; NPR–Nuclear Posture Review; NPT–Nuclear Nonproliferation Treaty; PBFA– Particle Beam Fusion Accelerator; PDD–Presidential Decision Directive; PHERMEX–Pulsed High-Energy Radiation Machine Emitting X-Rays (Facility); RD&T–Research, Development, and Testing.

FIGURE 2.7–2.—*Stockpile Perspective of the Stockpile Stewardship and Management Program.*

CHAPTER 3

Chapter 3

CHAPTER 3: STOCKPILE STEWARDSHIP AND MANAGEMENT PROGRAM ALTERNATIVES

Chapter 3 provides descriptions of the alternative sites and the program alternatives for meeting the Nation's nuclear weapons stockpile stewardship and management requirements. The chapter begins with a summary of the development of the alternatives, followed by descriptions of the alternative sites and their current missions. The stockpile stewardship discussion provides a description of the three basic stewardship areas, along with the associated alternatives, including a brief description of concepts for next-generation stewardship facilities. The stockpile management discussion provides a description of the various management functions and their associated alternatives. Brief discussions of emerging technologies that may affect stockpile management facilities and functions in the future and a discussion of a potential next-generation plutonium fabrication facility follow. The chapter concludes with a comparison of the stockpile stewardship and management alternatives and a discussion of the preferred alternatives.

3.1 Development of Stockpile Stewardship and Management Program Alternatives

This programmatic environmental impact statement (PEIS) evaluates the direct, indirect, and cumulative impacts associated with the Stockpile Stewardship and Management Program alternatives that are summarized in figure 3.1–1. For the various alternatives, this includes evaluating the applicable impacts of new facility construction or existing facility modification. Also assessed are the operational impacts of long-term stewardship and management activities in support of the base case nuclear weapons stockpile, including transportation of materials and components between sites. This PEIS also provides a sensitivity analysis of differences, when applicable, from the base case alternatives for the high and low case stockpile. However, since it is expected that the annual workload may vary above and below the base case capacity assumptions, the base case is analyzed in the greatest detail.

3.1.1 Planning Assumptions and Basis for Analysis

In the Stockpile Stewardship and Management Program and in this PEIS, the Department of Energy (DOE) will:

- Emphasize compliance with applicable laws and regulations and accepted industrial and weapons safety practices that safeguard the health of workers and the general public, protect the environment, and ensure the security of nuclear material and weapons
- Analyze alternatives that are consistent with, and supportive of, national security policies
- Maximize efficiency and minimize cost and waste, consistent with programmatic needs
- Minimize the use of hazardous materials and the number and volume of waste streams consistent with programmatic needs through active pollution prevention programs and measures

As explained in section 1.7, DOE is currently preparing site-wide environmental impact statements (EIS)s covering continued operations for some of the alternative sites evaluated in this PEIS. Some of the existing activities covered by these site-specific, site-wide EISs are similar to those of the No Action alternative of this PEIS. Although the near-term analytical periods for the site-wide EIS analyses are different from those of the *Programmatic Environmental Impact Statement for Stockpile Stewardship and Management*, which is focused on long-term activities, the preparation of these documents has been closely reviewed and coordinated. As work on these site-wide EISs proceeds, their analyses will continue to be reviewed to ensure consistency. To the

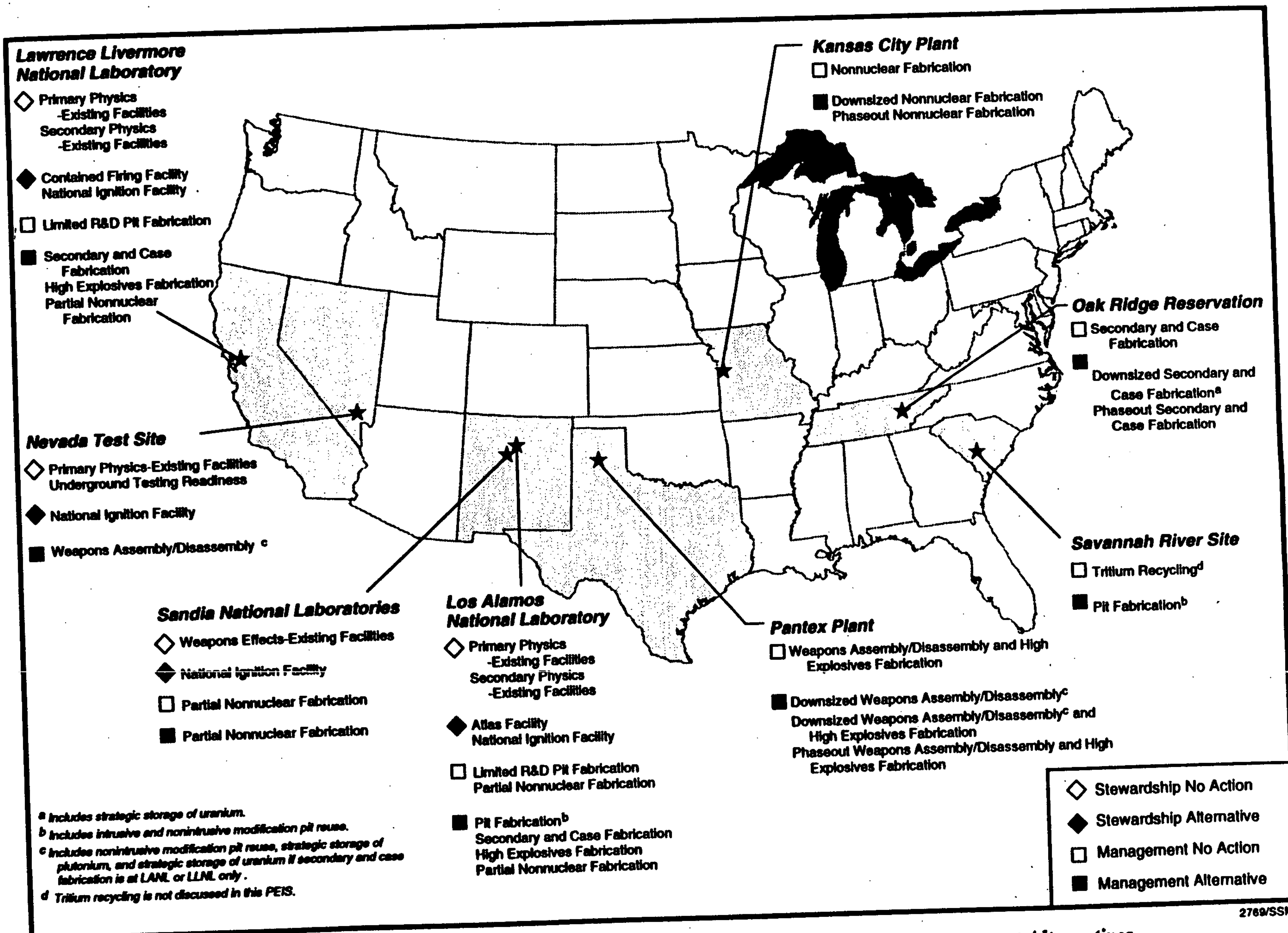


FIGURE 3.1–1.—*Nuclear Weapons Complex Sites and Stockpile Stewardship and Management Alternatives.*

extent that the site-wide EIS analyses provide better information, such information has been incorporated, as appropriate. In the preparation of the Stockpile Stewardship and Management Final PEIS, any updated information relating to the sites' affected environment was reviewed and appropriate changes were made if new information could potentially change results of the impact analyses.

DOE has developed several planning assumptions as the basis of analyses presented in this PEIS. These considerations are summarized below.

3.1.1.1 *No Action Alternative Assumptions*

- The No Action alternative for this PEIS is defined in a way that takes into account the fact that DOE for decades has had in place a program for the stewardship and management of the nuclear weapons stockpile. Consistent with CEQ guidance, the No Action alternative consists of those facilities necessary to maintain the status quo in terms of DOE's current program direction. These consist primarily of existing facilities where DOE currently conducts weapons activities, including modifications to those facilities necessary to maintain their current mission capabilities. However, the No Action alternative also includes a small number of minor new facilities that will also be needed simply to maintain current mission capabilities at individual sites. Finally, the No Action alternative includes two major new facilities which are proceeding independent of this PEIS, and for which DOE has prepared separate EISs under the interim action provisions of the CEQ regulations. These EISs are the Programmatic Environmental Impact Statement for Tritium Supply and Recycling (DOE/EIS-0161) and the EIS for the Dual Axis Radiographic Hydrodynamic Test (DARHT) Facility (DOE/EIS-0228).

3.1.1.2 *Stockpile Management Assumptions*

- Base case stockpile size for the PEIS analysis is consistent with the Strategic Arms Reduction Talks (START) II protocol, but larger than 3,500 weapons. This PEIS also analyzes a high and a low case stockpile size to determine how the environmental impacts may change due to changes in the stockpile size. The high case consists of maintaining the stockpile at a level consistent with the START I Treaty, but larger than 6,000 weapons. The hypothetical low case is a stockpile of approximately 1,000 weapons.

- Analysis is provided for facilities that would be sized to support estimated average annual manufacturing requirements resulting from the base case stockpile size assuming single-shift operation, 5 days per week. This PEIS analyzes environmental impacts of the base case quantitatively, including an evaluation of three-shift operation, 5 days per week (surge operation), to provide a bounding analysis. For stockpile management, this PEIS assesses alternatives that would downsize or modify existing facilities. With the exception of one nonnuclear facility at Sandia National Laboratories (SNL) and the expansion of the Device Assembly Facility at Nevada Test Site (NTS), there would be no greenfield construction of new facilities for any of the stockpile management alternatives. Existing facilities that would be downsized or modified have inherent differences in capacities when operated in the base case three-shift surge mode. For a given stockpile management mission, the downsize alternatives generally have a greater inherent capacity than other alternatives. For the downsize alternatives, therefore, a portion of the environmental impacts are due to the higher output associated with the three-shift surge mode of operation.

- This PEIS also qualitatively assesses each stockpile management alternative against identical low and high case single-shift workloads. Differences in environmental impacts for these single-shift workloads are attributable primarily to inherent differences in the existing facility and support infrastructure of the different sites.

- The facility sizing assumptions for the various stockpile management facilities,

TABLE 3.1.1.2–1.—***Stockpile Management Facility Sizing Assumptions (Annual Activity on Single Operating Shift)***

Function	Low Case	Base Case	High Case
Weapons Assembly/Disassembly			
Rebuilds			
(disassemblies)	50	150	300
(assemblies)	50	150	300
Evaluation			
(disassemblies)	120	120	140
(rebuilds)	110	110	140
High Explosives Fabrication	50	150	300
Nonnuclear Fabrication			
Field and factory retrofits	up to 100	up to 300	up to 600
Nuclear Fabrication			
Pit fabrication	50[a]	50[a]	100
Pit reuse (nonintrusive modification)	50	100	200
Secondary and case fabrication	50[a]	50[a]	100

[a] Capability based capacity - the facility capacity (up to 50 per year) inherent with the facilities and equipment required to manufacture one component for any stockpile system.

Source: DOE 1996j.

based on the above assumptions, are shown in table 3.1.1.2–1.

- Impacts from construction, including modifying existing structures, and operation are evaluated. The period of construction or downsizing for each alternative varies; however, for analytical purposes, this PEIS assumes that operations would begin in 2005. A 25-year lifetime was evaluated for operations.

- Proven technologies are presented in this PEIS as a baseline for the various management alternatives. Section 3.5 discusses emerging technologies that have the potential to offer even greater environmental advantages. The design goal of all facilities includes consideration of waste minimization and pollution prevention to minimize facility and equipment contamination, and to make the future decontamination and decommissioning (D&D) of facilities as simple and inexpensive as possible. This PEIS includes a general discussion of environmental impacts from D&D, including a discussion of the D&D process, the types of actions associated with D&D, and the general types of impacts associated with D&D. Any discussion of specific impacts would be too speculative because the extent of contamination, the degree of decontamination, and the environmental impacts associated with performing D&D cannot be known without performing a detailed study of the facility. Such analyses are more appropriate for tiered project-specific *National Environmental Policy Act* (NEPA) documents.

- Designs of facilities for the fabrication of nuclear components include provisions for handling and storing working inventories of nuclear materials. For plutonium, working inventories would be stored at Savannah River Site (SRS) or Los Alamos National Laboratory (LANL). For highly enriched uranium (HEU), working inventories would be stored at Oak Ridge Reservation (ORR), LANL, or Lawrence Livermore National Laboratory (LLNL).

- For plutonium, strategic reserve storage is evaluated at the Pantex Plant (Pantex) and NTS. For HEU, strategic reserve storage is evaluated at ORR, Pantex, and NTS. For the purposes of this PEIS, DOE does not intend to move the strategic reserves of HEU to Pantex or NTS if

ORR is chosen as the secondary and case fabrication site.

- This PEIS contains an analysis of low-consequence/high-probability accidents (evaluation basis) and high-consequence/low-probability accidents (beyond evaluation basis). A spectrum of both types of accidents is analyzed. For radiological accidents, impacts are evaluated both for the general population residing within an 80-kilometer (km) (50-mile [mi]) radius (including the maximally exposed individual) and for noninvolved workers in collocated facilities. The accident analyses in this PEIS are based upon facility conditions that are expected to exist in 2005. In some cases, facility conditions in 2005 may differ from current facility conditions due to design upgrades.

In developing alternatives for pit components, the following additional assumptions were used for new pit fabrication and intrusive modification pit reuse:

- Plutonium would not be introduced into a site that does not currently have a plutonium infrastructure because of the high cost of new plutonium facilities and the complexity of introducing plutonium operations into sites without current plutonium capabilities.

- The plutonium research and development (R&D) mission and functions would remain at LANL and LLNL, and the plutonium pit surveillance mission would remain at LANL. Both sites would store the materials required to support these missions.

In developing alternatives for secondaries and cases, the following additional assumptions were used:

- HEU would not be introduced into a site that does not currently have an infrastructure because of a desire to use suitable existing structures where possible and because of the high cost of new facilities.

- The uranium R&D mission and functions would remain at LANL and LLNL. If the Y-12 Plant (Y-12) at ORR is selected to retain the secondary and case fabrication mission, these R&D missions would be undertaken in partnership with Y-12. These sites would store the materials required to support this mission.

3.1.1.3 *Stockpile Stewardship Assumptions*

- The range of stockpile sizes used for analysis of manufacturing capacity-related issues for stockpile management functions is not applicable to stockpile stewardship functions. As explained in chapter 2, national security policies require all the historical stockpile stewardship and management capabilities to be maintained. Capabilities are independent of stockpile size. Stockpile stewardship functions are basic capabilities. For the same reason it is not reasonable to assume a "zero level" stockpile for the foreseeable future (sections 2.2.1 and 3.1.2), it is also not reasonable to assume the United States would eliminate the basic capabilities it needs to maintain a safe and reliable stockpile within the same foreseeable future.

- National security policy requires a safe and reliable stockpile without further nuclear testing and with an aggressive pursuit of enhanced experimental capabilities (section 2.5.1). Three stockpile stewardship facilities are proposed in this PEIS: the National Ignition Facility (NIF), the Contained Firing Facility (CFF), and the Atlas Facility. These facilities are analyzed as supplements to the facilities and capabilities that currently exist for carrying out the stockpile stewardship mission. Each proposed facility is an independent component of the overall stockpile stewardship program, each has unique value, and, therefore, these proposed facilities are not competing alternatives.

- Assumptions, regarding accident analyses are the same as described under stockpile management.

3.1.2 Alternatives Considered but Eliminated from Detailed Study and Related Issues

This section of the PEIS has been revised in response to comments received on the Draft PEIS concerning its scope and the alternatives considered. To begin, it is important to review the basic logic used in constructing this PEIS and to restate the nature of the decisions expected to be made based on the contents of the PEIS.

Chapter 2 describes the national security policy framework that defines the purpose and need for DOE's nuclear weapons mission for the foreseeable future. It also describes the development of proposed actions and reasonable alternatives in response to recent changes in national security policy. Chapter 2 also puts those changes in broad technical perspective. Successive levels of technical detail are provided in chapters 3 and 4, and in Volumes II and III. The discussions that follow refer to the appropriate sections of this PEIS to avoid unnecessary repetition.

As stated in the Notice of Intent (60 FR 31291) published on June 14, 1995, DOE intends that the ROD on this PEIS will:

- Identify the future missions of the Stockpile Stewardship and Management Program; and
- Determine the configuration (facility locations) of the Complex necessary to accomplish the Program missions

While the terms "stockpile stewardship" and "stockpile management" are relatively new, the Program is not new when considered in terms of its substructure capabilities (section 1.1). What the terms are meant to convey is a change in Program focus away from large-scale development and production of new-design nuclear weapons with nuclear testing, to one that focuses on the safety and reliability of a smaller, aging stockpile without nuclear testing. Even with this change in focus, however, national security policies require DOE to maintain the capabilities of the ongoing Program. The proposed actions flow logically from the mission purpose and need, given the policy constraints placed on the Program. Enhanced experimental capability is proposed because it is the surrogate source of experimental data that are needed to continually assess and certify a safe and reliable stockpile constrained by the absence of nuclear testing. Rightsizing manufacturing capacities is proposed in direct response to the reduced requirements of a smaller, aging stockpile constrained by the absence of new-design weapon production. Reestablishing pit manufacturing capability is proposed because it restores a required capability of the Program that was temporarily lost as a consequence of the closure of the Rocky Flats Plant.

In developing this PEIS, DOE judged the above three proposed actions to be significant at the programmatic level. Some additional strategies of the Stockpile Stewardship and Management Program, such as enhanced computational capability, were judged not to have significance for this PEIS because they did not have the potential for significant environmental impacts relative to the ongoing Program at a site, nor was the mission capability being considered for transfer to another site. The programmatic level environmental impacts of the ongoing Program at each of the eight sites in the Complex are described in chapter 4. Projects and facilities to support the ongoing Program are subject to site-specific NEPA review.

The issue of Stockpile Stewardship and Management Program alternatives is complex because nuclear weapons require a complete integrated set of technical capabilities and an appropriately sized manufacturing capacity. The technical capabilities are generally characterized as research, design, development, and testing; reliability assessment and certification; and manufacturing and surveillance operations (section 2.2 and figure 2.7–2). From a technical point of view, none of these capabilities can be deleted if DOE is to maintain a safe and reliable stockpile (section 2.4). In addition, DOE has been directed to maintain these capabilities by national security policy from the President and Congress (section 2.4).

3.1.2.1 *Alternatives in General*

Commentors questioned the different treatment of stewardship and management alternatives, mainly the lack of stewardship alternatives. Stewardship and management alternatives are treated differently in the PEIS because they address fundamentally different problems. Stockpile stewardship capabilities form the basis of U.S. judgments about the safety, reliability, and performance of U.S. nuclear weapons, and in a larger context, U.S. judgments about the nuclear weapons capabilities of others (section 2.4.1). DOE did not consider it reasonable to propose stewardship alternatives that would diminish stewardship capabilities, particularly given the fact that historic confidence in the safety and performance of the stockpile was derived from nuclear testing that is no longer part of the ongoing stewardship program. National security policy requires DOE to maintain, and in some areas enhance, the stewardship capabilities of the three weapons laboratories and NTS (section 2.2). The PEIS also explains the basis for this in a technical context, including the need for two independent nuclear design laboratories (section 2.4.1). Therefore, this PEIS has no proposed actions that transfer ongoing stockpile stewardship missions from one site to another, or that would otherwise diminish ongoing stewardship missions.

National security policy also requires DOE to maintain stockpile management capabilities and appropriate manufacturing capacity for a smaller stockpile. Unlike stockpile stewardship capabilities, the smaller stockpile does permit some reasonable siting alternatives for stockpile management capabilities and capacities to accomplish the mission purpose and need within the current national security policy framework (section 2.4.2).

3.1.2.2 *Enhanced Experimental Capability*

DOE has considered that there are differing opinions on the technical merit of DOE's proposed actions with regard to enhanced experimental capability. Nuclear weapons design information, including the complex physics of nuclear weapon explosions, is classified for reasons of national security and nonproliferation. Even if this information were unclassified, the physics problems remain daunting; hence, the reason why nuclear testing was so important to the past program. Both the classification of information and technical complexity of the issues form natural barriers to public communication. The technical complexity alone engenders significant debate among qualified experts, especially in the area of high energy density physics. This PEIS attempts to explain the weapon physics issues in an unclassified, comprehensible manner regarding its relation to mission purpose and need (chapter 2), proposed actions and alternatives (section 3.3), and project-specific technical detail (Volume III). In the absence of nuclear testing, there are two basic alternatives: (1) rely on existing facilities as sources of experimental data described by the No Action alternative, and (2) pursue the enhanced capability of the proposed facilities to provide the sources of experimental data needed.

Role of Existing Experimental Facilities. In DOE's technical judgment, the existing facilities described by the No Action alternative are inadequate to meet the challenge of assessing and certifying a safe and reliable stockpile over the longer term. It is also DOE's technical judgment that it is impossible to speculate at this time whether any of the existing facilities could be retired, because they would be obsolete or redundant, as a result of a decision to construct and operate any or all of the three proposed new stewardship facilities. The uncertainties inherent in the R&D nature of the stewardship program would make that kind of exercise essentially guesswork. The development of machines to simulate the intricacies of a nuclear detonation requires a highly sophisticated scientific R&D program. It very likely will take 5 to 10 years to begin obtaining reliable data from the new facilities. Until those facilities are operational, DOE cannot reliably predict how the additional capabilities they provide will mesh with the capabilities of previously existing machines to further the goals of the Program. It is only through incremental advances in the state of the science that decisions can eventually be made regarding the retirement of obsolete or redundant facilities.

DOE is committed to making maximum efficient use of the stewardship capabilities at its disposal. However, it is not reasonable to speculate at this time about how future stewardship requirements might affect existing facilities and capabilities.

Next Generation Experimental Facilities. Commentors suggested that potential next generation experimental facilities be analyzed as part of the proposed action. This PEIS includes a discussion of potential next-generation experimental facilities and the reasons why they are not proposed actions or alternatives (sections 2.5 and 3.3.4). These facilities, while contemplated on the basis of anticipated technical need, have not reached the stage of design maturity through R&D for DOE to include a decisionmaking analysis at this time. However, this PEIS does broadly describe, in general terms or by reference, what is known today about their potential environmental impacts. The environmental impacts from these facilities as contemplated today would not be significantly different from existing "similar" facilities. By characterizing the potential impacts in this way, the decision-maker will be aware of the potential program-level cumulative impacts of the next-generation facilities when deciding whether to pursue a program of enhanced experimental capability. If DOE proposes to construct and operate such facilities in the future, appropriate NEPA review will be performed.

New Weapon Design. Commentors have suggested that the proposal for enhanced experimental capabilities is directed more at the capability to design new weapons in the absence of nuclear testing than at maintaining the safety and reliability of the existing stockpile and that stewardship alternatives could be different if the facilities were directed only at maintaining the existing stockpile. This PEIS explains why these capabilities are needed to maintain the safety and reliability of a smaller, aging stockpile in the absence of nuclear testing (chapter 2). The existing U.S. stockpile of nuclear weapons is highly engineered and technically sophisticated in its design for safety, reliability, and performance. The stewardship capabilities required to make technical judgments about the existing stockpile are likewise technically sophisticated; therefore, it would be unreasonable to say that these stewardship capabilities could not be applied to the design of new weapons, albeit with less confidence than if new weapons could be nuclear tested.

However, the development of new weapon designs requires integrated nuclear testing such as occurs in nuclear explosive tests. Short of nuclear testing, no single stockpile stewardship activity, nor any combination of activities, could confirm that a new-design weapon would work. In fact, a key effect of a "zero-yield" CTBT would be to prevent the confident development of new-design weapons. National security policy requires DOE to maintain the capability to design and develop new weapons, and it will be a national security policy decision to use or not use that capability. Choosing not to use enhanced experimental capability for new weapons designs would not change the technical issues for the existing stockpile and, therefore, the stewardship alternatives would not change.

The issue of new-design weapons is separate from DOE's need to perform modifications to existing weapons that require research, design, development, and testing. The phrase used in this PEIS, "without the development and production of new-design weapons," is meant to convey the fact that the historical continuous cycle of large scale development and production of new weapons designs replacing older weapon designs has been halted. For example, during the 1980s, about a dozen new-design weapons were in full-scale development or production. Over the decade, production of new-design weapons replaced dismantled weapons nearly one for one. Today, only modifications to parts of existing weapons are being performed or planned; dismantlement has continued. This results in a smaller, aging stockpile that must be assessed and certified without nuclear testing. This is now the primary focus of the stewardship program.

Nonproliferation. Commentors have suggested that enhanced experimental capability is a proliferation risk. The national security policy framework discussed in this PEIS seeks a new balance between U.S. arms control and nonproliferation objectives and U.S. national security requirements for nuclear deterrence while pursuing these objectives (section 2.2). In addition, a discussion is provided on some of the more difficult issues that must be considered in determining the balance, including a discussion of experimental capability (section 2.6). In particular, the issue of nonproliferation and the proposed NIF was studied in detail. The study, prepared by the DOE Office of Arms Control and Nonproliferation, has been the subject of extensive public involvement, interagency review, and review by outside experts. The study concluded that the technical proliferation concerns of NIF are manageable and can therefore be made acceptable and that NIF can contribute positively to U.S. arms control and nonproliferation policy goals (appendix section I.2.1 of Volume III). NIF is a proliferation concern because of its broader scientific applications and expected frequent use by researchers worldwide, and, like the other proposed enhanced experimental facilities because of its possible relevance to the development of new weapon designs. However, the development of new weapon designs requires integrated testing. None of the proposed facilities, either alone or together, could perform such integrated testing of new concepts, and therefore cannot replace nuclear testing for the development of new weapon designs. The role of these facilities will be to help assess and certify the safety and reliability of the nuclear weapons remaining in the stockpile in the absence of nuclear testing. The national security policy framework and the technical issues that drive the proposed action for enhanced experimental capability remain the same.

Subcritical Experiments. With regard to the treatment of ongoing stewardship activities or enhanced experimental capability, subcritical experiments are an example of how changes in terminology have caused some confusion about what is evaluated in this PEIS under the No Action alternative. Subcritical experiments have been conducted at NTS over many years. Historically, operations at NTS have included tests or experiments that included both HE and special nuclear materials that were intended to produce no nuclear yield or negligible nuclear energy releases. These experiments frequently remained subcritical (i.e., they did not achieve self-sustaining fission chain reactions). The term "subcritical experiments" does not define a new form of activity or mission. It is intended to underscore the fact that in the future such experiments will be configured to ensure that the condition of criticality cannot be achieved. This issue has been clarified in the NTS Site-Wide EIS.

3.1.2.3 *Safe and Reliable Stockpile*

Some commentors have suggested that nuclear weapon reliability is not important in the post-Cold War era. National security policy as established by the President and Congress requires a safe and reliable stockpile. In order for the nuclear deterrent to be credible within the current national security policy framework, it must be reliable in a militarily effective way. A program designed to ensure the safety but not the reliability of the stockpile would require DOE to speculate on an alternate concept of nuclear deterrence and a national security policy framework to support it. See also the discussion of denuclearization in section 3.1.2.4.

Commentors have also suggested acceptance of lower standards of reliability as an alternative to enhanced stewardship capabilities. This PEIS explains how the assessment and certification of nuclear performance is carried out, and how this process differs from the more conventional statistical methods used for assessing reliability of the nonnuclear portion of the weapon. Assessment and certification of nuclear performance is a technical judgment by the weapons laboratories based on scientific theory, experimental data, and computational modeling (sections 2.4.1 and 2.3). The question is not whether to accept a lower standard of nuclear performance (less nuclear explosive yield), but whether or not there is a technical basis to confidently know how well the weapon will perform at all. Enhanced stewardship capability is focused on the technical ability to confidently judge nuclear safety and performance in the absence of nuclear testing.

Aside from being inconsistent with national security policy, attempting to separate weapon safety and reliability is more technically complex than it sounds. A modern nuclear weapon is highly integrated in its design for safety, reliability, and performance. It contains electrical energy sources and many explosive energy sources in addition to the main charge HE. The principal safety concern is accidental detonation of the HE causing dispersal of radioactive materials (plutonium and uranium). Modern weapons are designed and system-engineered to provide a predictable response in accident environments (e.g., fire, crush, or drop). However, because of the technical complexity of potential accident scenarios (i.e., combined environments) and the fact that complete nuclear weapons cannot be used for experimental data, assessment of the design and the effect of changes that might be occurring due to stockpile environments must rely on other sources of experimental data and complex computer modeling. Enhanced experimental capability specifically related to the weapon secondary is a nuclear performance concern. Enhanced computational capability in general, and enhanced experimental capability related to the weapon primary in particular, are both nuclear safety and performance concerns.

3.1.2.4 *Description of Alternative Approaches*

Commentors have suggested that DOE consider alternative forms of stewardship. While their comments are responded to in Volume IV, this section discusses DOE's consideration of the broad range of views on this issue. The Congressional Research Service report, *Nuclear Weapons Stockpile Stewardship: Alternatives for Congress*, December 14, 1995, provides a reasonable description of the various viewpoints on alternatives and a framework for discussion. (The report uses the term stockpile stewardship generically to describe the Stockpile Stewardship and Management Program.) The following discussion of alternative approaches is taken from the summary of that report.

> **Denuclearizers** would eliminate nuclear weapons worldwide in the foreseeable future, perhaps one to two decades. Until then, they would have a minimal U.S. stewardship program whose personnel, as curators of weapons knowledge, would monitor weapons. **Restorers** would maintain nuclear weapons with the only proven method, an ongoing program of research, development, design, testing, and

production, downsized to meet post-Cold War needs. Three intermediate positions seek to maintain weapons indefinitely without nuclear testing. **Remanufacturers** believe that since current weapons have been tested and certified as meeting military requirements, this Nation can maintain them indefinitely by "remanufacturing"—reproducing them to the exact specifications of the originals. Remanufacturers would go to great lengths to do so in order to avoid risks that even slight changes to warheads might introduce. **Enhancers**, who take the Administration's position on stewardship, see identical remanufacture as impossible. They believe some changes in design, process, and materials are unavoidable and others are desirable. A robust science program, they hold, is the best that can be done without testing to monitor warheads, anticipate problems, modify warheads when problems arise, and revalidate stockpile effectiveness on an ongoing basis. They would have a small manufacturing program. **Maintainers** fall between remanufacturers and enhancers. They focus on how to maintain warheads. They prefer to avoid changes to warheads but would not go to great lengths to do so. They view a strong science program as essential, but only to the extent that its elements connect directly to maintaining weapons. They emphasize manufacturing as the ultimate guarantor of U.S. ability to solve warhead problems. They, along with enhancers, favor some link to testing if confidence cannot be maintained in any other way.

Beyond the broad overview of alternative approaches to stockpile stewardship and management, the main text of the report discusses variations within each of the five points of view. Given the political and technical complexity of the Program, many approaches can appear to be distinct or reasonable alternatives for detailed study. In fact, while the enhancer's viewpoint as described above most closely resembles the Program described in this PEIS, the Program actually embraces elements of all five viewpoints. The following discussion illustrates this point and focuses on the main issue(s) that, in DOE's view, eliminate the other approaches as distinct or reasonable alternatives for this PEIS.

Denuclearization. This approach is reflected in this PEIS to the extent that national security policy is pointed toward the goals of denuclearization. Since the end of the Cold War, more than 8,000 U.S. nuclear weapons have been dismantled, no new-design weapons are being produced, three former nuclear weapons industrial plants have been closed, and the United States is observing a nuclear test moratorium and seeking a "zero-yield" CTBT. Maintenance of a safe and reliable stockpile is not inconsistent with working toward the NPT goal of eliminating nuclear weapons worldwide at some unspecified time in the future. However, denuclearization is not a reasonable alternative for this PEIS because it is not feasible based on current national security policy.

The main issue discussed in this section is consideration of an alternative with a very small (10s or 100s) or zero stockpile. Two of the stockpile sizes analyzed in this PEIS, a START I Treaty- and START II protocol-sized stockpile, are the only ones currently defined and directed by national security policy. The PEIS also analyzes a hypothetical 1,000 weapon stockpile for the purpose of a sensitivity analysis for manufacturing capacity decisions. The NWSM specifies the types of weapons and quantities of each weapon type by year (section 1.1). The NWSM is developed based on DOD force structure requirements necessary to maintain nuclear deterrence and comply with existing arms control treaties while pursuing further arms control reductions. This PEIS explains the complexity of this process and why DOE does not believe it reasonable to speculate using a large number of arbitrary assumptions (section 2.2). DOE has considered that a future national security policy framework could define a path to a smaller stockpile. However, DOE has the following perspective on this issue.

Stockpile stewardship capabilities are currently viewed by the United States as a means to further U.S. nonproliferation objectives in seeking a "zero-yield" CTBT. Likewise, it would be reasonable to assume that U.S. confidence in its stewardship capabilities would remain as important, if not more important, in future arms control negotiations to reduce its stockpile further. The path to a very small (10s or 100s) or zero stockpile would require the negotiation of complex international treaties, most likely with provisions that require intrusive international verification inspections of nuclear weapons related facilities. Therefore, DOE believes it reasonable to assume that complex treaty negotiations, when coupled with complex implementation provisions, would likely stretch over several decades. On a gradual path to a very small or zero stockpile, stockpile size alone would not change the purpose and need, proposed actions, and alternatives in this PEIS as they relate to stewardship capabilities. The issues of maintaining the core competencies of the United States in nuclear weapons, and the technical problems of a smaller, aging stockpile in the absence of nuclear testing, remain the same.

On a gradual path to a very small or zero stockpile, this PEIS evaluates reasonable approaches to stockpile management capability and capacity. At some point on this path, further downsizing of existing industrial plants or the alternative of consolidating manufacturing functions at stewardship sites would become more attractive as manufacturing capacity becomes a less important consideration. However, in the near term, the preferred alternative of downsizing the existing industrial plants would still be a reasonable action because the projected downsizing investment pays back within a few years through reduced operating expense; in addition, the downsizing actions are consistent with potential future decisions regarding plant closures. In regard to the proposed action of reestablishing pit manufacturing capability, DOE does not propose to establish higher manufacturing capacities than are inherent in the reestablishment of the basic manufacturing capability. In developing the criteria for reasonable stockpile management alternatives, DOE was careful not to propose the introduction of significant new types of environmental hazards to any prospective site. On a gradual path to a very small or zero stockpile, stockpile size alone would not change the purpose and need, proposed actions, and alternatives in this PEIS with regard to stockpile management capabilities and capacities.

To achieve eventual denuclearization, some commentors have asserted that DOE should adopt a passive curatorship approach to maintaining the declining nuclear weapons stockpile. The concept of curatorship is already being implemented at the existing sites in the form of knowledge preservation programs. While not necessary in an era of continuous development and production of new-design weapons and nuclear testing, knowledge preservation is now part of DOE's overall effort to maintain core competency in the weapons complex. However, as an inherently imperfect reconstruction, this effort can never ensure completeness of information nor relevance to future stockpile problems. More importantly, knowledge preservation does not address the fundamental issue of confidence in future technical judgments about issues that are yet to arise regarding the safety and performance of the stockpile. In highly technical matters, confidence arises from having appropriate data to support conclusions. In the absence of nuclear testing, the science-based approach to stockpile stewardship is focused on achieving the capability to acquire appropriate data.

From an environmental impact point of view, this PEIS displays the environmental impacts of each site's ongoing Program operations on an annual basis. The impacts of alternatives for proposed actions are displayed individually on the same basis. If one assumes that denuclearization leads to eventual site closure, then this PEIS, together with the Tritium Supply and Recycling PEIS, presents the environmental impacts of closing the four remaining industrial plants. While this PEIS does not directly consider the closure of the weapons laboratories and NTS, it is not at all clear what nuclear weapons capabilities the U.S. would retain even if it decided on a zero stockpile. However, the environmental impacts of the ongoing Program (No Action alternative) are essentially what would be phased out, with or without the proposed actions. DOE does not believe that speculative combinations of this data on speculative time lines provides any useful information for decisionmaking.

Restoration. The restorer's point of view is reflected in this PEIS to the extent that current national security policy requires DOE to maintain all the historical capabilities of the Program, including the capability for new-design weapons and nuclear testing. However, restoration is not a reasonable alternative for this PEIS because it requires a national security policy decision to reverse the constraints placed on the Program, namely, by resuming nuclear testing and new-design weapons production.

The environmental impacts of the restoration approach would be the same as those described in this PEIS to the extent that such a decision did not require manufacturing capacities higher than analyzed in this PEIS. In addition, this PEIS includes a brief description of the environmental impacts of nuclear testing (section 4.12); the Site-Wide EIS for NTS contains detailed information.

Remanufacturing. The remanufacturer's point of view is reflected in this PEIS by the fact that remanufacturing to specification will be attempted when possible and when appropriate to the problem being solved. With more than a half dozen different weapon types projected to remain in the stockpile, and with each weapon type containing thousands of parts, remanufacturing will undoubtedly occur for a significant number of repair and replacement activities. However, remanufacturing is not reasonable as a distinct exclusive alternative to the ongoing stockpile stewardship program or the proposed action of enhanced experimental capability for the technical reasons discussed below. In addition, it would not be a reasonable alternative because it does not fully support national security policies that require the conduct of a science-based stockpile stewardship and maintenance of the capability to design and produce new weapons.

Remanufacturing weapon components to their original specification, or maintaining weapons to their original design specifications, would superficially appear to be a reasonable approach to maintaining the safety and reliability of the stockpile in the absence of nuclear testing. Precise replication, however, is often not possible. Subtle changes in materials, processing, and fabrication techniques are an ever-present problem. In some cases, specialty materials and components become unavailable for commercial or environmental reasons. Implicit in the remanufacturing assumption is that the design blueprint, manufacturing process, and the materials used are specified in exact detail in every way. However, there is an unwritten element of "know how" that knowledgeable and experienced personnel contribute to any complicated manufacturing process (for this reason, controlling the acquisition of "know-how" is a major nuclear weapons nonproliferation objective). Materials and processes are not always specified in important ways because, at the time, they were not known to be important. The problem is illustrated by the following hypothetical example:

A material produced for a critical weld has a specification for a trace impurity; the manufacturing process consistently produced the material with a trace impurity less than the maximum allowed and the welds were satisfactory; the manufacturing process is changed for some reason, such as cost or environmental concerns; the material is now being produced with less trace impurity than before the process was changed; the material is still within specification; however, the welds are no longer satisfactory; it was unknown at the time that the higher level of the trace impurity was necessary to produce a satisfactory weld.

While remanufacturing sounds simple in principle, it is likely in fact to present complex issues of design, manufacturing process, and material variables. A simplified view of remanufacturing cannot serve as a "stand alone" manufacturing approach, let alone an alternative approach to enhanced stewardship capability. In the absence of underground nuclear testing, nuclear components (pits and secondaries) cannot be functionally tested. Stewardship capabilities provide the analytical tools (experimental and computational) to assess the significance of a problem observed during surveillance and to decide if the problem should be fixed; and if fixed, to certify that the fix will work (section 2.4.1). In the past, the decision to fix or not fix an observed problem could be made with nuclear testing (section 2.3). Stockpile stewardship strategies focus on the basic material science and the enhanced experimental and computational tools necessary to better predict age-related defects and to make sound technical judgments on nuclear safety and performance in the absence of nuclear testing.

The DARHT EIS (DOE/EIS-0228, section 2.3.2) provides an additional discussion of the limitations of a remanufacturing-to-specification approach. It discusses, as an example, the actions taken to evaluate and resolve unanticipated deterioration of HE in the now-retired W68 warhead for a submarine-launched ballistic missile. In that case it was necessary to replace the HE with a more chemically stable formulation. In addition, some other materials were no longer commercially available, requiring changes in the rebuilt weapons. Nuclear testing was ultimately used to verify that the necessary changes were acceptable. DOE does not consider it feasible to maintain all potentially obsolescent commercial sources and processes used for materials in existing weapons; aging would still occur in stored reserves of such materials.

With regard to stockpile management, remanufacturing without enhanced stewardship capability would also have notable drawbacks. DOE plans to maintain the capability to produce secondaries, and proposes to reestablish the capability to produce pits, by producing small quantities (10s) of each annually to maintain capability. This capacity should be sufficient to replace components attrited from the stockpile by surveillance testing. Remanufacturing these components, without the enhanced stewardship analytical capability to determine if and when replacement is necessary, is likely to require higher levels of production than DOE believes necessary to maintain production capability. Also, remanufacturing a nuclear component to the original specifications will not prevent age-related problems related to those specifications from recurring. Since these components use plutonium and uranium, radiation exposure to personnel and generation of radioactive waste would also be higher than necessary. If repeated remanufacturing were required, further unnecessary risks would result from additional weapon assembly/disassembly (A/D) operations and additional transport of nuclear components between sites.

From an environmental impact point of view, the remanufacturing concept would have greater impacts for the proposed action of reestablishing pit capability because DOE proposes to use a cleaner, less waste-generating process than was used at the Rocky Flats Plant. All other environmental impacts would not be distinguishable from those described in this PEIS because existing manufacturing processes form the Program baseline.

Maintenance. The maintainer's point of view is reflected in this PEIS to the extent that it is consistent with the No Action alternative. Under this approach, weapons maintenance would be the focus of stockpile stewardship. This approach would rely on enhanced surveillance and dual revalidation, whereby the weapons laboratories would conduct independent technical examinations of weapons to validate their safety and reliability. Any problems that arose would be solved through either remanufacture or "fixes" proposed by the weapons laboratories. These attributes are all part of the ongoing Program that will continue into the future. The principal difference between the Program as presented in this PEIS and this point of view is differing judgment on how much enhanced experimental capability would be needed to assess and certify a safe and reliable stockpile over the long term. The maintainers believe that less (or no) additional experimental capability would be required if DOE placed more emphasis on enhanced surveillance and dual revalidation.

DOE believes that this approach would not provide a sufficient basis for assessing and certifying the safety and reliability of the stockpile. Although enhanced surveillance will play an important role in the future of the Program, it serves a limited purpose. Surveillance activities identify stockpile problems through the examination and analysis of weapons sampled from the stockpile. An enhanced surveillance program would serve to identify problems with greater confidence and increased warning time. However, it would not provide a sole basis for assessing the significance of the problem or determining its solution. The ability of the laboratories to validate that the problem has been corrected, in the absence of nuclear testing, depends on their experimental and computational capabilities. In DOE's judgment, as explained in section 2.4, those capabilities are inadequate. Therefore, to the extent that maintenance would not provide sufficient enhanced experimental capability, it is not a reasonable alternative.

From an environmental impact point of view, the maintenance concept is not distinguishable from the impacts of the No Action alternative for stockpile stewardship and the proposed actions for stockpile management.

3.1.3 Underground Nuclear Testing

The last underground nuclear test conducted by the United States was in 1992. Since then, the United States has observed a moratorium on underground nuclear testing while pursuing a CTBT. On August 11, 1995, the President announced that, "one of my Administration's highest priorities is to negotiate a Comprehensive Test Ban Treaty to reduce the danger posed by nuclear weapons proliferation." In this announcement, the President also stated that he would seek a "zero yield" CTBT, which would "ban any nuclear weapon test explosion or any other nuclear explosion immediately upon entry into force." The President declared his commitment "to do everything possible to conclude the Comprehensive Test Ban Treaty negotiations as soon as possible so that a treaty can be signed next year."

As part of this announcement, the President also stated that he had been assured "that we can meet the challenge of maintaining our nuclear deterrent under a Comprehensive Test Ban Treaty through a science-based stockpile stewardship program without nuclear testing." However, the President cautioned that "while I am optimistic that the stockpile stewardship program will be successful, as President, I cannot dismiss the possibility, however unlikely, that the program will fall short of its objectives." The President went on to say further: "In the event that I were informed by the Secretary of Defense and Secretary of Energy ... that a high level of confidence in the safety or reliability of a nuclear weapons type which the Secretaries consider to be critical to our nuclear deterrent could no longer be certified, I would be prepared, in consultation with Congress, to exercise our 'supreme national interests' rights under the Comprehensive Test Ban Treaty in order to conduct whatever testing might be required."

One of the primary purposes of the Stockpile Stewardship and Management PEIS is to evaluate ways of maintaining a continued safe and reliable nuclear deterrent in the absence of nuclear testing. Thus, the proposal described in this PEIS does not include nuclear testing. However, because it is possible—although not probable—that the United States might one day exercise its "supreme national interests" rights and conduct underground nuclear testing to certify the safety and reliability of its nuclear weapons, this PEIS and the NTS Site-Wide EIS include an analysis of the environmental impacts of underground nuclear testing at NTS.

3.1.4 No Action Alternative

Under the No Action alternative, DOE would not take the actions proposed in this PEIS. Activities associated with stockpile stewardship and management would continue at the Complex sites using existing facilities, and no significant changes would occur.

With regards to stockpile stewardship, under the No Action alternative, activities at the three weapons laboratories (LANL, LLNL, and SNL) and NTS would continue using existing experimental facilities, but the proposed new experimental facilities would not be constructed. The major No Action facilities for the various stockpile stewardship functions include: the DARHT Facility and the Pulsed High Energy Machine Emitting X-Rays (PHERMEX) Facility at LANL, the Flash X-Ray (FXR) Facility at LLNL, and the Big Explosives Experimental Facility (BEEF) at NTS for studying the physics of the weapons primary; the Nova Facility at LLNL and the Pegasus II Facility at LANL for studying physics of the weapons secondary; and the Saturn and Particle Beam Fusion Accelerator (PBFA) Facilities at SNL for studying weapon effects. These facilities are more fully described in section 3.3, while the major activities at sites involved with stockpile stewardship are described in section 3.2.

Under the No Action alternative, stockpile management functions would remain at their current locations, no further rightsizing or consolidation beyond currently planned initiatives would take place, and pit manufacturing capability would not be reestablished. The major No Action facilities for the various stockpile management functions include: A/D and HE fabrication at Pantex; secondary and case fabrication at Y-12; nonnuclear fabrication facilities primarily at Kansas City Plant (KCP), with smaller capabilities at LANL and SNL; R&D plutonium fabrication capabilities at LANL and LLNL; and tritium supply and recycling facilities at SRS per the decisions in the Tritium Supply and Recycling ROD. These facilities are more fully described in section 3.4, while the major activities at sites involved with stockpile management are described in section 3.2.

From a programmatic perspective, the No Action alternative would not ensure DOE's ability to maintain core U.S. competencies in nuclear weapons in the long term while also maintaining a safe and reliable, smaller, aging U.S. stockpile. Because this is not acceptable, the No Action alternative is not considered to be reasonable. However, in accordance with the CEQ regulations, the No Action alternative is presented and assessed in this PEIS.

3.2 Alternative Sites

Eight locations (ORR, SRS, KCP, Pantex, LANL, LLNL, SNL, and NTS) are being considered as alternative sites for stockpile stewardship and management missions. All of these sites are currently performing DOE Office of the Assistant Secretary for Defense Programs (DP) activities.

3.2.1 Site Selection

One important strategy of the Stockpile Stewardship and Management Program is to maximize the use of existing infrastructure and facilities as the Complex transitions to be smaller and more efficient in the 21st century. Consequently, only those sites with existing infrastructure or facilities capable of supporting a given stockpile stewardship or stockpile management mission are considered reasonable site alternatives for detailed study in this PEIS. Sites without a technical infrastructure or facilities for a given mission would require significant new construction that would be costly and would create excessive technical risk compared to sites with existing infrastructure and facilities.

For stockpile stewardship, the three existing weapons laboratories and NTS are being considered for new or upgraded stockpile stewardship facilities. This is because the weapons testing mission and stockpile stewardship have always been primary responsibilities of the weapons laboratories and NTS, and existing facilities and capabilities can be built upon to meet the stewardship mission.

For stockpile management, all of the eight current Complex sites could be considered for one or more stockpile management functions. The three weapons laboratories and NTS have various production and manufacturing capabilities and infrastructure that could be improved upon to meet the stockpile management missions. As an example, for the A/D mission there are two reasonable site alternatives: Pantex, which currently performs this mission and has facilities that could be downsized for the future A/D mission; and NTS, which has a relatively new facility known as the Device Assembly Facility that could be upgraded and expanded to perform the A/D mission. Other sites, such as SRS or ORR, that do not have existing facilities or experience necessary to perform the A/D mission, are unreasonable options relative to the sites that have existing A/D facilities. This same logic is similarly applied for the other stockpile management missions.

3.2.2 Oak Ridge Reservation

ORR covers approximately 13,980 hectares (ha) (34,545 acres) in Oak Ridge, TN. ORR contains the Oak Ridge National Laboratory (ORNL), Y-12, and the K-25 Site (K-25). The primary focus of ORNL is on conducting basic and applied scientific research and technology development. Y-12 engages in national security activities, which are included in this PEIS. The Oak Ridge Gaseous Diffusion Plant, which has been shut down, is located at K-25. K-25 now serves as an operations center for environmental restoration and waste management programs.

Y-12 receives, processes, and provides interim storage for unirradiated enriched uranium returned from dismantled weapons and DOE sites as described in the *Environmental Assessment and Finding of No Significant Impact, Proposed Interim Storage of Enriched Uranium Above the Maximum Historical Level at the Y-12 Plant, Oak Ridge, Tennessee* (DOE/EA-0929). The capacity of existing processing and storage facilities is sufficient to accommodate all of the forecasted amounts of enriched uranium that would be placed in interim storage. The current missions and functions are described in table 3.2.2-1.

Defense Program Activities. The ORR DP assignments are performed at Y-12 and include maintaining the capability to produce secondaries and cases for nuclear weapons, storing and processing uranium and lithium materials and parts, dismantling nuclear weapons secondaries returned from the stockpile, and providing special production support to DOE weapons laboratories and to other DOE programs. To accomplish its storage mission, some processing of special nuclear materials may be required to recover materials from the returned secondaries. In addition, Y-12 performs stockpile surveillance activities on the components it produces.

3.2.3 Savannah River Site

SRS, located on approximately 80,130 ha (198,000 acres) near Aiken, SC, was established in 1950. The major nuclear facilities at SRS have included fuel and target fabrication facilities, nuclear material production reactors, chemical separation plants used for recovery of plutonium and uranium isotopes, a uranium fuel processing area, and the Savannah River Technology Center, which provides process support. Historically, DOE has produced tritium at SRS; however, DOE has not produced new tritium since 1988. Plutonium and spent nuclear fuel processing to produce material for nuclear weapons at SRS, have been terminated. DOE is currently preparing a separate EIS to explore the use of these facilities to stabilize existing quantities of plutonium residues as well as other nuclear materials. Tritium recycling operations will continue at SRS with the Replacement Tritium Facility conducting the majority of these operations. Tritium decays and must be replaced periodically to meet weapons spec-

TABLE 3.2.2–1.—*Current Major Missions at Oak Ridge Reservation*

Mission	Description	Sponsor
Weapon Components	Maintain capability to fabricate uranium and lithium components and parts for nuclear weapons	Defense Programs (DP)
Stockpile Surveillance	Evaluation of components and subsystems returned from the stockpile	Defense Programs (DP)
Uranium and Lithium Storage	Store enriched uranium, depleted uranium, and lithium materials and parts	Defense Programs (DP)
Dismantlement	Dismantle nuclear weapon secondaries returned from the stockpile	Defense Programs (DP)
Special Nuclear Material	Process uranium	Defense Programs (DP); Nuclear Energy (NE)
Test Devices	Provide support to weapons laboratories	Defense Programs (DP)
Environmental Restoration and Waste Management	Waste management and decontamination and decommissioning activities at Oak Ridge National Laboratory and K-25	Environmental Management (EM)
Research and Development	Oak Ridge National Laboratory basic research and development in energy, health, and environment	Energy Research (ER); Environment, Safety, and Health (EH); Nuclear Energy (NE)
Isotope Production	Oak Ridge National Laboratory produces radioactive and stable isotopes not available elsewhere	Nuclear Energy (NE)

ifications. Tritium recycling facilities empty tritium from weapons reservoirs, purify it to eliminate the helium decay product, and fill replacement reservoirs with specification tritium for nuclear stockpile weapons. Filled reservoirs are delivered to Pantex for weapons assembly and directly to the Department of Defense as replacements for weapons reservoirs. As part of the previous nonnuclear consolidation, SRS is also in the process of receiving some of the tritium processing and reservoir surveillance functions previously performed at the Mound Plant in Miamisburg, OH. The current missions at SRS are shown in table 3.2.3–1.

Defense Program Activities. In the past, the SRS complex for the production of nuclear materials consisted of five reactors (the C-, K-, L-, P-, and R-Reactors) in addition to a fuel and target fabrication

TABLE 3.2.3–1.—*Current Major Missions at Savannah River Site*

Mission	Description	Sponsor
Tritium Recycling and Reservoir Surveillance	Operate H-Area tritium facilities	Defense Programs (DP)
Stockpile Surveillance	Evaluation of reservoir components returned from stockpile	Defense Programs (DP)
Research and Development	Savannah River Technology Center technical support of Defense Programs, Environmental Management, and Nuclear Energy programs	Defense Programs (DP); Environmental Management (EM); Nuclear Energy (NE)
Stabilize Targets, Spent Nuclear Fuels, and Other Nuclear Materials	Operate F- and H-Canyons	Environmental Management (EM)
Waste Management	Operate waste processing facilities	Environmental Management (EM)
Environmental Monitoring and Restoration	Operate remediation facilities	Environmental Management (EM)
Space Program Support	Provide plutonium-238 for space program missions	Nuclear Energy (NE)

plant, two target and spent nuclear fuel chemical separation plants, a tritium-target processing facility, a heavy water rework facility, and waste management facilities.

The K-Reactor, the last operational reactor, was put into cold standby status in 1992 with no planned provision for restart. SRS is now conducting tritium-recycling operations in support of stockpile requirements using dismantled weapons as the tritium supply source.

3.2.4 Kansas City Plant

KCP is situated on approximately 57 ha (141 acres) of the 121-ha (300-acre) Bannister Federal Complex, which is located within incorporated city limits 19 km (12 mi) south of the downtown center of Kansas City, MO. The plant shares the Bannister Federal Complex site with other Federal agencies: the General Services Administration, the U.S. Marine Corps, the Federal Aviation Administration, the National Archives, and the Internal Revenue Service, among others.

KCP produces and procures nonnuclear electrical, electronic, electromechanical, mechanical, plastic, and nonfissionable metal components for the nuclear weapons program. Current missions at KCP are shown in table 3.2.4–1.

Defense Program Activities. KCP is currently the principal nonnuclear fabrication facility within the Complex. As such, KCP produces a variety of nonnuclear components and provides surveillance testing and repair services for these components.

3.2.5 Pantex Plant

Pantex is located about 27 km (17 mi) northeast of Amarillo, TX, on approximately 4,119 ha (10,177 acres) of DOE-owned land. Pantex missions are the fabrication of chemical HE for nuclear weapons, assembly, disassembly, maintenance, and surveillance of nuclear weapons in the stockpile, dismantlement of nuclear weapons being retired from the stockpile, and interim storage of plutonium components from dismantled weapons. Weapons activities involve the handling (but not processing) of uranium, plutonium, and tritium components, as well as a variety of nonradioactive hazardous or toxic chemicals. The current Pantex missions and functions are listed in table 3.2.5–1.

In the near term, weapons dismantlement and plutonium pit storage activities will dominate activities at Pantex. Although analysis in the *Environmental Assessment for Interim Storage of Plutonium Components* (DOE/EA-0812) found that Pantex has a sufficient number of storage magazines to safely accommodate 20,000 pits, Pantex only has authority to provide interim storage for up to 12,000 pits as described in a Finding of No Significant Impact (59 FR 3674) on January 26, 1994. Decisions regarding additional pit storage beyond 12,000 pits are being

TABLE 3.2.4–1.—*Current Major Missions at Kansas City Plant*

Mission	Description	Sponsor
Nonnuclear Component Fabrication	Manufacture electrical, electronic, electromechanical, plastic, and metallic components; fuzing and firing systems; and composite structures	Defense Programs (DP)
Telemetry Assembly	Manufacture telemetry assemblies and neutron detectors for flight test assemblies	Defense Programs (DP)
Test Equipment Design and Fabrication	Manufacture test equipment capable of performing electrical and mechanical tests on nonnuclear weapon components	Defense Programs (DP)
Stockpile Surveillance	Evaluation of components and subsystems returned from stockpile	Defense Programs (DP)

considered in the *Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components* (DOE/EIS-0225).

Defense Program Activities. The main mission of Pantex is the A/D of nuclear weapons. Other than HE, virtually all other components of the weapons come from other DOE or DOD sites. Modification, maintenance, and repair activity at Pantex involves the disassembly of nuclear weapons so that one or more of the components can be repaired, replaced, or modified. After replacing components, the weapons are reassembled and returned to the stockpile. Pantex surveillance activities involve weapon disassembly, laboratory testing of various components, and rebuilding weapons for shipment back to the stockpile. Production of HE components includes processing and machining main charge subassemblies and fabrication of mock components for use in weapon test assemblies, manufacturing small HE components, producing a variety of explosive materials from chemical reactants and commercially produced explosives, and evaluating explosive materials and components through a variety of analytical, mechanical, and explosive tests. Retired weapon dismantlement is the predominant current activity at Pantex. Weapons are returned from DOD, disassembled, and components are either destroyed, reclaimed, or returned to the original manufacturer. The exception is plutonium pits, which are stored onsite on an interim basis.

3.2.6 Los Alamos National Laboratory

LANL was established as a nuclear weapons design laboratory in 1943 and was formerly known as the Los Alamos Scientific Laboratory. Its facilities are located on about 11,300 ha (28,000 acres) about 40 km (25 mi) northwest of Santa Fe, NM.

LANL is a multidisiciplinary research facility engaged in a variety of programs for DOE and other Government agencies. Its primary mission is the nuclear weapons Stockpile Stewardship and Management Program and related emergency response, arms control, and nonproliferation and environmental activities. It conducts R&D activities in the basic sciences, mathematics, and computing with applications to these mission areas and to a broad range of programs including: nonnuclear defense; nuclear and nonnuclear energy; atmospheric, space, and geosciences; bioscience and biotechnology; and the environment. Table 3.2.6–1 illustrates current missions at LANL. A more detailed discussion of the complete spectrum of laboratory activities can be found in the current LANL Institutional Plan, which is unclassified and available to the public.

In regard to nuclear weapons, LANL is responsible for the design of the nuclear explosive package in certain U.S. weapons (LLNL has this responsibility for other weapons.) LANL maintains research, design, development, testing (including nuclear testing), surveillance, assessment, and certification capabilities in

TABLE 3.2.5–1.—*Current Major Missions at Pantex Plant*

Mission	Description	Sponsor
Weapons Assembly/Disassembly	Assemble and disassemble nuclear weapons as necessary	Defense Programs (DP)
Weapons Dismantlement	Dismantle nuclear weapons no longer required	Defense Programs (DP)
Weapons Maintenance	Retrofit, maintain, and repair stockpile weapons	Defense Programs (DP)
Stockpile Surveillance	Disassembly and inspection	Defense Programs (DP)
High Explosive Components	Manufacture for use in nuclear weapons	Defense Programs (DP)
Plutonium Storage	Provide interim storage of pits	Defense Programs (DP)
Test/training Programs	Assemble nuclear explosive-like assemblies for training or flight test	Defense Programs (DP)
Waste Management	Provide waste management and decontamination and decommissioning activities	Environmental Management (EM)

TABLE 3.2.6–1.—*Current Major Missions at Los Alamos National Laboratory*

Mission	Description	Primary Sponsor
Nuclear Weapons	Stockpile stewardship; production of nonnuclear components; pit surveillance; tritium production R&D	Defense Programs (DP)
Arms Control and Nonproliferation	Intelligence analysis; technology R&D; treaty verification; fissile material control; counterproliferation analysis	Nonproliferation and National Security (NN)
Energy Research, Science and Technology	Neutron science (e.g., at LANSCE); scientific computing; fusion energy; health and environmental research; high energy and nuclear physics; basic energy sciences	Energy Research (ER)
Energy Technology	Fossil; nuclear	Energy Efficiency and Renewable Energy (EE)
Environmental	Environmental restoration; waste management and treatment	Environmental Management (EM)
Work for Others	Conventional weapons; computing, modeling and simulation	DOD and various other agencies

support of the Stockpile Stewardship and Management Program. In addition, since the end of the Cold War, LANL now conducts the pit surveillance program and some manufacturing of nonnuclear components due to termination of the nuclear weapons mission at the Mound, Pinellas, and Rocky Flats Plants.

3.2.7 Lawrence Livermore National Laboratory

LLNL was established as a nuclear weapons design laboratory in 1952 and was formerly known as the Lawrence Radiation Laboratory. Its facilities are located on about 332 ha (821 acres) in Livermore, CA. A 2,800-ha (7,000-acre) auxiliary testing range known as Site 300 is located about 29 km (18 mi) east of the Livermore Site. Site 300 is used primarily for HE testing and other experimentation, such as particle beam research.

LLNL is a multidisiciplinary research facility engaged in a variety of programs for DOE and other Government agencies. Its primary mission is the nuclear weapons stewardship program and related emergency response, arms control, and nonproliferation activities. It conducts research and development activities in the basic sciences, mathematics, and computing, with applications to these mission areas and to a broad range of programs including: nonnuclear defense; nuclear and nonnuclear energy; atmospheric, space, and geosciences; bioscience and biotechnology; and the environment. Table 3.2.7–1 illustrates current missions at LLNL. A more detailed discussion of the complete spectrum of laboratory activities can be found in the current LLNL Institutional Plan which is unclassified and available to the public. In regard to nuclear weapons, LLNL is responsible for the design of the nuclear explosive package in certain U.S. weapons (LANL has this responsibility for other weapons). LLNL maintains research, design, development, testing (including nuclear testing), surveillance, assessment, and certification capabilities in support of the Stockpile Stewardship and Management Program.

3.2.8 Sandia National Laboratories

SNL was established as a nuclear weapons design laboratory in 1945. Its facilities are in three locations in the continental United States: Albuquerque, NM; Livermore, CA; and Tonopah, NV. The facilities discussed in this document refer only to the main Albuquerque site, which is located on about 1,150 ha (2,842 acres) of DOE property on Kirtland Air Force Base and an additional 6,072 ha (15,003 acres) provided to DOE through ingrant land from Kirtland Air Force Base, the State of New Mexico, and Isleta Pueblo.

SNL is a multidisiciplinary research and engineering facility engaged in a variety of programs for DOE and other Government agencies. Its primary mission is the nuclear weapons Stewardship and Management Program and related emergency, arms control, and nonproliferation activities. In addition, it conducts R&D activities in advanced manufacturing, electronics, information, pulsed power, energy, environment, transportation, and biomedical technologies. Table 3.2.8–1

TABLE 3.2.7–1.—*Current Major Missions at Lawrence Livermore National Laboratory*

Mission	Description	Primary Sponsor
Nuclear Weapons	Stockpile stewardship	Defense Programs (DP)
Arms Control and Nonproliferation	Intelligence analysis; treaty verification; fissile material control; counterproliferation analysis	Nonproliferation and National Security (NN)
Energy Research, Science and Technology	Scientific computing; fusion energy; health and environmental research; high energy and nuclear physics; basic energy sciences	Energy Research (ER)
Energy Technology	Nuclear safety; uranium - AVLIS	Nuclear Energy (NE)
Environmental	Environmental restoration; waste management and treatment	Environmental Management (EM)
Radioactive Waste	Repository studies	Radioactive Waste (RW)
Work for Others	Conventional weapons; space	DOD and various other agencies

Note: AVLIS - Atomic Vapor Laser Isotope Separation.

illustrates current missions at SNL. A more detailed discussion of the complete spectrum of laboratory activities can be found in the current SNL Institutional Plan, which is unclassified and available to the public.

In regard to nuclear weapons, SNL is responsible for the design of nonnuclear components and related system engineering. It maintains research, design, development, testing (including nuclear testing), surveillance, assessment, and certification capabilities in support of the Program. In addition, because of the end of the Cold War, SNL now performs some nonnuclear manufacturing functions due to termination of the nuclear weapons mission at the Mound and Pinellas Plants.

3.2.9 Nevada Test Site

NTS occupies approximately 351,000 ha (867,000 acres) in the southeastern part of Nye County in southern Nevada. NTS is located about 104 km (65 mi) northwest of Las Vegas. It is a remote, secure facility that maintains the capability for conducting underground testing of nuclear weapons and evaluating the effects of nuclear weapons on military communications systems, electronics, satellites, sensors, and other materials. The first nuclear test at NTS was conducted in January 1951. Since the signing of the Threshold Test Ban Treaty in 1974, it has been the only U.S. site used for nuclear weapons testing. Approximately one-third of the land (located in the eastern and northwestern portions of the site) has been used for nuclear weapons testing, one-third (located in the western portion of the site) has been reserved for future missions, and one-third has been reserved for R&D and other facility requirements. Facilities include nuclear device assembly, diagnostic canister assembly, hazardous liquid spill, and the radioactive waste management site. In addition, Yucca Mountain, an area on the southwestern boundary of the site, is being evaluated by DOE for siting of a spent nuclear fuel and high-level waste (HLW) repository. While the primary purpose of Yucca Mountain

TABLE 3.2.8–1.—*Current Major Missions at Sandia National Laboratories*

Mission	Description	Primary Sponsor
Nuclear Weapons	Stockpile stewardship; nonnuclear component production	Defense Programs (DP)
Arms Control and Nonproliferation	Intelligence support; policy analysis; verification and control	Nonproliferation and National Security (NN)
Energy Research, Science and Technology	Electric, geothermal, solar, wind and photovoltaics; coal, gas and petroleum; fusion; basic energy sciences	Energy Efficiency and Renewable Energy (EE); Fossil Energy (FE); Energy Research (ER)
Environmental	Environmentally conscious manufacturing; environmental restoration; waste management; HazMat transport	Environmental Management (EM)
Work for Others	Satellites; arming, fuzing, and firing systems; probabilistic risk assessment; transport packaging	DOD and various other agencies

is for commercial HLW, it is also slated to receive some defense HLW.

Activities at NTS are concentrated in several general areas. Most of the onsite work is related to DP activities, although there are DOE Office of Environmental Management (EM), other DOE, and non-DOE activities as well. NTS is a unique facility because it is a large open area into which access is tightly controlled, it has a substantial infrastructure, and it has the capability to handle and run tests with hazardous or radioactive materials. Because of these factors, activities other than nuclear testing, such as mobile missile transporter tests and nuclear rocket tests, have been carried out for other Federal departments and agencies. The current missions and functions of NTS are shown in table 3.2.9–1.

Defense Program Activities. The primary DP mission at NTS is to help ensure the safety and reliability of the Nation's nuclear weapons stockpile. This stewardship program includes maintaining the readiness and capability to conduct underground nuclear weapons tests and conducting such tests if so directed by the President. Other aspects of stockpile stewardship also include conventional HE tests, dynamic experiments, and hydrodynamic testing. The Nuclear Emergency Search Team based at NTS maintains the readiness to respond to any type of nuclear emergency, including search and identification for lost or stolen weapons, and training exercises related to nuclear bomb and radiation dispersal threats.

NTS has also been a key site for past efforts in the areas of nuclear nonproliferation and verification of international treaties. This work was exemplified recently by the Joint Treaty Verification Project, a cooperative effort between the United States and the former Soviet Union.

North Las Vegas Facility. Located on a 32-ha (80-acre) site in the city of North Las Vegas, NV, the North Las Vegas Facility supports the DOE Nevada Operations Office and LLNL, LANL, and SNL weapons test programs and is considered an adjunct to NTS. The facility supports test prestaging activities and fabrication, assembly, and testing of field diagnostic systems that collect data from NTS weapons testing activities. This facility is being considered as an alternative location for NIF and is described more fully in appendix I.

3.3 STOCKPILE STEWARDSHIP ENHANCED EXPERIMENTAL CAPABILITY

Historically, nuclear testing has provided unambiguous high confidence in the safety and reliability of weapons in the stockpile. Without additional underground nuclear testing, DOE must rely on experimental and computational capabilities, especially in weapons physics, to predict the consequences of the complex problems that are likely to occur in an aging stockpile. Without these enhanced capabilities, DOE will lack the ability to adequately evaluate some safety and reliability issues, which could significantly affect the Nation's confidence in the stockpile. It is also possible that, without these enhanced capabili-

TABLE 3.2.9–1.—*Current Major Missions at Nevada Test Site*

Mission	Description	Sponsor
Defense Program	Stockpile stewardship activities, including maintenance of readiness to conduct underground nuclear tests, if directed	Defense Programs (DP)
Waste Management	Safe and permanent disposal of waste through disposal on NTS or to offsite commercial waste treatment or disposal facilities	Environmental Management (EM)
Environmental Restoration	Identification and cleanup of contaminated areas	Environmental Management (EM)
Nondefense Research and Development	Original research efforts by DOE, other Federal agencies, and universities	Environmental Management (EM); Energy Research (ER); and others
Work for Others	Provides for the use of NTS areas and facilities by other groups and agencies for activities such as military training exercises	DOD and various other agencies

ties, DOE could not certify the acceptability of certain weapons components repaired or modified to address future safety or reliability issues.

The physical principles involved in nuclear weapons call for a range of experimental capabilities to provide data. These capabilities differ in time and energy density (related to temperature and pressure), and they are complementary rather than duplicative, because they serve different needs. These aboveground sources of experimental data can be categorized most easily by time; that is, by the duration of the output pulse of the data. Thermonuclear processes vary in time down to the nanosecond range.[1] For example, powerful lasers do the best job of producing experimental data at the highest temperatures (millions of degrees) in the laboratory, but only for very short time intervals. Multi-nanosecond pulsed-power sources do the best job of producing very energetic pulses of x radiation in that time period, but at moderate temperatures. And microsecond pulsed-power sources and HE do the best job of providing an energetic but controlled hydrodynamic "push" in that time period for simulation and study of complex hydrodynamic phenomena.[2] The three weapons laboratories are also complementary in providing these technologies. The powerful laser capability is centered at LLNL, the nanosecond pulsed-power capability is centered at SNL, and the microsecond pulsed-power capability is centered at LANL.

As discussed in chapter 2, the historical stockpile data indicate that problems are likely to develop in the aging stockpile that will require certified repairs or replacements without nuclear testing. Thus, U.S. national security policy in pursuit of a "zero yield" CTBT calls for the aggressive pursuit of enhanced experimental capabilities to help ensure a safe and reliable stockpile without additional nuclear testing. Therefore, DOE has included the detailed project-specific analyses for the proposed facilities (NIF, CFF, and Atlas) in this PEIS. Enhanced experimental facilities considered in this PEIS are those that either require or may require budget "line item" authorization from Congress. Next generation facilities are discussed in section 3.3.4. Within the next several years, it is expected that the weapons laboratories may request DOE authorization to begin the formal Congressional budget "line item" process for these facilities. NEPA documentation would be completed as a normal part of this process.

The nuclear weapons phenomena involved in enhanced experimental capability can be broadly grouped into three categories: physics of nuclear weapons primaries, physics of nuclear weapons secondaries, and weapons effects. Table 3.3–1 depicts the proposed alternatives and facilities for enhanced experimental capability.

3.3.1 Physics of Nuclear Weapons Primaries

Primary implosion is initiated by detonating a layer of chemical HE that surrounds the plutonium pit. The HE drives the pit material into a compressed mass at the center of the primary assembly, resulting in a fission reaction. With respect to the physics phenomena from the implosion of the primary, the experimental facilities provide physics validation, material behavior information, improved understanding of the implosion, and the ability to assess age-related defects. LANL and LLNL have been conducting basic work in these areas for many years. However, in the absence of additional nuclear testing, new and improved capabilities are needed. Proposed new facilities and site alternatives under consideration, along with the existing facilities which are part of the No Action alternative, are discussed below.

3.3.1.1 *No Action*

The principal diagnostic tools DOE currently uses to study nuclear weapons primaries are hydrodynamic tests and dynamic experiments. Hydrodynamic tests examine interactions among parts of the weapons primary. Dynamic experiments explore broader issues regarding materials science. Under the No Action alternative, DOE would continue to use the hydrodynamic testing facilities currently available at LANL, LLNL, and NTS, and a new facility planned for LANL. The FXR Facility at LLNL Site 300 has been in continuous operation since 1983. The FXR Facility uses linear induction accelerator technology for high-speed radiography. DOE does not perform dynamic experiments with plutonium at LLNL because the necessary infrastructure is not in place at Site 300. The PHERMEX Facility has been in continuous operation at LANL since 1963. The PHERMEX Facility uses a radio-frequency accelerator designed

[1] Nanoseconds are billionths of a second; microseconds are millionths of a second.

[2] Under extreme temperatures and pressures, the dynamics (motion) of solids, such as metals, behave more like fluids, thus the term hydrodynamic.

TABLE 3.3–1.—*Stockpile Stewardship Enhanced Experimental Capability Alternatives*

Capability	LANL	LLNL	SNL	NTS
Physics of Nuclear Weapons Primaries				
No Action	X	X		X
Contained Firing Facility[a]		X		
Physics of Nuclear Weapons Secondaries[b]				
No Action	X	X		
National Ignition Facility[a]	X	X	X	X
Atlas Facility[a]	X			
Weapons Effects				
No Action[c]			X	

[a] Proposed facilities. The Stockpile Stewardship and Management PEIS includes both a programmatic assessment and a project-specific analysis of these potential experimental facilities.

[b] Facilities used to investigate the physics of nuclear weapons secondaries may also be used to investigate some physics phenomena related to nuclear weapons primaries and weapons effects.

[c] No new facilities solely to investigate weapons effects phenomena are being proposed at this time.

for high-speed radiography at LANL. Because neither the FXR Facility nor the PHERMEX Facility is capable of providing the degree of resolution, intensity, rapid time sequencing, or three-dimensional views that are now needed to provide answers to current questions regarding weapons condition or performance, DOE has decided to construct and operate a new facility (DARHT) at LANL.

The DARHT Facility will consist of a new accelerator building with two accelerator halls to provide two perpendicular lines-of-sight, which will enable two radiographic images to be captured simultaneously or sequentially and will provide a capability to perform three-dimensional diagnostics of a simulated nuclear weapon primary. Most tests and experiments at the DARHT Facility would be conducted inside of modular steel containment vessels. In the future, DOE may perform dynamic experiments with plutonium at the DARHT Facility; these experiments would be conducted in specially designed double-walled containment vessels. DOE has analyzed the environmental impacts of this proposal; the DARHT Facility Final EIS (DOE/EIS-0228) was published in August 1995 and on October 10, 1995, DOE issued its ROD to proceed with the facility. Construction of the facility was enjoined by the U.S. District Court for the District of New Mexico on January 27, 1995, pending completion of the EIS and ROD. Following the ROD, DOE filed motion for dissolution of the injunction. On April 16, 1996, the U.S. District Court concluded that the purpose of the injunction had been satisfied, and therefore lifted the injunction and dismissed the case.

For the purposes of this PEIS, DOE includes DARHT as an existing facility at LANL because DOE has reached an independent decision to construct and operate the facility. Under all alternatives considered in this PEIS, including the No Action alternative, DOE would complete construction and operate both axes of the DARHT Facility. When DARHT becomes operational, DOE would phase out operation of the PHERMEX Facility. Modular steel containment vessels would be used at the DARHT Facility firing site to contain emissions and debris from selected hydrodynamic tests and dynamic experiments; any experiments involving plutonium would always be conducted inside a specially designed double-walled steel vessel.

Besides LANL and LLNL, NTS has some hydrodynamic testing facilities in place. In addition to its past underground nuclear testing program, DOE has conducted underground and aboveground hydrodynamic tests at NTS. For example, BEEF is used to study hydrodynamic motion associated with HE detonations; however, BEEF does not include a high resolution radiographic diagnostic capability.

3.3.1.2 *Proposed Contained Firing Facility*

As discussed previously, both LANL and LLNL are considered necessary for the continued development of the science-based stockpile stewardship program. In this regard both laboratories will continue to utilize and improve radiographic hydrodynamic test capability.

TABLE 3.3.1.2–1.—*Contained Firing Facility Construction Requirements*

Requirement	Consumption
Material/Resource	
Electrical energy (MWh)	64
Peak electrical demand (MWe)	0.1
Concrete (m^3)	3,000
Steel (t)	1,500
Gasoline, diesel, and lube oil (L)	56,800
Industrial gases[a] (m^3)	4,300
Water (L)	3,790,000
Land (ha)	1.2
Employment	
Total employment (worker years)	60
Peak employment (workers)	30
Construction period (years)	2

[a] Cubic meters at standard temperature and pressure.
Source: LLNL 1995i:3; appendix J.

The proposed CFF would augment and upgrade the existing FXR Facility at LLNL's Site 300. The containment enclosure would provide for containment of hydrodynamic tests and reduce the environmental, safety, and health impacts of current outdoor testing. The enclosure will also improve the quality of diagnostics data derived from testing by better controlling experimental conditions. Tables 3.3.1.2–1 through 3.3.1.2–3 show CFF construction and operating requirements and waste volumes. More detailed information about CFF can be found in appendix section A.2.2 and in the project-specific analysis presented in appendix J.

TABLE 3.3.1.2–2.—*Contained Firing Facility Annual Operation Requirements*

Requirement	Consumption
Resource	
Electrical energy (MWh)	1,600
Peak electrical demand (MWe)	1.2
Liquid fuel (L)	2,650
Natural gas[a] (m^3)	None
Water (L)	2,300,000
Coal (t)	None
Plant Footprint (ha)	0.4
Employment (Workers)	6[b]

[a] Cubic meters at standard temperature and pressure.
[b] In addition to current B801/FXR Facility staff of approximately 20.
Source: LLNL 1995i:3; appendix J.

3.3.2 Physics of Nuclear Weapons Secondaries

The energy released by the fission of the nuclear weapons primary activates the secondary assembly, creating a thermonuclear (fusion) explosion. The physics of nuclear weapons secondaries deals with the interaction of many dynamic physics processes, including hydrodynamics, thermodynamics, fission, and fusion. With respect to the phenomena of the physics from the thermonuclear explosion of the secondary, the experimental facilities provide improved understanding of thermonuclear ignition, secondary physics validation, and material behavior information. LANL and LLNL have been conducting basic work in these areas for many years. However, without additional nuclear testing, new and improved capabilities are needed. The proposed new facilities and site alternatives under consideration are discussed below. Some of the facilities may also be useful for investigating physics phenomena related to nuclear weapons primaries and weapons effects. The capabilities that would be provided by the proposed NIF and the Atlas Facility are independent components needed to improve the understanding of the physics of nuclear weapons secondaries. Each proposed facility responds to a different diagnostic need related to nuclear weapons secondaries and is not competing with other alternatives.

3.3.2.1 *No Action*

Few methods are currently available to study the physics of nuclear weapons secondaries. The principal facilities currently available are the Nova Facility at LLNL and the Pegasus II Facility at LANL. The Nova Facility and the Pegasus II Facility do not provide conditions sufficiently close to those in a nuclear weapon secondary to improve our understanding of these important concepts and processes. Without improvements to these capabilities, as proposed by NIF and the Atlas Facility, DOE would lack the ability to evaluate some significant nuclear performance issues, which could adversely affect confidence in the Nation's nuclear deterrent.

3.3.2.2 *Proposed National Ignition Facility*

The proposed NIF would make it possible to study radiation physics in laboratory experiments that would approach certain conditions of a thermonuclear detonation. NIF would achieve higher temperatures and pressures, albeit in a very small volume, than any other existing or proposed stockpile stewardship facility. This facility could be located at either LANL, LLNL,SNL, or NTS. Tables 3.3.2.2–1 through 3.3.2.2–3 show generic

TABLE 3.3.1.2-3.—*Contained Firing Facility Waste Volumes (100 Tests Per Year)*

Category	Average Annual Volume Generated from Construction (m^3)	Annual Volume Generated from Operation (m^3)	Annual Volume Effluent from Operation (m^3)
Low-Level			
Liquid	None	None	None
Solid	None	90[a]	90[b]
Mixed Low-Level			
Liquid	None	None	None
Solid	None	10[c]	10
Hazardous			
Liquid	None	8[d]	8
Solid	None	4	4
Nonhazardous (Sanitary)			
Liquid	1,420	284[e]	284
Solid	64	13[f]	13
Nonhazardous (Other)			
Liquid	None	None	None
Solid	None	None	None

[a] Assumes density of 500 kg/m^3.
[b] Solid low-level waste is not compactible.
[c] Assumes 0.1 m^3 (3.7 ft^3) per test although none is expected.
[d] Assumes density of 1,000 kg/m^3. Liquid is mostly film processing solutions.
[e] Based on 50 gal/day per person and 250 days/yr for six employees.
[f] Based on 0.3 ft^3/day per person and 250 days/yr for six employees.
Source: LLNL 1995i:3; LLNL 1996i:2; appendix J.

TABLE 3.3.2.2-1.—*National Ignition Facility Construction Requirements*

Requirement	Consumption
Material/Resource	
Electrical energy (MWh)	24
Concrete (m^3)	60,000
Steel (t)	10,000
Liquid fuel and lube oil (L)	1,500,000
Industrial gases[a] (m^3)	9,000
Water (L)	14,300,000[b]
Land (ha)	20
Employment	
Total employment (worker years)	1,627
Peak employment (workers)	470
Construction period (years)	5

[a] Cubic meters at standard temperature and pressure.
[b] 11,400 L per day for a 5-year construction period, assuming 250 days of construction per year.
Note: This table provides nonsite-specific requirements. See appendix I for site-specific information.
Source: LLNL 1995m; appendix I.

TABLE 3.3.2.2-2.—*National Ignition Facility Annual Operation Requirements*

Requirement	Consumption
Resource	
Electrical energy (MWh)	58,000
Peak electrical demand (MWe)	20
Liquid fuel (L)	5,820
Natural gas[a] (m^3)	1,100,000[b]
Water (L)	152,000,000
Coal (t)	None
Plant Footprint (ha)	20[c]
Employment (Workers)	267[d]

[a] Cubic meters at standard temperature and pressure.
[b] Energy requirement is 40,900,000 megajoules. Conversion assumes 1,000 British thermal units per cubic foot and 1,055 joules per British thermal unit.
[c] Maximum size could be smaller depending on site conditions.
[d] Technicians for baseline operations. Does not include 60 scientists required. For enhanced operations, employment would increase by 50 technicians and 10 scientists.
Note: This table provides nonsite-specific requirements. See appendix I for site-specific information.
Source: ANL 1995a:1; LLNL 1995m; appendix I.

TABLE 3.3.2.2–3.—*National Ignition Facility Conceptual Design Waste Volumes*

Category	Average Annual Volume Generated from Construction (m^3)	Annual Volume Generated from Operation (m^3)	Annual Volume Effluent from Operation (m^3)
Low-Level			
Liquid	None	0.6	None
Solid	None	3	3
Mixed Low-Level			
Liquid	None	2	2
Solid	None	0.3	0.3
Hazardous			
Liquid	None	2.3	2.3
Solid	None	8	8
Nonhazardous (Sanitary)			
Liquid	2,800	17,900[a]	17,800[b]
Solid	100	6,000	6,050
Nonhazardous (Other)			
Liquid	180	Included in sanitary	Included in sanitary
Solid	180	Included in sanitary	Included in sanitary

[a] Assumes 365 days of operation.
[b] Assumes 350:1 wastewater to sludge ratio for treatment of liquid sanitary waste.
Note: This table provides nonsite-specific requirements. See appendix I for site-specific information.
Source: LLNL 1995m; appendix I.

NIF construction, operating requirements, and waste volumes. The data in these three tables reflect nonsite-specific estimates developed prior to site-specific analyses. More detailed and site-specific information about NIF can be found in the project-specific analysis presented in appendix I.

3.3.2.3 *Proposed Atlas Facility*

The proposed Atlas Facility at LANL would be used for experiments that would contribute to the development of predictive capabilities related to the aging and performance of secondaries. This facility would build on existing special equipment at LANL, SNL, or NTS. Tables 3.3.2.3–1 through 3.3.2.3–3 show Atlas Facility construction and operating requirements and waste volumes. Although principally considered as a stewardship facility for study of the physics of nuclear weapons secondaries, the proposed Atlas Facility at LANL could also be used for hydrodynamic experiments to resolve issues related to material properties, mixing and other physics aspects of weapons primaries. More detailed information about the Atlas Facility can be found in the project-specific analysis presented in appendix K.

TABLE 3.3.2.3–1.—*Atlas Facility Construction Requirements*

Requirement	Consumption
Material/Resource	
Electrical energy (MWh)	520
Peak electrical demand (MWe)	0.1
Concrete (m^3)	<100
Steel (t)	<10
Liquid fuel and lube oil (L)	<1,000
Industrial gases[a] (m^3)	<100
Water (L)	<10,000
Land (ha)	0.04
Employment	
Total employment (worker years)	53
Peak employment (workers)	35
Construction period (years)	4

[a] Cubic meters at standard temperature and pressure.
Source: LANL 1995b:4; LANL 1996e:1; appendix K.

3.3.3 Weapons Effects

One of the reasons for past underground nuclear testing has been to determine the effects of nuclear weapon radiation outputs of x rays, gamma rays, and neutrons on nuclear weapon subsystems and components. Of particular importance is the ability to certify

TABLE 3.3.2.3–2.—*Atlas Facility Annual Operation Requirements*

Requirement	Consumption
Resource	
Electrical energy (MWh)	5,360
Peak electrical demand (MWe)	12
Liquid fuel (L)	None
Natural gas[a] (m^3)	45,710
Water (L)	10,000
Coal (t)	None
Plant Footprint (ha)	0.3
Employment (Workers)	15

[a] Cubic meters at standard temperature and pressure.
Source: LANL 1995b:4; LANL 1996e:1; appendix K.

that crucial nuclear weapons components meet military requirements to withstand radiation. Additionally, underground nuclear testing has been used to establish, with high confidence, adherence to military requirements for nonweapons systems such as satellites. Existing facilities at SNL, such as the Saturn Facility or the PBFA Facility, provide a limited capability to investigate these effects, and would continue to operate under the No Action alternative. No alternatives for new facilities designed principally for weapons effects testing are being proposed in this PEIS.

3.3.4 Next Generation Stockpile Stewardship Facilities

The science-based stockpile stewardship program will build upon existing information and capabilities and the program is expected to continuously evolve as better information becomes available and technological advancements occur. Today, because of limitations on data and technology, only the first steps to a fully capable science-based stockpile stewardship program can be taken. Thus, DOE is only in a position to propose NIF, CFF, and Atlas Facility for decisionmaking analysis in this PEIS. These three facilities are described in detail in appendixes I, J, and K, respectively. The goal is to provide a sufficiently detailed analysis for these three facilities in this PEIS to allow for their construction and operation if the decision is made to do so.

TABLE 3.3.2.3–3.—*Atlas Facility Waste Volumes*

Category	Average Annual Volume Generated from Construction (m^3)	Annual Volume Generated from Operation (m^3)	Annual Volume Effluent from Operation (m^3)
Low-Level			
Liquid	None	None[a]	None
Solid	None	None[a]	None
Mixed Low-Level			
Liquid	None	None[a]	None
Solid	None	None[a]	None
Hazardous			
Liquid	None	<1[b]	None
Solid	None	<1[b]	None
Nonhazardous (Sanitary)			
Liquid	1,120[c]	710[d]	708[e]
Solid	15.3	7	9
Nonhazardous (Other)			
Liquid	None	Included in sanitary	Included in sanitary
Solid	None	Included in sanitary	Included in sanitary

[a] Anticipated experiments do not utilize radioactive materials.
[b] For purposes of this analysis, occasional use of hazardous material is anticipated.
[c] Assumes 25 gal/day per construction worker for 250 days/yr and 35 construction workers. Also includes 290 m^3 (76,610 gal) from washdown.
[d] Assumes 50 gal/day/worker, 250 days/year of operation, and 15 employees.
[e] Assumes 350:1 wastewater to sludge ratio for treatment of liquid sanitary wastes.
Source: LANL 1996e:1; appendix K.

While these three proposed facilities would provide improvements over existing capabilities, and are expected to be important components of science-based stewardship, they do not represent the entire science-based stewardship program that is envisioned for all time. The next generation of potential stockpile stewardship facilities cannot be defined to the degree necessary to perform detailed environmental impact analysis. However, these next generation facilities can be described in general terms such that a consideration of cumulative impacts that might be related to the ultimate science-based stockpile stewardship program can be qualitatively assessed. Next generation facilities anticipated for science-based stockpile stewardship are the Advanced Hydrotest Facility (AHF), the High Explosive Pulsed Power Facility (HEPPF), the Advanced Radiation Source (ARS [X-1]), and the Jupiter Facility. The following sections provide a broad description of what these three facilities might look like. Section 4.11 describes the general impacts of constructing and operating these types of facilities.

3.3.4.1 *Advanced Hydrotest Facility*

AHF would be the next generation hydrodynamic test facility following the DARHT Facility at LANL. AHF would be an improved radiographic facility that would provide for imaging on more than two axes, each with multiple time frames, though the number of axes and time frames is still subject to requirements definition and design evolution. The facility would be used to better reveal the evolution of weapon primary implosion symmetry and boost-cavity shape under normal conditions and in accident scenarios. Due to the nature of the dynamic experiments and hydrodynamic testing to be conducted with the facility, AHF would probably be considered for location at NTS and LANL only.

At this point, the feasibility and definition of an AHF is still insufficiently determined for DOE to propose such a facility. For example: performance requirements and specifications for such a facility (i.e., determination of what capabilities should be required of an AHF for assessment of stockpile aging and related effects, beyond those of the DARHT Facility) have not been fully established. In addition, the type of technology to provide the basis for the facility has not been determined, and concepts for the resultant physical plant would accordingly vary significantly. Three basic technology approaches are currently being examined. These include linear induction accelerators of a type similar to that in the baseline DARHT Facility design (DOE/EIS-0228), an inductive-adder pulsed-power technology based on technology now in use for other purposes at SNL and elsewhere, and high-energy proton accelerators similar to technology in use at LANSCE and a number of facilities in the United States and internationally. The first two are different approaches to accelerating a high-current burst of electrons, which when stopped in a dense target produce x rays for radiography. This is the approach used in the existing PHERMEX (LANL) and FXR (LLNL) Facilities, and which will be used in the DARHT Facility. The third approach would use bursts of very energetic protons, magnetic lenses, and particle detectors to produce the radiographic image. These technologies still require development and validation.

3.3.4.2 *High Explosives Pulsed Power Facility*

This facility would provide experimental capabilities for studying secondary physics at shock pressures and velocities approaching those of actual weapon conditions. Explosive pulsed power is the most economically feasible means of providing aboveground experimental capability at energies above 100 megajoules. While current explosives testing facilities can probably test explosives systems using up to 500 kilograms (kg) (1,100 pounds [lb]) of HE, future systems may require up to 3,000-kg (6,600-lb) explosive charges. Systems so large cannot be tested at current laboratory facilities; therefore, BEEF at NTS is a likely candidate site.

For some years, DOE has pursued both capacitor bank facilities and HE experiments in pulsed power. HE generators offered a means to explore higher energy (higher current) frontiers without major capital investment, albeit at a relatively low data rate, and capacitor banks offered the advantages of repeatable (and indoor) experimental facilities with higher data rates, for broad experimental use. Data from HE experiments, for example, has helped provide validation of technical issues used in the Atlas Facility design concept.

An HE pulsed-power generator, such as Procyon at LANL, is basically an assembly of HE and metal (e.g., copper) and other components which is explosively and destructively detonated a single time, resulting in a brief pulse of high electrical current being delivered to the experimental configuration. High magnetic fields result from the high current pulse and may either be directly used to study materials phenomena or may be used to produce high pressures and implosions of (typically) cylindrical shells. (See the discussion in the Atlas Facility site-specific analysis, appendix sections K.1 and K.2.1.)

As distinct from an explosive generator, a firing site is a facility typically consisting of a firing location, associated hardened bunkers, and related equipment, in an area from which personnel can be excluded. Many different HE experiments (including those in which pulsed electrical power is produced) can be performed at an HE firing site, as long as the explosive blast, and other experiment parameters, do not exceed the designed or permitted capabilities of the firing site. Currently most of the largest-scale HE pulsed-power experiments in the United States, whether for technology development or weapons stockpile stewardship, are conducted at a pulsed-power firing point at TA-39 at LANL. As noted, this experimental capability has a limit of approximately 500 kg (1,100 lb) of HE. Therefore a potential need for a new HEPPF was postulated to support generators using much larger explosive charges, which though not yet demonstrated could produce higher pressures in larger masses and volumes than can be accessed at the LANL site. Existing laboratory sites cannot readily support experiments with much larger charges.

3.3.4.3 *Advanced Radiation Source (X-1) and Jupiter Facility*

The ARS (X-1) and Jupiter Facilities would have advanced pulsed-power x-ray sources to provide enhanced experimental capabilities in the areas of weapons physics and weapon effects.

Conceptually, the ARS(X-1) Facility would be a new facility containing a pulsed-power accelerator capable of producing intense bursts of x rays and high temperature and density plasmas. ARS (X-1) would be a technological advance over the current PBFA II Facility and would provide about 8 megajoules of x-ray energy in contrast to 2 megajoules expected from PBFA II in the near term. ARS (X-1) would be an interim step to the conceptual Jupiter Facility, which limits the risk involved in developing a new facility that requires a much larger investment. Conceptually, the Jupiter Facility would provide about 32 megajoules of x-ray energy.

ARS (X-1) would be used to study the physics of radiation flow, opacities, high energy densities, the effects of radiation on weapons, and potentially, inertial confinement fusion relevant physics. Section 3.3 describes the complementary nature of experimental facilities required to perform weapon assessment and certification functions in the absence of nuclear testing. ARS (X-1) would provide greatly improved capability over the current Saturn and PBFA II Facilities with regard to higher temperatures, higher densities, and longer pulse widths in the multi-nanosecond range. ARS (X-1) would thereby add to the complement of fast pulsed power, slow pulsed power, and laser facilities needed to begin addressing the full spectrum of weapons physics and weapon-effects science in the absence of nuclear testing.

Although other stewardship sites would be considered, if ARS (X-1) were constructed at SNL, the conceptual design would use some of the pulsed-power facility infrastructure existing in Technical Area IV. Various accelerator architecture concepts are being explored which present different performance, cost, and risk options. The ARS (X-1) accelerator is conceived of as a 24-module machine which would store approximately 56 megajoules of electrical energy in capacitors. This electrical energy would be released and compressed to produce an output pulse on the order of 100 nanoseconds long. This pulse may be used to generate an intense burst of x rays and high temperature and density plasmas. Supporting facilities for the accelerator, such as storage and circulation systems for insulating oil and de-ionized water, would also be required to supplement the already present capacity used by the other major facilities collocated in Technical Area IV. About 4,645 m^2 (50,000 ft^2) of space available in Technical Area IV would be needed to construct the facility which would be operated and maintained by a staff of about 20 people.

3.4 STOCKPILE MANAGEMENT

Stockpile management activities include dismantlement, maintenance, surveillance, and repair or replacement of weapons and weapons components in the existing stockpile. In the past, a large Complex provided the capability and capacity to rapidly fix any problems found in the stockpile. One of the primary goals of stockpile management is to rightsize functions to provide an effective and efficient manufacturing capability for the smaller stockpile. The individual stockpile management functions can be grouped into five major categories: weapons A/D, nonnuclear components fabrication, pit fabrication, secondary and case fabrication, and HE fabrication. Both intrusive and nonintrusive modification pit reuse are considered inherent capabilities of pit fabrication and nonintrusive modification pit reuse is always considered to be collocated with A/D. Specific alternatives that would enable DOE to maintain its stockpile management responsibilities are shown in table 3.4–1 and are discussed below.

3.4.1 Weapons Assembly/Disassembly Alternatives

Weapons A/D provides the capability to dismantle retired weapons, assemble nuclear and nonnuclear components into nuclear weapons, perform weapons surveillance, store strategic reserves of nuclear components (pits and secondaries), and recertify and requalify pits. In addition, nonintrusive modification pit reuse capabilities would be collocated with the weapons A/D Facility.

To maintain confidence in the safety and reliability of the stockpile, DOE conducts surveillance operations on a statistically significant number of weapons annually. Surveillance operations consist primarily of disassembly and inspection of stockpile weapons

TABLE 3.4–1.—*Stockpile Management Alternatives*

Capability[a]	Y-12	SRS	KCP	Pantex	LANL	LLNL	SNL	NTS
Weapons Assembly/Disassembly[b]								
No Action				X				
Downsize existing capability				X				
Relocate capability								X
Nonnuclear Fabrication								
No Action			X		X		X	
Downsize existing capability			X					
Relocate capability					X[c]	X[c]	X[c]	
Pit Fabrication and Intrusive Modification Pit Reuse[d]								
No Action[e]					X	X		
Reestablish capability		X			X			
Secondary and Case Fabrication[d]								
No Action	X[f]							
Downsize existing capability	X[f]							
Relocate capability					X	X		
High Explosives Fabrication								
No Action				X				
Downsize existing capability				X				
Relocate capability					X	X		

[a] Surveillance is included in all capabilities.
[b] Includes nonintrusive modification pit reuse and the option of strategic reserve storage of plutonium and HEU.
[c] KCP functions would be distributed among two or three of the laboratories.
[d] Staging and storage of working inventories of nuclear materials and components are included.
[e] Research and development capability only.
[f] Includes strategic storage of HEU reserve.

returned to DOE from DOD. Most of these weapons are rebuilt and returned to the stockpile during what is called the "protected period." Extra components are built at the end of the production run to replace components attrited by surveillance testing for a specified protected period established by DOD. When the replacement components are exhausted, the weapon is not rebuilt and the stockpile is reduced.

The nonintrusive modification pit reuse alternative would provide a capability to perform nonintrusive modification of pits for reuse in the stockpile. Nonintrusive modification is modification to the external surfaces and features of a pit. For example, to add safety features such as fire resistant cladding, there is little risk of contamination, and the generation of radioactive waste is very low.

Operation. The weapons A/D process consists of five main functions and nonintrusive modification pit reuse, which are described below.

Weapons Assembly. Weapons assembly is performed to produce a new weapon, rebuild a weapon that has been disassembled for surveillance, repair a weapon, or modify or replace components. The assembly steps for a rebuild are the same as for a new weapon, except that the starting point varies depending on the extent of disassembly.

Complete weapons assembly is accomplished in three stages: nuclear explosive package assembly, mechanical assembly, and final package assembly. Nuclear explosive package assembly entails bonding or mating HE main charge subassemblies to a pit and then enclosing this subassembly in a case along with other components such as the secondary. Mechanical weapons assembly entails placing the nuclear explosive package in a warhead or bomb case, then installing the arming, fusing and firing system; neutron generator; and gas transfer system components. Numerous quality control inspections and tests of electrical and mechanical systems are performed throughout the process. Final package assembly involves installing some additional components and packaging the weapons for shipment.

Weapons Disassembly. Weapons disassembly is similar to the reverse of the assembly process and is performed to dismantle, modify, repair, or evaluate a weapon. The operations conducted for each type of disassembly are similar, but the extent of the disassembly and the procedures used vary. Many of the facilities used for various disassembly and testing operations are the same as facilities used for weapons assembly.

Joint Test Assembly and Post-Mortem. As part of the ongoing stockpile surveillance program, weapons are randomly selected from the stockpile or from new production for conversion into a joint test assembly. The nuclear explosive package is removed and replaced with a mock assembly that includes telemetry components. After flight tests by DOD, joint test assemblies are often recovered and returned to the A/D Facility for post-mortem disassembly and evaluation.

Test Bed Assembly and Disassembly. A test bed is an apparatus used for bench testing weapons systems, subsystems, and components. Testing is generally conducted at Pantex in the Weapons Evaluation Test Laboratory operated by SNL. Test beds are disassembled at the A/D Facility after testing.

Optional Storage of Plutonium and Highly Enriched Uranium Strategic Reserve. Storage of the plutonium strategic reserve could occur at the weapons A/D Facility. If Y-12 is selected as the site for the secondary and case fabrication mission, HEU strategic reserve storage would remain at ORR. If Y-12 is not selected, then the HEU strategic reserve could also be stored at the weapons A/D Facility. The strategic reserve provides pits and secondaries which could be used for replacement in the enduring stockpile or as feedstock for nuclear fabrication. The quantities associated with strategic reserve storage are classified. If the decision is made that strategic reserves will be stored with nonstrategic reserves, then consolidated storage could occur at one of the five sites being considered in the *Storage and Disposition of Weapons Usable Fissile Materials Programmatic Environmental Impact Statement*, rather than at the weapons A/D Facility.

Nonintrusive Modification Pit Reuse. This alternative supports three major operations: pit recertification, pit requalification, and nonintrusive modification. Nonintrusive modification pit reuse includes the operations, inspections, and evaluations that are required to change design features by the addition of shells or other nonnuclear components for the incorporation of fire safety or security improvements. Pits received from strategic reserve storage or weapon disassembly for surveillance or maintenance may be used as feed stock for nonintrusive modification.

The alternatives for A/D are to continue in current facilities at Pantex with only those changes that are currently scheduled and budgeted (No Action), to downsize and consolidate facilities and operations at Pantex, or to relocate operations to NTS.

3.4.1.1 *No Action*

The No Action alternative for these activities, except nonintrusive modification pit reuse, is presently located at Pantex. Pantex dismantles retired weapons, assembles nuclear and nonnuclear components into nuclear weapons, repairs and modifies weapons, evaluates weapons, and performs nonnuclear testing of nuclear weapons. Current plutonium R&D facilities at LANL and LLNL have limited capability and capacity to perform nonintrusive modification pit reuse.

3.4.1.2 *Downsize at Pantex Plant*

This alternative would downsize and consolidate facilities and operations including strategic reserve storage at Pantex primarily into Zone 12 (figure 3.4.1.2–1), using existing modern structures. This alternative is described in more detail in appendix section A.3.1.1.

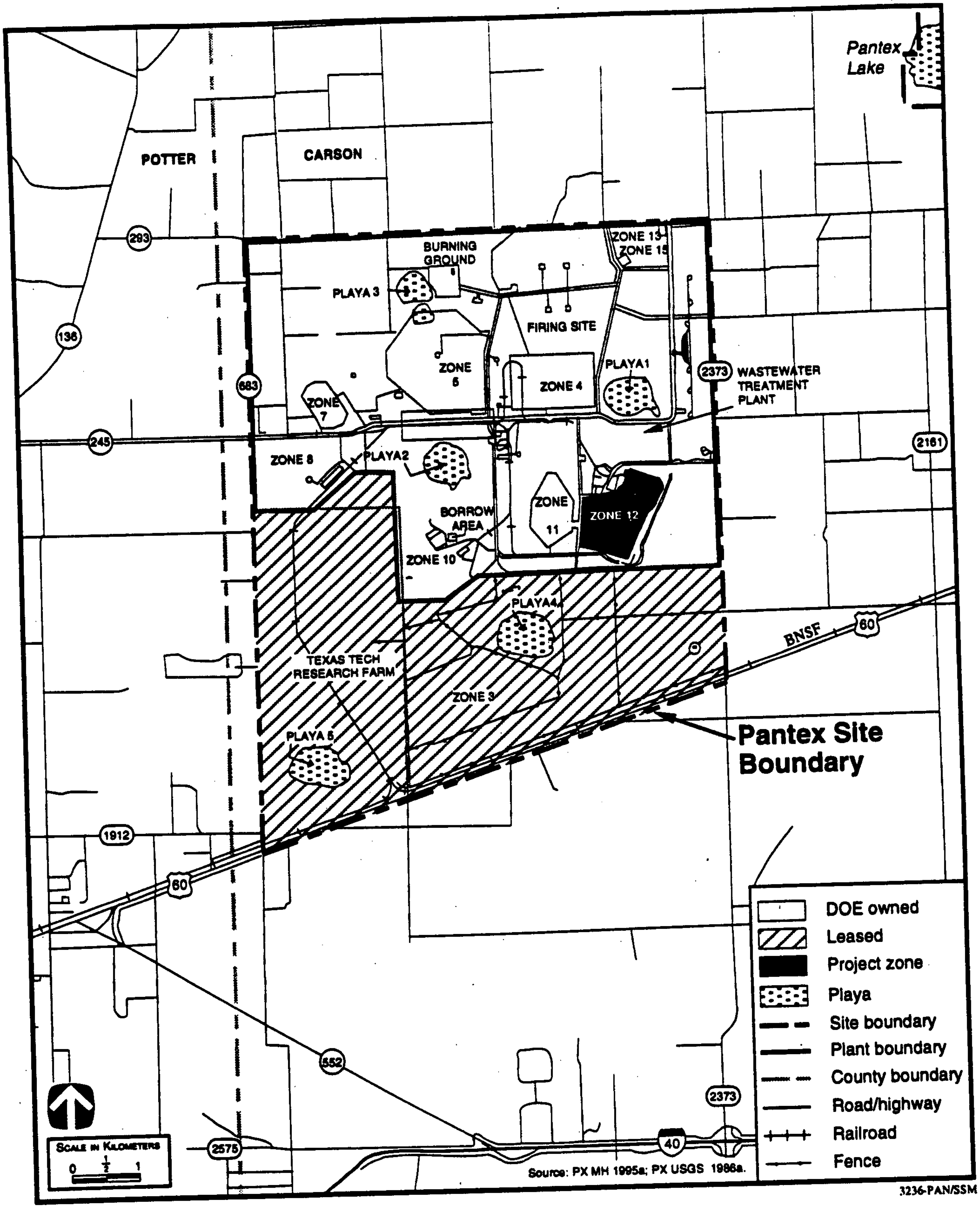
Downsizing of the A/D operation at Pantex would consist of an in-place decrease in facility footprints and relocation into modern, existing facilities, mostly within Zone 12. The facilities primarily used are cells and bays that were specifically designed and constructed for A/D operations. The consolidation of the site would not require modification of these structures, but would require relocation and installation of equipment within them. Support functions would remain within the currently established facilities, some of which are outside Zone 12. No new construction would be required at Pantex; however, relocation and reinstallation of equipment would be required.

The capabilities for nonintrusive modification pit reuse would be established in existing facilities within Zone 12. This would require modification of some of the bays to install glove boxes; redesign of the heating, ventilation, and air conditioning; and improvement of the fire detection and suppression systems. These facilities would also have the capability to support pit recertification and requalification operations.

Construction. There would be no new construction anticipated at Pantex for this alternative. The A/D mission would be consolidated primarily into Zone 12 with some supporting operations in Zones 13, 15, and 16. Figure 3.4.1.2–2 shows the weapons A/D site plan for Zone 12 and the facilities included in the proposed downsized and consolidated A/D mission at Pantex. Strategic reserve storage would be in Zone 12 for both plutonium and HEU. The nonintrusive modification pit reuse alternative would require modification of four bays in Building 12-104. The capability to perform recertification, requalification, and nonintrusive modification pit reuse activities currently exists at Pantex except for processes that are needed for pit tube replacement, welding on the pit, and inspection of internal pit surfaces. The existing capabilities would be upgraded and relocated within Building 12-116.

Building 12-116 is a new building that was constructed in accordance with the requirements for a safety class (Category 2) vault-type nuclear facility. This facility would support consolidation of the activities that involve processing of components that contain special nuclear material. Recertification, requalification, and reuse activities would use almost the entire facility.

Building 12-104 is a new building that was also constructed in accordance with the requirements for a safety class (Category 2) nuclear explosives A/D Facility. To fulfill the pit reuse mission, one module (four bays) of the building would be modified to meet nonreactor nuclear facility requirements. These requirements include improvements to the fire detection and suppression system; a capture system for fire water runoff; the addition of control, change out, and decontamination areas; security improvements to provide facility control; and complete redesign of the heating, ventilation, and air conditioning system to provide the progressive negative pressure scenario required for containment of radionuclide contamination. Three of the four bays would



3236-PAN/SSM

FIGURE 3.4.1.2–1.—*Weapons Assembly and Disassembly Zones at Pantex Plant.*

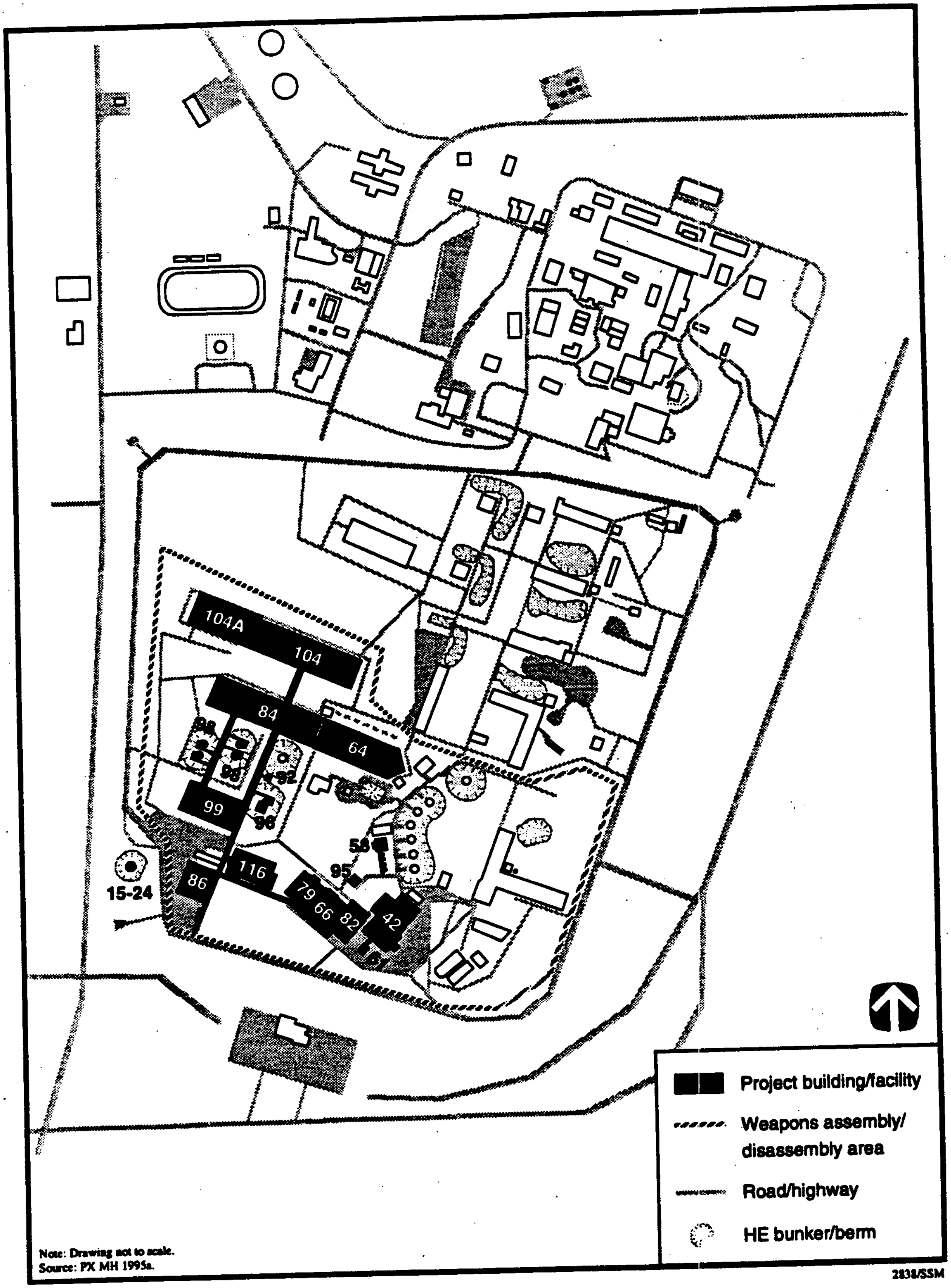


FIGURE 3.4.1.2–2.—*Weapons Assembly/Disassembly Site Plan at Pantex Plant (Zone 12).*

be fitted with pit reuse process equipment to provide the minimum capability required to support recertification, requalification, and nonintrusive modification activities. The fourth bay would be available for installation of additional equipment if workload requirements increase. The pit reuse facility would have the capability to support all recertification, requalification, and nonintrusive modification pit reuse activities. Table 3.4.1.2–1 shows building modification construction requirements for downsizing and consolidating into existing facilities.

TABLE 3.4.1.2–1.—*Pantex Plant Weapons Assembly/Disassembly Facility Construction Requirements*

Requirement	Consumption
Material/Resource	
Electrical energy (MWh)	609
Peak electrical demand (MWe)	4
Concrete (m^3)	840
Steel (t)	15
Gasoline, diesel, and lube oil (L)	28,800
Industrial gases[a] (m^3)	600
Water (L)	1,400,000
Land (ha)	NA[b]
Employment	
Total employment (worker years)	99
Peak employment (workers)	67
Construction period (years)	3

[a] Cubic meters at standard temperature and pressure.
[b] Laydown area for construction within existing facilities or previously disturbed areas.
Note: NA - not applicable.
Source: PX MH 1995a.

Operation. Operation requirements for surge operation of the downsized/consolidated weapons A/D facilities are shown in table 3.4.1.2–2.

Process Support Systems. Process support systems include systems, equipment, and procedures that support the weapons A/D processes. The process support systems are described in more detail in appendix section A.3.1.1.

Waste Management. Pantex's existing waste management infrastructure can be applied to manage and treat all anticipated waste streams from this alternative. All hazardous, radioactive, and mixed wastes generated at Pantex facilities would be managed in accordance with all applicable Federal and state waste regulations. The wastes anticipated from the estimated workloads would not require significant modification of the existing Pantex waste management infrastructure. Waste generation for construction and operation of the Pantex A/D alternative is shown in table 3.4.1.2–3.

TABLE 3.4.1.2–2.—*Pantex Plant Weapons Assembly/Disassembly Facility Surge Operation Annual Requirements*

Requirement	Consumption
Resource	
Electrical energy (MWh)	43,000
Peak electrical demand (MWe)	10
Liquid fuel (L)	740,000
Natural gas[a] (m^3)	7,150,000
Water (L)	196,000,000
Plant Footprint (ha)	NA[b]
Employment (Workers)	1,890[c]

[a] Cubic meters at standard temperature and pressure.
[b] Contained within existing facilities.
[c] Includes 22 workers for nonintrusive modification pit reuse and 624 Work for Others employees.
Note: NA - not applicable.
Source: PX 1995a:6; PX 1996e:1; PX DOE 1995k; PX MH 1995a.

3.4.1.3 *Relocate to Nevada Test Site*

This alternative is based on the use of the current Device Assembly Facility and balance of plant infrastructure available and required to maintain the capability for underground nuclear testing. The alternative is discussed in more detail in appendix section A.3.1.2. Additional new construction would be required and would be designed and sized to meet the specific needs of the reduced program and enhanced safety and environmental objectives.

Construction. This alternative would require modification of existing facilities and new construction. Nonintrusive modification pit reuse would require construction of a new pit reuse facility as an adjunct to the existing Device Assembly Facility. Equipment for the facility would be purchased or transferred from existing Complex facilities. The new facility would be classified as a nonreactor nuclear facility. Though new construction would be required, the

TABLE 3.4.1.2–3.—*Pantex Plant Weapons Assembly/Disassembly Facility Waste Volumes*

Category	Annual Average Volume Generated from Construction (m^3)	Annual Volume Generated from Surge Operations (m^3)	Annual Volume Effluent from Surge Operations (m^3)
Low-Level			
Liquid	None	0.06	None
Solid	None	21[a]	10[b]
Mixed Low-Level			
Liquid	None	0.06	0.06
Solid	None	Minimal	Minimal
Hazardous			
Liquid	None	2	2
Solid	0.25	0.05	0.05
Nonhazardous (Sanitary)			
Liquid	315	141,000	141,000
Solid	5[c]	340	170[d]
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	Included in sanitary
Solid	Included in sanitary	Included in sanitary	Included in sanitary

[a] Includes 9.2 m^3 generated from A/D operations and 11.3 m^3 generated from pit reuse operations.
[b] Assumes two-thirds of solid LLW is compactible by a factor of 4:1 and the liquid LLW is solidified by a factor of 2:1.
[c] Includes 4.6 m^3 of concrete and 0.6 t (0.7 tons) of steel. Volume estimate made by using 0.127 m^3/t for density of steel.
[d] Assumes two-thirds of solid is compactible by a factor of 4:1.
Source: PX 1995a:6; PX DOE 1995k; PX MH 1995a.

existing NTS infrastructure would be sufficient to support the facility.

The facility would be placed in the backfill area north of the Device Assembly Facility, with a specific location to be developed in conjunction with the A/D effort. The current Device Assembly Facility would be used for a secure shipping and receiving station with no additional construction requirements.

A site map of the proposed A/D plant is shown in figure 3.4.1.3–1. This map shows the overall plant, including associated support facilities, the plant protected area, and limited area. A site plan of the material access area is shown in figure 3.4.1.3–2. The size, number, and arrangement of the plant building and support areas are conceptual and can change as design progresses. The site plans are included to convey general layout information only.

The existing Device Assembly Facility would form the cornerstone of the A/D plant, but additional facilities to handle the workload, pit reuse, and strategic storage (if appropriate) would have to be added. All plant facilities located within the material access area either occupy existing buildings inside the Device Assembly Facility or are located in hardened new construction connected to the Device Assembly Facility. All plant facilities located within the limited area, at the plant site (adjacent to the Device Assembly Facility), would require new construction. Approximately 11 percent of this construction is needed to support the option of storing strategic reserves of nuclear components (pits and secondaries). Table 3.4.1.3–1 shows construction requirements for the NTS weapons A/D alternative.

Operation. Operating requirements for surge operation of the NTS weapons A/D Facility are shown in table 3.4.1.3–2. The water usage at NTS is somewhat lower than at Pantex since Pantex has a larger plant population and uses more water for supporting operations such as steam heat.

Waste Management. NTS's existing waste management infrastructure can be applied to manage and treat all anticipated waste streams from this alterna-

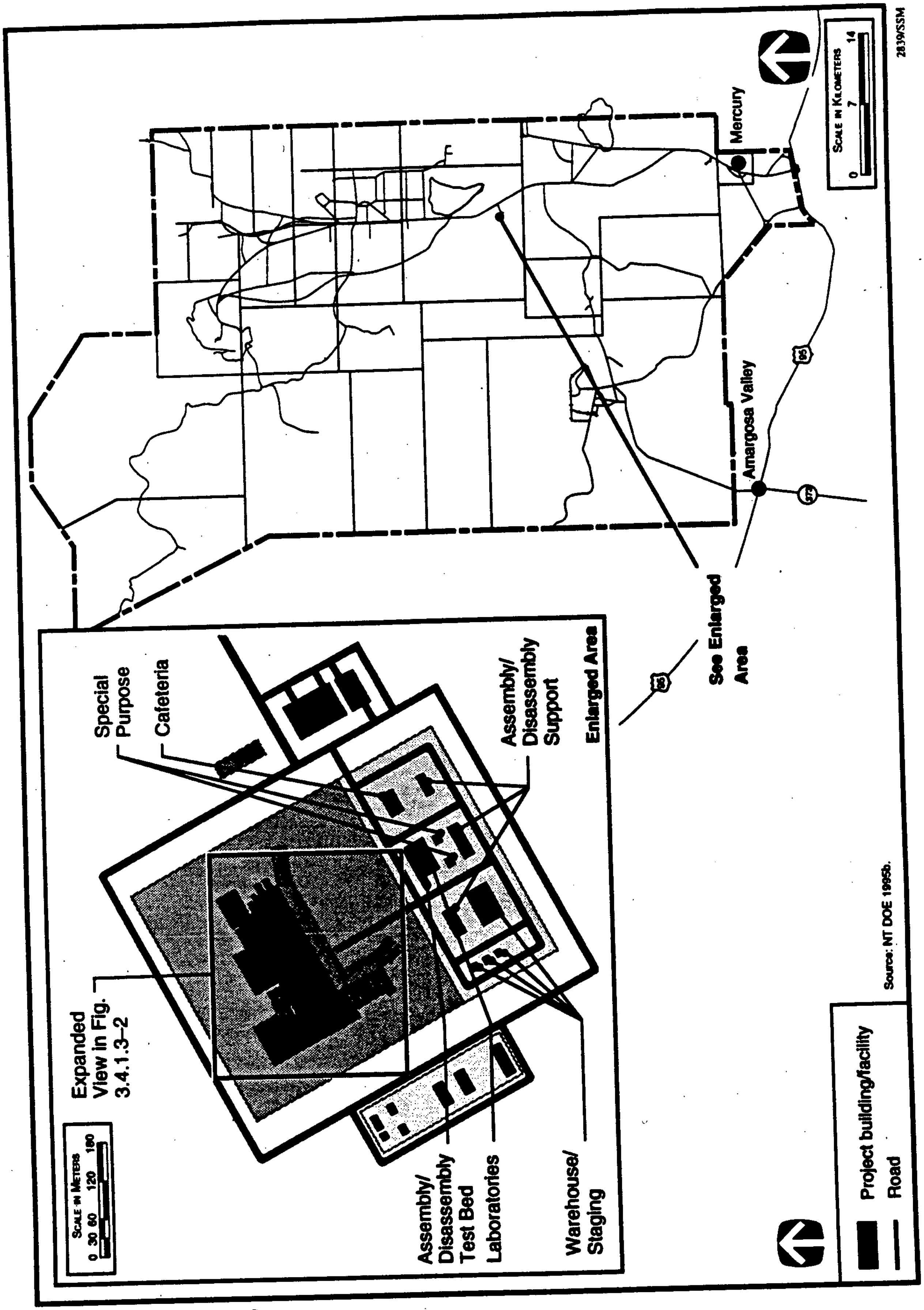


FIGURE 3.4.1.3–1.—*Weapons Assembly/Disassembly Site Map for Nevada Test Site.*

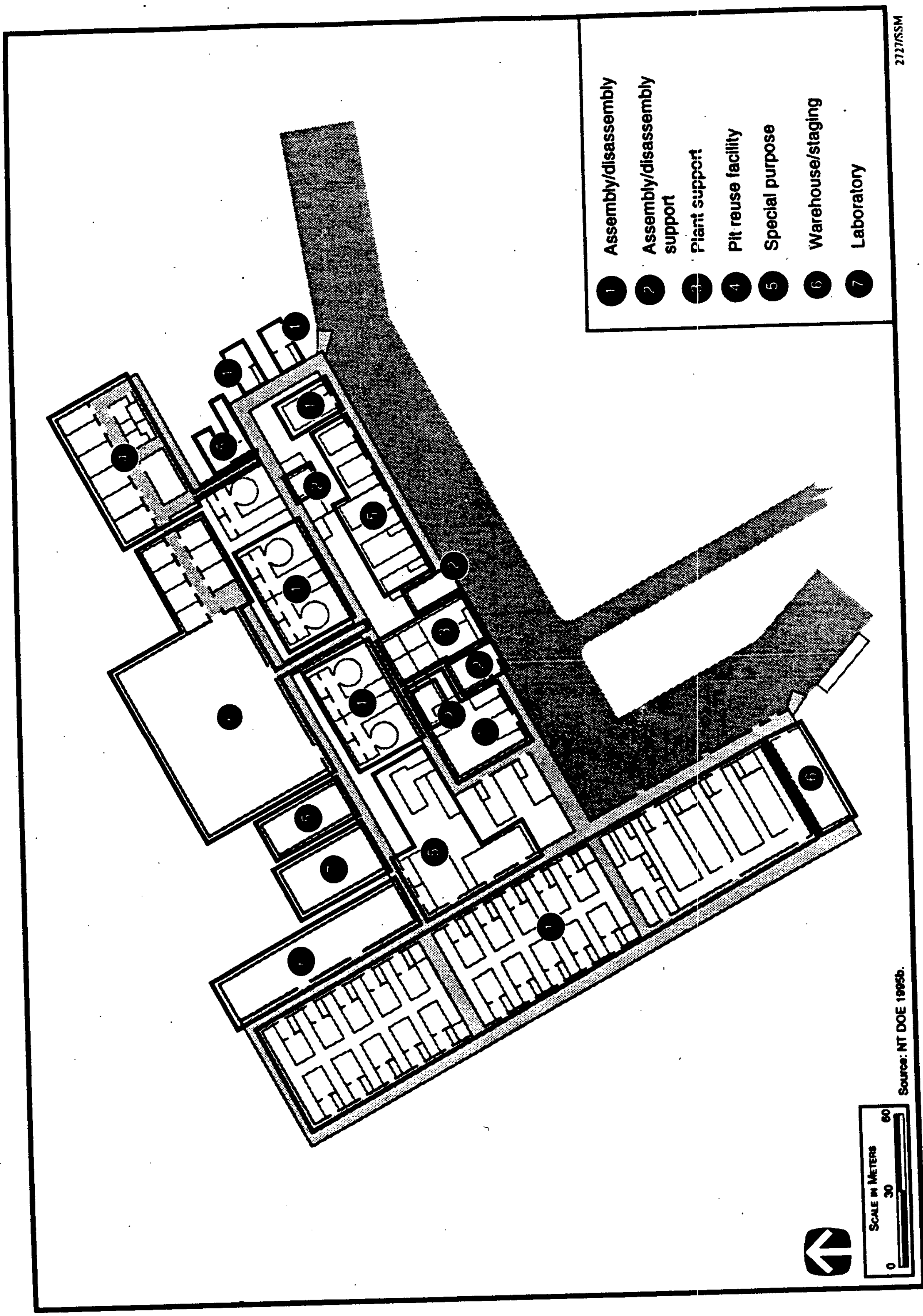


FIGURE 3.4.1.3–2.—*Weapons Assembly/Disassembly Site Plan (Expanded View) for Nevada Test Site.*

TABLE 3.4.1.3–1.—*Nevada Test Site Weapons Assembly/Disassembly Facility Construction Requirements*

Requirement	Consumption
Material/Resource	
Electrical energy (MWh)	38,000
Peak electrical demand (MWe)	5
Concrete (m^3)	75,000
Steel (t)	16,300
Gasoline, diesel, and lube oil (L)	3,030,000
Industrial gases[a] (m^3)	65,100
Water (L)	98,400,000
Land (ha)	3.2[b]
Employment	
Total employment (worker years)	2,768
Peak employment (workers)	662
Construction period (years)	6

[a] Cubic meters at standard temperature and pressure.
[b] Does not include 4.3 ha of new facility footprint.
Source: NT DOE 1995b.

TABLE 3.4.1.3–2.—*Nevada Test Site Weapons Assembly/Disassembly Facility Surge Operation Annual Requirements*

Requirement	Consumption
Resource	
Electrical energy (MWh)	45,000
Peak electrical demand (MWe)	7
Gasoline and diesel fuel (L)	432,000
Natural gas[a] (m^3)	3,680,000
Water (L)	98,400,000
Plant Footprint (ha)	4.3[b]
Employment (Workers)	1,093[c]

[a] Cubic meters at standard temperature and pressure.
[b] New facility footprint. Total including existing facilities is 10.5 ha.
[c] Includes 22 workers for nonintrusive modification pit reuse.
Source: NT DOE 1995b; NT DOE 1995f; NTS 1995a:3.

tive. All hazardous, radioactive, and mixed wastes generated at NTS facilities would be managed in accordance with all applicable Federal and state waste regulations. The wastes anticipated from the estimated workloads would not require significant modification of the existing NTS waste management infrastructure. Waste generation for construction and operation of the NTS A/D alternative is shown in table 3.4.1.3–3.

3.4.2 Nonnuclear Fabrication Alternatives

Nonnuclear fabrication consists of the following general functions:

- Fabrication of electrical, electronic, electromechanical and mechanical components (plastics, metals, and composites), and assembly of arming, fuzing, and firing systems
- Surveillance inspection and testing of nonnuclear components

The nonnuclear components alternatives provide for the nonnuclear fabrication missions currently residing at KCP. Production requirements for nonnuclear components, in terms of factory and field retrofits to weapons, are shown in table 3.1.1.2–1.

The alternatives considered for nonnuclear fabrication included downsizing and consolidating existing facilities at KCP, or closing KCP and sharing nonnuclear fabrication functions among SNL, LANL, and/or LLNL. These alternatives are discussed below.

3.4.2.1 *No Action*

The No Action alternative facilities for these activities are presently located at KCP, SNL, and LANL. KCP manufactures nonnuclear weapons components and conducts surveillance testing on, and makes repairs to, nonnuclear weapons components. SNL conducts system engineering of nuclear weapons, designs and develops nonnuclear components, conducts field and laboratory nonnuclear testing, manufactures some nonnuclear weapons components, and provides safety and reliability assessments of the stockpile. LANL also manufactures a few nonnuclear weapons components and conducts surveillance on certain nonnuclear weapons components.

3.4.2.2 *Downsize at Kansas City Plant*

The downsized nonnuclear fabrication alternative consists of three major factories designed around electronic, mechanical, and engineered materials product lines; procuring some components from outside sources; and reducing the KCP footprint for DP activities to 167,000 square meters (m^2) (1.8 million square feet [ft^2]) from the current

TABLE 3.4.1.3–3.—*Nevada Test Site Weapons Assembly/Disassembly Facility Waste Volumes*

Category	Annual Average Volume Generated from Construction (m^3)	Annual Volume Generated from Surge Operations (m^3)	Annual Volume Effluent from Surge Operations (m^3)
Low-Level			
Liquid	None	0.06	None
Solid	None	30[a]	15[b]
Mixed Low-Level			
Liquid	None	None	None
Solid	None	2	2
Hazardous			
Liquid	None	6	6
Solid	5	0.05	0.05
Nonhazardous (Sanitary)			
Liquid	6,670	53,000	53,000
Solid	260[c]	100	50[d]
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	Included in sanitary
Solid	Included in sanitary	Included in sanitary	Included in sanitary

[a] Includes 18.3 m^3 generated from A/D operations and 11.3 m^3 generated from pit reuse operations.
[b] Assumes two-thirds of solid LLW is compactible by a factor of 4:1 and the liquid LLW is solidified by a factor of 2:1.
[c] Includes 255 m^3 of concrete and 39 t (43 tons) of steel. Volume estimate made by using 0.127 m^3/t for density of steel.
[d] Assumes two-thirds of solid is compactible by a factor of 4:1.
Source: NT DOE 1995b; NT DOE 1995f; NTS 1995a:2; NTS 1995a:3; PX DOE 1995k.

297,000 m^2 (3.2 million ft^2). This alternative is discussed in more detail in appendix section A.3.6.1.

Construction. This alternative consists of downsizing and consolidating existing facilities and would require facility modification but no new construction. Currently, KCP occupies approximately 297,000 m^2 (3.2 million ft^2) contained in three buildings: the Main Manufacturing Building, the Manufacturing Support Building, and the Technology Transfer Center (figure 3.4.2.2–1). The downsized and consolidated KCP would reduce the size of the plant to approximately 167,000 m^2 (1.8 million ft^2) for DP activities. The Technology Transfer Center and Manufacturing Support Building facilities would be totally vacated of DP activities. All operations and support functions required for the nonnuclear fabrication mission would be accomplished within the reduced floor space of the Main Manufacturing Building. Vacated floor space would be returned to the General Services Administration or retained for Work for Others use, if appropriate. The downsized KCP facility would consist of the following major factories and product-oriented departments: Electronics Factory, Mechanical Factory, Engineered Materials Factory, Joint Test Assembly and Special Electronic Assembly Department, Reservoir Fabrication and Assembly Department, and Transportation Safeguards Department.

Facilities modification to establish the downsized and consolidated KCP configuration would take approximately 4 years. During this time, major interior building modification would occur. Table 3.4.2.2–1 shows construction requirements for the KCP nonnuclear fabrication alternative.

Operation. The operation of the downsized and consolidated KCP is based on current KCP facilities and missions, downsized and reorganized for efficiency into several modules and product departments.

Electronics Factory. Existing separate departments for electronics products would be combined into the electronics factory and would be designed around three common process modules: microelectronics, interconnects, and final assembly.

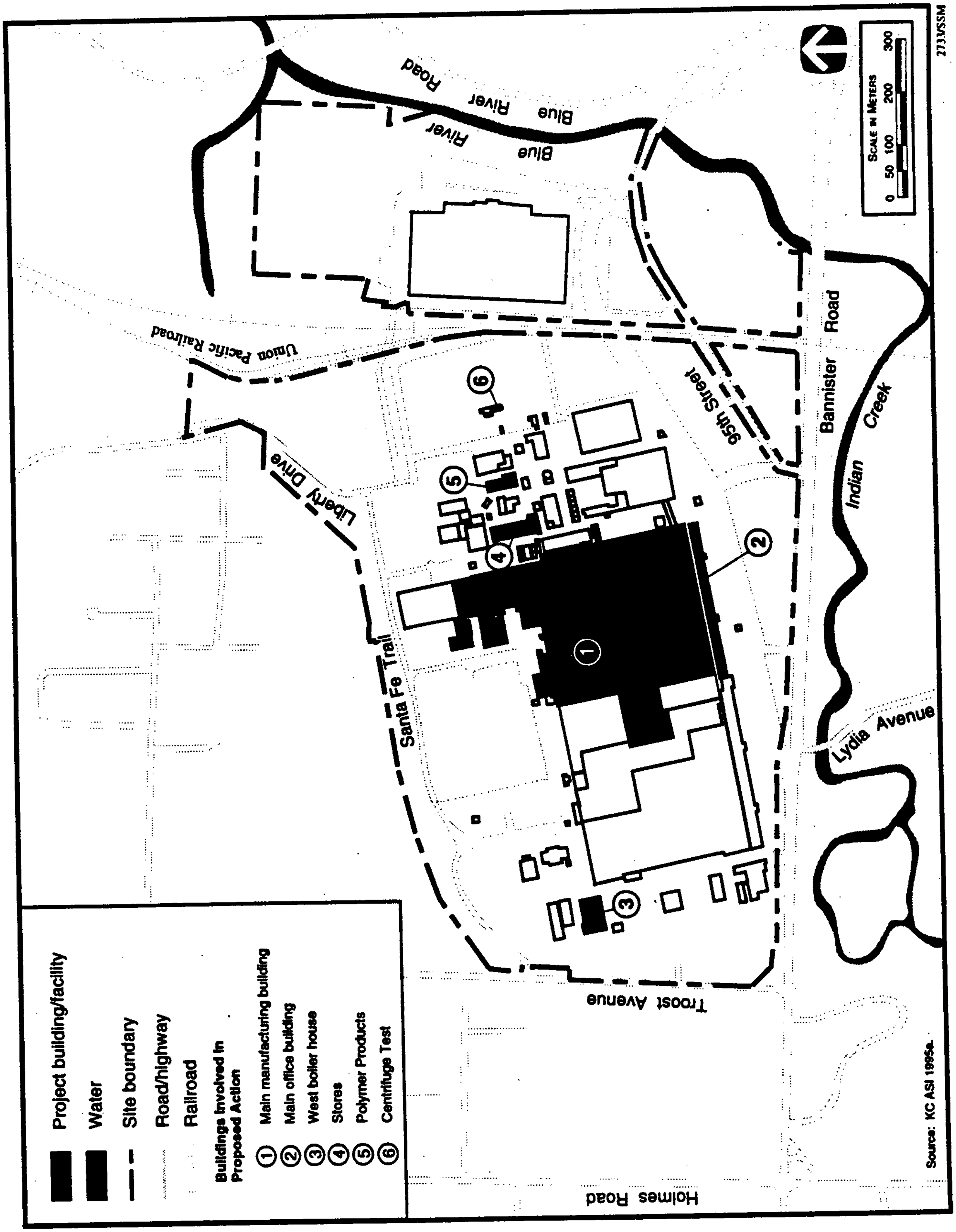


FIGURE 3.4.2.2–1.—*Location of Downsized Nonnuclear Fabrication Facilities at the Bannister Federal Complex/Kansas City Plant.*

TABLE 3.4.2.2–1.—*Kansas City Plant Nonnuclear Fabrication Facility Construction Requirements*

Requirement	Consumption
Material/Resource	
Electrical energy (MWh)	Minimal
Peak electrical demand (MWe)	Minimal
Concrete (m^3)	286
Steel (t)	220
Gasoline, diesel, and lube oil (L)	Minimal
Industrial gases[a] (m^3)	Minimal
Water (L)	Minimal
Land (ha)	NA[b]
Employment	
Total employment (worker years)	459
Peak employment (workers)	187
Construction period (years)	4

[a] Cubic meters at standard temperature and pressure.
[b] Laydown area for construction within existing facilities or previously disturbed areas.
Note: NA - not applicable.
Source: KC ASI 1995a.

Mechanical Factory. KCP has already implemented a process-based approach for most mechanical technologies. The alternative would achieve substantial downsizing in processing areas to maximize efficiency and cost savings. The mechanical factory would be organized around three process modules: mechanical assembly, mechanical welding, and sheet metal and special processing.

Engineered Materials Factory. This factory would manufacture products that depend on special materials (foams, polymers, and composites) for unique performance or functional characteristics. These products include cushions, desiccants, getters, and composite cases. The engineered materials factory would consist of four generic processing modules (machining, pressing, molding, and compounding), one assembly module, and the Polymer Production Facility. The processing and assembly areas would be consolidated, but the Polymer Production Facility would remain unchanged. The facility is a stand-alone facility that produces materials not available from commercial industry. The consolidation of facilities for the engineered materials factory would reduce floor space requirements for these operations by approximately 50 percent.

Joint Test Assembly and Special Electronics Assembly. Even though these products are electronic assemblies similar to the products fabricated in the electronics factory, they would be built in separate areas because of their unique production and security requirements. These production operations would be combined into one organizational unit. This would provide savings in indirect support, yet allow the unique operations practices and security considerations to be maintained.

Reservoir Fabrication and Assembly. Reservoir production, a relatively new responsibility at KCP, was transferred from the Rocky Flats Plant through the previously authorized nonnuclear consolidation program. The new reservoir production area is correctly sized to support the ongoing workload associated with limited-life component exchanges and would not be changed for this alternative.

Transportation Safeguards. Trailer production and escort vehicle modification would continue to be managed and operated as a separate unit. Floor space requirements would be reduced by relocation of the escort vehicle modification operations so they would be contiguous with the trailer operations.

Table 3.4.2.2–2 shows the KCP Nonnuclear Fabrication Facility annual surge operating requirements.

TABLE 3.4.2.2–2.—*Kansas City Plant Nonnuclear Fabrication Facility Surge Operation Annual Requirements*

Requirement	Consumption
Resource	
Electrical energy (MWh)	225,000
Peak electrical demand (MWe)	30
Liquid fuel (L)	None
Natural gas[a] (m^3)	18,900,000
Water (L)	1,340,000,000
Plant Footprint (ha)	NA[b]
Employment (Workers)	2,928[c]

[a] Cubic meters at standard temperature and pressure.
[b] Contained within existing facilities.
[c] Includes 671 workers performing work for others.
Note: NA - not applicable.
Source: KC ASI 1995a; KCP 1995a:2; KCP 1995a:3.

Waste Management. The KCP waste management infrastructure can be applied to manage and treat all anticipated waste streams from this alternative. All wastes generated at KCP facilities would be managed in accordance with all applicable Federal and state waste regulations. The wastes anticipated from the estimated workload would not require significant modification of the existing KCP waste management infrastructure. Waste generation for construction and operation of the KCP nonnuclear fabrication alternative is shown in table 3.4.2.2–3.

3.4.2.3 *Relocate to Los Alamos National Laboratory*

Historically, LANL has maintained a prototyping capability in support of R&D for nearly all of the components in nuclear weapons that are designed at LANL. The basis for this alternative would be to use the existing infrastructure at LANL to provide for production requirements of the Complex. Figures 3.4.2.3–1 through 3.4.2.3–5 show the technical areas (TAs) involved and the detailed facility layout for key project TAs. Nonnuclear fabrication missions considered for transfer to LANL fall into the following categories: plastics, detonator inert components, and pilot plant; and reservoirs and valves. The LANL nonnuclear fabrication alternative is discussed in more detail in appendix section A.3.6.2.

Construction

Plastics, Detonator Inert Components, and Pilot Plant. In the areas of plastics production and high energy detonator inert components, existing facilities contain nearly all required processing equipment and facilities to provide for the production mission. LANL facilities currently used for plastics processing and polymer synthesis activities include the Weapons Plastics and Adhesives Facility at TA-16, the Detonator Production Facility at TA-22, Reservoir and Valve Production at TA-3, and a Polymer Synthesis, Processing, and Characterization Facility at TA-35. Additional floor space is available at TA-16 for production and two bays are available in the DX-16 Pilot Processing Facility for large-scale pilot processes. The following facilities, with the specified installations/upgrades, would be used for nonnuclear production activities at LANL: plastics production would be located in TA-16, Buildings 302, 303, 304, 305, 306, and 307; detonator inert

TABLE 3.4.2.2–3.—*Kansas City Plant Nonnuclear Fabrication Facility Waste Volumes*

Category	Annual Average Volume Generated from Construction (m^3)	Annual Volume Generated from Surge Operations (m^3)	Annual Volume Effluent from Surge Operations (m^3)
Low-Level[a]			
Liquid	None	None	None
Solid	None	None	None
Mixed Low-Level[a]			
Liquid	None	None	None
Solid	None	None	None
Hazardous			
Liquid	None	60	60
Solid	786	61	61
Nonhazardous (Sanitary)			
Liquid	None	570,000	570,000
Solid	745	310	310
Nonhazardous (Other)			
Liquid	None	223,900	223,900
Solid	None	11,500	11,500

[a] LLW or mixed LLW would not be generated during normal operation. However, upset conditions may result in the generation of minimal quantities of LLW or mixed LLW.

Source: KC ASI 1995a; KCP 1995a:2; KCP 1995a:3.

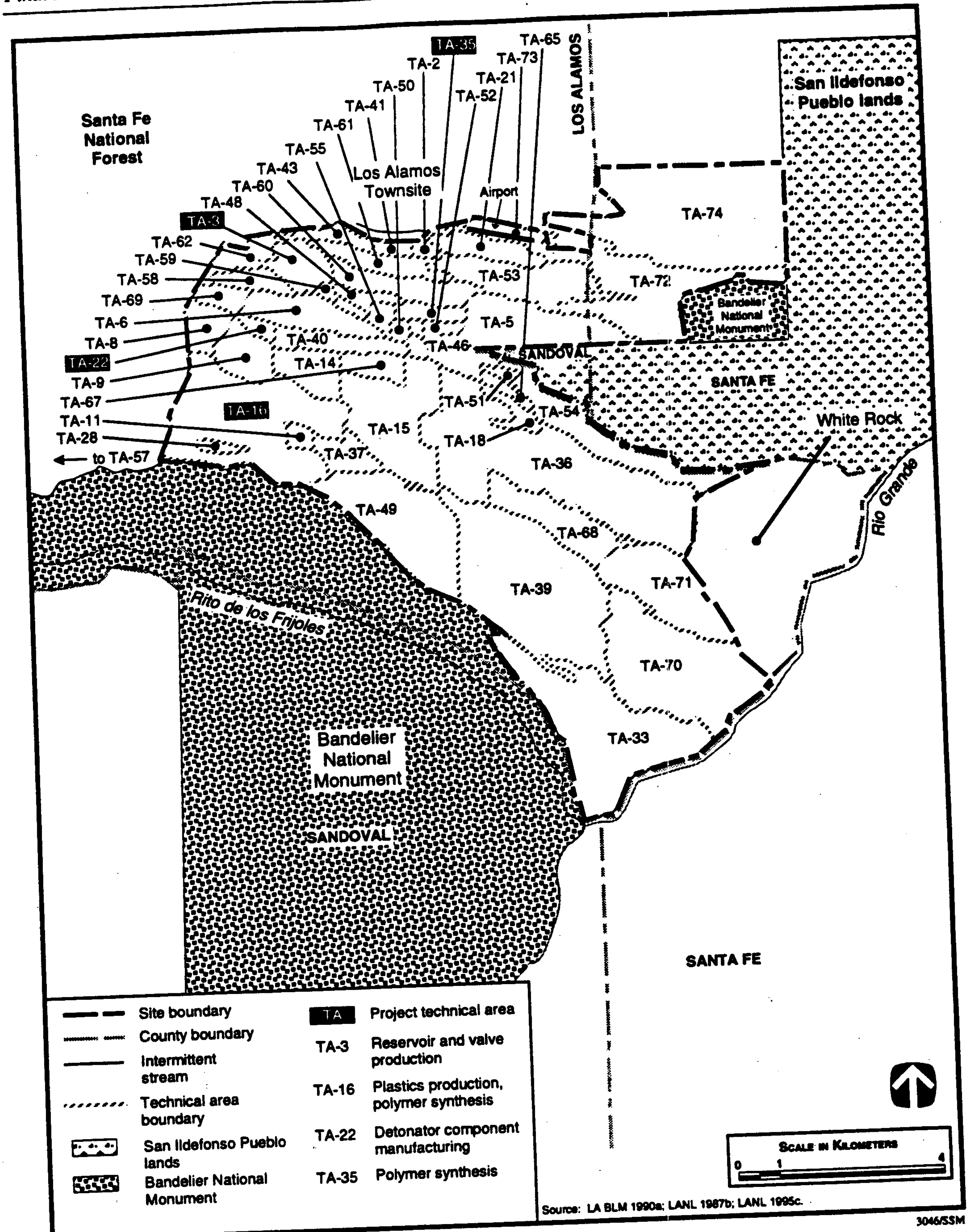


FIGURE 3.4.2.3–1.—*Nonnuclear Fabrication Alternative Technical Areas at Los Alamos National Laboratory.*

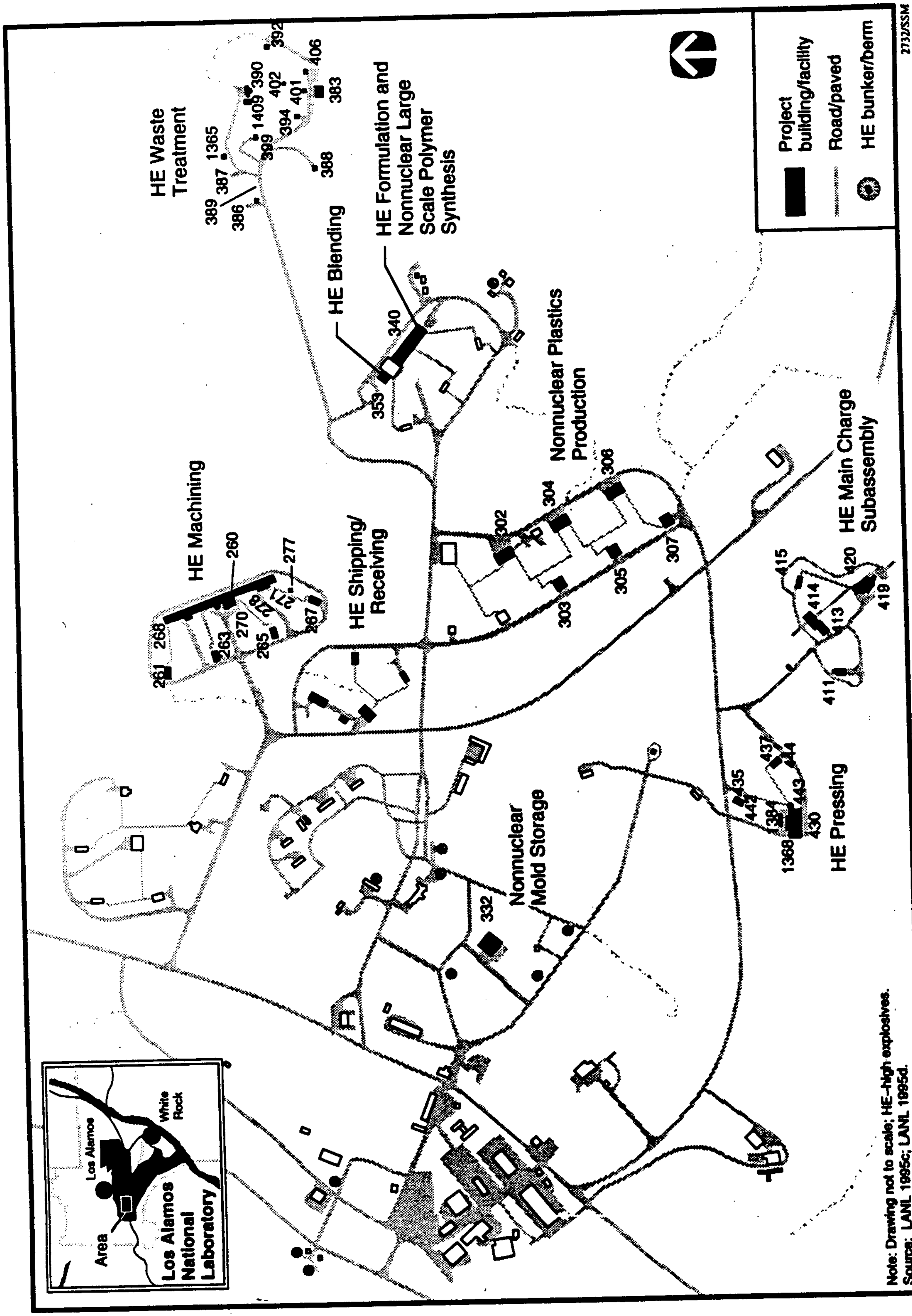


FIGURE 3.4.2.3–2.—*Nonnuclear Fabrication Technical Area 16 Site Plan at Los Alamos National Laboratory.*

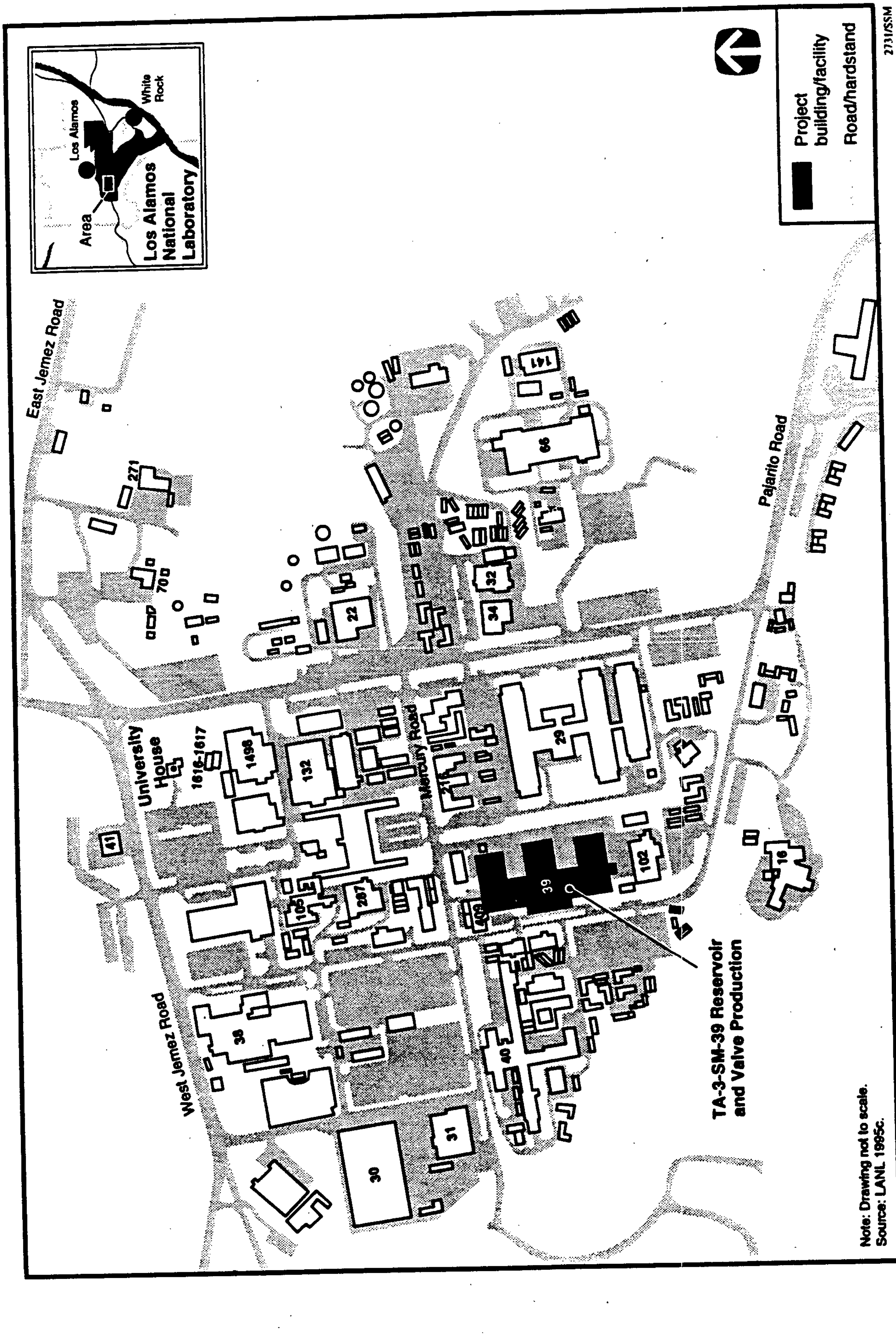


FIGURE 3.4.2.3–3.*—Nonnuclear Fabrication Technical Area 3-SM-39 Site Plan at Los Alamos National Laboratory.*

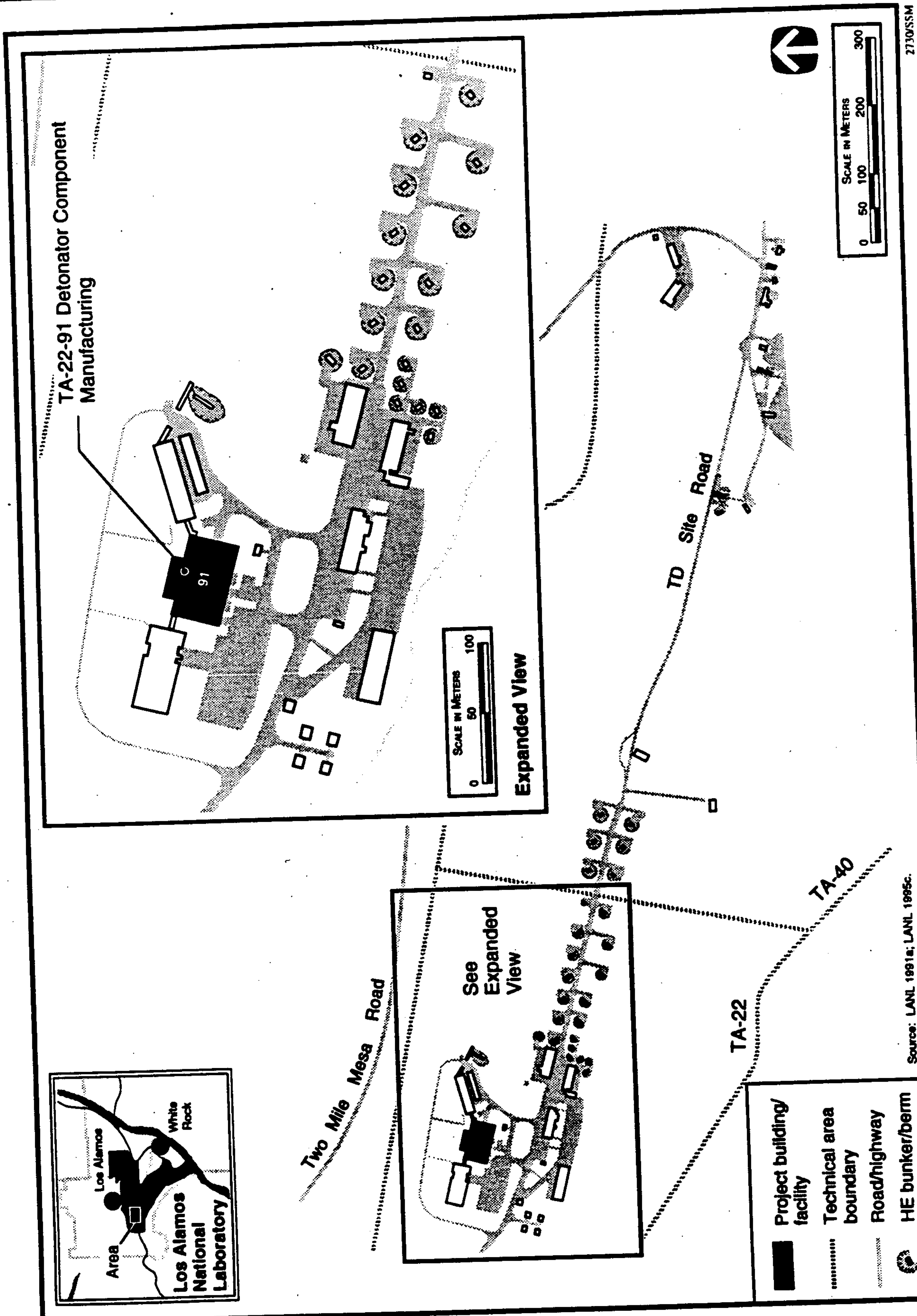


FIGURE 3.4.2.3-4.—*Nonnuclear Fabrication Technical Area 22 Site Plan at Los Alamos National Laboratory.*

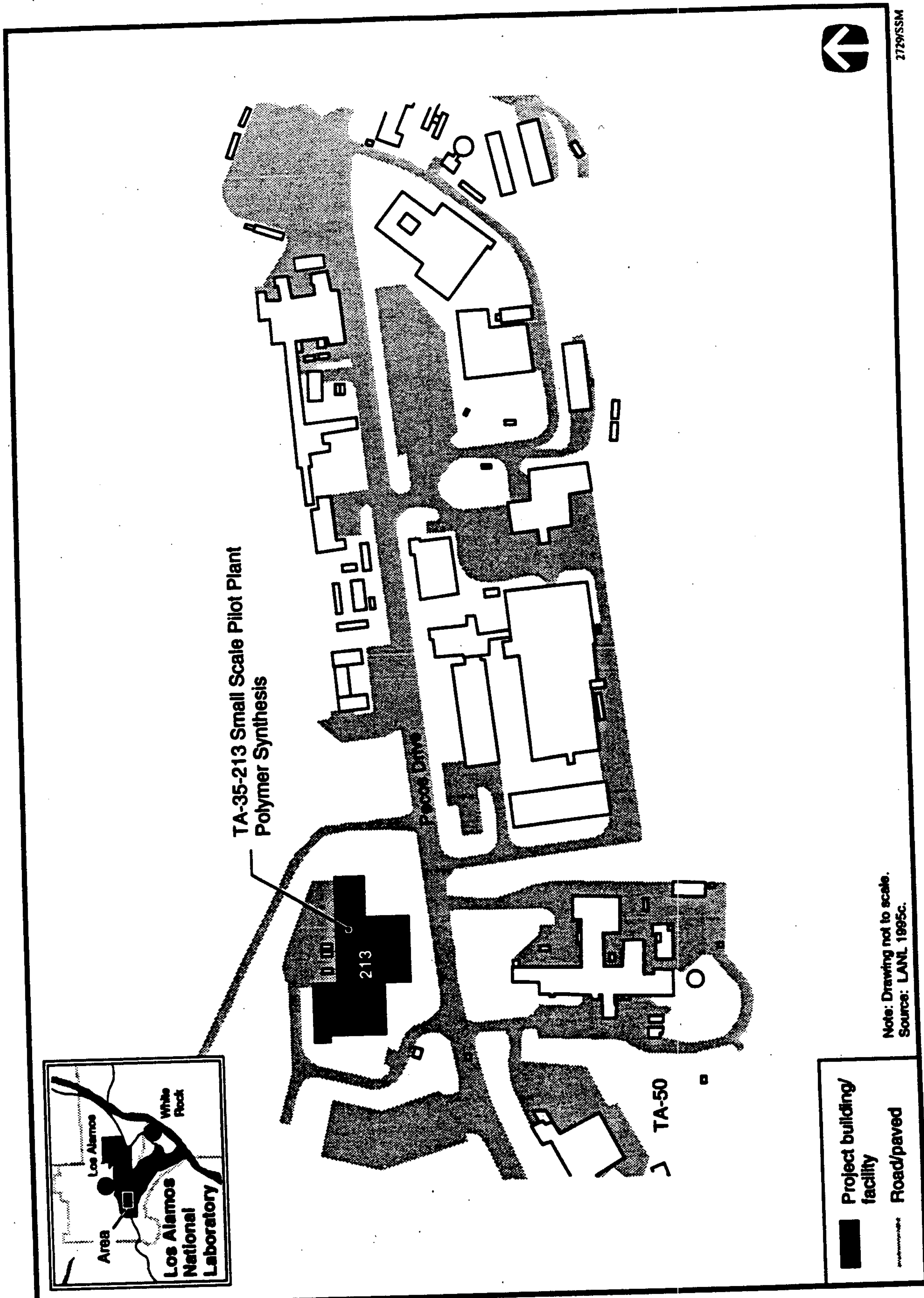


FIGURE 3.4.2.3–5.—*Nonnuclear Fabrication Technical Area 35 Site Plan at Los Alamos National Laboratory.*

components would be manufactured in TA-22, Building 91; and large-scale pilot plant polymer synthesis would occur in TA-16, Building 340. Electrical system upgrades and the installation of new and/or transferred equipment would be required in most of these facilities. Small-scale pilot plant polymer synthesis operations and mold storage, which require no installations or upgrades, would be located in TA-35, Building 213, and TA-16, Building 332, respectively.

Reservoirs and Valves. The basis for the reservoir alternative is to construct a Boost System Production Facility and establish a nuclear-grade material mission. The alternative would dedicate 2,300 m^2 (25,000 ft^2) in TA-3, Building SM-39 (Main Shops) for boost system production and the nuclear grade materials mission. Building modification activities would include removal of existing machine tools and replacement with new or transferred machine tools. No other upgrades would be necessary. The proposed installations and modifications would occur over a 2-year period.

Table 3.4.2.3–1 shows construction requirements to install 50 pieces of equipment and to upgrade electrical systems for the LANL nonnuclear fabrication alternative.

TABLE 3.4.2.3–1.—*Los Alamos National Laboratory Nonnuclear Fabrication Facility Construction Requirements*

Requirement	Consumption
Material/Resource	
Electrical energy (kWh)	105
Peak electrical demand (kWe)	3.8
Concrete (m^3)	None
Steel (t)	None
Gasoline, diesel, and lube oil (L)	None
Industrial gases[a] (m^3)	None
Water (L)	9,500
Land (ha)	NA[b]
Employment	
Total employment (worker years)	12
Peak employment (workers)	6
Construction period (years)	2

[a] Cubic meters at standard temperature and pressure.
[b] Laydown area for construction within existing facilities or previously disturbed areas.
Note: NA - not applicable.
Source: LANL 1995c.

Operation

Plastics, Detonator Inert Components, and Pilot Plant. LANL currently has process equipment and capabilities in place to support much of this mission. Additional processing capability would be transferred from KCP in the areas of polyurethane foam dispensing, intensive mixing, extruding and leaching of cellular silicone, flame spraying, and parylene coating. The proposed plastics production activities would use equipment such as mixers, extruders, roll mills, presses, coaters, screeners, testing equipment, and quality assurance equipment. For pilot plant operations, additional processing capability would be required for large-scale processing of up to 379 liters (L) (100 gallons [gal]). The proposed pilot plant production activities would use reactor vessels, mixer heaters, pulverizers, and solvent recovery equipment during operation. All detonator flat cable processing capability is currently available; however, upgraded equipment would be used to better meet production requirements. Detonator inert component manufacture and assembly operations would use several types of equipment including drills, cleaners, etchers, strippers, developers, scanners, laminators, presses, lasers, and welders.

Reservoirs and Valves. Process equipment and capabilities exist at LANL to support small-scale reservoir and valve production. Operation activities would consist of metal machining, inspection, packaging, and storage functions. Typical production equipment would include lathes, mills, drills, grinders, welders, and inspections/testing equipment. Table 3.4.2.3–2 shows the LANL Nonnuclear Fabrication Facility surge operating requirements.

Waste Management. The LANL existing waste management infrastructure can be applied to manage and treat all anticipated waste streams from this alternative. All hazardous and nonhazardous wastes generated at LANL facilities would be managed in accordance with all applicable Federal and state waste regulations. The wastes anticipated from the estimated workload would not require significant modification of the existing LANL waste management infrastructure. Waste generation for construction and operation of the LANL nonnuclear fabrication alternative is shown in table 3.4.2.3–3.

TABLE 3.4.2.3–2.—*Los Alamos National Laboratory Nonnuclear Fabrication Facility Surge Operation Annual Requirements*

Requirement	Consumption
Resource	
Electrical energy (MWh)	525
Peak electrical demand (MWe)	0.23
Liquid fuel (L)	None
Natural gas[a] (m^3)	340
Water (L)	48,300,000
Plant Footprint (ha)	NA[b]
Employment (Workers)	315[c]

[a] Cubic meters at standard temperature and pressure.
[b] Contained within existing facilities.
[c] Total surge employment. Increase to current employment would be 194.
Note: NA - not applicable.
Source: LANL 1995b:3; LANL 1995b:4; LANL 1995c.

3.4.2.4 *Relocate to Lawrence Livermore National Laboratory*

This alternative calls for LLNL to provide support for nuclear system plastic components. The LLNL Nonnuclear Fabrication Facility would provide the plastic components and polymers currently produced at KCP. These products include filled and unfilled molded parts; syntactic, rigid, and flexible foam parts; composite structures and specialty polymers currently produced at the KCP pilot plant. All processes would be identical to those currently used at KCP, except for the scaling down of the cellular silicone process and one polymer synthesis process.

This alternative would build on LLNL's established plastics fabrication mission. Over half of the equipment to be used is currently operational at LLNL. The laboratory has used this equipment to provide components for prototypes, underground test devices, and hydrotest devices to the weapons program, and numerous other components to other DOE programs. As a result of this established mission, LLNL has developed a site infrastructure that would support this alternative at the Livermore Site (figure 3.4.2.4–1). All facilities meet the current Federal and state environment, safety, and health requirements. The LLNL nonnuclear fabrication alternative is discussed in more detail in appendix section A.3.6.3.

Construction. The LLNL Nonnuclear Fabrication Facility would consist of 15 departments with facilities located primarily in Building B231 and 4 other buildings nearby. No new facility construction is

TABLE 3.4.2.3–3.—*Los Alamos National Laboratory Nonnuclear Fabrication Facility Waste Volumes*

Category	Annual Average Volume Generated from Construction (m^3)	Annual Volume Generated from Surge Operations[a] (m^3)	Annual Volume Effluent from Surge Operations (m^3)
Hazardous			
Liquid	None	11	11
Solid	None	0.11	0.11
Nonhazardous (Sanitary)			
Liquid	None	568	566[b]
Solid	None	10	6[c]
Nonhazardous (Other)			
Liquid	5[d]	25[e]	None
Solid	0.04	3[f]	None

[a] Data for multiple shifts were not provided. Single-shift values were multiplied by 3.
[b] Assumes a 350:1 wastewater to sludge ratio in the treatment of liquid sanitary wastes.
[c] Assumes that two-thirds of the solid waste is compactible by a factor of 4:1.
[d] 2,500 gal of cleanup/washdown water, converted to cubic meters and divided by 2 for the 2-year construction period.
[e] Industrial liquid wastes, which include cleaners, liquids, lube oils, and developers, are recycled.
[f] Metal machining wastes, wire, scrap, and molds are recycled.
Source: LANL 1995c.

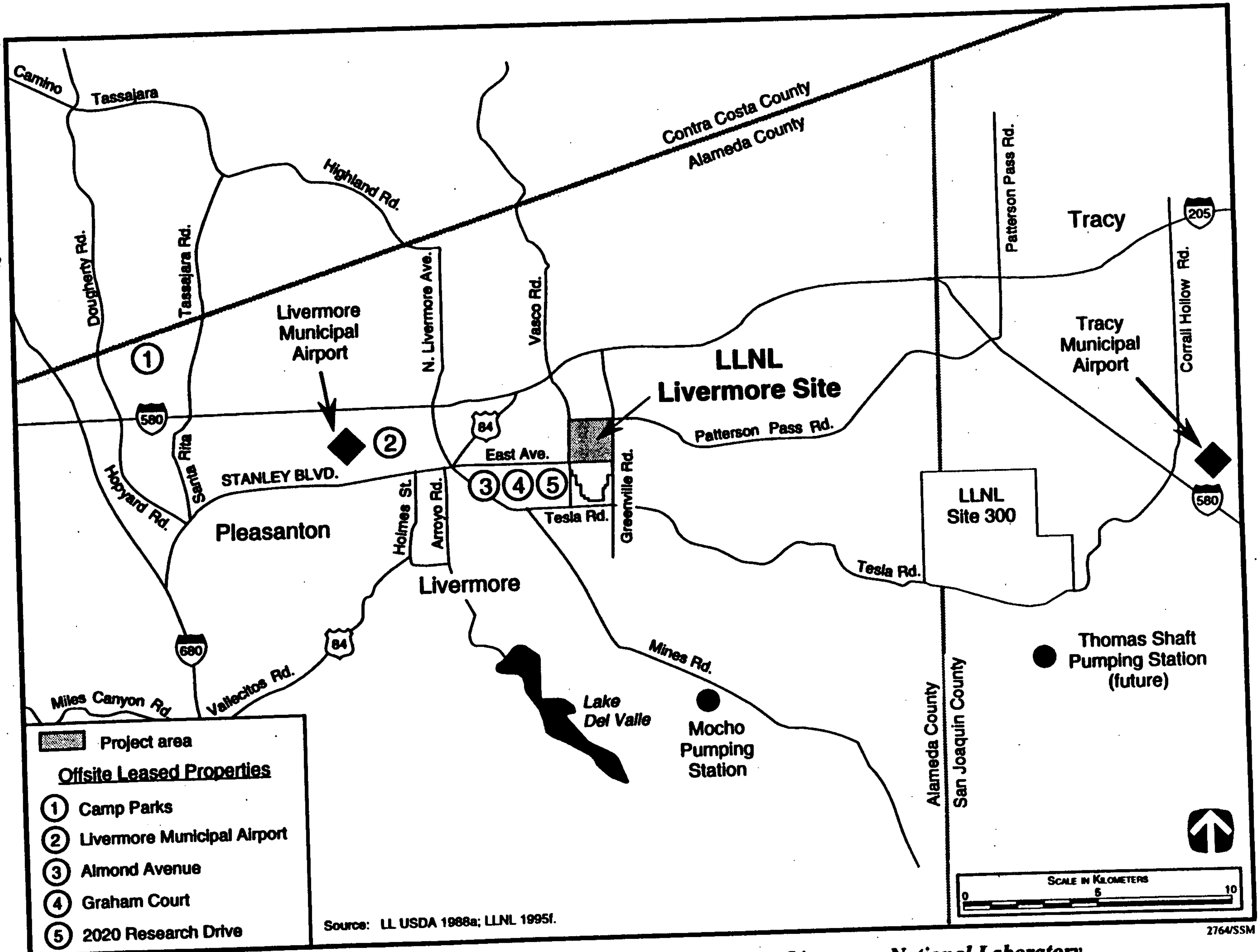


FIGURE 3.4.2.4–1—*Nonnuclear Fabrication Area at Lawrence Livermore National Laboratory.*

required. Modification efforts would essentially consist of a small to moderate expansion within existing facilities. The fabrication, including polymer synthesis, would be confined to a consolidated area consisting of five adjacent buildings as shown in figure 3.4.2.4–2. Table 3.4.2.4–1 shows construction requirements for the LLNL Nonnuclear Fabrication Facility.

TABLE 3.4.2.4–1.—*Lawrence Livermore National Laboratory Nonnuclear Fabrication Facility Construction Requirements*

Requirement	Consumption
Material/Resource	
Electrical energy (MWh)	21
Peak electrical demand (MWe)	0.05
Concrete (m^3)	7.6
Steel (t)	7.3
Gasoline, diesel, and lube oil (L)	19,900
Industrial gases[a] (m^3)	7.5
Water (L)	79,500
Land (ha)	NA[b]
Employment	
Total employment (worker years)	19
Peak employment (workers)	6
Construction period (years)	5

[a] Cubic meters at standard temperature and pressure.
[b] Laydown area for construction within existing facilities or previously disturbed areas.
Note: NA - not applicable.
Source: LLNL 1995f.

Operation. The operation of the LLNL nonnuclear fabrication mission includes production or procurement of plastic components, polymers, and composite parts. The processes and products included in the LLNL nonnuclear fabrication alternative are transfer molded parts, compression molded parts, injection molded parts, machined plastic parts, silicone cushions (all types), syntactic components, filled polymers, and polymer synthesis. Table 3.4.2.4–2 shows the surge operating requirement for the LLNL Nonnuclear Fabrication Facility.

TABLE 3.4.2.4–2.—*Lawrence Livermore National Laboratory Nonnuclear Fabrication Facility Surge Operation Annual Requirements*

Requirement	Consumption
Resource	
Electrical energy (MWh)	108
Peak electrical demand (MWe)	0.095
Gasoline and diesel fuel (L)	None
Natural gas[a] (m^3)	28,900
Water (L)	3,790,000
Plant Footprint (ha)	NA[b]
Employment (Workers)	114[c]

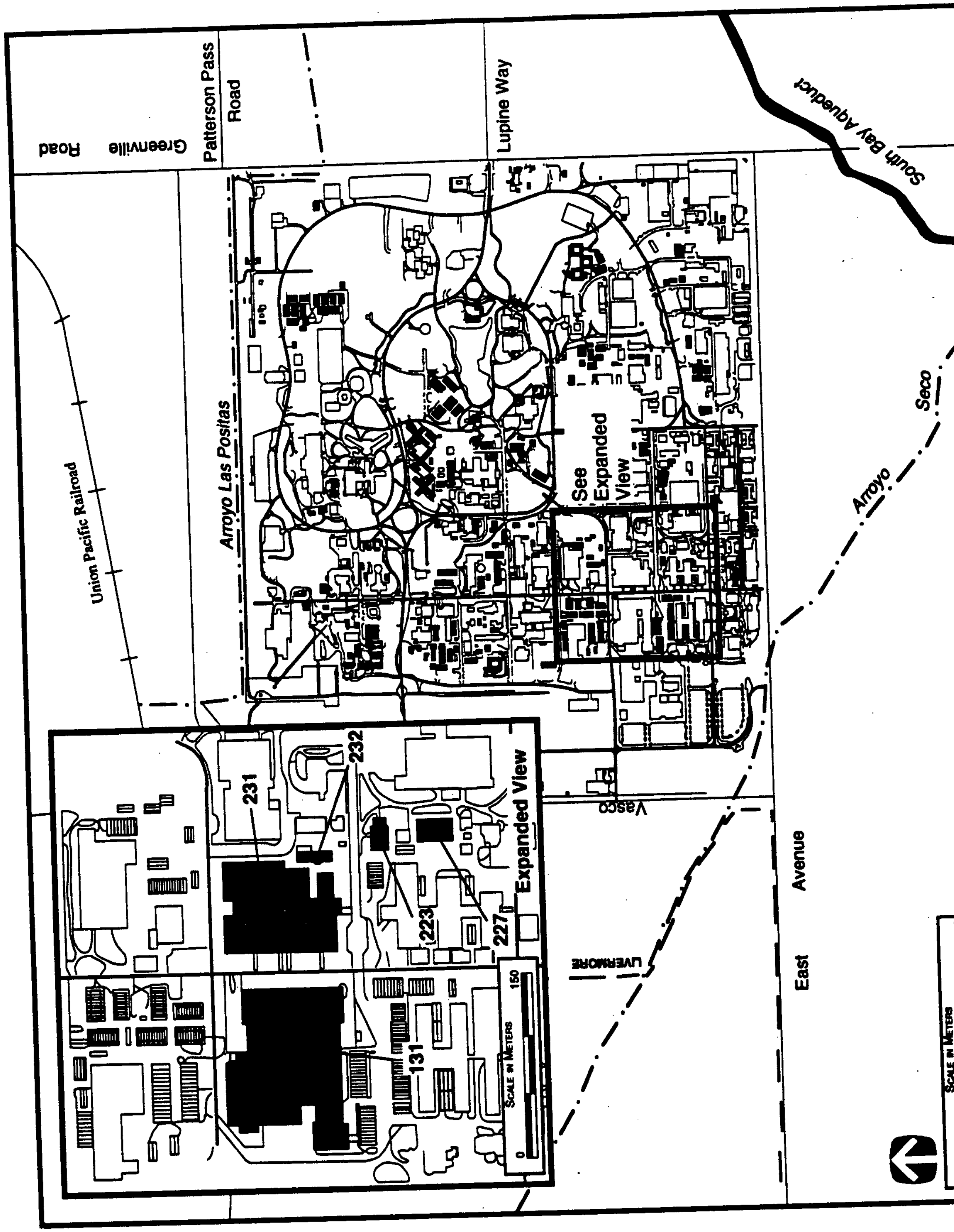
[a] Cubic meters at standard temperature and pressure.
[b] Contained within existing facilities.
[c] Total surge employment. Increase to current employment would be 60.
Note: NA - not applicable.
Source: LLNL 1995f; LLNL 1995i:2.

Waste Management. LLNL's existing waste management infrastructure can be applied to manage and treat all anticipated waste streams from this alternative. All hazardous and nonhazardous wastes generated at LLNL facilities would be managed in accordance with all applicable Federal and state waste regulations. The wastes anticipated from the estimated workloads would not require significant modification of the existing LLNL waste management infrastructure. Waste generation for construction and operation of the LLNL nonnuclear fabrication alternative is shown in table 3.4.2.4–3.

3.4.2.5 *Relocate to Sandia National Laboratories*

This alternative would transfer the majority of current KCP missions to the Albuquerque, NM facility of SNL, except for nuclear system plastic components that would go to either LANL or LLNL, and high energy detonator inert components that would go to LANL. In addition, there is the option of moving the reservoir mission to either SNL or LANL.

Only major assemblies or those components requiring special security considerations would be planned for in-house fabrication. SNL production would consist primarily of assembly of procured piece parts. The technologies that have been traditionally retained in-house at KCP, but under this alternative would be produced commercially, include the following: printed wiring boards, interconnect/junction boxes, lasers and electro-optics, interconnect cables, and molded plastic parts. Additionally, SNL would outsource metal machining, hybrid microcircuit substrates, and sheet metal forming. A more detailed dis-



Source: LL DOE 1992c; LL USGS 1981a; LLNL 1995f.

FIGURE 3.4.2.4–2.—*Nonnuclear Fabrication Facility Plot Plan at the Livermore Site.*

TABLE 3.4.2.4–3.—*Lawrence Livermore National Laboratory Nonnuclear Fabrication Facility Waste Volumes*

Category	Annual Average Volume Generated from Construction (m^3)	Annual Volume Generated from Surge Operations[a] (m^3)	Annual Volume Effluent from Surge Operations (m^3)
Hazardous			
Liquid	0.08	7[b]	3[c]
Solid	0.15	None	0.2
Nonhazardous (Sanitary)			
Liquid	36	5,770[d]	5,770[e]
Solid	0.9	127[f]	64[g]
Nonhazardous (Other)			
Liquid	76	Included in sanitary	Included in sanitary
Solid	10	Included in sanitary	Included in sanitary

[a] With the exception of sanitary wastes, the data for a multiple shift were determined by multiplying the single-shift values by 2.5.

[b] Data were provided as 2,500 lb of acetone, 3,500 lb of toluene/methanol, 250 lb of toluene, and 270 lb of dimethyl formamide. Assuming a density of 1,000 kg/cubic meter, these were converted to cubic meters.

[c] Assumes toluene/methanol wastewaters would be recycled by a distillation process. Five percent of the toluene/methanol volume is assumed for the distillation bottoms, which appear as a solid waste effluent.

[d] No data provided for liquid sanitary wastes such as sewage. Assumed 50 gal/day per person, 250 days/yr operation. Number of employees used is 60. The urea waste stream was multiplied by 2.5. for three shifts.

[e] LLNL does not treat sanitary wastewater. It goes to the municipal sanitary sewer system; thus, the effluent is the same as generated.

[f] No data provided for solid sanitary wastes such as housekeeping trash. Assumed 0.3 ft^3/day per person, 250 days/yr operation. Number of employees used is 60.

[g] Assumes that two-thirds of the solid waste is compactible by a factor of 4:1.

Source: LLNL 1995f; LLNL 1995i:2.

cussion of this alternative is provided in appendix section A.3.6.4.

Construction. This alternative would require construction of a new stand-alone production site at SNL, directly east of Technical Area I (figure 3.4.2.5–1). The alternative includes six new buildings and renovation or minor modifications to some existing buildings. The site would have four new production facilities, an office structure, and a central utilities building, all surrounded by a security fence with guards. The facility plot plan is shown in figure 3.4.2.5–2.

The new site would be independent of the existing Technical Area I, but would be connected to the area's utility network. The new construction would total approximately 58,060 m^2 (625,000 ft^2), which would be located on 9 ha (22 acres) of available land. In addition to renovation projects, some existing buildings would undergo minor modifications to accept the new workload. These minor modifications would yield an additional 5,110 m^2 (55,000 ft^2) of work space.

The new or modified facilities are Office Facility; Distribution Center Facility, Electronic Assembly Facility, Mechanical Assembly Facility, Special Products Facility, Central Utility Building, and modifications to existing buildings (820, 860, 894, 905, 913, and others). Table 3.4.2.5–1 shows construction requirements for the SNL Nonnuclear Fabrication Facility.

Operation. The nonnuclear fabrication alternative at SNL would operate processes and manufacturing functions similar to those of KCP. Manufacturing activities would be designed to fabricate the numerous electrical and mechanical components of nuclear weapons not proposed to be secured commercially. Fabrication activities would involve a precision machine shop with forges, presses, ovens, other metal-forming and metal-treating equipment, mechanical assembly areas, and clean rooms. Table 3.4.2.5–2 shows the surge operating requirements for the SNL Nonnuclear Fabrication Facility.

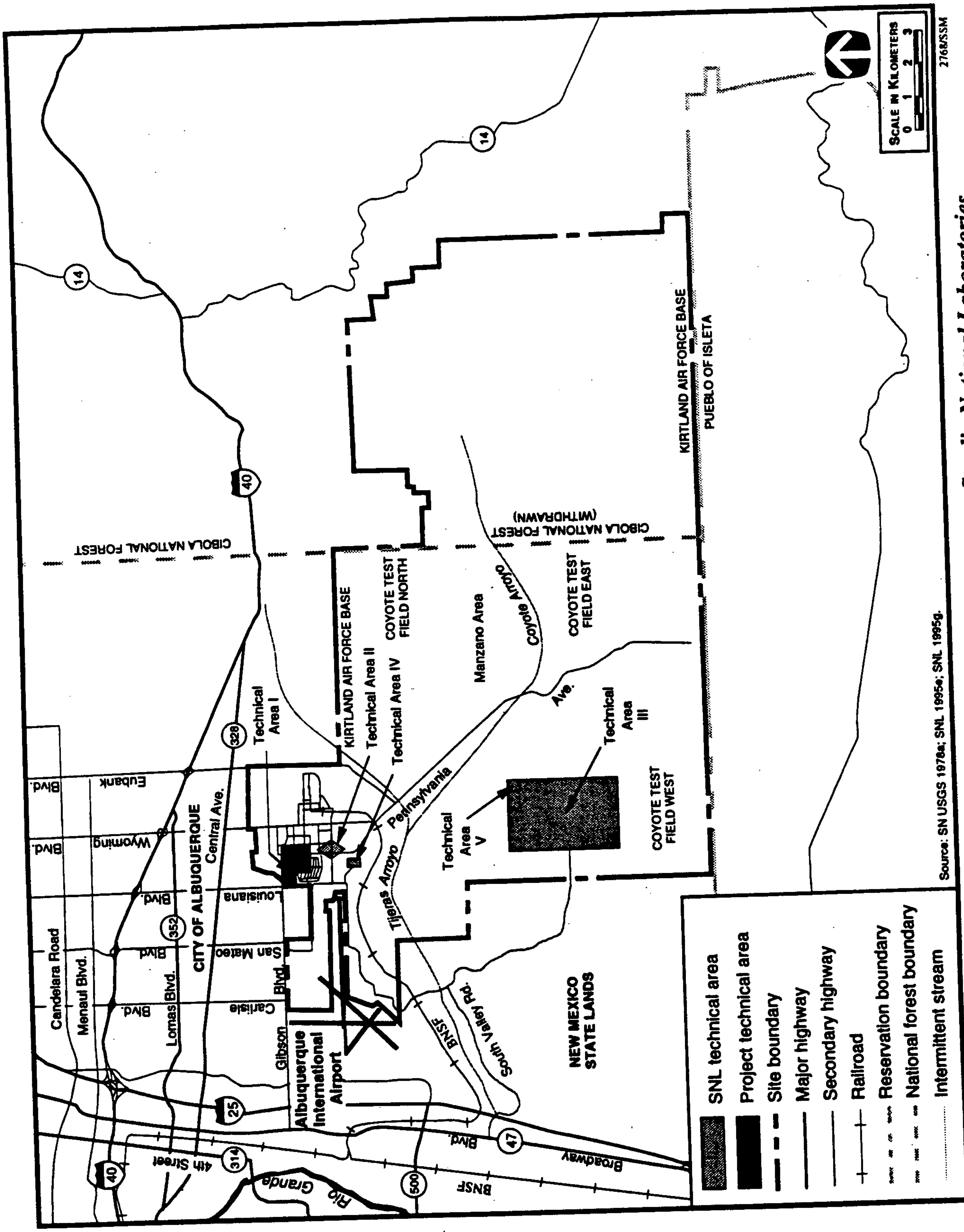


FIGURE 3.4.2.5–1.—*Nonnuclear Fabrication Areas at Sandia National Laboratories.*

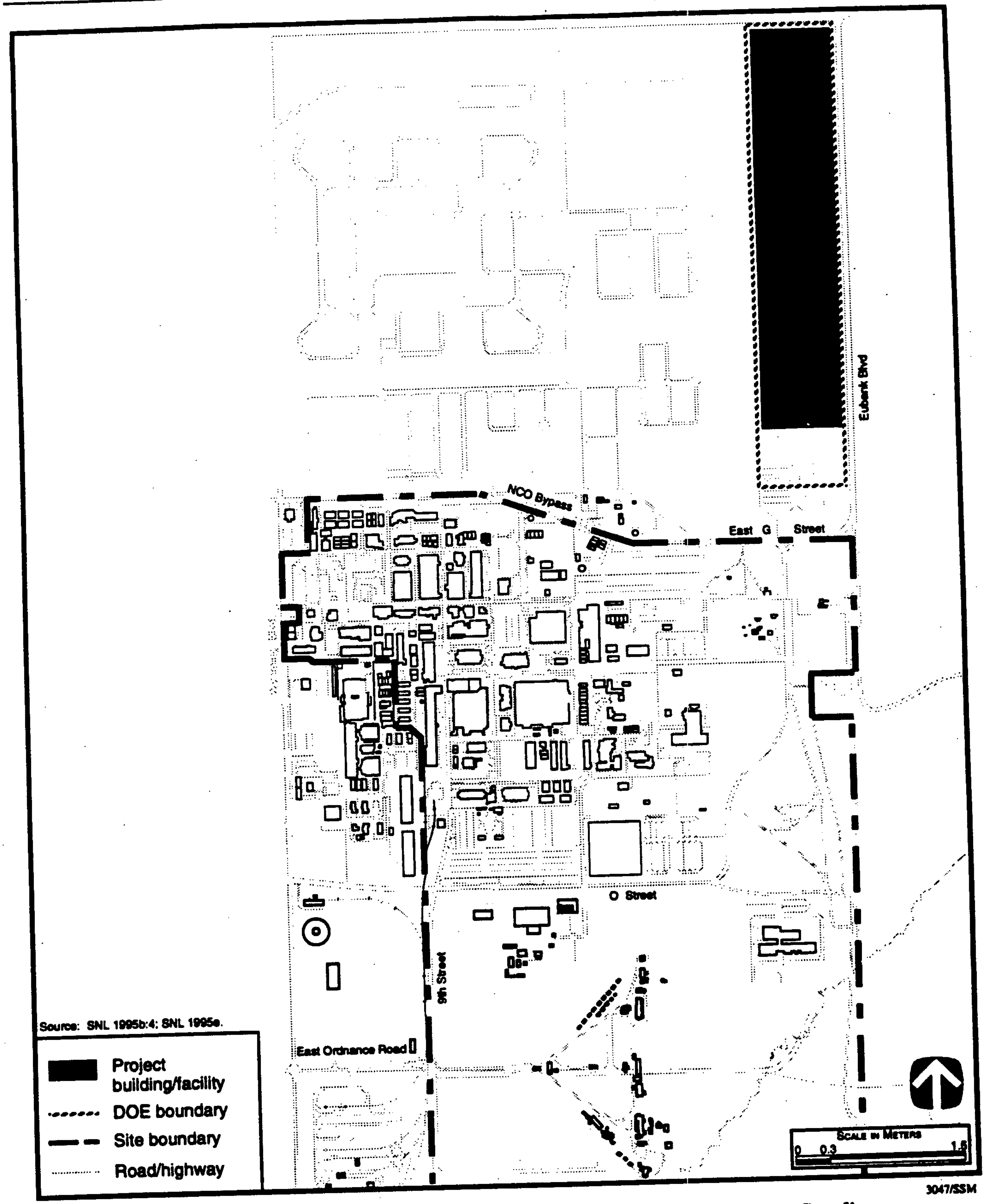


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Figure 3.4.2.5–2.—*Nonnuclear Fabrication Facility Plot Plan at Sandia National Laboratories.*

TABLE 3.4.2.5–1.—*Sandia National Laboratories Nonnuclear Fabrication Facility Construction Requirements*

Requirement	Consumption
Material/Resource	
Electrical energy (MWh)	46.8
Peak electrical demand (MWe)	2.5
Concrete (m^3)	12,800
Steel (t)	5,440
Gasoline, diesel, and lube oil (L)	2,600,000
Industrial gases[a] (m^3)	NA
Water (L)	2,200,000
Land (ha)	9
Employment	
Total employment (worker years)	781
Peak employment (workers)	379
Construction period (years)	3

[a] Cubic meters at standard temperature and pressure.
Note: NA - not applicable.
Source: SNL 1995b:5; SNL 1995e.

TABLE 3.4.2.5–2.—*Sandia National Laboratories Nonnuclear Fabrication Facility Surge Operation Annual Requirements*

Requirement	Consumption
Resource	
Electrical energy (MWh)	39,700
Peak electrical demand (MWe)	6.2
Gasoline and diesel fuel (L)	None
Natural gas[a] (m^3)	3,270,000
Water (L)	893,000,000
Plant Footprint (ha)	9
Employment (Workers)	1,160

[a] Cubic meters at standard temperature and pressure.
Source: SNL 1995b:4; SNL 1995b:5; SNL 1995e.

Waste Management. The SNL existing waste management infrastructure can be applied to manage and treat all anticipated waste streams from this alternative. All hazardous and nonhazardous wastes generated and any radioactive or mixed wastes generated under upset conditions at SNL facilities would be managed in accordance with all applicable Federal and state waste regulations. The wastes anticipated from the estimated workload would not require significant modification of the existing SNL waste management infrastructure. Waste generation for construction and operation of the SNL Nonnuclear Fabrication Facility is shown in table 3.4.2.5–3.

3.4.3 Pit Fabrication and Intrusive Modification Pit Reuse Alternatives

This capability, hereafter referred to as pit fabrication, includes all activities necessary to fabricate new pits, to modify the internal features of existing pits (intrusive modification), and to recertify or requalify pits. Processes for fabrication of replacement pits and modification of existing pits may involve handling, storing, and shipping HEU components. It is assumed that HEU components for assembly into replacement pits will be fabricated at Y-12 and shipped to LANL. Uranium components removed from pits that are to be replaced would be processed to remove residual plutonium, packaged, and shipped to Y-12.

For the base case analysis, workload requirements are assumed to be at a level necessary to maintain competence and to replace components destroyed during surveillance testing. This base case production rate is approximately 20 pits per year. In order to ensure that DOE is able to support the national security mission, equipment would be installed to provide the capability to fabricate one each of every pit type in the post-2005 stockpile. This concept is called capability-based capacity. Operating this array of equipment 5 days per week, on a single shift, provides an annual capacity of approximately 50 pits of, at most, 2 different types.

There are two alternative sites for pit fabrication: SRS and LANL. Nonintrusive modification pit reuse, which is an inherent capability of the pit fabrication facility, includes the processes and systems necessary to make modifications to the external features of a pit, if necessary, and to recertify the pit for reuse in a weapon.

3.4.3.1 *No Action*

Under the No Action alternative, DOE would continue to use existing R&D capabilities at LANL and LLNL. LANL maintains a limited capability to fabricate plutonium components using its Plutonium Research and Development Facility and performs surveillance operations on plutonium components returned from the stockpile. In addition, less extensive capabilities would continue at LLNL to

TABLE 3.4.2.5–3.—*Sandia National Laboratories Nonnuclear Fabrication Facility Waste Volumes*

Category	Annual Average Volume Generated from Construction (m^3)	Annual Volume Generated from Surge Operations[a] (m^3)	Annual Volume Effluent from Surge Operations (m^3)
Low-Level[b]			
Liquid	None	None	None
Solid	None	None	None
Mixed Low-Level[b]			
Liquid	None	None	None
Solid	None	None	None
Hazardous			
Liquid	0.11	15	15
Solid	23	17	17
Nonhazardous (Sanitary)			
Liquid	6,160[c]	291,470	291,470[d]
Solid	236	7,880	3,940[e]
Nonhazardous (Other)			
Liquid	383[f]	Included in sanitary	Included in sanitary
Solid	5	Included in sanitary	Included in sanitary

[a] The data for a multiple shift were determined by multiplying single-shift data by 2.
[b] LLW or mixed LLW would not be generated during normal operation. However, upset conditions may result in the generation of minimal quantities of LLW or mixed LLW.
[c] No data provided. Assumes 25 gal/day per construction worker for 250 days/yr and 260 construction workers. Construction toilets are trucked offsite for servicing.
[d] SNL sanitary wastewater goes to the city of Albuquerque sanitary sewer system; thus the effluent is the same as generated.
[e] Assumes that two-thirds of the solid waste is compactible by a factor of 4:1.
[f] Includes washing from flushing mechanical systems, dust control water, and blockwork, cementitious coatings.
Source: SNL 1995b:5; SNL 1995e.

support material and process technology development. Under No Action, DOE would not have the capability to perform pit fabrication to meet the requirements described in section 3.1 for the base case.

3.4.3.2 *Reestablish at Los Alamos National Laboratory*

This alternative would reconfigure the Plutonium Facility at LANL to fulfill the pit fabrication mission and the intrusive modification pit reuse mission. Pit manufacturing would consist of the following functions: pit fabrication, plutonium processing, waste processing, analytical chemistry, physical vapor deposition coatings, and storage. A more detailed discussion of this alternative is provided in appendix section A.3.3.1.

Construction. This alternative would locate pit manufacturing in existing facilities within five technical areas (TAs -55, -3, -8, -50, and -54). Figure 3.4.3.2–1 shows the LANL TAs. The pit fabrication/modification and plutonium processing activities would be located in the existing Plutonium Facility (PF-4), which is situated within the controlled access area of TA-55. The 300 Area of PF-4 would be used to fabricate plutonium components and to assemble those components into pits. Existing equipment would be retained as much as possible, but some equipment would be upgraded to production quality. Other TAs would provide waste processing, analytical chemistry, and other support functions. Figure 3.4.3.2–2 shows the plot plan for the pit fabrication/modification and plutonium processing facilities in TA-55. Table 3.4.3.2–1 shows construction requirements for the LANL Pit Fabrication Facility.

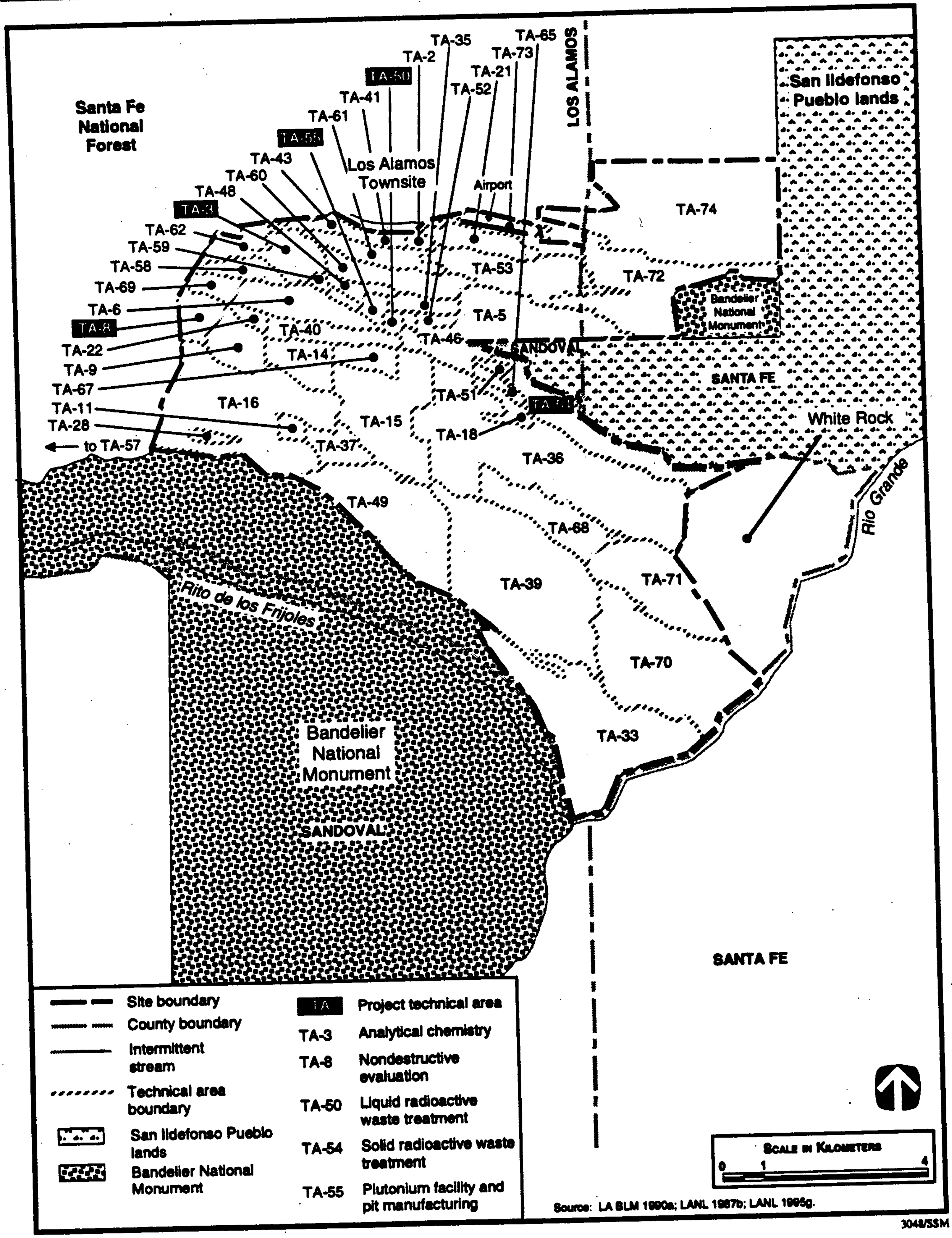


FIGURE 3.4.3.2–1.—*Pit Fabrication Technical Areas at Los Alamos National Laboratory.*

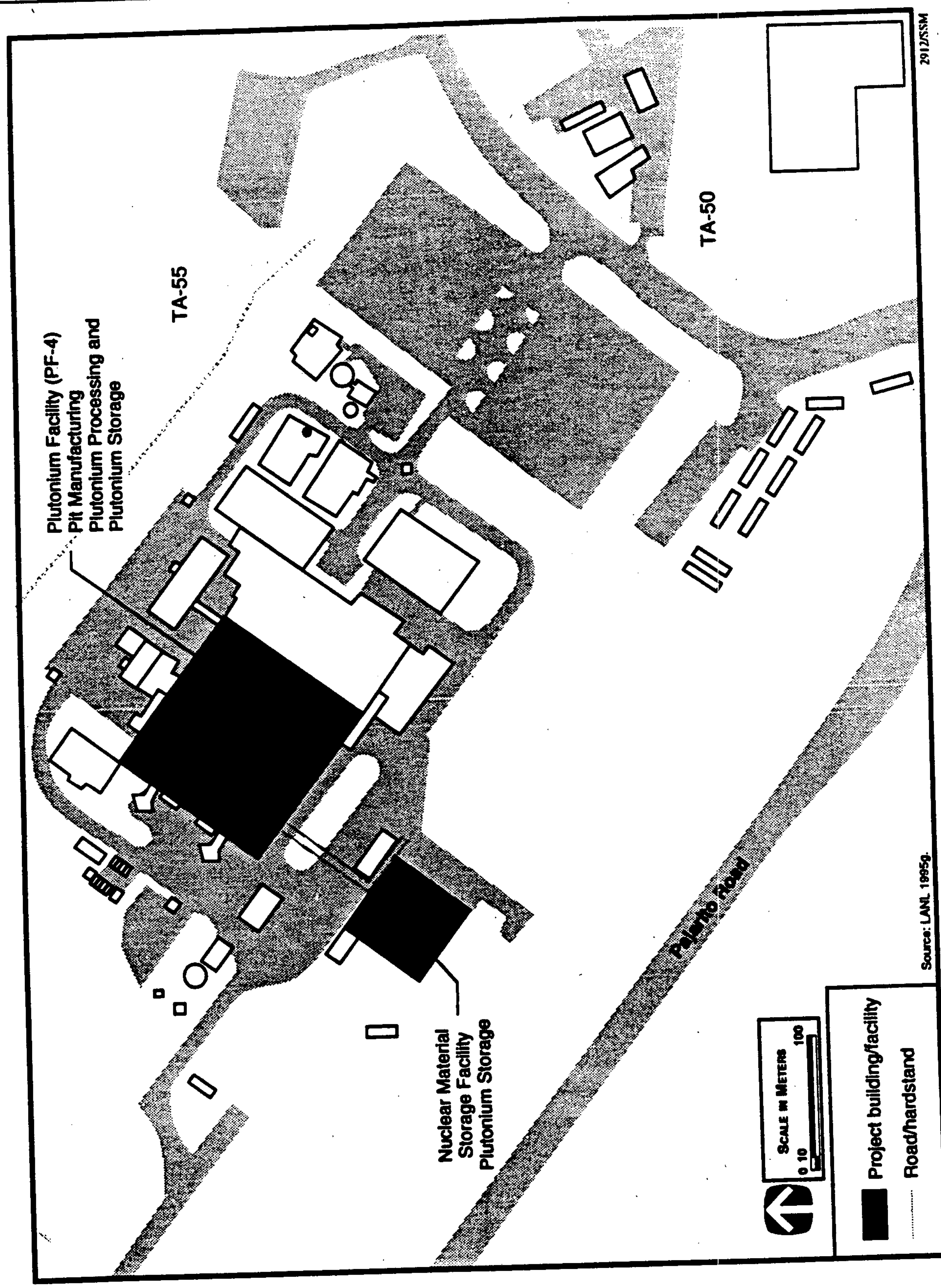


Figure 3.4.3.2–2.—*Pit Fabrication Facility Site Plan at Los Alamos National Laboratory, TA-55*

TABLE 3.4.3.2–1.—*Los Alamos National Laboratory Pit Fabrication Facility Construction Requirements*

Requirement	Consumption
Material/Resource	
Electrical energy (MWh)	Minimal
Peak electrical demand (MWe)	Minimal
Concrete (m^3)	Minimal
Steel (t)	Minimal
Gasoline, diesel, and lube oil (L)	Minimal
Industrial gases[a] (m^3)	Minimal
Water (L)	Minimal
Land (ha)	NA[b]
Employment	
Total employment (worker years)	216
Peak employment (workers)	138
Construction period (years)	3

[a] Cubic meters at standard temperature and pressure.
[b] Laydown area for construction within existing facilities or previously disturbed areas.
Note: NA - not applicable.
Source: LANL 1995g.

Operation. This alternative would consolidate the pit fabrication and modification processes, receiving pits from offsite and shipping new or rebuilt pits to the Weapons Assembly Facility. The pits received from offsite would be routed to a disassembly area. The plutonium metal from disassembled pits would be purified before transfer to the fabrication area. Residues generated in the disassembly/metal purification areas would primarily consist of chloride salts, crucibles, and chloride-contaminated scrap. The bulk of the residual plutonium would be purified and converted to plutonium metal in the chloride recovery area. Recovered plutonium metal would also be sent to the fabrication area. During fabrication, plutonium metal would be cast into the desired near-net shape and machined to the final shape with desired tolerances. The finished components would be assembled with other nonplutonium materials into the new pit component. These new pits would be sent to the Weapons Assembly Facility. During the casting and machining operations, a number of residues would be generated that require processing and would subsequently undergo nitrate aqueous recovery operations. In nitrate aqueous recovery, the residues are purified and converted to oxide for return to the reduction operations. Solid and liquid wastes from processing areas would be routed to waste management facilities for processing into a disposable waste form. Analytical laboratories provide chemical analyses of plutonium metal, oxides, solutions, and wastes. Table 3.4.3.2–2 shows the surge operating requirements for the LANL Pit Fabrication and Intrusive Modification Pit Reuse Facility.

TABLE 3.4.3.2–2.—*Los Alamos National Laboratory Pit Fabrication Facility Surge Operation Annual Requirements*

Requirement	Consumption
Resource	
Electrical energy (MWh)	5,480
Peak electrical demand (MWe)	0.7
Liquid fuel (L)	None
Natural gas[a] (m^3)	30,900
Water (L)	30,200,000
Plant Footprint (ha)	NA[b]
Employment (Workers)	628[c]

[a] Cubic meters at standard temperature and pressure.
[b] Contained within existing facilities.
[c] Total surge employment. Increase to current employment would be 260.
Note: NA - not applicable.
Source: LANL 1995b:4; LANL 1995g.

Waste Management. The existing LANL waste management infrastructure can be applied to manage and treat all anticipated waste streams from this alternative. All hazardous, radioactive, and mixed waste generated at LANL facilities would be managed in accordance with all applicable Federal and state regulation. The wastes anticipated from the estimated workloads would not require significant modifications of the existing LANL waste management infrastructure. Waste generation for construction and operation of the LANL Pit Fabrication Facility is shown in table 3.4.3.2–3.

3.4.3.3 *Reestablish at Savannah River Site*

This alternative would establish a pit fabrication and reuse facility at SRS within existing hardened facilities, but with new equipment and systems. The facility would fulfill the replacement pit fabrication mission and the intrusive and nonintrusive modification pit reuse missions. This alternative would consolidate all pit fabrication and modification

TABLE 3.4.3.2–3.—*Los Alamos National Laboratory Pit Fabrication Facility Waste Volumes (80 Pits Per Year)*

Category	Annual Average Volume Generated from Construction (m^3)	Annual Volume Generated from Surge Operation (m^3)	Annual Volume Effluent from Surge Operation (m^3)
Transuranic			
Liquid	None	5	None
Solid	6[a]	43	60
Mixed Transuranic			
Liquid	None	None	None
Solid	None	2	2
Low-Level			
Liquid	None	15	None
Solid	12[b]	386	393
Mixed Low-Level			
Liquid	None	None	None
Solid	None	None	None
Hazardous			
Liquid	0.06	2	2
Solid	51	None	None
Nonhazardous (Sanitary)			
Liquid	None	12,300[c]	12,300
Solid	None	552[d]	552
Nonhazardous (Other)			
Liquid	None	Included in sanitary	Included in sanitary
Solid	26[e]	Included in sanitary	Included in sanitary

[a] Over 3-year construction period a total of 27 t (30 tons) of associated piping and ventilation ductwork from glove boxes would be generated. For volume conversion 1500 kg/m^3 was assumed.

[b] Over 3-year construction period a total of 41 t (45 tons) of glove boxes and 14 t (15 tons) of associated piping ventilation and ductwork, would be generated. For volume conversion, 1500 kg/m^3 was assumed.

[c] Assumes 50 gal/day/person/shift with the parameters of 250 days/yr and 260 total additional employees for three shifts.

[d] Assumes 0.3 ft^3/day/person/shift with the parameters of 250 days/yr and 260 total additional employees for three shifts.

[e] Includes 0.15 t (0.17 tons) of steel assuming density of 0.127 m^3/t.

Source: LANL 1995g; LANL 1996e:1.

processes, receiving pits from offsite and shipping new or rebuilt pits off site to the Weapons Assembly Facility. Nonnuclear pit components would be manufactured at other DOE sites and shipped to SRS for assembly into pits. The receiving, handling, and disposition of surplus plutonium could also be consolidated with the plutonium processing facilities. A more detailed discussion of this alternative is provided in appendix section A.3.3.2.

Construction. Facilities are available at the SRS separation areas, F-Area, and H-Area, which could house, in hardened structures, all the process functions required for the manufacture of plutonium pits (figure 3.4.3.3–1). Pit fabrication would be located in Building 232-H, and plutonium processing would be located in the F-Canyon facilities.

Building 232-H is primarily a hardened facility that is used for tritium processing and handling operations that are being relocated to the Replacement Tritium Facility. Adequate space would be available for the Pit Fabrication Facility following removal of some existing equipment and piping systems. New equipment and systems would be required for the Pit Fabrication Facility.

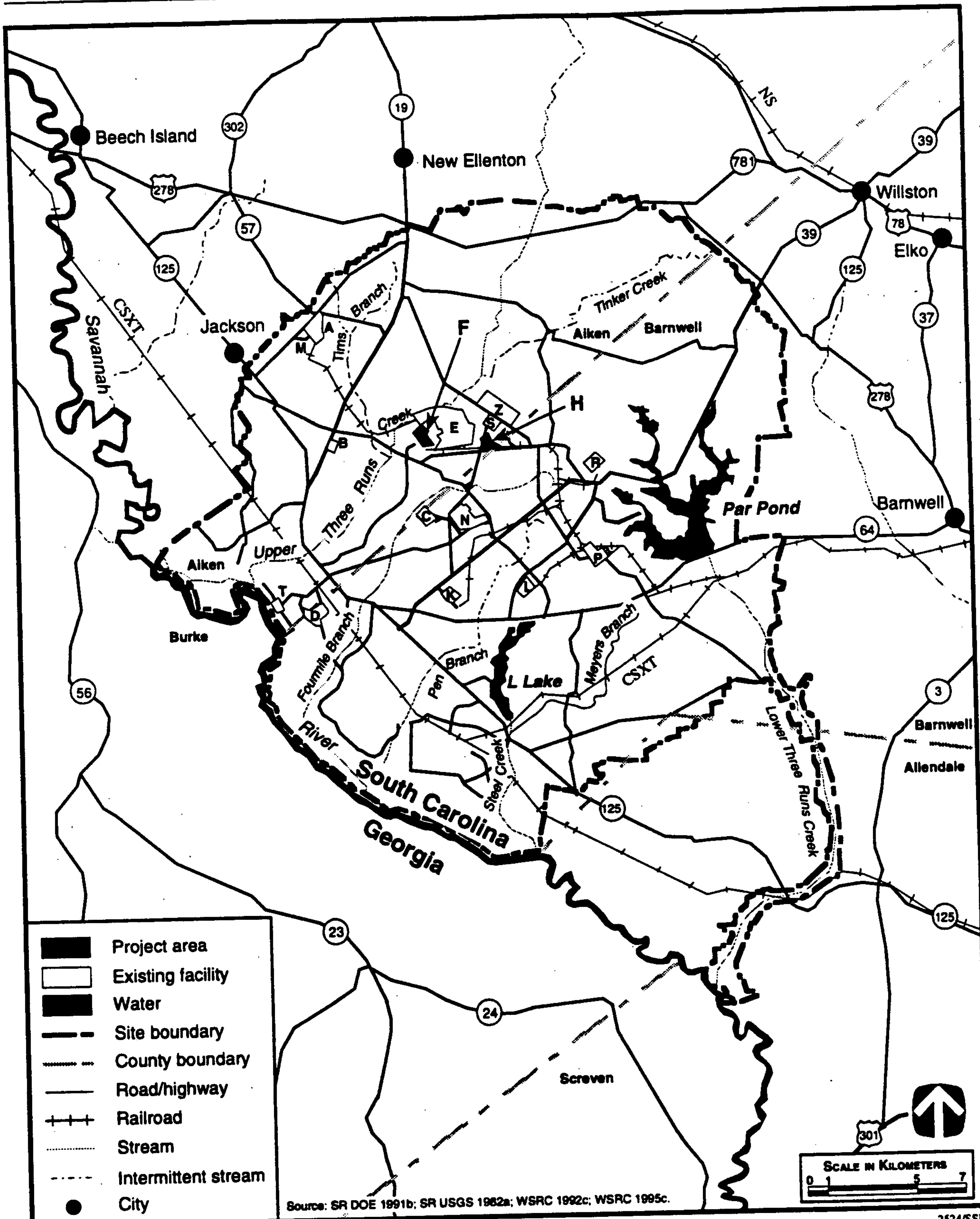


FIGURE 3.4.3.3–1.—*Pit Fabrication Areas at Savannah River Site.*

F-Canyon facilities have adequate noncontaminated hardened areas to house the plutonium processing functions. The Plutonium Storage Facility and the New Special Recovery Facility, which have never been started up, would be used in addition to a third level F-Canyon building production space that has been decontaminated. Many of the unused glove boxes in these facilities could be used as is or with minor modifications. Table 3.4.3.3–1 shows construction requirements, and figure 3.4.3.3–2 provides a site plan for the SRS Pit Fabrication and Intrusive Modification Pit Reuse Facility.

TABLE 3.4.3.3–1.—*Savannah River Site Pit Fabrication Facility Construction Requirements*

Requirement	Consumption
Material/Resource	
Electrical energy (MWh)	15
Peak electrical demand (MWe)	0.37
Concrete (m^3)	1,600
Steel (t)	249
Gasoline, diesel, and lube oil (L)	175,000
Industrial gases[a] (m^3)	3,780
Water (L)	30,000,000
Land (ha)	NA[b]
Employment	
Total employment (worker years)	801
Peak employment (workers)	288
Construction period (years)	5

[a] Cubic meters at standard temperature and pressure.
[b] Laydown area for construction within existing facilities or previously disturbed areas.
Note: NA - not applicable.
Source: WSRC 1995c.

Operation. Table 3.4.3.3–2 shows the surge operating requirements for the SRS Pit Fabrication and Intrusive Modification Pit Reuse Facility. Specific processes required for pit fabrication are discussed in appendix section A.3.3.2.

Pit disassembly, plutonium purification, and residue processing would be performed in existing hardened facilities in the F-Area. These facilities include New Special Recovery, which is equipped to dissolve and purify plutonium, a new reduction (metal preparation) facility in Building 221-F, and the Plutonium

TABLE 3.4.3.3–2.—*Savannah River Site Pit Fabrication Facility Surge Operation Annual Requirements*

Requirement	Consumption
Resource	
Electrical energy (MWh)	9,700
Peak electrical demand (MWe)	1.6
Liquid fuel (L)	28,400
Natural gas[a] (m^3)	None
Water (L)	46,200,000
Coal (t)	1,090
Plant Footprint (m^2)	NA[b]
Employment (Workers)	813

[a] Cubic meters at standard temperature and pressure.
[b] Contained within existing facilities.
Note: NA - not applicable.
Source: WSRC 1995c.

Storage Facility. Existing facilities in the F-Area are sized for a large yearly throughput (2 to 5 metric tons [t] [2.2 to 5.5 short tons {tons}]), if required. Also available onsite is the Defense Waste Processing Facility, which would be used for disposal of americium that is a byproduct of plutonium purification. Analytical laboratories in the F-Canyon Area are available to support process control requirements. These facilities in F-Area are operated by the DOE Environmental Management Program.

The plutonium fabrication process in Building 232-H would be an abbreviated version of the process used by the Rocky Flats Plant. Though there are several pit types, the process for each pit type is basically the same. The process consists of casting parts to the near-net shape, machining the surfaces of the casting to achieve the final shape, and performing tests on the completed parts to ensure suitability. After this inspection, the plutonium components are cleaned and assembled with the nonnuclear components to be built into the pit and then welded together into one unit. With the plutonium encapsulated, it may then be safely removed from the glove box, certified, and stored or shipped offsite, as needed.

Nonnuclear components used in the new pits would be received from offsite. After inspection, these parts would be stored in Building 704-55H until needed for either newly fabricated or reused pits.

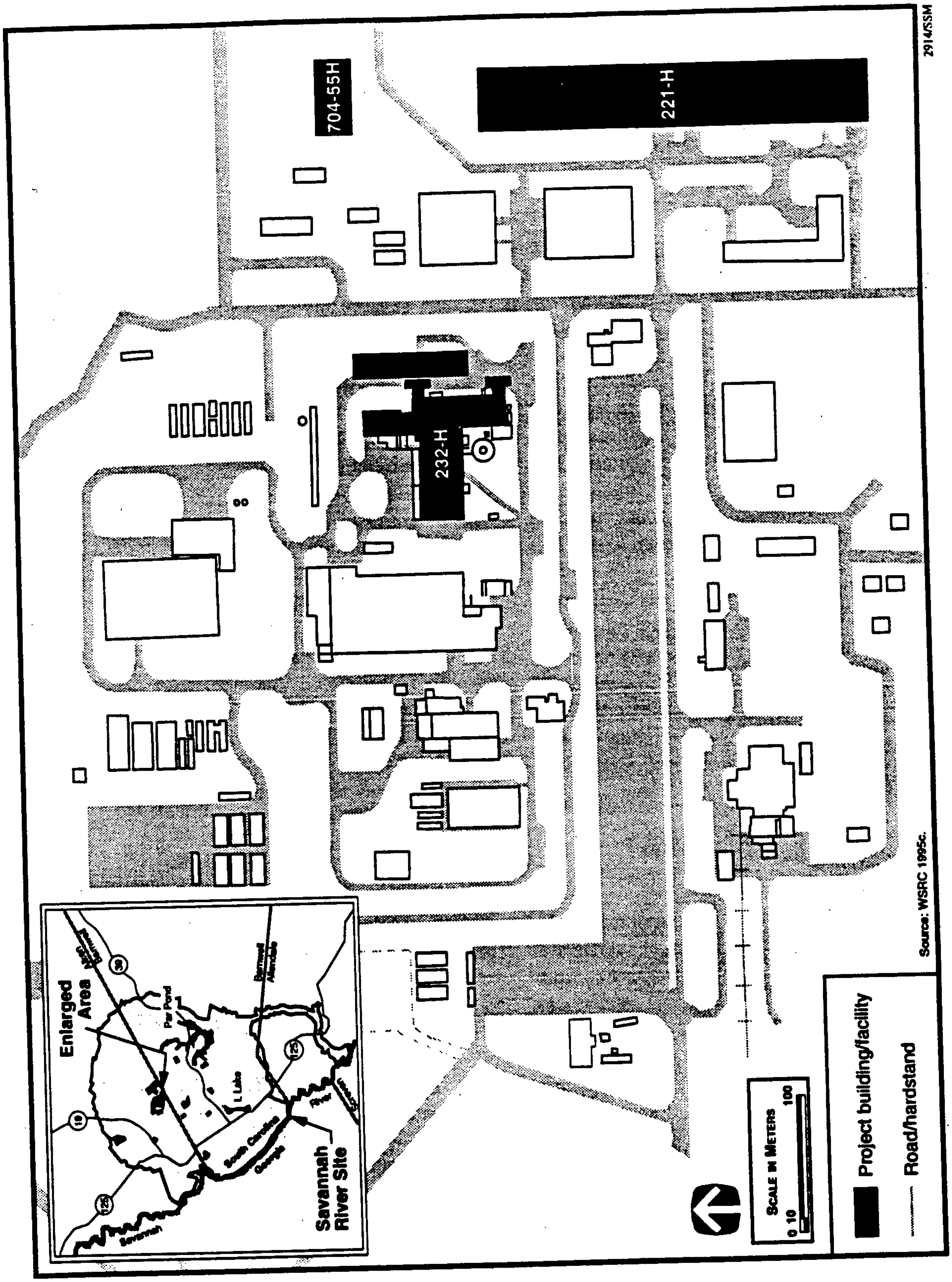


FIGURE 3.4.3.3–2.—*Pit Fabrication Facility Site Plan at Savannah River Site.*

For the nonintrusive modification pit reuse function, the pit is not disassembled. The entire pit is received through the weapons retirement/disassembly process. The pit is then cleaned, inspected and, if necessary, the exterior of the pit is modified. No plutonium is exposed in the nonintrusive modification pit reuse function.

Waste Management. The existing SRS waste management infrastructure can be applied to manage and treat all anticipated waste streams from this alternative. All hazardous, radioactive, and mixed waste generated at SRS facilities would be managed in accordance with all applicable Federal and state regulations. The wastes anticipated from the estimated workloads would not require significant modifications of the existing SRS waste management infrastructure. The plutonium recovery process would generate a liquid transuranic (TRU) waste that SRS would manage as a high-specific activity waste. This waste would be managed in accordance with the SRS HLW management plan and would result in HLW glass logs and LLW saltstone. Radiographic inspection would generate a low-specific activity waste stream that would include development chemicals such as silver. This stream would be treated as mixed LLW. Waste generation for construction and operation of the SRS Pit Fabrication Facility is shown in table 3.4.3.3–3.

3.4.4 Secondary and Case Fabrication Alternatives

The secondary and case fabrication mission includes all activities to support fabrication, surveillance, inspection, and testing of secondaries and components. Functional capabilities for these services include operations to physically and chemically process, machine, inspect, assemble, and disassemble secondary and case materials. Materials include depleted uranium, enriched uranium, uranium alloys, isotopically enriched lithium hydride and lithium deuteride, and other materials. The concept of capability-based capacity discussed in section 3.4.3 applies to this section. Alternative sites considered for stockpile management secondary activities are ORR, LANL, and LLNL.

When comparing data between site alternatives, it is important to note that there are differences in the facility designs. The Y-12 alternative includes all the necessary support facilities to conduct the missions, not just the production and storage facilities. The LANL and LLNL alternatives only consider the incremental changes for operating the production facilities. The actual production footprint size of each alternative is almost identical; however, the production capacities vary between site alternatives. For example, base case, multiple-shift capacities at Y-12 and LANL are about 150 units, whereas at LLNL the equivalent production capability would be about 50 units. This creates significant differences in some of the data.

3.4.4.1 *No Action*

Under No Action, ORR would continue secondary and case fabrication. Y-12 maintains the capability to produce and assemble uranium and lithium components, to recover uranium and lithium materials from the component fabrication process and disassembled weapons, and to produce secondaries, cases, and related nonnuclear weapons components.

3.4.4.2 *Downsize at Oak Ridge Reservation*

This alternative would be based on downsizing the existing secondary and case fabrication facilities at Y-12 (figure 3.4.4.2–1) consistent with future requirements. The downsized facilities would only require approximately 14 percent of the existing Y-12 floor space for the DP mission, while EM missions would assume the majority of the remaining area. The Y-12 secondary and case fabrication facilities would be divided into the following four factories:

- Enriched uranium factory for processing enriched uranium
- Depleted uranium factory for processing depleted uranium and uranium alloys
- Special materials factory for processing lithium compounds and other materials
- Nonnuclear factory for processing nonnuclear secondary and case parts and materials

This alternative is discussed in more detail in appendix section A.3.2.1.

TABLE 3.4.3.3–3.—*Savannah River Site Pit Fabrication Waste Volumes (120 Pits Per Year)*

Category	Annual Average Volume Generated from Construction (m^3)	Annual Volume Generated from Surge Operations (m^3)	Annual Volume Effluent from Surge Operations (m^3)
Transuranic			
Liquid	None	28[a]	None
Solid	None	129[b]	129[b]
Mixed Transuranic			
Liquid	None	None	None
Solid	None	11	11
Low-Level			
Liquid	None	80[c]	None
Solid	None	88[d]	34
Mixed Low-Level			
Liquid	None	None	None
Solid	None	None	None
Hazardous			
Liquid	<0.01	<1	None
Solid	8[e]	None	<0.01[f]
Nonhazardous (Sanitary)			
Liquid	3,020	46,160	46,140[g]
Solid	23	1,450	1,580
Nonhazardous (Other)			
Liquid	None	None	None
Solid	500[h]	1,450[i]	None

[a] At SRS, this would be managed as high-specific activity liquid waste, which would be combined with HLW at the Tank Farm and then processed in accordance with the High-Level Waste Management Plan as described in appendix section H.2.2. The resultant waste forms include 0.61 glass logs composed of comingled TRU waste from pit fabrication and legacy HLW, and LLW saltstone. Based on aqueous alternative process for Complex 21; denitrated water=49.3 L/kg plutonium metal processed and discarded filtrates=6.9 L/kg plutonium metal. Neutralized with 0.2 L of 50-percent caustic per kilogram of waste.

[b] One-half of this volume is considered intermediate-level waste at SRS and would be disposed of in the intermediate-level waste vaults in E-Area. It is managed as TRU waste because it contains beta or gamma emitters that produce a dose equal to or greater than 200 millirem/hr at 5 cm (2 in) from an unshielded container.

[c] Based on aqueous alternative process for Complex 21; 166 L of recycle water per kilogram of plutonium metal processed. Assume "recycle" water sent to Effluent Treatment Facility; recovered acid recycled.

[d] Incinerable=58 m^3, nonincinerable=30 m^3.

[e] Includes 7.6 m^3 (9.9 yd^3) of D&D wastes such as wall material contaminated with asbestos.

[f] Treatment of liquid hazardous wastes results in solid hazardous ash. Volume reduction is 200:1.

[g] Assumes 350:1 wastewater to sludge ratio for treatment of liquid sanitary waste.

[h] Includes 1.5 m^3 (2 yd^3) of concrete and 0.18 t (0.2 tons) of steel. Includes 498 m^3 (651 yd^3) of D&D wastes such as ductwork, concrete, electrical wiring, and equipment.

[i] Recyclable wastes.

Source: SRS 1996a:2; WSRC 1995c.

Construction. This alternative consists of five principal production buildings, one shared production facility, and a number of office, utility, and change-house facilities. Buildings 9204-2 and 9201-5W would be placed in cold standby for potential activation should unforeseen capacity needs arise. Re-activation of these buildings would require separate NEPA evaluation. Figure 3.4.4.2–2 shows the location of the Y-12 secondary and case fabrication facilities. There would be no new facility construction at Y-12 to support the secondary and case fabrication mission. Modifications to the existing buildings would be required for implementation of the alternate secondary and case fabrication mission and to upgrade the

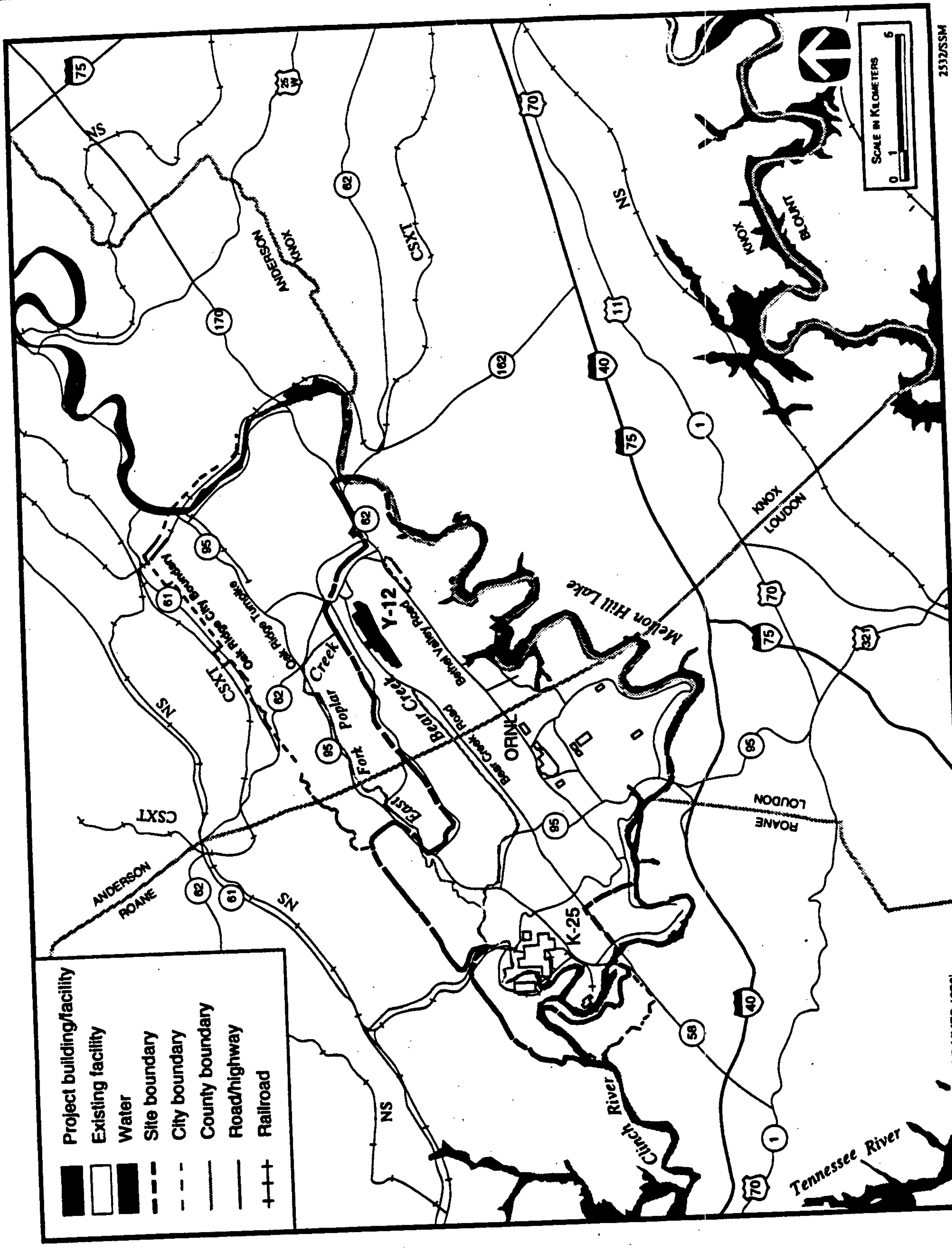


FIGURE 3.4.4.2–1.—*Secondary and Case Fabrication Area at Oak Ridge Reservation.*

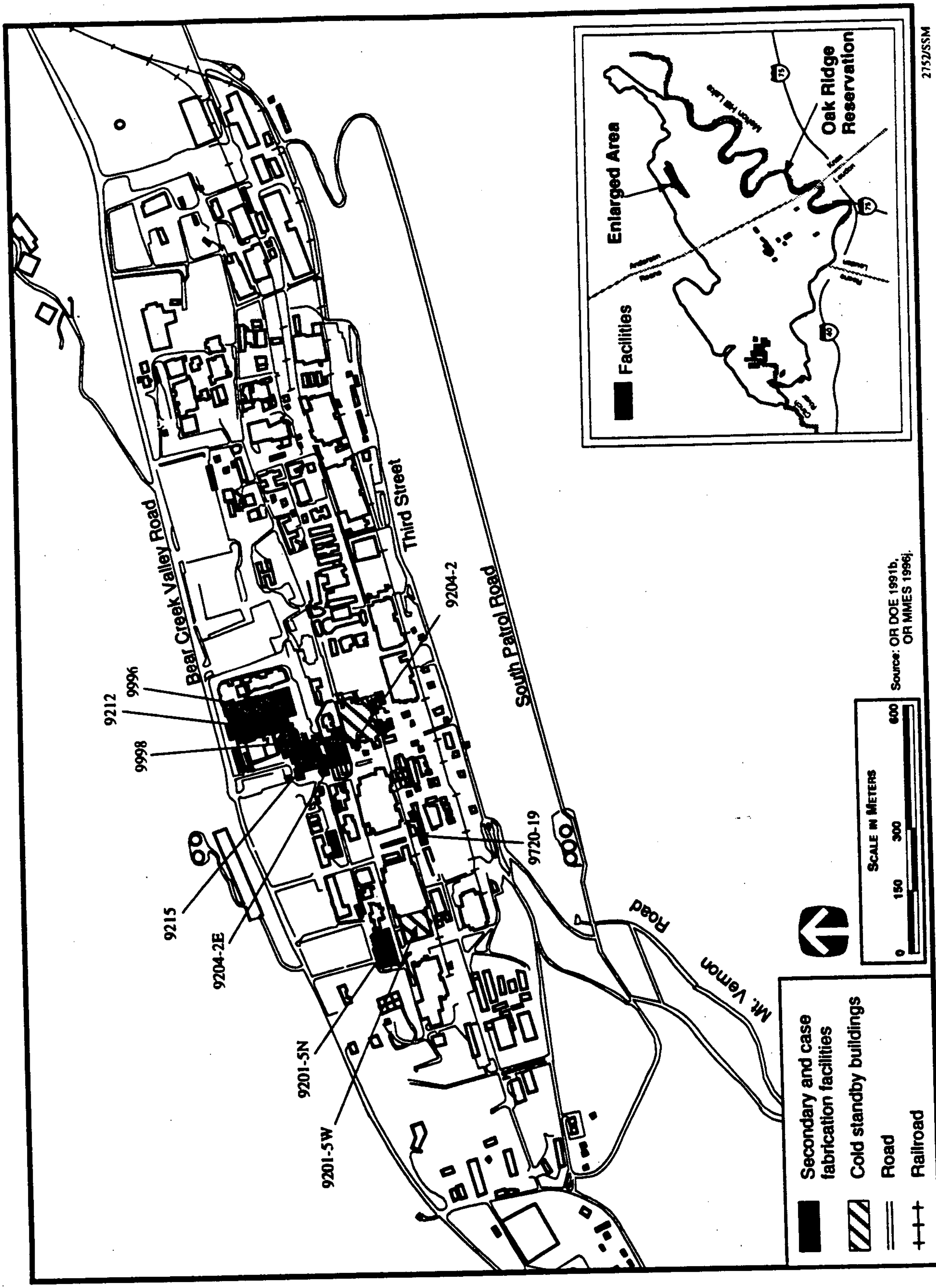


FIGURE 3.4.4.2-2.—*Secondary and Case Fabrication and Materials Management Areas Plot Plan at Y-12 Plant.*

buildings to meet natural phenomena requirements. The modifications would be as follows:

- Building 9996: Connections between the building and the A-2 Wing of Building 9212 complex would be strengthened.

- Building 9212: Modifications would be made to numerous columns, knee braces, and cross braces to provide proper stiffness and load distribution.

- Buildings 9215: The M-Wing area of this building would be converted primarily for enriched uranium storage. The high case would require some machine tools to be in cold standby. The F-Wing area would house the can shop, to be relocated from Building 9201-1. The roof deck would be tack welded to existing purlins, additional corner supports would be added to this area of the roof, and four new scuppers would be added.

- Building 9998: This building houses the depleted uranium/binary foundry area. The installation of a 3,175-t (3,500-ton) press would be required in F-Area. Enriched uranium machining and the associated dimensional inspection would be relocated to the H2-Area. Other additions include the plasma-spray coating and ceramic machining operations to be located in the G3-Area. Some new equipment for special materials processing would also be installed in the G3-Area. Four steel columns and two steel girders would be strengthened by adding additional steel. Roof bracing would be added and additional tack welding of the roof support steel would be done.

- Building 9201-5N: Tack weld roof deck to roof, provide additional roof corner support, and install scuppers.

- Building 9204-2E: The first floor of this building would have a lithium processing, forming, and machining area installed. The metal room deck would be tack welded to existing purlins, and additional roof scuppers would be added.

- Building 9201-5W: The placement of this building in cold standby would be accomplished by installation of a new east wall that would separate the 5W-Area from the rest of the building.

- Building 9204-2: Isolation of most of this building would be required to put the building in cold standby. The only portion of the building that would be used for the base case secondary and case fabrication plant would be the isostatic press area in the northwest corner of the building. Additional roof scuppers would be added and the metal roof deck would be tack welded to the existing purlins. Major structural upgrading would be required on the eastern portion of the building.

Table 3.4.4.2–1 shows construction requirements for the Y-12 Secondary and Case Fabrication Facility.

TABLE 3.4.4.2–1.—*Y-12 Plant Secondary and Case Fabrication Facility Construction Requirements*

Requirement	Consumption
Material/Resource	
Electrical energy (MWh)	2.7
Peak electrical demand (MWe)	0.2
Concrete (m^3)	100
Steel (t)	20
Gasoline, diesel, and lube oil (L)	10,000
Industrial gases[a] (m^3)	300
Water (L)	2,000,000
Land (ha)	NA[b]
Employment[c]	
Total employment (worker years)	72
Peak employment (workers)	14
Construction period (years)	6

[a] Cubic meters at standard temperature and pressure.
[b] Laydown area for construction within existing facilities or previously disturbed areas.
[c] Does not include employment requirements for D&D of vacated buildings.
Note: NA - not applicable.
Source: OR MMES 1996j; ORR 1995a:3; ORR 1995a:4.

Operation. Table 3.4.4.2–2 shows the surge operating requirements for the Y-12 Secondary and Case Fabrication Facility.

Waste Management. The ORR existing waste management infrastructure can be applied to manage and treat all anticipated waste streams from this alternative. All hazardous, radioactive, and mixed wastes generated at Y-12 facilities would be managed in accordance with all applicable Federal and state waste regulations. The wastes anticipated from the estimated workloads would not require significant modification of the existing ORR waste management infrastructure. Waste generation for construction and operation of the Y-12 secondary and case fabrication alternative is shown in table 3.4.4.2–3.

TABLE 3.4.4.2–2.—*Y-12 Plant Secondary and Case Fabrication Facility Surge Operation Annual Requirements*

Requirement	Consumption
Resource	
Electrical energy (MWh)	118,000
Peak electrical demand (MWe)	19
Liquid fuel (L)	250,000
Natural gas[a] (m^3)	17,000,000
Water (L)	1,510,000,000
Coal (t)	500
Plant Footprint (ha)	NA[b]
Employment (Workers)	4,508[c]

[a] Cubic meters at standard temperature and pressure.
[b] Contained within existing facilities.
[c] Includes 1,152 D&D workers, 1,980 work for others.
Note: NA - not applicable.
Source: OR MMES 1996j; ORR 1995a:3; ORR 1995a:4.

TABLE 3.4.4.2–3.—*Y-12 Plant Secondary and Case Fabrication Facility Waste Volumes*

Category	Annual Average Volume Generated from Construction (m^3)	Annual Volume Generated from Surge Operations (m^3)	Annual Volume Effluent from Surge Operations (m^3)
Low-Level			
Liquid	None	320	None
Solid	8	1,120[a]	570[b]
Mixed Low-Level			
Liquid	None	3,400	3,400
Solid	1	92[c]	92
Hazardous			
Liquid	None	Included in mixed	Included in mixed
Solid	2	Included in mixed	Included in mixed
Nonhazardous (Sanitary)			
Liquid	27	320,000	319,400[d]
Solid	30[e]	13,500[f]	7,670[g]
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	Included in sanitary
Solid	2	10,000[h]	Included in sanitary

[a] Includes 10 m^3 of classified waste, 40 drums depleted uranium ash from chip oxidation (one 55-gal drum=0.2 m^3), and 1,100 m^3 of unclassified waste.
[b] Assumes 100:1 wastewater to sludge ratio for the treatment of liquid LLW followed by 2:1 for solidification. Assumes two-thirds of LLW is compactible by a factor of 4:1. LLW in drums is not compactible.
[c] Includes 2 m^3 of classified waste and 90 m^3 of unclassified waste.
[d] Y-12 only pretreats industrial wastewater prior to discharge to the city of Oak Ridge municipal sanitary sewer system.
[e] Includes 3.4 m^3 of concrete and 4.1 t of steel.
[f] Includes 5 m^3 of classified waste.
[g] Assumes two-thirds of solid is compactible by a factor of 4:1.
[h] Recyclable wastes.
Source: OR MMES 1996j; ORR 1995a:4.

3.4.4.3 *Relocate to Los Alamos National Laboratory*

This alternative would establish a secondary and case fabrication capability using the processes proven at Y-12 and would use facilities in 11 existing buildings. The LANL Secondary and Case Fabrication Facility operations would fall into the following four categories:

- Enriched uranium operations
- Depleted uranium and uranium alloy operations
- Special materials fabrication for lithium compounds and other materials
- Nonnuclear fabrication and processing for nonnuclear secondary and case parts and materials

This alternative is discussed in more detail in appendix section A.3.2.2.

Construction. Secondary and case fabrication at LANL would utilize existing facilities within the boundaries of TAs -3, -8, -50, -55, and -54. Facilities within each of these TAs include the TA-3 Sigma complex (Buildings SM-35, SM-66, and SM-141), the TA-3 Chemistry and Metallurgy Research Building (Building SM-29), the TA-3 Main Machine Shop (Buildings SM-39 and SM-102), the TA-8 Nondestructive Evaluation Facility (Buildings 22 and 23), the TA-55 Nuclear Material Storage Facility for overflow capacity, the TA-50 Liquid Radioactive Waste Management Facility, and the TA-54 Solid Radioactive Waste Management Area. These areas are shown in figure 3.4.4.3–1.

Figure 3.4.4.3–2 shows the major structures located in TA-3. The buildings shown on this plot plan for use in stockpile stewardship and management operations are SM-29, SM-35, SM-39, SM-66, SM-102, and SM-141. Modifications would be required for the following facilities:

- Renovations to Wings 2, 4, and 9 of the Chemistry and Metallurgy Research Building
- Main machine shop change room and ventilation upgrades
- Sigma complex lithium forming, machining, and inspection
- Sigma complex lithium purification and storage

Modification to the LANL facilities to perform the stockpile management secondary and case fabrication mission would require approximately 7 years for design, construction, mission transfer, and operational startup. Table 3.4.4.3–1 shows construction requirements for the LANL Secondary and Case Fabrication Facility.

Table 3.4.4.3–1.—*Los Alamos National Laboratory Secondary and Case Fabrication Facility Construction Requirements*

Requirement	Consumption
Material/Resource	
Electrical energy (MWh)	4,130
Peak electrical demand (MWe)	0.75
Concrete (m^3)	245
Steel (t)	54
Gasoline, diesel, and lube oil (L)	22,700
Industrial gases[a] (m^3)	11,500
Water (L)	4,160,000
Land (ha)	NA[b]
Employment	
Total employment (worker years)	205
Peak employment (workers)	55
Construction period (years)	4

[a] Cubic meters at standard temperature and pressure.
[b] Laydown area for construction within existing facilities or previously disturbed areas.
Note: NA - not applicable.
Source: LANL 1995b:4; LANL 1995e.

Operation. Table 3.4.4.3–2 shows the surge operating requirements for the LANL Secondary and Case Fabrication Facility.

Waste Management. The LANL existing waste management infrastructure can be applied to manage and treat all anticipated waste streams from this alternative. All hazardous, radioactive, and mixed wastes generated at LANL facilities would be managed in accordance with all applicable Federal and state

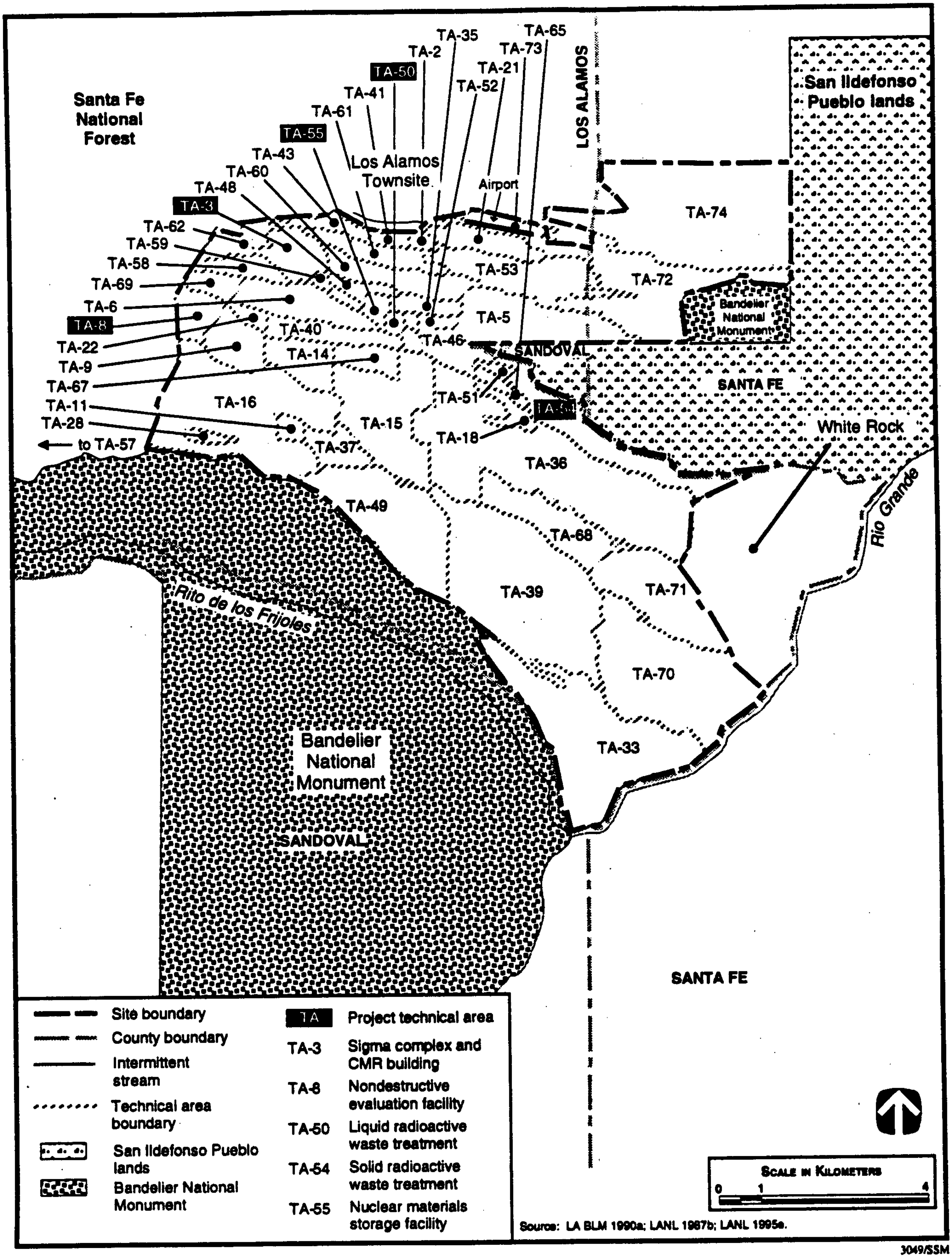


FIGURE 3.4.4.3–1.—*Secondary and Case Fabrication Alternative Technical Areas at Los Alamos National Laboratory.*

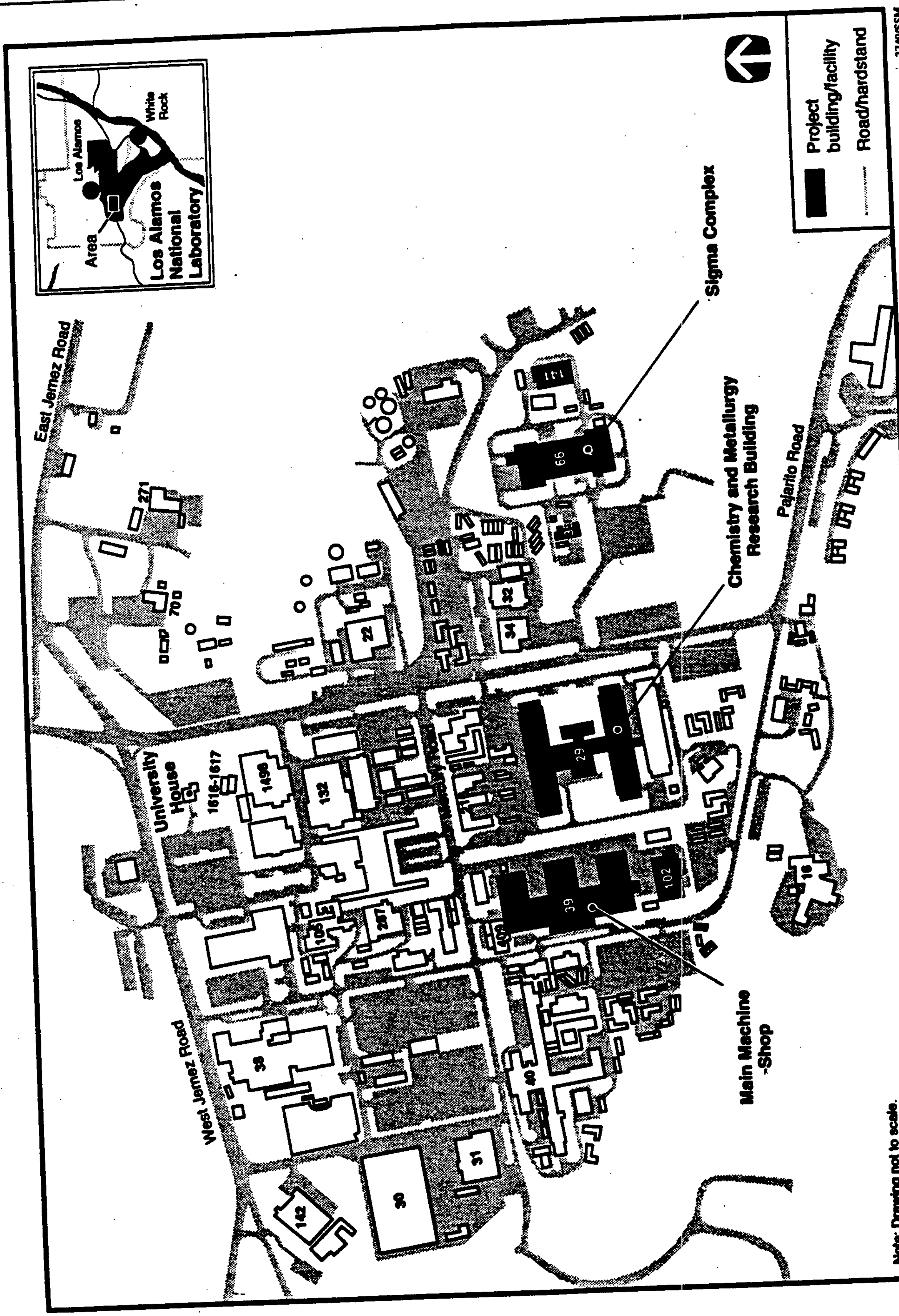


FIGURE 3.4.4.3–2.—***Secondary and Case Fabrication Alternative Facilities at Los Alamos National Laboratory, Technical Area 3.***

TABLE 3.4.4.3–2.—*Los Alamos National Laboratory Secondary and Case Fabrication Facility Surge Operation Annual Requirements*

Requirement	Consumption
Resource	
Electrical energy (MWh)	36,000
Peak electrical demand (MWe)	5
Liquid fuel (L)	100,000
Natural gas[a] (m^3)	None
Water (L)	55,000,000
Plant Footprint (ha)	NA[b]
Employment (Workers)	523[c]

[a] Cubic meters at standard temperature and pressure.

[b] Contained within existing facilities.

[c] Total surge employment. Increment to current employment would be 321.

Note: NA - not applicable.

Source: LANL 1995b:4; LANL 1995e.

waste regulations. The wastes anticipated from the estimated workloads would not require significant modification of the existing LANL waste management infrastructure. Waste generation for construction and operation of the LANL secondary and case fabrication alternative is shown in table 3.4.4.3–3.

3.4.4.4 *Relocate to Lawrence Livermore National Laboratory*

This alternative would establish a secondary and case fabrication capability using the processes proven at Y-12, and would use facilities in existing buildings. The LLNL Secondary and Case Fabrication Facility operations are the same as those described in section 3.4.4.3. This alternative is discussed in more detail in appendix section A.3.2.3.

Construction. Manufacturing and assembly of the secondaries and cases would take place at the Livermore Site (figure 3.4.4.4–1) in the buildings shown on the LLNL site plan, figure 3.4.4.4–2. The

TABLE 3.4.4.3–3.—*Los Alamos National Laboratory Secondary and Case Fabrication Facility Waste Volumes*

Category	Annual Average Volume Generated from Construction (m^3)	Annual Volume Generated from Surge Operations (m^3)	Annual Volume Effluent from Surge Operations (m^3)
Low-Level			
Liquid	None	192	None
Solid	134	690	349[a]
Mixed Low-Level			
Liquid	None	30	30
Solid	10	108	108
Hazardous			
Liquid	None	60	60
Solid	37	216	216
Nonhazardous (Sanitary)			
Liquid	890	20,240	20,370
Solid	120	1,160	639[b]
Nonhazardous (Other)			
Liquid	Included in sanitary	None	None
Solid	10[c]	3,000	3,000

[a] Assumes two-thirds of the solid LLW is compactible by a factor of 4:1. The wastewater to sludge ratio for liquid LLW treatment is 100:1 followed by 2:1 solidification ratio.

[b] Assumes two-thirds of the solid waste is compactible by a factor of 4:1. The wastewater to sludge ratio for liquid sanitary treatment is 350:1.

[c] Includes 300 t of recyclable steel and 18 t of recyclable copper.

Source: LANL 1995b:4; LANL 1995e.

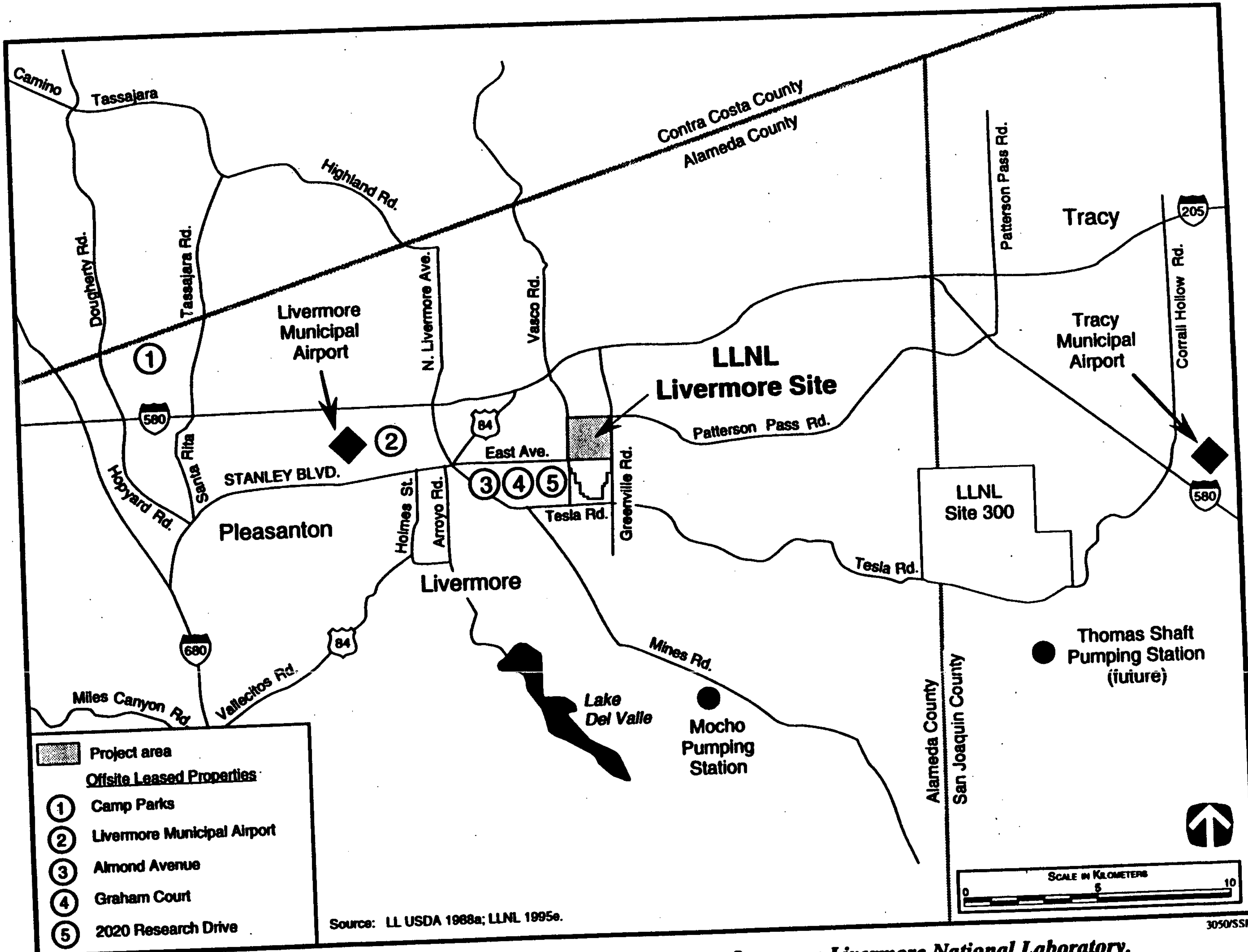


FIGURE 3.4.4.4–1.—*Secondary and Case Fabrication Area at Lawrence Livermore National Laboratory.*

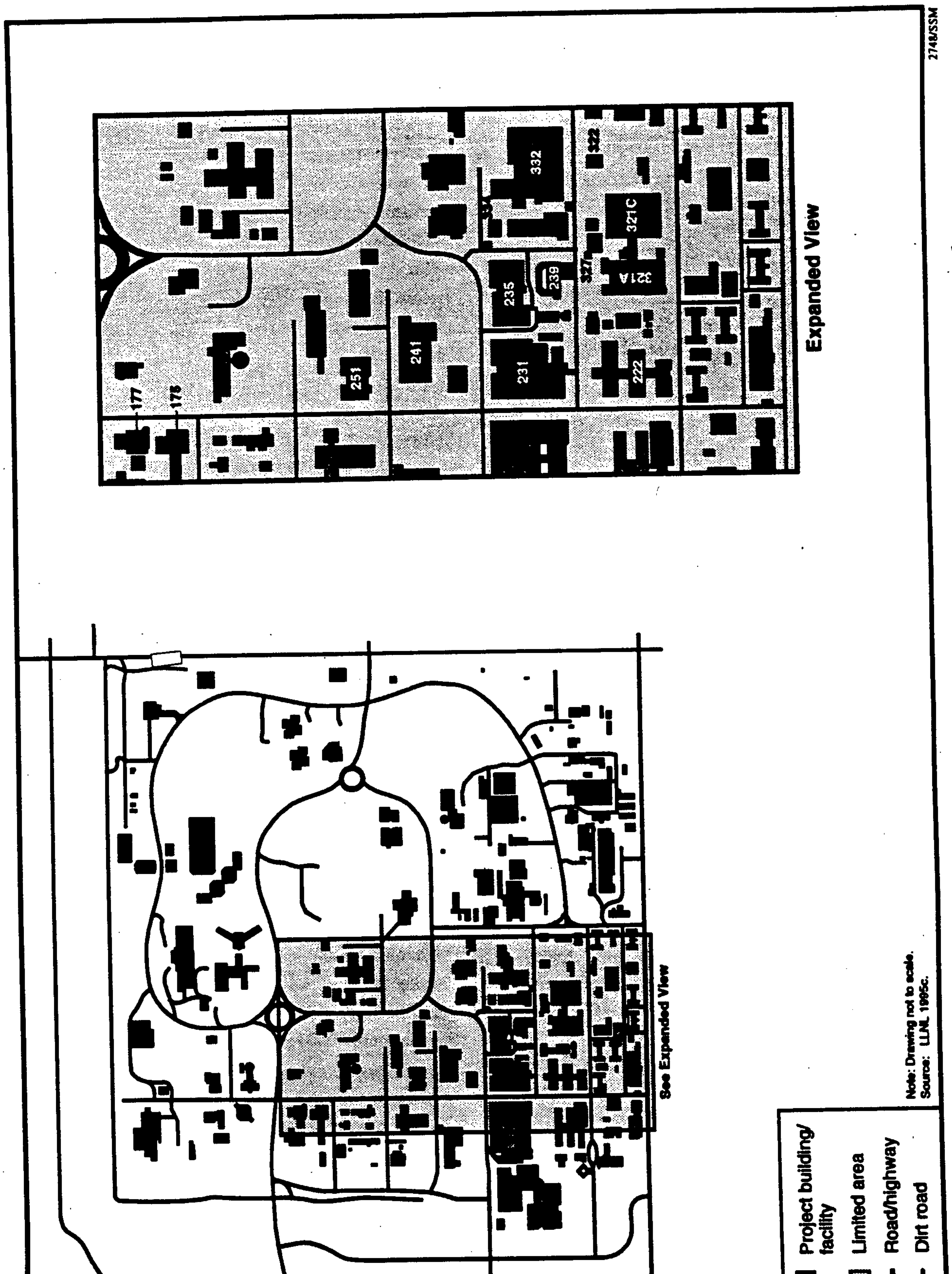


FIGURE 3.4.4.4–2.—*Secondary and Case Fabrication Site Plan at Lawrence Livermore National Laboratory.*

secondary and case fabrication facilities at LLNL would principally involve the following buildings with minor modifications:

- Building 175 for E-beam melt facility for uranium alloy billets
- Building 231 for uranium foundry and metal working for uranium alloys
- Building 241 for special material fabrication (lithium and other special materials)
- Building 321 for machining of depleted uranium and uranium alloys and fabrication of nonnuclear components
- Building 332 as the Main Enriched Uranium Piece Part Fabrication Facility and the Main A/D Quality Evaluation Facility
- Building 334 as an extension to Building 332

In addition, the secondary and case fabrication functions would share facilities in several buildings with other LLNL programs for sample test activities. While this alternative would not require new building construction, it would require some modifications and building renovations, and the construction of a 167 m^2 (1,800 ft^2) steel frame covered space within the Superblock protected area to house the enriched uranium inventory. Table 3.4.4.4–1 shows construction requirements for the LLNL Secondary and Case Fabrication Facility.

Operation. Table 3.4.4.4–2 shows the surge operating requirements for the LLNL Secondary and Case Fabrication Facility.

Waste Management. The LLNL existing waste management infrastructure can be applied to manage and treat all anticipated waste streams from this alternative. All hazardous, radioactive, and mixed wastes generated at LLNL facilities would be managed in accordance with all applicable Federal and state waste regulations. The wastes anticipated from the estimated workload would not require significant modifications to the existing LLNL waste management infrastructure. Waste generation for construction and operation of the LLNL secondary and case fabrication alternative is shown in table 3.4.4.4–3.

TABLE 3.4.4.4–1.—*Lawrence Livermore National Laboratory Secondary and Case Fabrication Facility Construction Requirements*

Requirement	Consumption
Material/Resource	
Electrical energy (MWh)	3,500
Peak electrical demand (MWe)	0.4
Concrete (m^3)	612
Steel (t)	73
Gasoline, diesel, and lube oil (L)	908,000
Industrial gases[a] (m^3)	142
Water (L)	8,710,000
Land (ha)	NA[b]
Employment	
Total employment (worker years)	330
Peak employment (workers)	130
Construction period (years)	3

[a] Cubic meters at standard temperature and pressure.
[b] Laydown area for construction within existing facilities or previously disturbed areas.
Note: NA - not applicable.
Source: LLNL 1995e.

TABLE 3.4.4.4–2.—*Lawrence Livermore National Laboratory Secondary and Case Fabrication Facility Surge Operation Annual Requirements*

Requirement	Consumption
Resource	
Electrical energy (MWh)	15,000
Peak electrical demand (MWe)	2.0
Liquid fuel (L)	85,200
Natural gas[a] (m^3)	566,000
Water (L)	194,000,000
Plant Footprint (ha)	NA[b]
Employment (Workers)	760[c]

[a] Cubic meters at standard temperature and pressure.
[b] Contained within existing facilities.
[c] Total surge employment. Increase to current employment would be 290.
Note: NA - not applicable.
Source: LLNL 1995e; LLNL 1995i:3; LLNL 1996i:2.

3.4.5 High Explosives Fabrication Alternatives

The HE fabrication mission is described in two functional areas: HE main charge fabrication and small HE component fabrication. Capabilities required

TABLE 3.4.4.4–3.—*Lawrence Livermore National Laboratory Secondary and Case Fabrication Facility Waste Volumes*

Category	Annual Average Volume Generated from Construction (m^3)	Annual Volume Generated from Surge Operations (m^3)	Annual Volume Effluent from Surge Operations (m^3)
Low-Level			
Liquid	None	105	None
Solid	5	370	304
Mixed Low-Level			
Liquid	None	550	550
Solid	None	12	12
Hazardous			
Liquid	11	540	540
Solid	41	18	18
Nonhazardous (Sanitary)			
Liquid	5,050	102,000	102,000
Solid	2,820	4,320	4,320
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	Included in sanitary
Solid	255	3,200[a]	None

[a] Recyclable wastes.

Source: LLNL 1995e; LLNL 1995i:3.

include manufacturing process development, formulation, synthesis, main charge manufacturing (pressing, machining, subassembly, receiving/storage, quality assurance, and disposition), and energetic component manufacture. The HE fabrication mission supports the production aspect of stockpile management and also supports HE surveillance and some stockpile stewardship activities.

3.4.5.1 *No Action*

Under No Action, Pantex would continue, in its current configuration, the fabrication and surveillance of HE components for nuclear weapons. LANL and LLNL would continue to perform weapons HE R&D, surveillance, and HE safety studies.

3.4.5.2 *Downsize at Pantex Plant*

The Pantex HE fabrication alternative would downsize and consolidate current HE operations and facilities. This alternative would be considered only in conjunction with maintaining the weapons A/D mission at Pantex. Although there is no requirement for collocation of weapons A/D and HE fabrication, it would not be practical to maintain Pantex operations solely for HE fabrication. This alternative is discussed in more detail in appendix section A.3.5.1.

Construction. Figures 3.4.5.2–1, 3.4.5.2–2, and 3.4.5.2–3 show Zones 11 and 12 and the existing facilities within these zones that are part of the HE fabrication proposal. Only minor modifications to existing facilities within Zones 11 and 12 would be required. The Pantex HE fabrication alternative would use existing buildings and facilities within Zones 4, 11, 12, FS-11, FS-22, FS-24, and the Burning Ground. Table 3.4.5.2–1 shows construction requirements for the Pantex HE Fabrication Facility.

Operation. The HE fabrication process comprises HE main charge fabrication, small HE component fabrication, HE formulation and synthesis, and HE testing and characterization. Processes used include isostatic pressing, machining, mechanical punch and die pressing, laser welding, explosive-extrusion, mechanical assembly, dimensional checking, and a variety of testing methodologies. There would be no change in processes or operations for HE fabrication from existing Pantex operations. Table 3.4.5.2–2 shows the annual Pantex HE Fabrication Facility surge operating requirements.

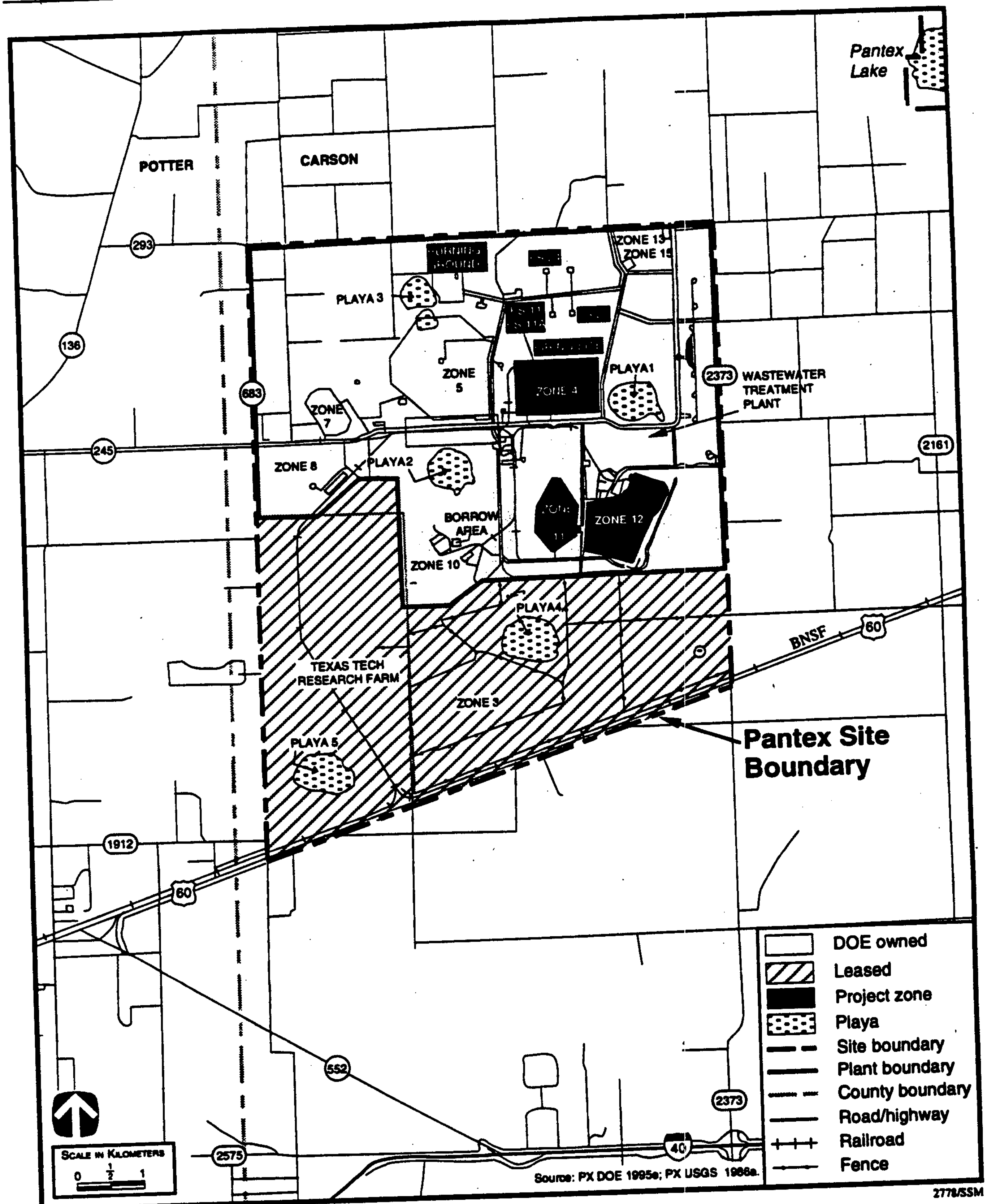


FIGURE 3.4.5.2–1.—*High Explosives Fabrication Alternative Locations at Pantex Plant.*

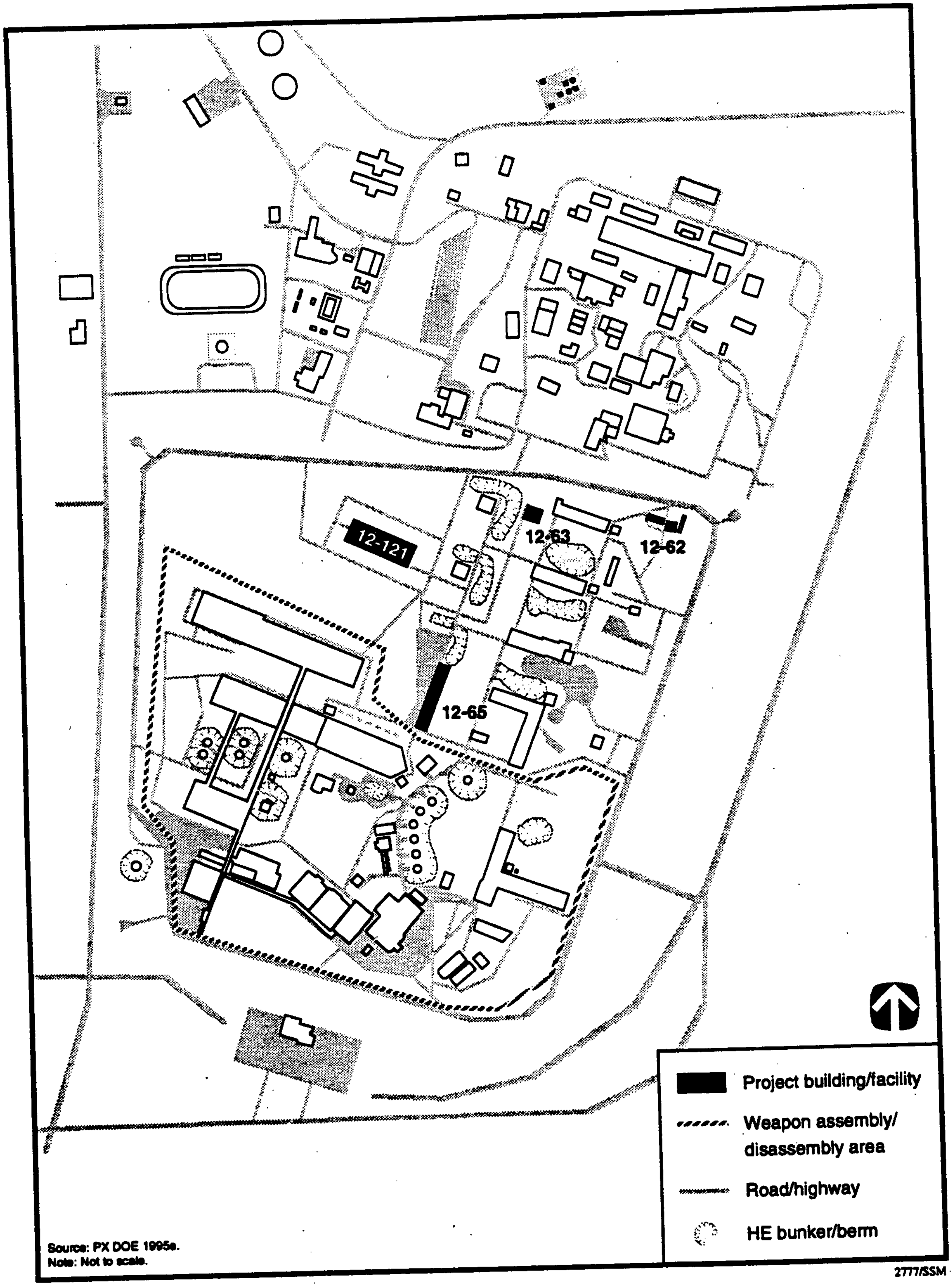


FIGURE 3.4.5.2–2.—*High Explosives Fabrication Alternative Facilities Within Zone 12 at Pantex Plant.*

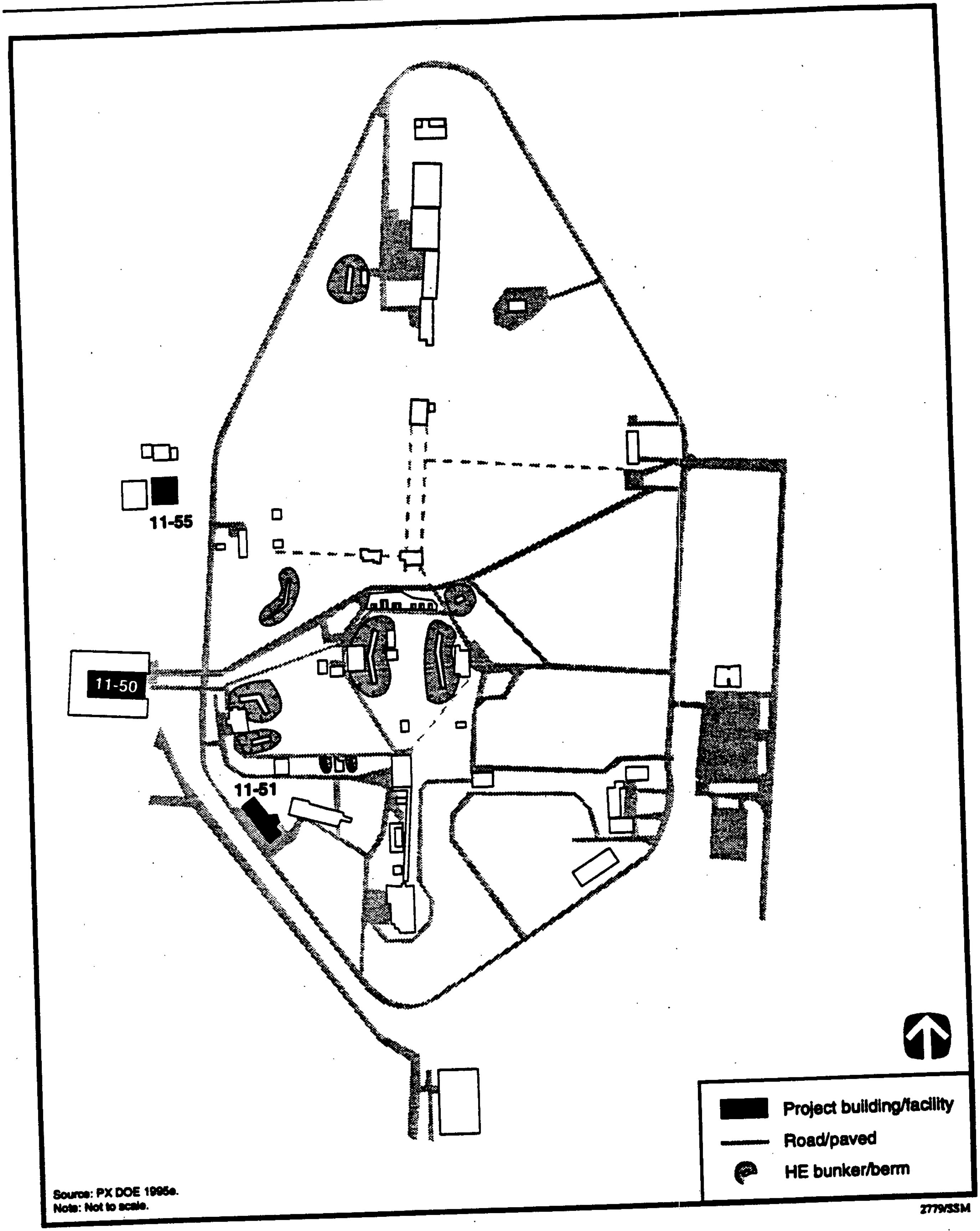


FIGURE 3.4.5.2–3.—*High Explosives Fabrication Alternative Facilities Within Zone 11 at Pantex Plant.*

TABLE 3.4.5.2–1.—*Pantex Plant High Explosives Fabrication Facility Construction Requirements*

Requirement	Consumption
Material/Resource	
Electrical energy (MWh)	257
Peak electrical demand (MWe)	2
Concrete (m^3)	356
Steel (t)	6
Gasoline, diesel, and lube oil (L)	12,200
Industrial gases[a] (m^3)	258
Water (L)	644,000
Land (ha)	NA[b]
Employment	
Total employment (worker years)	46
Peak employment (workers)	29
Construction period (years)	3

[a] Cubic meters at standard temperature and pressure.

[b] Laydown area for construction within existing facilities or previously disturbed areas.

Note: NA - not applicable.

Source: PX DOE 1995e.

TABLE 3.4.5.2–2.—*Pantex Plant High Explosives Fabrication Facility Surge Operation Annual Requirements*

Requirement	Consumption
Resource	
Electrical energy (MWh)	3,250
Peak electrical demand (MWe)	1
Liquid fuel (L)	55,600
Natural gas[a] (m^3)	500,000
Water (L)	12,500,000
Plant Footprint (ha)	NA[b]
Employment (Workers)	37[c]

[a] Cubic meters at standard temperature and pressure.

[b] Contained within existing facilities.

[c] No overhead workers are attributable to the HE mission.

Note: NA - not applicable.

Source: PX 1995a:5; PX 1995a:6; PX 1996e:1; PX DOE 1995e.

Waste Management. The existing Pantex waste management infrastructure can be applied to manage and treat all anticipated waste streams from this alternative. All hazardous, nonhazardous, and a minimal quantity of radioactive waste generated at Pantex facilities would be managed in accordance with all applicable Federal and state waste regulations. The wastes anticipated from the estimated workloads would not require significant modification of the existing Pantex waste management infrastructure. Waste generation for construction and operation of the Pantex HE fabrication alternative is shown in table 3.4.5.2–3.

3.4.5.3 *Relocate to Los Alamos National Laboratory*

This alternative would transfer HE operations to LANL from Pantex during a 2-year transition period, during which Pantex would continue to support the stockpile. This alternative would use existing LANL R&D facilities, which have sufficient capacity to accommodate the required workload. This alternative is discussed in more detail in appendix section A.3.5.2. The option to share the HE mission with LLNL is bounded by this analysis and is not discussed further.

Construction. LANL HE fabrication process capability is already established. HE fabrication and storage functions would be supported in existing facilities at LANL TAs -9, -16, and -37 (figure 3.4.5.3–1). Since LANL HE plant facilities already exist and have sufficient capacity for stockpile management requirements, no new building construction and no significant modifications would be required. As indicated in table 3.4.5.3–1, there would be minimal resource requirements other than personnel for modification and transition, and no waste would be generated. Figure 3.4.5.3–2 shows the existing major HE fabrication facilities at TA-16. Additional TAs would provide production support and testing functions.

Operation. The HE fabrication alternative at LANL would operate in the same manner as current HE fabrication processes and operations. HE processing facilities at LANL were designed and built for production-scale operations and were operated as production facilities for many years. The current baseline production technologies in use at Pantex would be used at LANL. HE processing at LANL includes HE storage; HE synthesis; HE formulations, pressing, machining, assembly, and subassembly of HE devices; quality assurance activities; and HE disposal. Operations would also continue to provide environmental, safety, and performance testing of HE and HE assemblies. Table 3.4.5.3–2 shows the annual LANL HE Fabrication Facility surge operating requirements.

TABLE 3.4.5.2–3.—*Pantex Plant High Explosives Fabrication Facility Waste Volumes*

Category	Annual Average Volume Generated from Construction (m^3)	Annual Volume Generated from Surge Operations (m^3)	Annual Volume Effluent from Surge Operations (m^3)
Low-Level			
Liquid	None	None	None
Solid	None	Minimal	Minimal
Mixed Low-Level			
Liquid	None	None	None
Solid	None	None	None
Hazardous			
Liquid	None	0.23	0.23
Solid	0.06	30	30
Nonhazardous (Sanitary)			
Liquid	146	7,120	7,120
Solid	None	17	8[a]
Nonhazardous (Other)			
Liquid	Included in sanitary	None	None
Solid	2[b]	Included in sanitary	Included in sanitary

[a] Assumes two-thirds of solid sanitary waste is compactible by a factor of 4:1.
[b] Includes 2 m^3 of concrete and 0.25 t (0.28 tons) of steel that is recycled. Density of steel was assumed to be 0.127 m^3/t for volume conversion.
Source: PX 1995a:5; PX 1995a:6; PX DOE 1995e.

TABLE 3.4.5.3–1.—*Los Alamos National Laboratory High Explosives Fabrication Facility Construction Requirements*

Requirement	Consumption
Material/Resource	
Electrical energy (MWh)	Minimal
Peak electrical demand (MWe)	Minimal
Concrete (m^3)	Minimal
Steel (t)	Minimal
Gasoline, diesel, and lube oil (L)	Minimal
Industrial gases[a] (m^3)	Minimal
Water (L)	Minimal
Land (ha)	NA[b]
Employment	
Total employment (worker years)	77
Peak employment (workers)	46
Construction period (years)	2

[a] Cubic meters at standard temperature and pressure.
[b] Laydown area for construction within existing facilities or previously disturbed areas.
Note: NA - not applicable.
Source: LANL 1995d.

TABLE 3.4.5.3–2.—*Los Alamos National Laboratory High Explosives Fabrication Facility Surge Operation Annual Requirements*

Requirement	Consumption
Resource	
Electrical energy (MWh)	5,600
Peak electrical demand (MWe)	1
Liquid fuel (L)	94,600
Natural gas[a] (m^3)	3,650,000
Water (L)	13,000,000
Plant Footprint (ha)	NA[b]
Employment (Workers)	200[c]

[a] Cubic meters at standard temperature and pressure.
[b] Contained within existing facilities.
[c] Total surge employment. Increase to current employment would be 67.
Note: NA - not applicable.
Source: LANL 1995b:4; LANL 1995d.

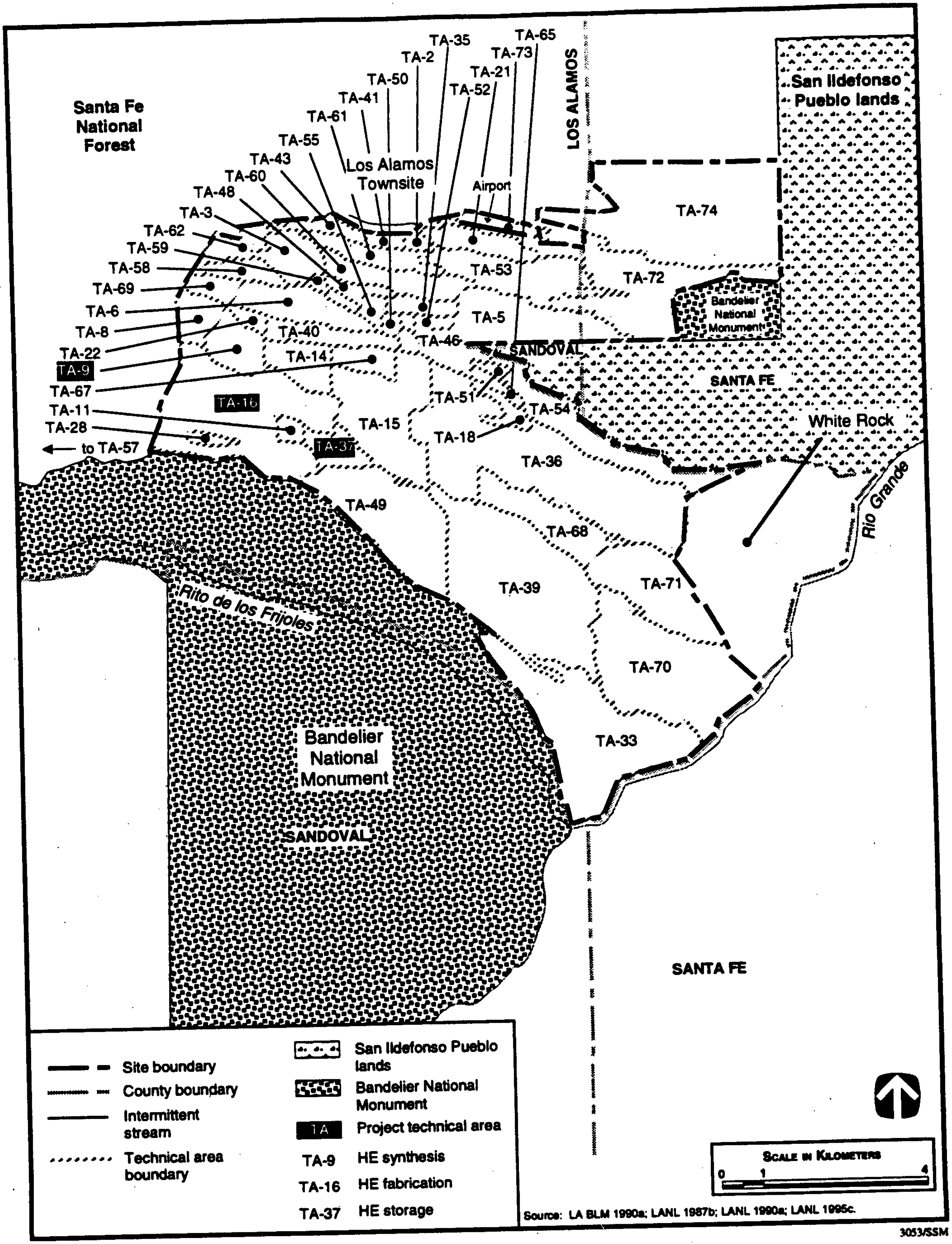


FIGURE 3.4.5.3–1.—*High Explosives Fabrication Alternative Technical Areas at Los Alamos National Laboratory.*

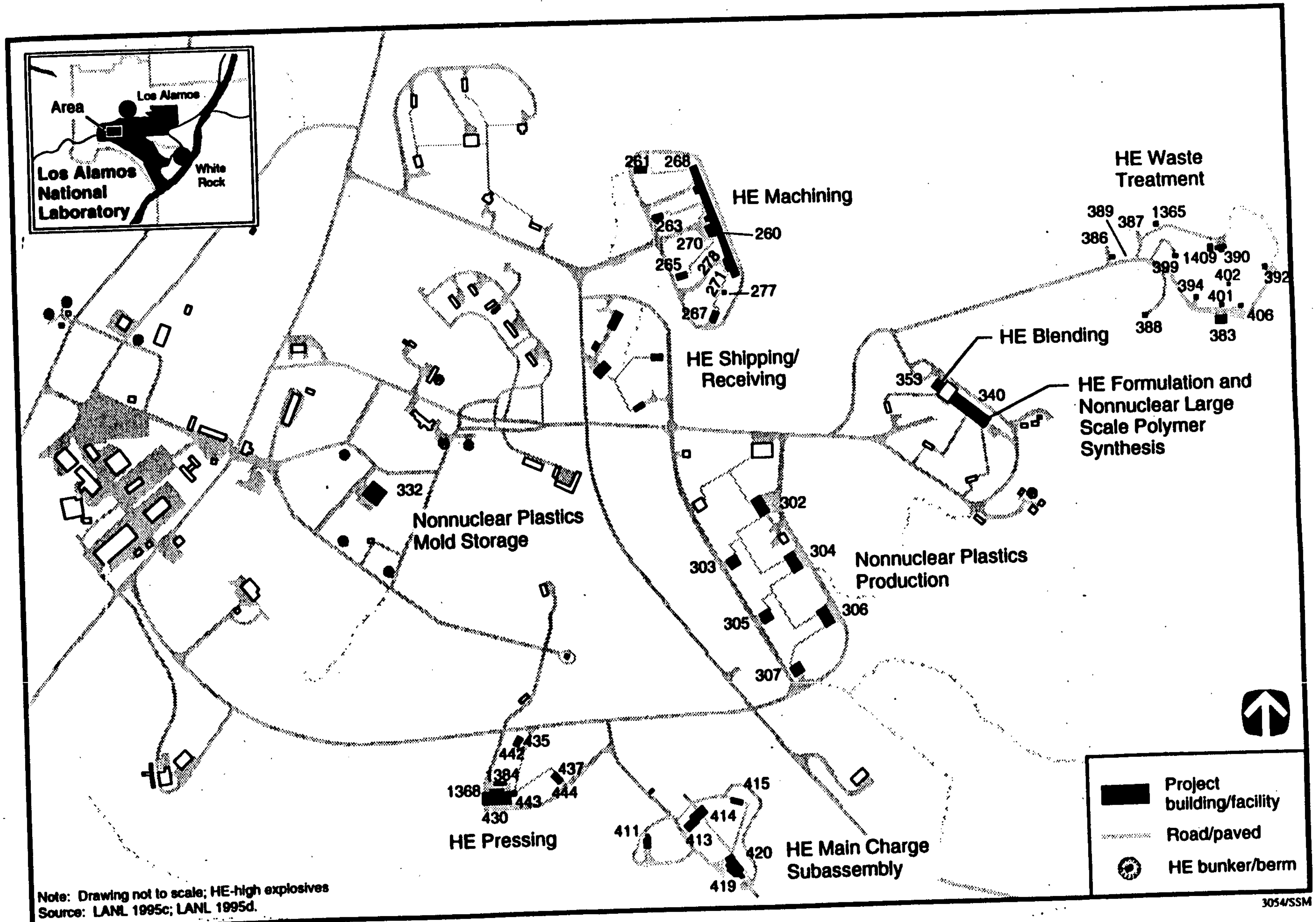


FIGURE 3.4.5.3–2.—*Technical Area 16 Site Plan at Los Alamos National Laboratory.*

Waste Management. The existing LANL waste management infrastructure can be applied to manage and treat all anticipated waste streams from this alternative. All hazardous, nonhazardous, and a minimal quantity of radioactive waste generated at LANL facilities would be managed in accordance with all applicable Federal and state waste regulations. The wastes anticipated from the estimated workloads would not require significant modification of the existing LANL waste management infrastructure. Waste generation for construction and operation of the LANL HE fabrication alternative is shown in table 3.4.5.3–3.

3.4.5.4 *Relocate to Lawrence Livermore National Laboratory*

The LLNL HE fabrication alternative would transfer HE fabrication activities from Pantex over a 2-year transition period, during which Pantex would continue to support the stockpile. The LLNL HE Fabrication Facility would consist of the HE technology functional area with four main functions: HE main charge fabrication, small HE component fabrication, HE formulation and synthesis, and HE testing and characterization. This alternative would use existing R&D facilities, with some minor enhancements and modifications. The LLNL HE fabrication alternative is discussed in more detail in appendix section A.3.5.3. The option to share the HE mission with LANL is bounded by this analysis and is not discussed further.

Construction. The LLNL HE fabrication alternative would require construction of 1 new facility and would use 23 existing buildings, 66 existing magazines, and various utilities and services at Site 300 (figure 3.4.5.4–1). The one new facility would be for storage of HE. This building would have 11,350 kg (25,000 lb) of conventional HE bulk and parts storage for a 116 m^2 (1,250 ft^2) staging capacity. Table 3.4.5.4–1 shows construction requirements for the LLNL HE Fabrication Facility.

Operation. The LLNL HE fabrication alternative activities would continue using the same facilities,

TABLE 3.4.5.3–3.—*Los Alamos National Laboratory High Explosives Fabrication Facility Waste Volumes*

Category	Annual Average Volume Generated from Construction (m^3)	Annual Volume Generated from Surge Operations (m^3)	Annual Volume Effluent from Surge Operations (m^3)
Low-Level			
Liquid	None	None	None
Solid	None	Minimal	Minimal
Mixed Low-Level			
Liquid	None	None	None
Solid	None	None	None
Hazardous			
Liquid	None	4[a]	4
Solid	None	13	13
Nonhazardous (Sanitary)			
Liquid	None	5,900	5,880[b]
Solid	None	Included in liquid	17
Nonhazardous (Other)			
Liquid	None	6,930[c]	6,930
Solid	None	28	28

[a] Includes high explosives process solvents and contaminated oils.
[b] Assumes 350:1 wastewater to sludge ratio in treatment of liquid sanitary waste.
[c] Treated process water to NPDES-permitted outfalls.
Source: LANL 1995b:3; LANL 1995b:4; LANL 1995d.

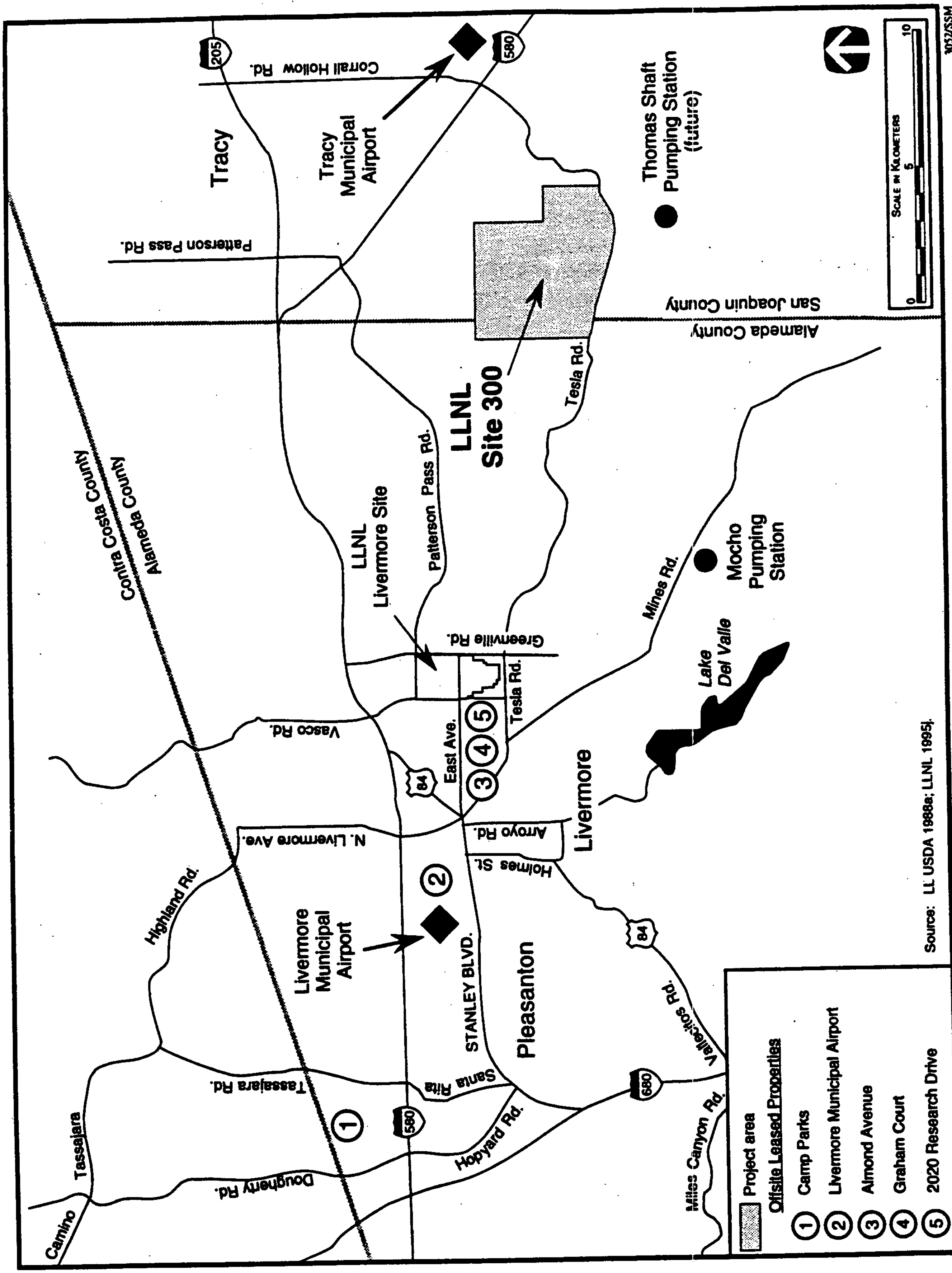


FIGURE 3.4.5.4–1.—*High Explosives Fabrication Alternative Area at Lawrence Livermore National Laboratory.*

TABLE 3.4.5.4–1.—*Lawrence Livermore National Laboratory High Explosives Fabrication Facility Construction Requirements*

Requirement	Consumption
Material/Resource	
Electrical energy (MWh)	15
Peak electrical demand (MWe)	0.2
Concrete (m^3)	190
Steel (t)	15
Gasoline, diesel, and lube oil (L)	9,500
Industrial gases[a] (m^3)	3
Water (L)	1,230,000
Land (ha)	0.8
Employment	
Total employment (worker years)	19
Peak employment (workers)	19
Construction period (years)	1

[a] Cubic meters at standard temperature and pressure.
Source: LLNL 1995i:3; LLNL 1995j.

processes, and operations as the existing HE manufacturing conducted at the site. The current baseline technologies in use at Pantex would be used at LLNL. The production and fabrication of the HE components and materials mission would be accommodated by an incremental increase in the workload currently supported by the HE technology at LLNL. The HE processing at LLNL includes storage, synthesis, formulation, pressing, machining, assembly, and subassembly of HE devices; quality assurance activities; and HE disposal. LLNL operations would also continue to provide environmental, safety, and performance testing of HE and HE assemblies. Table 3.4.5.4–2 shows the annual LLNL HE Fabrication Facility surge operating requirements.

TABLE 3.4.5.4–2.—*Lawrence Livermore National Laboratory High Explosives Fabrication Facility Surge Operation Annual Requirements*

Requirement	Consumption
Resource	
Electrical energy (MWh)	4,300
Peak electrical demand (MWe)	1
Liquid fuel (L)	53,100
Natural gas[a] (m^3)	None
Water (L)	58,200,000
Plant Footprint (ha)	0.8[b]
Employment (Workers)	232[c]

[a] Cubic meters at standard temperature and pressure.
[b] Existing facilities occupy 2,830 ha.
[c] Total surge employment. Increase to current employment would be 100.
Source: LLNL 1995i:3; LLNL 1995j.

Waste Management. The LLNL existing waste management infrastructure can be applied to manage and treat all anticipated waste streams from this alternative. All hazardous, nonhazardous, and a minimal quantity of radioactive waste generated at LLNL facilities would be managed in accordance with all applicable Federal and state waste regulations. The wastes anticipated from the estimated workloads would not require significant modification of the existing LLNL waste management infrastructure. Waste generation for construction and operation of the LLNL HE fabrication alternative is shown in table 3.4.5.4–3.

TABLE 3.4.5.4–3.—*Lawrence Livermore National Laboratory High Explosives Fabrication Facility Waste Volumes*

Category	Annual Average Volume Generated from Construction (m^3)	Annual Volume Generated from Surge Operations (m^3)	Annual Volume Effluent from Surge Operations (m^3)
Low-Level			
Liquid	None	None	None
Solid	None	Minimal	Minimal
Mixed Low-Level			
Liquid	None	None	None
Solid	None	None	None
Hazardous			
Liquid	1	3	3
Solid	2	54	54
Nonhazardous (Sanitary)			
Liquid	454	7,270	7,250[a]
Solid	11	69	55[b]
Nonhazardous (Other)			
Liquid	946	568	566
Solid	8[c]	36	20

[a] Assumes 350:1 wastewater to sludge ratio for treatment of liquid sanitary waste.
[b] Two-thirds of solid is compactible by a factor of 4:1.
[c] Includes 7.6 m^3 (9.9 yd^3) of concrete and 3 t (3.3 tons) of steel that is recycled.
Source: LLNL 1995i:3; LLNL 1995j.

3.5 Emerging Technologies

DOE is planning to maintain the weapons stockpile using technologies that are in many cases more cost effective with less environmental impact than those used in the past. In addition to these proven baseline technologies planned for the downsized weapons complex, there are newer technologies under consideration that have the potential to offer even greater cost and environmental advantages. However, these technologies have not matured sufficiently to be included with confidence within the current baseline design. In most cases, new technologies that reduce waste and scrap generation and raw material usage concurrently reduce processing steps and operating costs. However, installing new technology requires capital construction and in nuclear facilities may require substantial additional cost to decontaminate and remove old equipment. These construction and decontamination operations also generate waste. Nevertheless, it is foreseeable that the future Complex could include some of these emerging technologies. This section discusses the major emerging technologies under consideration and their potential to further reduce future environmental impacts.

In the design of the Complex, there is a common waste management approach that emphasizes four areas of concern: the reduction of environmental impacts by avoiding environmentally offensive substances; process improvements that minimize waste generation; recycling, in order to minimize waste and raw material use; and the treatment of generated wastes. For some of the major processes, the following sections identify the significant benefits from emerging technologies that could reduce plant effluent, emissions, wastes, worker exposures, and operating cost.

3.5.1 Plutonium Fabrication and Processing

The plutonium facility includes a fabrication area where the plutonium is shaped into usable geometric shapes called pits and a processing area where the supporting chemical operations are performed. Plutonium from dismantled weapons may also be recovered. An amount of plutonium sufficient for carrying out fabrication and processing operations would be stored at the facility. The facility would be supported by activities such as analytical laboratories and waste management operations.

The emerging technologies for plutonium fabrication and processing are directed at minimizing waste at the source, reducing the amount of emissions, reducing the exposure of personnel to radiation, reducing the operational cost of the facility, improving recovery efficiencies, and improving safety. The following specific emerging technologies could affect the characteristics of the Plutonium Fabrication and Processing Facility and further reduce its environmental impact on the public and the safety and health of its workers.

For fabrication of plutonium parts, a near-net shape casting process is part of the baseline design. The casting undergoes additional machining, cleaning, and certification steps. This fabrication process is vastly superior to fabrication processes used in the past because the amount of scrap, waste, residue, and worker radiation dose are greatly reduced. Near-net shape casting technology development is continuing toward a goal of producing precision castings that require no additional machining and associated handling and material recycling. Even if the final goal is not met, any additional progress toward the goal allows for reduced machining, which results in reduced scrap, waste, residue, and worker radiation exposure.

An important fabrication step is a density measurement of the plutonium part. The baseline design measurement process requires that the part be immersed in a brominated hydrocarbon fluid. Hazardous residue is left in the fluid and from the cleaning step that follows. An emerging technology would use a nonreactive gas as the density measurement medium. If this technology is able to provide the required precision, then no residue would be left from the measurement and no follow-up cleaning step would be required.

3.5.2 Uranium Fabrication and Processing

The production of nuclear weapons requires parts fabrication and supporting chemical operations for enriched uranium, depleted uranium, and depleted uranium alloys. Uranium from dismantled weapons may also be processed. An amount of uranium in its various forms would be stored at the facility sufficient for carrying out uranium fabrication and processing operations. The facility would be supported by activities such as analytical laboratories and waste management operations.

The emerging technologies for uranium fabrication and processing are directed at minimizing waste at the source, reducing the amount of emissions, reducing the operational cost of the facility, improving recovery efficiencies, improving safety, and reducing the exposure of personnel to radiation. Radiation exposure is not as big an issue for uranium operations as for plutonium operations, but there will always be an operational goal to reduce exposures consistent with an as-low-as-reasonably-achievable philosophy. The following specific emerging technologies could affect the characteristics of the Uranium Fabrication and Processing Facility and further reduce its environmental impact on the public and the impact to the safety and health of its workers.

The baseline technology for enriched uranium parts fabrication largely continues to rely on the same technologies that have been in use for many years. Some enriched uranium parts are produced by a wrought process that includes casting, rolling, forming, and machining. This process produces a substantial amount of scrap that must be recycled. Other parts are produced directly from a casting to a near-net shape, but these require a substantial amount of final machining. Advances in technology should improve the near-net shape casting process so that final machining is greatly reduced. The improved near-net shape casting process has fewer steps and generates far less scrap that must be recycled. The full implementation of this process would reduce cost, worker radiation exposure, and waste and residue production.

Baseline technology for depleted uranium and uranium alloy parts involves casting, rolling, forming, and machining operations in which the finished part is much smaller than the starting material. An emerging technology is spin forming of some or all of these parts. Although conceptually simple, it is very difficult to spin form to the proper specifications because of the metallurgical properties of uranium. After spin forming, a machining step would still be required, but the final part would have a substantial portion of the metal contained in the starting blank. Spin forming has far fewer process steps than the current process and generates far less scrap that must be processed. The full implementation of this process would reduce cost, worker radiation exposure, and waste and residue.

All uranium and uranium alloy products, whether using the baseline technology or emerging technologies, require a casting step. Currently, the crucibles and molds for casting are made of graphite. In some cases, the graphite is coated with rare earth oxides to extend its life and to reduce carbon contamination of the parts. Graphite molds and crucibles are expensive, have a short life even when coated, and become contaminated with uranium. There is ongoing development to improve coatings, to extend the life of molds and crucibles, and to reduce carbon contamination of parts and uranium contamination of the molds and crucibles. There is also development in alternative materials for molds and crucibles. If improved coating or metal molds and crucibles prove to be feasible, their use in a production environment could reduce cost, and reduce or eliminate substantial quantities of contaminated graphite that must be processed.

Advanced uranium chemical processing technologies are currently under development. These technologies allow high-efficiency recovery and waste and residue processing with reduced worker and environmental radiation exposure. The chemicals used for processing, and the resulting emissions and effluents, are largely benign. These emerging processing technologies have been successfully tested in the laboratory, but have not been scaled up to the pilot plant level. This technology, if successful, could result in reductions in plant emissions and effluents as well as improvements in worker and public health and safety.

3.5.3 Lithium Hydride Fabrication and Processing

The basic steps of producing lithium hydride parts are hydriding lithium metal, grinding hydrided lithium into powder, pressing the powder into blanks, and machining the blanks into the final part. Near-net shape pressing technology has the potential to produce blanks that require less machining and therefore generate less material that must be recycled or stored. This process, if successful, could reduce the cost of operations. Environmental and waste impacts from current operations are very small.

Scrap and parts from old weapons are converted to a hydroxide, then to lithium chloride. The lithium chloride is converted to lithium metal in an electrolytic cell. This process poses hazards for workers and is an environmental emission hazard. The next step is to hydride the metal so it can serve as the feed material for the fabrication process. An emerging technology proven on a laboratory scale uses a bipolar electrolytic cell to convert lithium hydroxide directly to lithium metal. This avoids the lithium chloride step and its associated emission and worker safety hazards.

3.5.4 High Explosives

The HE processes formulate, press, machine, and inspect main charges required for nuclear weapons and related research, development, and testing programs. Also included are explosive material recycling and disposition of explosives from disassembled weapons. Currently, excess explosive materials are disposed of by open burning or detonation. Alternative disposal technologies are being reviewed or developed for possible application. These alternative technologies include biodegradation, base hydrolysis, and reaction in a molten salt solution. Each of these technologies, if proved feasible, would be capable of reducing explosive materials to environmentally benign gases and chemicals.

3.6 Next Generation Stockpile Management Facilities

Stockpile management facilities have been sized in this analysis based on the planned and expected workload to support a START II-sized nuclear weapons stockpile. In addition, stockpile sizes larger and smaller than the START II protocol stockpile have been analyzed to assess the sensitivity of the analysis and the ultimate decision to pursue alternative stockpile sizes.

For all parts of nuclear weapons, except the plutonium pits, an existing large manufacturing capacity exists. Alternatives are considered for downsizing this large capacity at the manufacturing site or transferring the mission to a laboratory or test site where a smaller development and test capability could be expanded to accommodate the production mission. The pit manufacturing capability and capacity was located at the DOE Rocky Flats Plant, which is no longer available for this mission. Therefore, only alternatives that build on an R&D plutonium infrastructure or, in the case of SRS, build on a plutonium infrastructure established for a different purpose, are considered in this analysis.

In sizing pit fabrication for the foreseeable future, consideration was given to establishing a larger fabrication capacity in line with the capacity planned for other portions of the Complex. However, after review of historical pit surveillance data, larger capacity was rejected because of the expected small demand for the fabrication of new replacement pits for the foreseeable future covered in this PEIS.

Construction and operation of a larger pit production capacity at this time would be expensive and would not have sufficient workload requirements for the foreseeable future to justify its maintenance and operation. DOE believes that significant advances are possible in facility design, construction, and operation which would significantly affect new plutonium facility size, cost, and environmental impact. DOE further believes that development and demonstration work should be performed on alternative facility concepts prior to making large financial and programmatic commitments, particularly in light of the expected small near-term requirement for pit production. DOE will perform development and demonstration work at its operating plutonium facilities over the next 5 years to study alternative modular facility concepts that could be utilized in the future in the construction of a larger fabrication capacity. Should a larger pit production capacity be required in the future, appropriate environmental and siting analyses would be performed at that time.

3.7 Comparison of Alternatives

To aid the reader in understanding the differences in environmental impacts among the various PEIS alternatives, this section presents comparisons of the alternatives, concentrating on the major resources assessed in this PEIS. In section 3.7.1, alternatives for each stockpile management mission (e.g., A/D, pit fabrication, secondary and case fabrication, nonnuclear fabrication, and HE fabrication) are compared with one another and the No Action alternative. Tables 3.7.1–1 through 3.7.1–4 contain the quantitative data to support these comparisons.

Section 3.7.1 also contains a top-level comparison of the entire stockpile management program. That comparison assesses the major differences in environmental impacts between a Complex that is downsized/rightsized in-place (the preferred alternative) and a Complex that is consolidated to the maximum extent practicable.

In section 3.7.2, the three proposed stockpile stewardship facilities are compared with the No Action alternative. The quantitative data to support the comparisons for the proposed stockpile stewardship facilities are in the project-specific analyses found in appendixes I, J, and K.

3.7.1 Stockpile Management

To aid the reader in understanding the differences in environmental impacts among the various PEIS alternatives, this section presents comparisons of the alternatives, concentrating on the major resources assessed in this PEIS.

Assembly/Disassembly. In addition to the No Action alternative, two alternatives are being considered that would meet the needs of the Program: (1) downsizing the existing A/D facilities at Pantex and (2) transferring the A/D mission to NTS by expanding the Device Assembly Facility. Under No Action, the A/D mission would remain at Pantex. No downsizing or modification of facilities would occur, and there would be no construction impacts. Downsizing existing facilities at Pantex would involve internal modifications to the existing facility. Transferring the A/D mission to NTS would entail upgrading and expanding the Device Assembly Facility.

Socioeconomic Impacts. Because of the reduced workload associated with completing the weapon dismantlement backlog, significant employment reductions will occur at Pantex for all alternatives. There would be a decrease from the current total of 3,437 workers to about 1,644 workers. Of the current workforce, 3,002 are associated with A/D operations. Under No Action only 915 A/D workers would be required. The downsized Pantex facility would be optimally configured for the reduced future workload, and would operate more efficiently than the No Action Pantex facility. The downsized Pantex facility would require 800 workers for single-shift operation. To perform operations in the downsized Pantex facility in a three-shift mode, 1,266 workers would be required.

If the A/D mission were transferred to NTS, 1,093 direct jobs (based on three-shift operation) would be created at that site, along with 1,160 indirect jobs. The 2,253 total new jobs would cause the regional economic area unemployment rate to decrease by approximately 0.1 percent. Housing/rental vacancies and public finance expenditures/revenues would change by less than 1 percent. If the A/D mission were transferred to NTS, there would be socioeconomic impacts associated with phasing out the A/D mission at Pantex. The phaseout would result in 1,644 direct jobs lost at the Pantex site, and another 1,905 indirect jobs would be lost in the regional economic area. The loss of 3,549 total jobs would cause the regional economic area unemployment rate to increase from 4.8 to 6.2 percent. Housing/rental vacancies and public finance expenditures/revenues would change by less than 1 percent.

Socioeconomic impacts at NTS associated with a peak construction workforce of 662 would produce small positive economic benefits. The 662 direct workers would also generate 622 indirect jobs. The 1,284 total new jobs during peak construction would cause no change in the regional economic area unemployment rate. Housing rental vacancies and public finance expenditures/revenues would change by less than 1 percent.

Resource Impacts. Due to the reduced workload expected in the future at Pantex, impacts from operations are expected to be less than current impacts. Air quality would remain within regulatory limits, and water requirements would be met without increased aquifer drawdowns. In addition, downsizing existing facilities at Pantex would involve internal modifications to the existing facility. No land would be disturbed.

Transferring the A/D mission to NTS would entail upgrading and expanding the Device Assembly Facility, with associated increases in land disturbance. An estimated 7.5 ha (18.5 acres) of additional land would be disturbed, which is less than 1 percent of the land available at NTS for development. This land disturbance would increase the potential to impact cultural and biotic resources; however, the impact to cultural resources is not expected to be significant because the proposed A/D site has been previously disturbed during construction activities associated with the Device Assembly Facility. Impacts to biotic resources are expected to be minor; however, the presence of the desert tortoise at NTS would require a site survey to determine any impacts. With mitigation measures already in place at NTS to minimize impacts to the Federal-listed desert tortoise, significant impacts due to the proposed project are not expected.

Because both alternatives would utilize similar facilities, procedures, resources, and numbers of workers during operation, both alternatives would produce similar operational environmental impacts for most resource areas. Impacts to air quality were modeled, and results indicate minimal impacts for both alternatives. Water use for the NTS alternative is projected to be less than for the Pantex alternative because continued operations at Pantex would rely on existing, older, site-wide infrastructure. At both sites, water requirements could be adequately met without substantial aquifer drawdown. At Pantex, downsizing would reduce groundwater withdrawals by 21 percent compared to No Action. At NTS, water requirements to support the A/D mission would be approximately 4 percent more than projected usage. Groundwater withdrawals at NTS would be less than the recharge rates for the aquifer.

Radiation and Waste Management Impacts. The average radiological dose to workers at Pantex would not be expected to change, although the total worker dose would change due to the reduced number of workers associated with a reduction in workload. Worker exposure to radiation is expected to be about equal (approximately 10 mrem/year) for both alternatives and well within regulatory limits. Because of the small difference in the workforce for this mission at the two sites, this would result in a total worker dose of 3.0 person-rem/year at Pantex and 2.6 person-rem/year at NTS. The added risk to the workforce due to these levels of radiation exposure is extremely small.

Radiation exposure to the public from normal operation would be well within regulatory limits at both sites. At Pantex, the incremental dose to the population within 80 km (50 mi) would be 4.0×10^{-4} person-rem/year. At NTS, the incremental dose to the public within 80 km (50 mi) resulting from operation of the A/D Facility would be 3.1×10^{-6} person-rem/year. The added risk to the public due to these levels of radiation exposure is extremely small.

Both sites have adequate waste management facilities to treat, store, and/or dispose of wastes from the A/D mission, although LLW at Pantex would continue to be shipped offsite to NTS. The impacts of transporting LLW are similar to the impacts of transporting nonradiological materials, which are small. Transferring the A/D mission to NTS would eliminate the need to ship LLW from Pantex to NTS. Transferring the A/D mission to NTS by expanding the Device Assembly Facility would also increase the overall amount of eventual D&D activities and wastes.

Accident Impacts. Potential impacts from accidents would not be expected to change significantly due to reduced workload. Accident impacts were determined using computer modeling. For the composite accident, less than one fatal cancer would be expected for the surrounding 80-km (50-mi) population at either Pantex or NTS. Based on a weighted averaging of the postulated accidents, at Pantex there would be a statistical risk that one fatal cancer to a member of the public would result approximately every 43,000 years from accidents. At NTS, there would be a statistical risk that one fatal cancer to a member of the public would result approximately every 500,000 years from accidents.

Other. The A/D mission also includes an option to store strategic reserves of plutonium and/or uranium. At Pantex, which presently stores both strategic reserves and surplus quantities of plutonium, no additional facilities would be needed, and no significant new environmental impacts or risks would result. Storing the strategic reserve would not produce any additional air emissions, require any additional water withdrawals, generate any wastes, or require additional workers. At NTS, however, the Device Assembly Facility would be further expanded to accomplish the strategic reserve storage. The additional construction would have smaller impacts (less than 10 percent) than the construction associated with the Device Assembly Facility upgrade for the A/D mission. Radiation exposure to the public in the event of an accident would be significantly less than for the A/D mission for either alternative.

Pit Fabrication. For pit fabrication, a capability that no longer exists due to the closure of the Rocky Flats Plant, two alternatives are being considered that would reestablish this mission and meet the needs of the Program: (1) upgrading the existing plutonium R&D fabrication capability at LANL and (2) upgrading existing H-Area and F-Canyon facilities at SRS. Both alternatives involve relatively minor (though costly) upgrades to existing facilities. Under the No Action alternative, DOE would not reestablish this mission, but would rely on the existing R&D capabilities at LANL and LLNL.

Socioeconomic Impacts. During operation, both alternatives would have small positive socioeconomic impacts. Based on the socioeconomic modeling, impacts would be higher at SRS because of the indirect jobs that would be created due to this mission. Modeling results indicate no indirect jobs for this mission at LANL. At SRS, up to 813 direct jobs would be created for surge operations, along with 1,594 indirect jobs. These 2,407 total new jobs would cause the regional economic area unemployment rate to decrease from 6.7 to 6.0 percent. Housing/rental vacancies and public finance expenditures/revenues would change by less than 1 percent. At LANL, up to 260 new direct jobs would be created for surge operations, but no indirect jobs would be created. The 260 total new jobs would cause the regional economic area unemployment rate to decrease from 6.2 to 6.0 percent. Housing/rental vacancies and public finance expenditures/revenues would change by less than 1 percent. Because the SRS alternative has less of an infrastructure in place for plutonium fabrication, the SRS alternative would require more direct workers (288 versus 138) during construction. At both sites, however, the socioeconomic impacts during construction would not cause any socioeconomic indicator to change by more than 1 percent.

Resource Impacts. Construction activities would involve internal modifications to existing facilities, no land would be disturbed, and thus, no impacts to cultural and biotic resources would result. Because both alternatives would utilize similar facilities, procedures, resources, and numbers of workers during operation, both alternatives would result in similar operational environmental impacts for most resource areas. Impacts to air quality were modeled, and results indicate minimal impacts to air quality for both alternatives. Water requirements at SRS would be provided from surface water, which is plentiful, and no adverse impacts would be expected. At LANL, groundwater would be used. Water requirements for this mission, which would be less than 1 percent of projected No Action uses, could be adequately met without exceeding the groundwater allotment at LANL.

Radiation and Waste Management Impacts. Worker exposure to radiation is expected to be about equal for both alternatives and well within regulatory limits. At either SRS or LANL, the average workforce dose from this mission would be approximately 380 mrem/year. Because of a difference in workforce for this mission at the two sites, this would result in a total worker dose of 156 person-rem/year at SRS and 55 person-rem/year at LANL. Statistically, this would equate to one fatal cancer every 16 years at SRS, and every 45 years at LANL, from operation of the Pit Fabrication Facility. Radiation exposure to the public from normal operation would be well within regulatory limits at both sites. At SRS and LANL, the incremental dose to the public within 80 km (50 mi) would be 5.9×10^{-4} person-rem/year and 8.6×10^{-5} person-rem/year, respectively. The added risk to the public due to these levels of radiation exposure is extremely small. Both site alternatives have adequate existing waste management facilities to treat, store, and/or dispose of wastes that would be generated by this mission.

Accident Impacts. Potential impacts from accidents were determined using computer modeling. For the composite accident, less than one fatal cancer would be expected for the surrounding 80-km (50-mi) population at both SRS and LANL. Based on a weighted averaging of the postulated accidents, at SRS there would be a statistical risk that one fatal cancer to a member of the public would result approximately every 360,000 years from accidents. At LANL, there would be a statistical risk that one fatal cancer to a member of the public would result approximately every 160,000 years from accidents.

Secondary and Case Fabrication. In addition to the No Action alternative, three alternatives being considered would meet the needs of the Program: (1) downsizing facilities that presently perform this mission at ORR, (2) transferring the secondary and case fabrication mission to LANL by upgrading the existing R&D secondary and case fabrication capabilities of LANL, and (3) transferring the secondary and case fabrication mission to LLNL by upgrading the existing R&D secondary and case fabrication capabilities of LLNL. Under No Action, the secondary and case fabrication mission would remain at Y-12 at ORR, and no downsizing or modification of facilities would occur.

Socioeconomic Impacts. Under No Action, there would be a decrease in the number of workers at Y-12 from the current total of 5,152 workers to 4,721 workers. Of the 5,152 workers, 3,126 are currently associated with the core stockpile management mission. Under No Action, only 2,741 core stockpile management workers would be required. The downsized Y-12 would be optimally configured for the reduced future workload, operate more efficiently, and require 784 workers for single-shift operation, a reduction of 1,957 workers. To perform operations in the downsized Y-12 in a three-shift mode, 1,376 core stockpile management workers would be required, a reduction of 1,365 workers. A reduction of 1,365 direct jobs represents approximately 9 percent of the projected No Action workforce at the entire ORR site, and less than 1 percent of the regional economic area. Another 3,490 indirect jobs would also be lost.

Mitigating the workforce reductions would be the fact that downsizing would require 1,152 new jobs associated with landlord activities in preparation for D&D activities. Another 1,600 indirect jobs would be created by these D&D jobs. The net effect for the three-shift mode of operation would be a loss of a total of 213 direct jobs at Y-12, which would represent less than 1 percent of the projected No Action workforce at ORR.

Transferring the secondary and case fabrication mission to either LANL or LLNL would have small positive socioeconomic impacts at those sites, and negative socioeconomic impacts at ORR due to the phaseout of this mission. At LANL, 321 direct jobs (based on three-shift operation) would be created, but no indirect jobs would be created for this industry. The 321 new jobs would cause the regional economic area unemployment rate to decrease from 6.2 to 6.0 percent. Housing/rental vacancies and public finance expenditures/revenues would change by less than 1 percent. At LLNL, 290 new direct jobs (based on three-shift operation) would be created, along with 722 indirect jobs. The 1,012 new jobs would cause the regional economic area unemployment rate to decrease by less than 1 percent. Housing/rental vacancies and public finance expenditures/revenues would change by less than 1 percent.

Transferring the secondary and case fabrication mission from ORR to either LANL or LLNL would result in the loss of 3,336 direct jobs projected for this mission under No Action at Y-12, and the closure and D&D of the Y-12 facilities previously involved in this mission. Another 10,134 indirect jobs could also be lost. It is expected that 1,385 new jobs would be created by a direct transfer of responsibilities from DP to EM. Additionally, because the D&D of facilities at ORR would be a relatively long-term process, any initial negative socioeconomic impacts resulting from the transfer of the secondary and case fabrication mission to LANL or LLNL would be minimized by the additional workforce associated with D&D activities at ORR. These 1,385 new D&D jobs would also create 1,937 new indirect jobs. The net effect would be a loss of a total of 13,470 total jobs (direct plus indirect) in the ORR regional economic area. This would cause the regional economic area unemployment rate to increase from 4.9 to 7.4 percent. Housing/rental vacancies and public finance expenditures/revenues would change by less than 1 percent.

During construction activities, socioeconomic impacts would result, but would be small. The number of peak workers would be 14 at ORR, 55 at LANL, and 130 at LLNL, which has the least extensive existing infrastructure for secondary and case fabrication. At all three sites, the socioeconomic impacts during construction would not cause any socioeconomic indicator to change by more than 1 percent.

Resource Impacts. Impacts from continued operation at Y-12 are expected to be similar to current impacts. Air quality would remain within regulatory limits and water requirements would be adequately met by surface water withdrawals. For the three "action" alternatives, no previously undisturbed land would be disturbed, and thus, no impacts to biotic resources would result. Minimal impacts to cultural resources may result from building modifications to facilities eligible for the National Register of Historic Places. Because each of the alternatives would utilize similar facilities, procedures, resources, and numbers of workers during operation, each of the alternatives would produce similar operational environmental impacts for most resource areas. Impacts to air quality were modeled for each alternative and results indicate minimal impacts to air quality for each of the alternatives. Water requirements at ORR would be met from surface water, which is plentiful, and no adverse impacts would be expected. At LANL, groundwater would be used. Groundwater withdrawals would increase by less than 1 percent over projected No Action water requirements, and LANL's groundwater allotment would not be exceeded. At LLNL, public water supply would be used, and usage would be approximately 20-percent higher than projected No Action water requirements. No adverse impacts to water resources are expected.

Radiation and Waste Management Impacts. Radiation worker exposure to radiation is expected to be about equal for all three alternatives and well within regulatory limits. At each of the three sites, the average workforce dose from this mission would be approximately 2.2 mrem/year. Because of differences in projected workforces, this would result in a total worker dose of 0.38 person-rem/year at ORR, 0.33 person-rem/year at LANL, and 0.55 person-rem/year at LLNL. The added risk to the workforce due to these levels of radiation exposure is extremely small. Radiation exposure to the public from normal operation would be well within regulatory limits at these sites. At ORR, the incremental dose to the population within 80 km (50 mi) would be 0.6 person rem/year. The probability of a member of the public dying from cancer would be 3×10^{-4}/year. At LANL, the incremental dose to the population within 80 km (50 mi) would be 0.5 person-rem/year. The probability of a member of the public dying from cancer would be 2.5×10^{-4}/year. At LLNL, the incremental dose to the population within 80 km (50 mi) would be 0.84 person-rem/year. The probability of a member of the public dying from cancer would be 4.2×10^{-4}/year. The added risk to the public due to these levels of radiation exposure is extremely small. All three site alternatives have adequate existing waste management facilities to treat, store, and/or dispose of wastes that would be generated by this mission.

Accident Impacts. Potential impacts from accidents were determined using computer modeling. For all postulated accidents, less than one fatal cancer would be expected for the surrounding 80-km (50-mi) population at each of the sites. Based on a weighted averaging of the postulated accidents, at ORR and LANL there would be a statistical risk that one fatal cancer to a member of the public would result approximately every 830,000 years from accidents. At LLNL, there would be a statistical risk that one fatal cancer to a member of the public would result approximately every 260,000 years from accidents.

Other. If the secondary and case fabrication mission were transferred from ORR, storage of the strategic reserves of HEU would be transferred to the A/D Facility (or a consolidated storage facility being assessed in the Storage and Disposition PEIS). The potential impacts associated with the one-time transfer of the strategic reserves of HEU to the A/D Facility are expected to be minor, even in the event of an accident, due to the robust shipping containers.

High Explosives Fabrication. In addition to the No Action alternative, three alternatives are being considered that would meet the needs of the Program: (1) downsizing facilities that presently perform this mission at Pantex, (2) transferring the HE fabrication mission to LANL by upgrading the existing R&D HE fabrication capabilities of LANL, and/or (3) transferring the HE fabrication mission to LLNL by upgrading the existing R&D HE fabrication capabilities of LLNL. Transferring the HE fabrication from Pantex to LANL and/or LLNL would result in the closure and D&D of Pantex facilities previously involved in this activity. Under No Action, the HE fabrication mission would remain at Pantex. No downsizing or modification of facilities would occur.

Socioeconomic Impacts. Downsizing the HE fabrication mission at Pantex would reduce the number of direct workers associated with this mission to 37, compared to 105 for No Action. Transferring the HE fabrication mission to either LANL or LLNL would create small positive socioeconomic impacts at either of those sites, and small negative socioeconomic impacts at Pantex, due to the phaseout of this mission. For surge operations at LANL, 67 new direct jobs would be created, but no indirect jobs would be created by this industry. The 67 new jobs would cause the regional economic area unemployment rate to decrease from 6.2 to 6.1 percent. Housing/rental vacancies and public finance expenditures/revenues would change by less than 1 percent. For surge operations at LLNL, 100 new direct jobs would be created, along with 155 indirect jobs. The 255 total new jobs would cause the regional economic area unemployment rate to decrease by less than 1 percent. Housing/rental vacancies and public finance expenditures/revenues would change by less than 1 percent. Phasing out the HE fabrication mission at Pantex would cause the loss of 105 direct jobs, which would be approximately 3 percent of the projected No Action workforce at Pantex. The direct plus indirect jobs lost would cause no observable change to the Pantex regional economic area unemployment rate, housing/rental vacancies, and public finance expenditures/revenues.

During construction activities, socioeconomic impacts would result, but they would be small. The number of peak workers would be 29 at Pantex, 46 at LANL, and 19 at LLNL. At all three sites, the socioeconomic impacts during construction would not cause any socioeconomic indicator to change by more than 1 percent.

Resource Impacts. For the three "action" alternatives, construction impacts are expected to be minor and would involve internal modifications to existing facilities. No land would be disturbed at Pantex or LANL, and thus, no impacts to cultural or biotic resources would result. At LLNL, a small area of land (less than 1 ha) would be disturbed to construct an HE and parts storage building, but impacts to biotic and cultural resources are not expected.

Because each of the alternatives would utilize similar facilities, procedures, resources, and numbers of workers during operation, each of the alternatives would result in similar operational environmental impacts for most resource areas. Impacts to air quality were modeled for each alternative, and results indicate minimal impacts to air quality for each of the alternatives. At all sites, water requirements would be met from groundwater. At Pantex, this alternative applies only in conjunction with the downsize A/D alternative at Pantex discussed earlier. Downsizing both missions would reduce groundwater withdrawals by 16 percent compared to No Action. At LANL, groundwater withdrawals would increase by less than 1 percent over projected No Action water requirements, and LANL's groundwater allotment would not be exceeded. At LLNL, groundwater and/or the public water supply could be used to support the HE fabrication mission. If public water were used, it would require approximately 21 percent of the design capacity of the public water tap line. If groundwater were used, withdrawals would increase by approximately 65 percent from No Action, but they would not have any adverse impacts to aquifer levels.

Radiation and Waste Management Impacts. There are no radiological risks to workers or the public associated with the HE fabrication mission and no adverse impacts associated with normal operation. All three site alternatives have adequate existing waste management facilities to treat, store, and/or dispose of wastes that would be generated by this mission.

Accident Impacts. Potential impacts from chemical accidents or explosions were determined using modeling. Impacts from these types of accidents could include death or bodily damage. Due to proximity, workers would be most susceptible to any potential impacts. For all postulated accidents, impacts to the public were much less than to workers. In the event of an accident involving HE fabrication, due to the higher population surrounding LLNL, public impacts could be higher at LLNL compared to LANL and Pantex. Lastly, transferring the HE fabrication mission from Pantex to LANL and/or LLNL would require HE components to be shipped from the fabrication site to the A/D Facility. HE is a nonradioactive, hazardous material. There are no impacts associated with the incident-free transportation of HE. In the event of an accident, HE transportation impacts would be no greater than those encountered by the public from industry's transportation of similar explosives. Potential accidents could include both explosive and nonexplosive roadway accidents, with potential impacts of death, lesser bodily injury, and property damage.

Nonnuclear Fabrication. In addition to the No Action alternative, two alternatives are being considered that would meet the needs of the Program: (1) downsizing the facilities that presently perform this mission at KCP and (2) transferring the KCP nonnuclear fabrication mission to LANL, LLNL, and SNL by upgrading existing nonnuclear fabrication capabilities at LANL and LLNL and constructing new nonnuclear fabrication facilities at SNL. Under No Action, the nonnuclear fabrication mission would remain at current locations; primarily at KCP, with small workloads at SNL and LANL.

Socioeconomic Impacts. At KCP, workforce downsizing consistent with a reduced workload has already taken place; therefore, the projected No Action workforce (3,179 workers) is equal to the current workforce. Of these 3,179 workers, 2,508 workers perform core stockpile management missions. The downsized KCP facility would be optimally configured for the reduced future workload, would operate more efficiently, and would require 1,669 core stockpile management workers for single-shift operation. To perform operations in the downsized KCP facility in a three-shift mode, 2,257 workers would be required. This is 251 workers less than the No Action single-shift number of workers. Another 443 indirect jobs would also be lost. The loss of a total of 694 jobs (direct plus indirect jobs) would not cause the regional economic area unemployment rate to change.

Transferring the nonnuclear fabrication mission to the laboratories would create small positive socioeconomic impacts at both LANL and LLNL, with increases of 240 and 131 total (direct plus indirect) jobs, respectively. At each of these sites, socioeconomic indicators would change by less than 1 percent. At SNL, 1,160 direct jobs would be created, along with 1,350 indirect jobs. The 2,510 new jobs would cause the regional economic area unemployment rate to decrease from 5.7 to 5.2 percent. Housing/rental vacancies and public finance expenditures/revenues would change by less than 1 percent. Phasing out the nonnuclear fabrication mission from KCP would cause the loss of 3,179 direct jobs and the loss of 5,609 indirect jobs in the regional economic area. The loss of 8,788 total jobs from KCP would cause the regional economic area unemployment rate to increase from 4.9 to 5.6 percent. Housing/rental vacancies and public finance expenditures/revenues would change by less than 1 percent. Some socioeconomic impacts could be mitigated by employing personnel for D&D of the KCP facility, although that is not expected to last more than 5 years.

During construction activities, socioeconomic impacts would result, but would be small. At KCP, 187 direct jobs would be created during downsizing activities, plus another 262 indirect jobs. The 449 total jobs created during construction at KCP would represent less than a 1 percent increase in the regional economic area, and would cause no observable change to the regional economic area unemployment rate, housing/rental vacancies, and public finance expenditures/revenues. If the nonnuclear fabrication mission is transferred to the three laboratories, no observable socioeconomic impacts would occur at LANL or LLNL. At SNL, 379 direct jobs would be created during construction activities, plus another 421 indirect jobs. The 800 total jobs created during construction at SNL would represent less than a 1 percent increase in employment in the regional economic area, and would not cause any socioeconomic indicator to change by more than 1 percent.

Resource Impacts. Due to the reduced workload expected in the future, impacts from operations are expected to be less than current impacts. Air quality would remain within regulatory limits at each of the sites, and water requirements would be adequately met.

For the alternative that would downsize KCP, the construction activities would involve internal modifications to the existing facility. No land would be disturbed. For the alternative that would transfer the KCP mission to the laboratories, construction impacts would involve internal facility modifications at LANL and LLNL. At SNL, approximately 9 ha (22 acres) of land would be disturbed to construct a new facility. This represents approximately 6 percent of the undisturbed land at SNL. Potential impacts to cultural and biotic resources would exist, but they would be mitigated to the extent practicable during follow-on, site-specific studies.

Because each of the alternatives would utilize similar facilities, procedures, resources, and numbers of workers during operation, each of the alternatives would result in similar operational environmental impacts for most resource areas. Impacts to air quality were modeled for each alternative. Modeling results indicate minimal impacts to air quality for each of the alternatives. Water requirements for nonnuclear fabrication are relatively minor at each of the sites. At KCP, water requirements, which are publicly provided, would be reduced by approximately 31 percent compared to No Action. At LANL, groundwater withdrawals would increase by less than 1 percent over projected No Action water requirements, and LANL's groundwater allotment would not be exceeded. At LLNL, there would also be a less than 1 percent increase in water requirements to support nonnuclear fabrication. At SNL, groundwater would be used. Groundwater withdrawals would increase by approximately 64 percent over projected No Action withdrawals, but would still represent only 29 percent of the Kirtland Air Force Base groundwater rights. Thus, no adverse impacts are expected.

Radiation, Waste Management, and Accident Impacts. There are no radiological risks to workers or the public associated with the nonnuclear fabrication mission, and there are no adverse impacts associated with normal operation. Accident profiles at the sites would not change as a result of downsizing KCP or transferring the nonnuclear fabrication mission to the laboratories. Phaseout of the nonnuclear mission from KCP would eliminate any potential accidents at that site. Lastly, all three site alternatives have adequate existing waste management facilities to treat, store, and/or dispose of wastes that would be generated by this mission.

Stockpile Management Top-Level Comparison. Based upon the reasonable alternatives for the five major missions that make up the stockpile management program, one could construct a matrix with a large number of discrete alternatives for the entire Complex. Analyzing such a large number of alternatives is neither practical nor useful. What is useful, however, is to look at the two extreme configurations for the entire Complex in order to compare environmental impacts for a bounding case analysis. Based on the alternatives that are reasonable for the individual missions, the bounding configurations and environmental impacts for the Complex are a relatively unconsolidated Complex that is downsized/rightsized in place or a relatively consolidated Complex that is rightsized by upsizing the laboratories and NTS.

For the first configuration (referred to as Downsize/Rightsize-in-Place), the Complex would consist of A/D at Pantex, HE fabrication at Pantex, pit fabrication at LANL (or SRS), secondary and case fabrication at ORR, and nonnuclear fabrication at KCP. This is essentially the preferred alternative for stockpile management. For the second configuration (referred to as Maximum Consolidation), the Complex would consist of A/D at NTS, HE fabrication at LANL (or LLNL), pit fabrication at LANL, secondary and case fabrication at LANL (or LLNL), and nonnuclear fabrication at SNL, LANL, and LLNL. Major differences in environmental impacts between these two configurations are presented below.

Socioeconomic Impacts. It is worthy to note that some of the reductions in workforce at the various stockpile management facilities are associated with reduced workloads expected in the future, while additional reductions in workforce could occur due to the physical downsizing of facilities. For the A/D and HE missions at Pantex, under No Action, the core stockpile management workforce would be reduced from the current level of 3,107 workers (3,002 for A/D and 105 for HE) to 1,020 workers (915 for A/D and 105 for HE) for single-shift operation. The physical downsizing of the facility would also improve efficiency such that the workforce could be reduced even further, to 831 workers for single-shift operation (800 for A/D and 31 for HE). Three-shift operation of the downsized Pantex facility would require 1,303 core stockpile management workers (1266 for A/D and 37 for HE).

For the secondary and case fabrication mission at ORR, under No Action, the workforce would be reduced from the current level of 3,126 core stockpile management workers to 2,741 workers for single-shift operation. The physical downsizing of Y-12 (essentially an 86-percent reduction in facility size) would also improve efficiency such that the core stockpile management workforce could be reduced even further, to 784 workers for single-shift operation. Three-shift operation of the downsized Y-12 facility would require 1,376 core stockpile management workers. The adverse socioeconomic impacts associated with the Y-12 downsizing would be mitigated by the creation of 1,152 new jobs associated with landlord activities in preparation for the D&D of the facilities no longer needed.

At KCP, workforce reductions consistent with a reduced workload have already taken place; therefore, the projected No Action workforce (2,508 core stockpile management workers) is equal to the current workforce. Downsizing the KCP facility would improve efficiency such that the workforce could be reduced to 1,669 workers for single-shift operation. Three-shift operation of the downsized KCP facility would require 2,257 workers.

Overall, socioeconomic impacts from construction for the Maximum Consolidation configuration would be minimal, except at NTS and SNL. Socioeconomic impacts from construction for the Downsize/Rightsize-in-Place configuration would also be minimal.

Resource Impacts. Construction impacts associated with the Downsize/Rightsize-in-Place configuration would be minimal. All construction activities would be modifications to existing facilities, with no new construction. Consequently, no significant land disturbance at any sites would result, and no potential impacts to biota or cultural resources would occur.

Construction impacts associated with the Maximum Consolidation configuration would be small overall; only the Device Assembly Facility upgrade at NTS and the Nonnuclear Facility at SNL involve any land disturbance greater than 1 ha (2.47 acres). Most construction activities would be modifications to existing facilities, with no significant land disturbance, and no potential impacts to biota or cultural resources.

During operation, because each of the two configurations would utilize similar facilities, procedures, resources, and numbers of workers, each would result in similar operational environmental impacts for most resource areas. For the Maximum Consolidation configuration, the greatest potential for any significant environmental impacts would occur at LANL, which would be the site for pit fabrication, secondary and case fabrication, HE fabrication, and a portion of nonnuclear fabrication. For each of the resources evaluated in this PEIS, no significant impacts are expected from such consolidation. Modeling results for air quality indicate minimal impacts to air quality. Water requirements would increase at LANL by 2.5 percent, but would still be less than the LANL allotment.

Radiation, Waste Management, and Accident Impacts. Cumulative doses to the population from normal operation would be less than regulatory limits. Impacts from accidents are independent of other missions (e.g., accident risks are additive, not multiplicative). Thus, the potential accident would be the sum of the risks from each mission. For maximum consolidation at LANL, there would be a statistical risk that one fatal cancer to a member of the public would result aproximately every 135,000 years from accidents. LANL would have adequate existing waste management facilities to treat, store, and/or dispose of wastes that would be generated by these missions.

A difference in the operation of the Downsize/Rightsize-in-Place configuration and the Maximum Consolidation configuration would involve the transportation of nuclear and hazardous materials. The Downsize/Rightsize-in-Place configuration would result in transporting plutonium components between LANL (or SRS) and Pantex, and transporting secondary and case components between ORR and Pantex. Incident-free impacts associated with this transportation are small, while accident impacts are minor. The Maximum Consolidation configuration would also result in transporting plutonium components and secondary and case components. Transportation would occur between LANL and NTS. Relative to the Downsize/Rightsize-in-Place configuration, any transportation impacts would be less due to shorter distances and less populated roadways. The Maximum Consolidation configuration would also result in transporting HE components between LANL and NTS, but no significant impacts are expected.

3.7.2 Stockpile Stewardship

Proposed National Ignition Facility. The following comparisons have been summarized from the more-detailed comparisons for the NIF alternatives found in appendix section I.3.5.

The NIF project-specific analysis addresses the impacts of constructing and operating NIF at four alternative sites: LLNL (preferred), LANL, SNL, and NTS (including NLVF). A No Action alternative is also assessed.

Under No Action, DOE would rely on existing aboveground experimental facilities, predominantly the Nova Facility at LLNL, to study the physics of nuclear weapons secondaries. No construction impacts are associated with the No Action alternative and the operational impacts of the Nova Facility have been accounted for in the overall environmental baseline presented for LLNL.

For the action alternative, the analysis indicates that there would be few significant differences in environmental impacts at the candidate sites. The maximum 24-hour concentration of particulate matter 10 microns or smaller (PM_{10}) in the air during site clearing would exceed applicable standards at LLNL and NLVF. However, the ambient air quality impacts would be localized and of short duration. Uncommitted land requirements would be greatest at NTS (18.2 ha [45.0 acres]), although this acreage is less than 1 percent of the uncommitted land at NTS. Conversely, the least amount of uncommitted land that would be required for NIF would be 3.2 ha (7.9 acres) at NLVF. However, this acreage represents the largest percentage of uncommitted land at a candidate site (56 percent). Of greater significance would be the quality of the habitat of the uncommitted land that would be affected by NIF construction. The highest-quality habitats that would be affected would be forest (4.0 ha [9.9 acres]) at LANL or desert (18.2 ha [45 acres]) at NTS. At the other candidate sites, habitat disturbance would occur to grassland (LLNL and SNL) or to an area of sparse vegetation (NLVF). No significant biotic or cultural impacts are expected at any of the NIF alternative sites.

At each NIF alternative site, beneficial socioeconomic impacts associated with construction and operation would occur. During construction, 270 to 470 direct new jobs would be created in the peak year of activity. These direct jobs would create indirect jobs such that the total jobs during the peak year would be: 2,870 at LLNL; 1,130 at LANL; 1,640 at NTS; and 1,770 at SNL. Once operations begin, NIF would employ 330 direct workers. The total number of jobs (direct plus indirect) during operation would be 890 at LLNL, 600 at LANL, 620 at NTS, and 670 at SNL.

Over the 30-year operational life of NIF, the public would be exposed to a very small dose of radiation. No cancer fatalities would be expected to occur from exposures associated with routine NIF operations under either the Conceptual Design or Enhanced options. A radiological accident at NIF would not cause any cancer fatalities to the public except possibly at NLVF and SNL. Under postulated accident conditions, radiological impacts to the public and workers would be minor. The highest calculated radiation dose is 4,900 person-rem. At most, two cancer fatalities could occur if an accidental release occurred. Because of the extremely low accidental release frequency ($2x10^{-8}$/yr), the risk of radiation-caused cancer fatalities from the postulated accident at any site is essentially zero. The cancer fatality risk associated with radiological exposure from an accident involving the transport of NIF tritium targets would range from $1x10^{-8}$ to $8x10^{-10}$/yr; whereas the nonradiological fatality risks associated with vehicular emissions and accidents would be in the range of 10^{-3} to 10^{-4}/yr.

Although each candidate site would implement waste minimization practices, the generation of additional wastes would be unavoidable. All candidate sites have current or planned capacity to handle wastes associated with construction and operation of NIF; however, this would entail offsite shipment of some of the wastes for all sites but LANL.

NIF would comply with all applicable Federal, state, and local environmental regulatory requirements, including the *California Environmental Quality Act* if NIF is sited in the State of California. Such compliance functions as a general form of mitigation. The candidate sites have also established several mitigative measures for construction actions that would also be applicable to NIF construction. While each of these mitigative measures may be minor, in combination they could significantly reduce impacts to the environmental resources of the selected site.

With regard to unavoidable impacts, land clearing and construction activities for NIF would eliminate habitat and destroy or displace wildlife. Construction of new facilities could result in short-term disturbances of previously undisturbed biological habitats. These disturbances could cause long-term reductions in the biological productivity of an area. Construction of NIF would replace natural habitat with areas of pavement and buildings. Depending upon the candidate site selected, this conversion could extend the influence of urbanized/industrial habitats into natural areas, increase fragmentation of natural habitat, and cause minor loss of habitat used by rare species. However, no critical habitat for federally threatened or endangered species would be affected.

Radiological doses to the general public from NIF operation would be no more than 20 percent of the dose from all other candidate site operations and no more than one-millionth of the dose to the population from normal background radiation. NIF would be considered a low-hazard, radiological facility. Such a facility uses radionuclides (for nonreactor purposes) and has other hazards (such as chemicals needed at the facility). Low hazard implies that there are minor onsite and negligible offsite consequences.

Cumulative impacts would result from the addition of the incremental effects of the construction and operation of NIF to the effects of other past, present, and reasonably foreseeable future actions at the selected site. Fugitive dust emissions from construction of NIF would be an incremental addition to the already existing environmental impact of dust emissions to the atmosphere. Minor changes in stormwater runoff are expected due to removal of grass cover during NIF construction and increased runoff from pavement during facility operation.

Proposed Contained Firing Facility. The following comparisons have been summarized from the more-detailed information for CFF found in appendix J.

Under No Action, DOE would rely on existing aboveground experimental facilities, predominantly the existing hydrotest facilities at LLNL, LANL, and NTS to study the physics of nuclear weapons primaries. No construction impacts are associated with those existing facilities, and the operational impacts of those facilities have been accounted for in the overall environmental baseline presented for LLNL, LANL, and NTS.

Because the proposal for CFF involves modification to the existing FXR Facility, construction impacts are expected to be small. Very little land would be disturbed and the construction activities would largely involve internal modifications to the existing facility. Wastes and socioeconomic impacts from construction would be negligible.

Impacts associated with operations would also be negligible. CFF would not utilize any significant quantities of resources, would not cause any significant socioeconomic changes at LLNL, and would not generate large quantities of hazardous or low-level wastes. LLNL has adequate existing waste management facilities to treat, store, and/or dispose of wastes that would be generated by CFF. Impacts to human health from CFF operations are expected to be extremely small and within regulatory limits.

Proposed Atlas Facility. The following comparisons have been summarized from the more-detailed information for the Atlas Facility found in appendix K.

Under No Action, DOE would rely on existing aboveground experimental facilities, predominantly the Pegasus Facility at TA-35 at LANL, to study the physics of nuclear weapon secondaries. No construction impacts are associated with that facility, and the operational impacts from Pegasus have been accounted for in the overall environmental baseline presented for LANL.

Because the proposal for the Atlas Facility involves modification to the existing facilities within TA-35, construction impacts are expected to be small. Very little land would be disturbed and the construction activities would largely involve internal modifications to the existing facility. Wastes and socioeconomic impacts from modification activities would be negligible.

Impacts associated with operations would also be negligible. The Atlas Facility would not utilize any significant quantities of resources, would not cause any significant socioeconomic changes at LANL, and would not generate large quantities of hazardous or low-level wastes. LANL has adequate existing waste management facilities to treat, store, and/or dispose of wastes that would be generated by the Atlas Facility. Impacts to human health from Atlas Facility operations are expected to be small and within regulatory limits.

3.8 Preferred Alternative

CEQ regulations require an agency to identify its preferred alternative(s) in the Final Environmental Impact Statement (40 CFR 1502.14[e]). The preferred alternative is the alternative which the agency believes would best fulfill its statutory mission, considering environmental, economic, technical, and other factors. This PEIS provides information on the environmental impacts. Cost, schedule, and technical analyses have also been prepared, and are presented in the *Analysis of Stockpile Management Alternatives* report (DOE 1996j) and the *Stockpile Management Preferred Alternatives Report* (DOE 1996k), which are available in the appropriate DOE Public Reading Rooms for public review.

DOE has identified the following preferred alternatives for the Stockpile Stewardship and Management Program:

Stockpile Stewardship:

- Construct and operate NIF at LLNL
- Construct and operate CFF at LLNL
- Construct and operate the Atlas Facility at LANL

Stockpile Management:

- Secondary and Case Component Fabrication—downsize the Y-12 Plant at ORR
- Pit Component Fabrication—reestablish capability and appropriate capacity at LANL
- Assembly/Disassembly—downsize at Pantex
- High Explosives Fabrication—downsize at Pantex
- Nonnuclear Component Fabrication—downsize at KCP
- Based on the analyses performed to support this PEIS, the preferred alternatives for strategic reserve storage are as follows: (1) HEU strategic reserve storage at Y-12 and (2) plutonium pit strategic reserve storage in Zone 12 at Pantex. The preferred alternatives for strategic reserve storage could change based upon decisions to be made in regard to the Storage and Disposition PEIS. Decisions on strategic reserve storage will not be made in the upcoming ROD for the Stockpile Stewardship and Management Program. Storage decisions are not expected to be made until both the Stockpile Stewardship and Management PEIS and the Storage and Disposition PEIS are completed.

The preferred alternative for plutonium-242 oxide at SRS is to transport the material to LANL for storage.

The preferred PEIS alternatives do not represent decisions by DOE. Rather, they reflect DOE's preferences based on existing information. The ROD, when issued, will describe DOE's decisions for the Stockpile Stewardship and Management PEIS proposed actions.

TABLE 3.7.1–1.—*Summary Comparison of Impacts for Assembly/Disassembly and High Explosives Fabrication Missions* [Page 1 of 3]

	Retain both at Pantex		Retain A/D[a] at Pantex, Relocate HE			Phaseout Pantex, Relocate A/D and HE			
	No Action	Downsize A/D and HE at Pantex	Downsize A/D at Pantex and Relocate HE	Relocate HE to LANL[b]	Relocate HE to LLNL[b] (Site 300)	Phaseout A/D and HE at Pantex	Relocate A/D to NTS	Relocate HE to LANL[b]	Relocate HE to LLNL[b] (Site 300)
Construction/Modification									
Land									
Disturbed land (ha)	0	0	0	0	0.8	0	7.5	0	0.8
Percent of available land	0	0	0	0	<1	0	<1	0	<1
Threatened and Endangered Species									
Potentially affected	None	None	None	None	None	None	Desert tortoise	None	None
Socioeconomics									
Peak workers (direct)	0	96	67	46	19	0	662	46	19
Total jobs (direct and indirect)	0	173	121	76	47	0	1,284	76	47
Operation[c]									
Water									
Use (MLY)	249	209	196	5,773	148	0	2,498	5,773	148
Percent change from current use	-70	-75	-77	4.6	64.7	-100	4.1	4.6	64.7
Percent change from No Action use	NA	-16	-21	0.2	64.7	-100	4.1	0.2	64.7
Percent of groundwater allotment[d]	NA	NA	NA	85	NA	NA	NA	85	NA
Discharge (MLY)	141	148	141	706	12.2	0	53	706	12.2
Percent change from current discharge	-71	-69	-71	2	154	-100	NA	2	154
Percent change from No Action discharge	NA	5	0	2	177	-100	NA	2	177
Percent of discharge capacity	NA	NA	NA	NA	102	NA	NA	NA	102

TABLE 3.7.1–1.—*Summary Comparison of Impacts for Assembly/Disassembly and High Explosives Fabrication Missions* [Page 2 of 3]

	Retain both at Pantex		Retain A/D[a] at Pantex, Relocate HE			Phaseout Pantex, Relocate A/D and HE			
	No Action	Downsize A/D and HE at Pantex	Downsize A/D at Pantex and Relocate HE	Relocate HE to LANL[b]	Relocate HE to LLNL[b] (Site 300)	Phaseout A/D and HE at Pantex	Relocate A/D to NTS	Relocate HE to LANL[b]	Relocate HE to LLNL[b] (Site 300)
	Operation[c] (continued)								
Socioeconomics (Continued)									
Total site workforce (all missions)	1,644	1,927	1,890	6,613	8,289	0	9,112	6,613	8,289
A/D workforce	915	1,266[e]	1,266[e]	0	0	0	1,093	0	0
HE workforce	105	37[f]	0	200[g]	232[h]	0	0	200[f]	232[g]
A/D and HE workforce	1,020	1,303	1,266	200	232	0	1,093	200	232
Change from No Action in Total Jobs (direct and indirect)	NA	611[i]	531[j]	67	255	-3,549	2,253	67	255
Human Health									
Normal Operations									
Annual population dose (person-rem) (incremental except No Action)	1.4×10^{-4}	4.0×10^{-4}	4.0×10^{-4}	NA	NA	-1.4×10^{-4}	3.1×10^{-6}	NA	NA
25-year fatal cancers (incremental except No Action)	1.8×10^{-6}	5.0×10^{-6}	5.0×10^{-6}	NA	NA	-1.8×10^{-6}	3.9×10^{-8}	NA	NA
Annual worker dose (mrem/yr) (total)	10	10	10	NA	NA	0	10	NA	NA
25-year fatal cancer risk (total)	1.0×10^{-4}	1.0×10^{-4}	1.0×10^{-4}	NA	NA	0	1.0×10^{-4}	NA	NA
Accidents									
Composite Set (EBAs and BEBAs)[k]									
Expected consequences (fatalities)[l]		5.2×10^{-4}	5.2×10^{-4}	NA	NA	0	4.4×10^{-5}	NA	NA
Expected Risk (fatalities per year)[l]		1.5×10^{-5}	1.5×10^{-5}	NA	NA	0	1.2×10^{-6}	NA	NA

TABLE 3.7.1–1.—*Summary Comparison of Impacts for Assembly/Disassembly and High Explosives Fabrication Missions* [Page 3 of 3]

	Retain both at Pantex		Retain A/D[a] at Pantex, Relocate HE			Phaseout Pantex, Relocate A/D and HE			
	No Action	Downsize A/D and HE at Pantex	Downsize A/D at Pantex and Relocate HE	Relocate HE to LANL[b]	Relocate HE to LLNL[b] (Site 300)	Phaseout A/D and HE at Pantex	Relocate A/D to NTS	Relocate HE to LANL[b]	Relocate HE to LLNL[b] (Site 300)
				Operation[c] (continued)					
Waste Management	LLW, mixed LLW, hazardous, and nonhazardous wastes would continue to be generated.	Existing facilities adequate; 1 additional shipment every 2 years of LLW to NTS	Same as Downsize A/D & HE during operation. HE fabrication D&D would require 579 shipments of LLW to NTS during HE phaseout period. Additional treatment capacity at Pantex would be needed for liquid LLW and Mixed LLW generated from D&D activities.	Existing facilities adequate	Existing facilities adequate	Eliminates future shipments of Pantex LLW to NTS. D&D would require 1,006 shipments of LLW to NTS during phaseout period. Additional treatment capacity at Pantex would be needed for liquid LLW and Mixed LLW.	Existing facilities adequate	Existing facilities adequate	Existing facilities adequate

[a] A/D mission includes impacts from strategic reserve storage.
[b] Data shown is for transfer of entire HE fabrication mission to LANL or LLNL. HE fabrication could be shared at LANL and LLNL.
[c] All data for operations are based on three shift except for No Action, which is based on one shift.
[d] Percent groundwater allotment only applies to LANL.
[e] Three-shift operation; single-shift operation would be 800 A/D direct workers and 624 support workers.
[f] Three-shift operation; single-shift operation would be 31 HE direct workers.
[g] At LANL, 67 of the 200 jobs would be new jobs.
[h] At LLNL, 100 of the 232 jobs would be new jobs.
[i] Three-shift operation; single-shift operation would result in a loss of 408 (189 direct and 219 indirect) jobs.
[j] Three-shift operation; single-shift operation would result in a loss of 475 (220 direct and 255 indirect) jobs.
[k] Impacts to population out to 80 km (50 mi).
[l] Appendix F provides reference to existing documents of No Action accidents. Appendix section F.3 describes a comparison of accidents for No Action versus accidents associated with downsizing.

Note: NA - not applicable; EBA - evaluation basis accident; BEBA - beyond evaluation basis accident.

TABLE 3.7.1–2.—*Summary Comparison of Impacts for the Nonnuclear Fabrication Mission* [Page 1 of 2]

	No Action	Downsize KCP	Relocate Nonnuclear and Phaseout KCP[a]			
			LANL	LLNL	SNL	Phaseout KCP
Construction/Modification						
Land						
• Disturbed land (ha)	0	0	0	0	9	0
• Percent of available land	0	0	0	0	6	0
Threatened and Endangered Species						
• Potentially affected	None	None	None	None	None	None
Socioeconomics						
• Peak workers (direct)	0	187	6	6	379	0
• Total jobs (direct and indirect)	0	449	10	15	800	0
Operation[b]						
Water						
• Use (MLY)	1,930	1,340	5,808	971	2,283	0
• Percent of groundwater allotment	NA	NA	85	NA	29[c]	NA
• Percent change from current use	-<1	-31	5.2	<1	135	-100
• Percent change from No Action use	NA	-31	<1	<1	64	-100
• Discharge (MLY)	702	794	694	462	1,048	0
• Percent change from current discharge	-21	-10	<1	16	39	-100
• Percent change from No Action Discharge	NA	13	<1	1.3	39	-100
Socioeconomics						
• Total site workforce (all missions)	3,179	2,928[d]	6,740	8,249	8,501	0
• Nonnuclear workforce	2,508	2,257[d]	315[e]	114[f]	1,160	0
• Change from No Action in total jobs (direct and indirect)	NA	-694[g]	240	131	2,510	-8,788

TABLE 3.7.1–2.—*Summary Comparison of Impacts for the Nonnuclear Fabrication Mission* [Page 2 of 2]

	No Action	Downsize KCP	Relocate Nonnuclear and Phaseout KCP[a] LANL	LLNL	SNL	Phaseout KCP
Operation[b] (continued)						
Waste Management	Small quantities of LLW would continue to be generated. Mixed waste would no longer be generated.	Existing facilities adequate; the generation of LLW and hazardous waste would be reduced.	Waste generation volumes would increase slightly. LANL has adequate existing waste management facilities.	Waste generation volumes would increase slightly. LLNL has adequate existing waste management facilities.	Waste generation volumes would increase slightly. SNL has adequate existing waste management facilities.	Hazardous wastes from operations would no longer be generated, but D&D activities during phaseout would generate some hazardous wastes.

[a] If nonnuclear fabrication were transferred to LANL, LLNL, and SNL, impacts of phaseout at KCP would also occur.
[b] All data for operations are based on three-shift except for No Action, which is based on single-shift.
[c] This number represents 29-percent of the Kirtland Air Force Base groundwater rights. SNL can obtain water from other groundwater sources.
[d] Three-shift operation, single-shift operation would be 1,669 nonnuclear direct workers and 671 support workers.
[e] At LANL, 194 of the 315 jobs would be new jobs.
[f] At LLNL, 60 of the 114 jobs would be new jobs.
[g] Three-shift operation; single-shift operation would result in a loss of 2,319 (839 direct and 1480 indirect) jobs.
Note: NA - not applicable.

TABLE 3.7.1–3.—*Summary Comparison of Impacts for the Pit Fabrication Mission* [Page 1 of 2]

	No Action	Reestablish at LANL	Reestablish at SRS
Construction/Modification			
Land			
• Disturbed land (ha)	0	0	0
• Percent of available land	0	0	0
Threatened and Endangered Species			
• Potentially affected	None	None	None
Socioeconomics			
• Peak worker (direct)	0	138	288
• Total jobs (direct and indirect)	0	228	516
Operation[a]			
Water			
• Use (MLY)	0	5,790	13,295
• Percent of groundwater allotment[b]	0	85	NA

TABLE 3.7.1-3.—*Summary Comparison of Impacts for the Pit Fabrication Mission* [Page 2 of 2]

	No Action	Reestablish at LANL	Reestablish at SRS
Operation[a] (continued)			
Water (Continued)			
• Percent change from current use	0	4.9	6
• Percent change from No Action use	NA	0.5	0.3
• Discharge (MLY)	0	705	746
• Percent change from current discharge	0	1.8	6
• Percent change from No Action discharge	0	1.8	7
Socioeconomics			
• Total site workforce (all missions)	0	6,806	20,101
• Pit fabrication workforce	0	628[c]	813
• Change from No Action in total jobs (direct and indirect)	0	260	2,407
Human Health			
Normal Operations			
• Annual population dose (person-rem) (Incremental except for No Action)	0	8.6×10^{-5}	5.9×10^{-4}
• 25-year fatal cancers (Incremental except for No Action)	0	1.1×10^{-6}	7.4×10^{-6}
• Annual worker dose (mrem/yr) (total)	0	380	380
• 25-year fatal cancer risk (total)	0	3.8×10^{-3}	3.8×10^{-3}
Accidents			
Complete Set (EBAs and BEBAs)[d]			
• Expected consequences (fatalities)	NA	1.2×10^{-4}	5.4×10^{-5}
• Expected risk (fatalities per year)	NA	6.2×10^{-6}	2.8×10^{-6}
Waste Management	NA	TRU, LLW, and hazardous waste generation would increase slightly. Existing waste management facilities are adequate.	TRU, LLW, and hazardous waste generation would increase slightly. Existing waste management facilities are adequate.

[a] All data for operations are based on three shift except for No Action, which is based on one shift.
[b] Percent groundwater allotment only applies to LANL.
[c] At LANL, 260 of the 628 jobs would be new jobs.
[d] Impacts to population out to 80 km (50 mi).
Note: NA - not applicable; EBA - Evaluation Basis Accident; BEBA - Beyond Evaluation Basis Accident.

TABLE 3.7.1–4.—*Summary Comparison of Impacts for the Secondary and Case Fabrication Mission* [Page 1 of 2]

	No Action	Downsize ORR	Transfer to LANL[a]	Transfer to LLNL[a]	Phaseout at Y-12
Construction/Modification					
Land					
• Disturbed land (ha)	0	0	0	0	0
• Percent of available land	0	0	0	0	0
Threatened & Endangered Species					
• Potentially affected	None	None	None	None	None
Socioeconomics					
• Peak worker (direct)	0	14	55	130	0
• Total jobs (direct and indirect)	0	29	91	324	0
Operation[b]					
Water					
• Use (MLY)	14,760	13,820	5,815	1,161	12,310
• Percent of groundwater allotment[c]	NA	NA	86	NA	NA
• Percent change from current use	4	-3	5.4	20	-13
• Percent change from No Action use	NA	-6	1.0	20	-17
• Discharge (MLY)	2,277	2,147	713	558	1,827
• Percent change from current discharge	71	62	2.9	40	38
• Percent change from No Action discharge	NA	-5.7	2.9	22	-20
Socioeconomics					
• Total site workforce (all missions)[d]	4,721	4,508	6,867	8,479	1,385
• Secondary and case workforce	2,741	1,376[e]	523[f]	760[g]	0
• Change from No Action in total jobs (direct & indirect)	NA	-2103[h]	321	1,012	-13,470
Human Health					
Normal Operations					
• Annual population dose (person-rem) (Incremental except for No Action)	40.2	0.6	0.5	0.84	-0.2
• 25-year fatal cancers (Incremental except for No Action)	0.51	7.5×10^{-3}	6.3×10^{-3}	1.1×10^{-2}	-2.5×10^{-3}
• Annual worker dose (mrem/yr) (total)	2.2	2.2	2.2	2.2	0
• 25-year fatal cancer risk (total)	2.2×10^{-5}	2.2×10^{-5}	2.2×10^{-5}	2.2×10^{-5}	0

TABLE 3.7.1–4.—*Summary Comparison of Impacts for the Secondary and Case Fabrication Mission* [Page 2 of 2]

	No Action	Downsize ORR	Transfer to LANL[a]	Transfer to LLNL[a]	Phaseout at Y-12
Operation[b] (continued)					
Complete Set (EBAs and BEBAs)[i]					
• Expected consequences (fatalities)	j	0.02	0.02	0.063	NA
• Expected risk (fatalities per year)	j	1.2×10^{-6}	1.2×10^{-6}	3.8×10^{-6}	NA
Waste Management	Spent nuclear fuel, TRU, LLW, mixed waste, hazardous waste, and nonhazardous waste would continue to be generated.	All waste generation would decrease. Existing and planned waste management facilities would be adequate.	Waste generation volumes would increase slightly. Existing waste management facilities are adequate.	Waste generation volumes would increase slightly. Existing waste management facilities are adequate.	Wastes generated by operation of the mission would be eliminated. Existing and planned waste treatment facilities are adequate.

[a] If secondary and case fabrication mission were transferred to LANL or LLNL, impacts of phase-out at Y-12 would also result.

[b] All data for operations based on three shift except for No Action, which is based on one shift.

[c] Percent groundwater allotment only applies to LANL.

[d] Total site workforce is for Y-12 only.

[e] Three-shift operation, single-shift operation would be 784 secondary and case direct workers and 1,980 support and other workers. 1,152 workers would support D&D of the facilities vacated by downsizing.

[f] At LANL, 321 of the 523 jobs would be new jobs.

[g] At LLNL, 290 of the 760 jobs would be new jobs.

[h] Three-shift operation; single-shift operation would result in a loss of 4,200 (805 direct and 3,395 indirect) jobs.

[i] Impacts to population out to 80 km (50 mi).

[j] Appendix F provides reference to existing documents for No Action accidents. Section F.3 describes a comparison of accidents for No Action versus accidents associated with downsizing.

Note: NA - not applicable; EBA - Evaluation Basis Accident; BEBA - Beyond Evaluation Basis Accident.

CHAPTER 4

Chapter 4

CHAPTER 4: AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS

Chapter 4 describes the affected environment and the environmental impacts associated with stockpile stewardship and management alternatives. The chapter begins with an overview of applicable environmental assessment methodologies. The affected environment and environmental impacts of stockpile stewardship and management facilities are then discussed for each of the following sites: Oak Ridge Reservation, Savannah River Site, Kansas City Plant, Pantex Plant, Los Alamos National Laboratory, Lawrence Livermore National Laboratory, Sandia National Laboratories, and Nevada Test Site. Each discussion begins with a brief site description and the stockpile stewardship and management alternatives being considered for that site, continues with a description of the affected environment at the site, and concludes with a description of environmental impacts, a sensitivity analysis for management alternatives, and potential mitigation measures. The general potential environmental impacts of next generation stockpile stewardship facilities and underground nuclear testing are discussed in separate sections. Following the sections that address individual sites, are discussions of potential impacts from intersite transportation, cumulative impacts, and several issues that are common to all sites: unavoidable adverse environmental impacts, the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, irreversible and irretrievable commitments of resources, and facility transition.

Discussions of the environment that may be affected at each alternative site, and the associated environmental impacts that would result from the Stockpile Stewardship and Management Program make up the core of this chapter. In accordance with Council on Environmental Quality (CEQ) regulations, the affected environment is "interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment" (40 CFR 1508.14). The environmental impacts sections provide the analytical basis for the comparisons of potential impacts of the various stockpile stewardship and management facilities and the No Action alternative that are presented in chapter 3.

Affected Environment. The descriptions of the affected environment provide a basis for understanding the direct, indirect, and cumulative effects of the proposed Program and alternatives. The localities and characteristics of each potentially affected environmental resource are described for each site. The scope of the discussions varies by resource to ensure that all relevant issues are included.

For land resources, geology and soils, biotic resources, and cultural and paleontological resources, discussions of each Department of Energy (DOE) site and its surroundings are included along with descriptions of the representative area within that site that could be affected by the Program alternatives. This information provides a basis for understanding both direct effects and the overall resource base that could be affected by ancillary activities that may be defined in later stages of Program development.

Ambient conditions are described for air and water resources. Discussions focus on air conditions at site boundaries and the surface water bodies and groundwater aquifers that could be affected. This information serves as a basis for analyzing key air and water quality parameters to obtain results that can then be compared to regulatory standards.

Socioeconomic conditions are described for the counties and communities that could be affected by regional population changes associated with the proposed stockpile stewardship and management facilities. The affected environment discussions include projections of regional growth and related socioeconomic indicators. Each region is large enough to account for growth related to direct project employment as well as secondary jobs that may be created by the project.

In addition to those natural and human environmental resources discussed above, the affected environment sections include a number of issues related to ongoing DOE activities at each site. These issues involve facility operations and site infrastructure, intersite transport of nuclear materials, waste management, and radiological and hazardous chemical impacts during normal operation and from accidents. Where reasonably foreseeable changes to any of these factors can be predicted, they are discussed.

Environmental Impacts. In accordance with CEQ regulations, the environmental consequences discussions provide the analytical detail for comparisons of environmental impacts associated with the various stockpile stewardship and management facilities. Discussions are provided for each DOE site and each environmental resource and relevant issues that could be affected.

For comparison purposes, environmental concentrations of emissions and other potential environmental effects are presented with appropriate regulatory standards or guidelines. However, compliance with regulatory standards is not necessarily an indication of the significance or severity of the environmental impact for purposes of the *National Environmental Policy Act* (NEPA) of 1969.

The purpose of the analysis of environmental consequences is to identify the potential for environmental impacts. The environmental assessment methods used and the factors considered in assessing environmental impacts are discussed in section 4.1 and in the appropriate appendixes. The potential for impacts to a given resource or relevant issue is described in the introduction to each section within the site discussions (sections 4.2 through 4.9) that follow.

4.1 ENVIRONMENTAL RESOURCE/ISSUE METHODOLOGIES

4.1.1 Land Resources

This section considers land use plans and policies, zoning regulations, specially protected lands, and existing land use as appropriate for all sites. The potential impacts associated with changes to land use as a result of the alternatives are discussed.

Land use changes associated with upgraded and/or experimental stockpile stewardship facilities could occur in both rural and urban settings and could affect both developed and undeveloped land. The analysis of land use considers impacts that could result from the modification of existing facilities or the construction of new facilities on or adjacent to each site. Potential changes in land use are expected to occur within the existing boundaries of most, if not all, DOE sites. However, the use of lands adjacent to or in the vicinity of DOE sites (i.e., non-DOE land) could be affected by these changes, including new or expanded safety zones.

The degree to which the alternatives affect future use or development of land at each DOE site is considered. Land use impacts are assessed based on the extent and type of land that would be affected. The land use analysis also considers potential direct impacts resulting from the conversion of, or the incompatibility of, land use changes with special status lands such as prime and unique farmlands, and other protected lands such as Federal- and state-controlled lands (e.g., public land administered by the Bureau of Land Management or other Government agencies).

4.1.2 Site Infrastructure

Changes to site infrastructure are assessed by overlaying the support requirements of the respective stockpile stewardship and management facilities upon the projected site infrastructure capacities. These assessments focus upon electrical power and fuel requirements. Projections of electricity availability, site development plans, and other DOE mid- and long-range planning documents are utilized to project site infrastructure conditions. Tables are presented that depict the additional infrastructure requirements resulting from the alternatives. Mitigation considerations that could reduce impacts due to changes in infrastructure are identified on a site-by-site basis.

4.1.3 Air Quality

The air quality assessment evaluates the consequences of criteria and hazardous/toxic air pollutants associated with each alternative at each site. The criteria pollutants are specified in 40 CFR 50, Environmental Protection Agency (EPA) Regulations on National Primary and Secondary Ambient Air Quality Standards. The hazardous/toxic air pollutants are listed in Title III of the 1990 *Clean Air Act* (CAA) *Amendments*, the National Emissions Standards for Hazardous Air Pollutants (NESHAPs)

(40 CFR 61), and standards or guidelines proposed or adopted by the respective states.

Air quality concentrations from modeling site emission rates projected to 2005 define No Action concentrations of pollutants. This programmatic environmental impact statement (PEIS) presents the estimated impacts on air quality based on No Action air quality conditions at each site and the projected impacts resulting from the alternatives and compares the total concentrations to the most restrictive Federal and/or state ambient air quality standards and guidelines.

The modeling of site-specific emissions was performed in accordance with EPA's Guideline on Air Quality Models. The EPA-recommended Industrial Source Complex Short-Term (ISCST) Model (Version 2) (EPA 1992f) was chosen as the most appropriate model to perform the air dispersion modeling analysis for this PEIS because it allows for the estimation of dispersion from a combination of point, area, and volume sources. Input data for the model was provided by DOE sites. For source characteristics that are not available, characteristics were estimated based on similar source configurations at sites employing similar processes.

EPA guidelines are conservatively applied in the air quality assessment. The "highest-high" was selected for comparison to applicable standards and guidelines for all averaging times, instead of the EPA-recommended "highest-high" and "highest second highest" concentration for long-term and short-term averaging times, respectively. The concentrations evaluated are the maximum occurring at or beyond the site boundary or public access roads. It was also assumed that the toxic/hazardous emissions for DOE sites with incomplete source characteristics originate from a single point source. This assumption generally results in higher concentrations than would actually occur since emission sources are commonly geographically separated from one another.

A more detailed and quantitative assessment will be performed in site-specific NEPA documents designed to support a construction-level siting decision. This PEIS assessment of impacts from the No Action alternative and the other alternatives uses a screening level analysis and is based on conservative assumptions for modeling of potential impacts. The screening level modeling analysis presented in this document is a programmatic approach intended to provide a comparison of the air quality among each of the DOE sites. Modeled concentrations of air pollutants presented in this document that exceed the Federal or state air quality standards provide an indication of a potential problem, not a de facto exceedance. Detailed modeling and/or monitoring at each site would be required in order to obtain more accurate estimates of pollutant concentrations. The assessment in site-specific NEPA documents would be more refined with detailed design, source characteristics, and exact source locations.

Uncertainties. The performance of the ISCST Model has been evaluated with field data for its point source submodel (EPA 1977a; EPRI 1983a; EPRI 1985a; EPRI 1988a) and for its special features, such as gravitational settling/dry deposition option (EPA 1981a; EPA 1982a) and building downwash option (APCA 1986a; EPA 1981a). The ISCST Model is an extended version of the Single Source (CRSTER) Model; based on field data measured at four large power plants, it was concluded that the model was acceptable for predicting the upper percentile of the frequency distributions of 1-hour concentrations and of the corresponding distributions of 24-hour concentrations. The highest second-highest 1-hour concentrations were predicted within a factor of two at two-thirds of the field sampling sites for elevated power plant plumes. The ratio of the highest second-highest 24-hour concentration tended to be underpredicted by the model, with the ratio of predicted concentration to measured concentration ranging from about 0.2 to 2.7 at about 90 percent of the sampling sites (EPA 1977a:F-31).

In other validation studies for the Point Source Model, the CRSTER Model predicted peak short-term (i.e., 1-, 3-, and 24-hour) concentration values within 30 to 70 percent at a plain site (EPRI 1983a:7-1). The CRSTER Model predicted peak 1-hour concentrations within 2 percent and underpredicted peak 3-hour concentrations by about 30 percent at a moderately complex terrain site (EPRI 1985a:7-1). The ISCST Model overpredicts 1-hour concentrations by about 60 percent with better predictions for longer time periods at an urban site (EPRI 1988a:5-2). Uses of gravitational settling/dry deposition and building downwash options were found to improve the model performance significantly over that of the model without such features (APCA 1986a; EPA 1981a; EPA 1982a). The concentrations presented in this document are the highest concentrations predicted by the model in order to present conservative estimates of pollutant concentrations.

4.1.4 Water Resources

The quality and quantity of surface water and groundwater resources are described using available data. Potential effects on surface water and groundwater availability and quality are assessed.

Surface Water. Local surface water resources in the project region, flow characteristics and relationships, and stream classifications are used to describe current conditions. Data used for impact assessments include rates of water consumption and wastewater discharge for both construction and operation phases. Changes in the annual low flows of surface water resulting from proposed withdrawals and discharges are determined. In cases where low flow data are unavailable, average flow data are used. The existing water supply is evaluated to determine if sufficient quantities are available to support an increased demand by comparing projected increases with the capacity of the supplier and existing water rights, agreements, or allocations.

The water quality of potentially affected receiving waters is determined by reviewing current monitoring data for nonradiological parameters. Potential impacts from radiological parameters are discussed in the radiological and hazardous chemical impacts sections of the normal operation and accidents sections. Focus is given to parameters that exceed applicable water quality criteria, as determined by the individual states. Monitoring reports for discharges permitted under the National Pollutant Discharge Elimination System (NPDES) program are examined for compliance with permit limits and requirements. The performance of each candidate DOE site in complying with the permit requirements is presented. In most cases, current design data do not include information on the constituents present or the rate of discharge. The assessment of water quality impacts from wastewater (sanitary and process) and stormwater runoff qualitatively addresses potential impacts to the receiving waters' minimum or average flow, as available and appropriate. Suitable mitigation measures for potential impacts such as stream channel erosion and sedimentation, stream bank flooding, and thermal changes are identified. Water quality management practices are also reviewed. If effluent constituent data are available, parameters with the potential to further degrade existing receiving water quality along with parameters exceeding existing NPDES permit limits are identified.

Floodplains are identified to determine whether any of the proposed stockpile stewardship and management facilities are located within a floodplain. Where possible, the proposed location is compared with the 500-year floodplain.

Groundwater. Groundwater resources are analyzed for effects on aquifers, groundwater usage, and groundwater quality within the regions. Groundwater resources are defined as the aquifers underlying the site and their extensions down the hydraulic gradients to, and including, discharge points. The affected environment discussion includes a description of the potentially affected groundwater basins. The local aquifers are described in terms of the extent, thickness, character of rock formations, and quality of the groundwater. Recharge areas are also noted. Total baseline groundwater use at the facility is compiled using the best available data. Groundwater usage is described and projections of future usage are made based on changing patterns of usage and anticipated growth patterns, whenever site-specific groundwater availability issues are identified.

Drawdown estimates are made both onsite and offsite. Short- and long-term impacts associated with construction withdrawals are estimated. Both proposed facilities and existing facilities are considered in determining cumulative impacts.

Available data on existing groundwater quality conditions are compared to Federal and state groundwater quality standards, effluent limitations, and safe drinking water standards. Additionally, Federal and state permitting requirements for groundwater withdraw and discharge are identified. Impacts of groundwater withdrawals on existing contaminant plumes due to construction and facility operation are assessed to determine the potential for changes in their rates of migration and the effects of any changes in the plumes on groundwater users. Impacts are assessed by the degree to which groundwater quality, drawdown of groundwater levels, and groundwater availability to other users would be affected. Impacts on groundwater quality are presented when effluent constituent data are available.

4.1.5 Geology and Soils

Geology. Impacts to the geological environment considers destruction of or damage to unique geological features, subsidence caused by groundwater withdrawal, and landslides or shifting caused by loading or removal of supporting rock or soil. The local geology that could affect the alternatives, including geomorphology, stratigraphy, structural attitude of rocks, faults and seismicity, general foundation, and boring conditions, are described as appropriate for each alternative site. The locations of faults are identified and an overview of the seismicity of the site areas, including the history and significance of earthquakes, along with their intensity and ground acceleration, is presented. Areas of potentially unstable slopes and impacts to the stability of slopes by the removal or addition of large volumes of earth in construction are characterized.

Soils. Soil types at the proposed project sites are described and the capability of supporting construction of the proposed facilities is assessed. Shrinking or swelling of ground as a result of landscaping, irrigation, or construction dewatering and soil erosion susceptibility associated with construction are also addressed.

4.1.6 Biotic Resources

During construction, impacts to biotic resources, including terrestrial resources, wetlands, aquatic resources, and threatened and endangered species, may result from land-clearing activities, erosion and sedimentation, and human disturbance and noise. Operations may affect biotic resources as a result of changes in land use, emission of radionuclides, water withdrawal, wastewater discharge, and human disturbance and noise. In general, potential impacts are assessed based on the degree to which various habitats or species could be affected by an alternative. Where appropriate, impacts are evaluated with respect to Federal and state protection regulations and standards.

The analysis of impacts of project alternatives to biological resources is addressed at a level that is appropriate to the specificity of available information. In general, the analysis of impacts to biological resources presented in this PEIS is qualitative rather than quantitative. Quantitative analyses would be performed in site- and project-specific NEPA documentation.

Terrestrial Resources. Impacts of the proposed alternatives on terrestrial plant communities are evaluated by comparing data on site vegetation communities to proposed land requirements for construction and operation. The analysis of impacts to wildlife is based to a large extent on plant community loss or modification, which directly affects animal habitat. The loss of important or sensitive habitats and species is considered more important than the loss of regionally abundant habitats or species. Where appropriate, the disturbance, displacement, or loss of wildlife is evaluated in accordance with wildlife protection laws such as the *Migratory Bird Treaty Act*. Impacts on biotic resources from the release of radionuclides are not evaluated. Radiological releases associated with the various alternatives would generally be at or below natural background levels and would be within limits established to protect workers and the public. Since humans have generally been shown to be the most sensitive organism to radiation release these levels should also be protective of biota (AEC 1968a:220; NAS 1972a:34). Radiological effects on humans are addressed in the human health sections.

Wetlands. The potential direct loss of wetlands resulting from construction and operation of the proposed alternatives is addressed in a way similar to the evaluation of impacts on terrestrial plant communities; that is, by comparing data on site or regional wetlands to proposed land requirements. Sedimentation impacts are evaluated based on the proximity of wetlands to project areas and with the knowledge that an erosion control and sedimentation plan would be required. Impacts resulting from wastewater discharge into a wetland system are evaluated, recognizing that effluents would be required to meet Federal and state standards.

Aquatic Resources. Impacts to aquatic resources resulting from sedimentation and wastewater discharge are evaluated as described for wetlands. Potential impacts from radionuclides are not addressed for the same reasons described for terrestrial resources. Where appropriate, impingement and entrainment impacts are evaluated as is compliance with protective measures, such as the *Anadromous Fish Conservation Act*.

Threatened and Endangered Species. Impacts on threatened and endangered species are determined in a manner similar to that used to describe terrestrial and aquatic resources since the sources of potential impacts are similar. A list of species potentially present on each site or in proximity to the site or region (appendix C) was developed using information obtained from the U.S. Fish and Wildlife Service (USFWS) and appropriate state agencies. This list, along with consideration of site environmental and engineering data, and provisions of the *Endangered Species Act*, are used to evaluate whether the various alternatives could impact any threatened or endangered plant or animal (or its habitat).

Species that are Federal proposed or candidates for listing as threatened or endangered species do not receive legal protection under the *Endangered Species Act*. However, the USFWS recommends that impacts to these species be considered in project planning since their status can be changed to threatened or endangered in the foreseeable future. The USFWS has recently changed the classification of species under review for listing as threatened or endangered (61 FR 7596). Proposed species include those plants and animals for which a proposed rule to list as threatened or endangered has been published. Candidate species include those plants and animals for which the USFWS has on file sufficient information on biological vulnerability and threat to support issuance of a proposed rule for listing as threatened or endangered. Candidate species previously included Category 1 (species appropriate for listing as protected) and Category 2 (species possibly appropriate for listing as protected). Due to the recent rule change, candidate species include only those which are appropriate for listing as protected species (i.e., species formerly listed as Category 1). The Category 2 designation has been omitted. Some of the species previously identified as Federal candidate Category 2 in the Draft PEIS also have a state status and continue to be evaluated for potential impacts. However, due to the change in candidate classification described above, many species have been eliminated from proposed site threatened and endangered species lists.

4.1.7 Cultural and Paleontological Resources

Included in these sections are evaluations of the impacts of the Stockpile Stewardship and Management Program alternatives on prehistoric, historic, Native American, and paleontological resources. The effects considered include those resulting directly from land disturbance during construction, visual intrusion to the settings or environmental context of historic structures, visual and audio intrusions on Native American sacred sites, reduced access to Native American traditional use areas, unauthorized artifact collecting, and vandalism. Laws, regulations, Executive orders, and DOE orders mandating protection of cultural and paleontological resources are described for each site in chapter 5.

Prehistoric Resources. Prehistoric resources are physical properties resulting from human activities that predate written records. They are generally identified as either isolated artifacts or sites. Sites may contain concentrations of artifacts (e.g., stone tools and ceramic sherds), features (e.g., remains of campfires and houses), and plant and animal remains. Depending on their age, complexity, integrity, and relationship to one another, sites may be important for and capable of yielding information about past populations and adaptive strategies. The affected environment section for prehistoric resources includes a brief overview of the number and types of prehistoric sites in the project areas, if known, and their status on the National Register of Historic Places (NRHP). The overview consists of a summary of existing information about prehistoric resources in the region and a discussion of types of sites that are likely to occur.

Impact assessments for prehistoric resources focus mainly on those properties likely to be eligible for the NRHP. Impacts are assessed by considering whether or not the proposed action could substantially add to an existing disturbance of resources in the project areas, adversely affect NRHP-eligible resources, or cause loss of or destruction to important prehistoric resources.

Historic Resources. Historic resources consist of physical properties that postdate the existence of written records. In the United States, historic resources are generally considered to be those that date from 1492 onward. Historic resources include architectural structures or districts (e.g., buildings, dams, and bridges), objects, and archaeological features (e.g., foundations of mills or residences, trails, and trash dumps). Ordinarily, sites less than 50 years old are not considered historic for analytical purposes, but exceptions can be made for younger properties if they are of exceptional importance (e.g., structures associated with Cold War themes [36 CFR 60]). The affected environment section for historic resources includes a brief overview of the number and types of historic sites in the project areas, if known, and their status on the NRHP. The overview consists of a summary of existing information about historic resources in the region and a discussion of the types of sites that are likely to exist.

Impact assessments for historic resources focus mainly on those properties likely to be eligible for the NRHP. Impacts are assessed by considering whether or not the proposed action could substantially add to an existing disturbance of resources in the project areas, could adversely affect NRHP-eligible resources, or could cause loss of or destruction to important historic resources.

Native American Resources. Native American resources are sites, areas, or materials important to Native Americans for religious or heritage reasons. In addition, cultural values are placed on natural resources such as plants, which have multiple purposes within various Native American groups. Of primary concern are concepts of sacred space that create the potential for land-use conflicts. Native American concerns would be identified through direct consultation with tribal representatives and field visits with tribal religious specialists during preparation of project-specific tiered NEPA documents. Contacts would be identified by reference to the ethnographic literature, by state and national pantribal organizations, and by agency and academic anthropologists.

The individual resource type, the proximity of impact areas to the resources, and the likely duration of impacts are considered in the analysis of Native American resources. Specific concerns include the relative importance of the resource in the Native American physical universe or religion, the distance at which activities in the vicinity of a sacred area constitute a disturbance, the extent to which affected resources may be restored, and the extent to which alternative sources for raw materials are available and/or suitable. Impacts to Native American resources are assessed by considering whether or not the proposed action has the potential to affect sites important for their position in the Native American physical universe or belief system, or the possibility of reducing access to traditional use areas or sacred sites.

Paleontological Resources. Paleontological resources are the physical remains, impressions, or traces of plants or animals from a former geological age. They include casts, molds, and trace fossils such as burrows or tracks. Fossil localities typically include surface outcrops, areas where subsurface deposits are exposed by ground disturbance, and special environments favoring preservation, such as caves, peat bogs, and tar pits. Paleontological resources are important mainly for their potential to provide scientific information on paleoenvironments and the evolutionary history of plants and animals. The affected environment section for paleontological resources includes a description of known paleontological localities and geological formations in the project areas that may be fossil bearing.

Impact assessments for paleontological resources are based on the numbers and kinds of resources that could be affected, as well as the quality of fossil preservation in a given deposit, particularly in deposits with high research potential. Such deposits include poorly known fossil forms; well-preserved terrestrial vertebrates; unusual depositional contexts; assemblages containing a variety of fossil forms, particularly associations of vertebrates, invertebrates, and plants; or deposits recovered from poorly studied regions or in unusual concentrations.

4.1.8 Socioeconomics

These sections describe and assess impacts on local and regional socioeconomic conditions and factors including employment, economy, population, housing, and public finance. This PEIS assesses the socioeconomic impacts of both the gains and losses of missions at each site. The potential for socioeconomic impacts on population, housing, and local government finance is greatest in those local jurisdictions immediately adjacent to each site and those that are the residential locations of the majority of DOE site employees. Potential socioeconomic impacts on the economy (employment and income) are not bounded by local government jurisdictions but rather by industrial linkages to a regional market. Therefore, potential socioeconomic impacts are assessed using two geographic regions, a regional economic area, and a region of influence (ROI). Regional economic areas are used to assess potential effects on the economy. ROIs are used to assess effects which are more localized in political jurisdictions surrounding the sites.

The regional economic area for each site encompasses a broad market that involves trade among and between regional industrial and service sectors. It is characterized by strong economic linkages between the communities located in the region. These linkages determine the nature and magnitude of multiplier effects on economic activity (i.e., purchases, earnings, and employment) at each candidate site. Regional economic areas are defined by the U.S. Bureau of Economic Analysis as consisting of an economic node that serves as the center of economic activity and the surrounding counties that are economically related and include the places of work and residences of its labor force.

The U.S. Bureau of Economic Analysis measures multiplier effects of interindustry linkages with the Regional Input-Output Modeling System (RIMS II). RIMS II is based on an accounting framework called an input-output table. An input-output table shows, for each industry, industrial distributions of inputs purchased and outputs sold. RIMS II Total Direct-Effect Multipliers are used in this PEIS to estimate additional regional employment and income generated by employment and income directly associated with the proposed alternatives. RIMS II is also used to estimate the effects of jobs and income lost in a region due to downsizing or phaseout.

Additional potential demographic impacts were assessed on a smaller geographic area (ROI) where the housing market and community public finances could be most affected. Proposed Program alternatives at alternative sites were assessed using a site-specific ROI, comprising those local jurisdictions likely to experience the greatest socioeconomic impacts. The ROI is defined as those counties where approximately 90 percent of the current DOE and contractor employees reside. This residential distribution reflects existing commuting patterns and attractiveness of area communities for people employed at each site, and is used to estimate the future distribution of direct workers with the proposed alternative. The evaluation of impacts is based on the degree to which changes in employment and population affect the regional economy, housing market, and public finance. It is assumed that most new or lost jobs would occur within the ROI where the majority of DOE and contractor employees live. The changes to these factors are projected to 2030 because the projected life of the DOE facilities for the alternatives under study is 25 years starting in 2005. The following sections discuss each of the socioeconomic conditions and factors considered.

Employment. The construction and operation of stewardship and management technologies and facilities could affect employment at DOE sites. Changes in site employment would, in turn, directly affect local and regional populations, economies, housing, and public finance. Current employment at each site is described, as well as projected employment associated with other planned DOE initiatives. Socioeconomic trends and the relationship of site employment to these trends are examined for each potentially affected socioeconomic region. Emphasis is placed on evaluating total direct and indirect employment changes and impacts associated with potential mission relocations.

Economy. The regional economies surrounding each site are characterized. Emphasis is placed on the measurement of the relative contribution and importance of each site's employment payroll and purchases to the economy. Changes to regional economic conditions are evaluated based on each site's relative contribution and changes to employment. Emphasis is placed on the economic effects of mission changes associated with the operation of stewardship and management technologies and facilities.

Population. The demographic changes in the ROI surrounding each site are described and assessed. Demographic characteristics are presented for the site's ROI to support the assessment of socioeconomic impacts. Trends are identified and used to project demographic changes over the environmental baseline period. Cumulative population impacts include the population impacts of other DOE actions under consideration, including planned environmental restoration activities.

Housing. Changes in employment at each site would affect the demand and supply of housing units, including the need for temporary housing (e.g., rental units) to support in-migrating construction workers. Trends in the housing availability within each site's socioeconomic ROI are characterized and evaluated. Numbers of in-migrating and out-migrating site employees associated with each of the alternatives are then used to evaluate housing impacts.

Public Finance. Each site is located on land owned by the Federal Government, which exempts these lands from state and local taxation. However, all employee income, property, and purchases are subject to applicable Federal, state, and local taxation requirements.

The additional workforce associated with any of these alternatives is small, and would require few in-migrating workers. For that reason, there would be little increased demand on specific community services. However, there would be fiscal impacts associated with additional missions or the phaseout of existing missions which could affect the community's ability to provide basic infrastructure and services. Therefore, the fiscal impacts on each site's ROI are assessed for counties, cities, and school districts, rather than the change in demand for specific community services. For a more detailed discussion of public finance, see appendix D.

4.1.9 Radiation and Hazardous Chemical Environment

4.1.9.1 *Normal Operation*

Public Health Risks. The risks to the general public during the 25-year operational interim are determined in three ways. Radiological releases/doses, which are conveyed in site-specific reports, are used to calculate risks associated with predicted baseline (No Action) operations in 2005. Incremental radiological/chemical doses and respective subsequent risks for management alternatives associated with each applicable site examined in this PEIS are calculated (modeled) via predicted release quantities supplied by "technology-specific" data reports and from site-dependent parameters. Incremental radiological/chemical doses and respective subsequent risks associated with certain proposed stewardship alternatives (on a per site basis) pursuant to this PEIS, are directly referenced from technology-specific or site-specific data reports.

Radiological Impacts. The assessment of incremental (or decremental) impacts incurred at each of the DOE sites are performed using the GENII computer code. This type of assessment uses such site-dependent factors as meteorology, population distributions, agricultural production, and an assumed facility location on a given site. Health risks to the maximally exposed individual and population within 80 kilometers (km) (50 miles [mi]) at Oak Ridge Reservation (ORR), Savannah River Site (SRS), Pantex Plant (Pantex), Sandia National Laboratories (SNL), and Nevada Test Site (NTS) are analyzed for each management and/or stewardship alternative, with the assumption that any two or more alternatives (with the exception of No Action) are not concurrently existing. At Los Alamos National Laboratory (LANL) and Lawrence Livermore National Laboratory (LLNL) however, a cumulative calculation is provided which includes all possible alternatives simultaneously existing at each respective site.

Resulting doses are compared with regulatory limits, and for perspective, are also compared with background radiation levels in the area of the site. These doses are then converted into the projected number of fatal cancers using a dose-to-risk conversion factor of 500 fatal cancers per 1,000,000 person-rem ($5x10^{-4}$ fatal cancers per person-rem) derived from data presented in a report prepared by the National Research Council's Committees on the Biological Effects of Ionizing Radiations (BEIR V) and also cited in the *1990 Recommendations of the International Commission on Radiological Protection.* The calculated health effects from each of the alternatives are then compared to one another (including the No Action alternative).

Hazardous Chemical Impacts. Public health risks from hazardous chemical releases during normal operation at the respective DOE sites are assessed by essentially the same analytical approach using conservative assumptions. This conservative approach is applied uniformly to all alternative sites using guidance provided under the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA). The initial assessment in risk analysis is considered a screening step that was determined to be the appropriate level of analysis for this

PEIS. Under this guidance, if the Hazard Index (HI) is ≤ 1.0, all noncancer exposure values meet Occupational Safety and Health Administration (OSHA) standards; if the cancer risk is $\leq 1 \times 10^{-6}$ (the default value, not a regulatory standard), no further analysis is indicated. A cancer risk of $\leq 1 \times 10^{-6}$ is considered acceptable by EPA (40 CFR 300.430) because this incidence of cancers cannot be distinguished from the cancer risk for an individual member of the general population.

Engineering designs used for the stockpile stewardship and management process and/or storage facilities include the anticipated emissions of hazardous chemicals. From emission data, concentrations at the site boundary are assumed to represent the maximum that any member of the public will encounter; therefore, the site boundary concentrations are derived through the ISCST Model (version 2) recommended by EPA. The noncancer risks of the maximally exposed individual of the public will consist of hazard quotients (HQs) that compare chemical exposure levels to the reference concentration values published by EPA in the Integrated Risk Information System. The cancer risk to the maximally exposed individual is calculated from the doses derived from modeling exposure levels, using slope factors or unit risks for individual chemicals published in the Integrated Risk Information System or the health effects summary tables. The health effects summary tables are the yearly summary of EPA's regulatory toxicity data. The HI values (i.e., the sum of the HQs) and cancer risks are conservative because a single source and a single point at the site boundary are chosen for the calculations. The cancer risks are also conservative due to the single point concentration and the position where the exposure is assumed to occur. The HI is independent of the cancer risk.

The HIs and cancer risks are used as screening tools to identify potential health concerns that may require further analysis. If the HI meets OSHA standards and cancer risks are within the default value, then further analysis is most likely not warranted. However, if in the conservative approach, there are sites or activities wherein the HI and/or cancer risk exceed acceptable limits, then these sites or activities become candidates for further in-depth analysis. The in-depth analysis should identify the individual chemicals that contribute to substantial adverse HI and/or cancer risk impacts, starting with those chemicals showing the highest HQs and/or cancer risk and grouping them according to their specific health effects. These chemicals then may be identified for inclusion in more specific site analyses. It should be noted that when the OSHA standards for HIs and/or the cancer risk default value are exceeded, a health concern may not necessarily exist. This PEIS does not purport to provide the level of detail needed to go beyond a conservative screening process for hazardous chemicals. As such, the analysis in this PEIS for the No Action alternative should not be relied upon as a basis for judging whether the sites have a health concern. The model used to calculate HI and cancer risk in this PEIS only establishes a baseline for comparison of alternatives among different sites. The baseline is then used to determine the extent to which each alternative adds or subtracts from the No Action HI and cancer risk to the public at each site.

Information pertaining to OSHA-regulated permissible exposure limits, reference concentrations, reference doses, cancer slope factors (if any), and toxicity profiles for all hazardous chemicals described in this PEIS may be found in the *Chemical Health Effects Technical Reference* (TTI 1996b.)

Occupational Health Risks. Health risks are assessed for two types of workers. The first type is the involved worker who would be located inside a facility that is involved with any of the given alternatives being examined. The second type is the noninvolved worker who would be located somewhere else on a given site but is not involved with occupational tasks associated with any of the given alternatives.

Radiological Impacts. Involved worker exposures are either based on values reported in technology-specific data reports or in occupational dose histories for similar operations. The doses to noninvolved workers at each respective site are determined based on occupational dose histories; in most cases for these workers, impacts associated with normal operation for each management and/or stewardship alternative are assumed to be negligible compared with those associated with their primary onsite activities. Worker impacts associated with each alternative at ORR, SRS, Pantex, SNL, and NTS are analyzed with the assumption that any two or more alternatives (with the exception of No Action) are not concurrently existing. At LANL and LLNL however, a cumulative calculation is reported that includes all possible alternatives simultaneously existing at each respective site.

The worker doses are converted into the number of projected fatal cancers using the dose-to-risk conversion factor of 400 fatal cancers per 1,000,000 person-rem ($4x10^{-4}$ fatal cancers per person-rem) given in ICRP Publication 60. This lower risk estimator, compared with that for members of the public, reflects the absence of children in the workforce.

Hazardous and Toxic Chemical Impacts. Since direct chemical monitoring data on worker exposure is not available for specific operations, the onsite worker is assumed to receive the maximum exposure any involved or noninvolved onsite person will receive. OSHA-regulated levels (i.e., permissible exposure levels) are applied to all hazardous chemicals that are released at the site. This includes both the project-specific releases as well as those that are a result of other site operations. All onsite exposures are assumed to occur at a distance of 100 meters (m) (330 feet [ft]) from a centralized point of release, which will yield a conservative concentration level for each chemical. The concentrations are derived through the ISCST Model recommended by EPA. The noncancer risks to the onsite worker consist of HQs that compare chemical exposure levels to the permissible exposure level values established by OSHA. The HI for each alternative is the sum of all HQs for the alternative. The cancer risks to the onsite worker are calculated from doses derived from modeled exposure level, using slope factors or unit risks for individual chemicals published in the Integrated Risk Information System or the health effects summary tables. The worker exposure is based on an 8-hour day and 52 weeks of 40 hours each (i.e., 0.237 fractional year). The HI values and cancer risks are conservative because a single point at 100 m (330 ft) from a centralized source term is chosen for the calculations. The cancer risks are conservative due to the single point concentration and the position where the exposure is assumed. The HI is independent of cancer risk. The cancer risks to the facility worker for each chemical are computed from the dose (converted from air concentrations) and the unit risk or slope factors to yield a probable risk. The risks are also conservative because a single point at or near the maximum onsite concentration is selected for calculating the exposure of the facility worker. Actual risks are likely lower than estimated risks.

As described for public health risks, this conservative approach is applied uniformly to workers at all sites using guidance under CERCLA. Under this guidance, if the HI is ≤ 1.0, all noncancer exposure values meet OSHA standards. If the cancer risk is $\leq 1 \times 10^{-6}$ (the default value, not a regulatory limit), no further analysis is indicated. If the HI exceeds the OSHA standards and/or the cancer risk exceeds the default value, a need for a more in-depth analysis of the data is indicated. It should be noted that when the OSHA standards for HIs and/or the cancer risk default value are exceeded, a health concern may not necessarily exist. The model used to calculate HI and cancer risk in this PEIS only establishes a baseline for comparison of alternatives among different sites. The baseline is then used to determine the extent to which each alternative adds or subtracts from the No Action HI and cancer risk for workers at each site.

Information pertaining to OSHA-regulated permissible exposure limits, reference concentration, reference doses, cancer slope factors (if any), and toxicity profiles for all hazardous chemicals described in this PEIS may be found in the *Chemical Health Effects Technical Reference* (TTI 1996b).

Epidemiological Studies. In March 1990, the Secretary of Energy announced that DOE would turn over responsibility for analytical epidemiologic research on long-term health effects on workers at DOE facilities and the public in surrounding communities to the Department of Health and Human Services. Further, DOE directed that this worker and public health and exposure data be released. A Memorandum of Agreement with the Department of Health and Human Services was signed in January 1991. The Department of Health and Human Services is now conducting the ongoing health effects research program. The National Institute for Occupational Safety and Health also initiated a study in 1994 but does not expect the results before 1997. Discussions are presented of past and ongoing health studies for each site.

4.1.9.2 *Facility Accidents*

Accident Analysis for Postulated Accident Scenarios. The relative consequences of postulated accidents in the evaluation of each alternative are considered. In evaluating the magnitude and consequences of each alternative, a suitable accident analysis is performed to produce results for decision-making purposes. Although the concepts used are analogous to a formal Probabilistic Risk Assessment, which would be appropriate for a project-level analysis, the accident analysis involves considerably less detail and only addresses a representative spectrum of beyond design-basis accidents (high-consequence, low-probability) and a representative spectrum of possible operational accidents (low-consequence but high-probability of occurrence). The technical approach for the selection of accidents is consistent with the DOE Office of NEPA Oversight *Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements* (May 1993), which recommends consideration of two major categories of accidents: within design-basis accidents and beyond design-basis accidents.

For the purpose of this assessment, risk is defined as the mathematical product of the probability and consequences of an accident. Both probability and consequences are presented in this PEIS. The risk-contributing scenarios consider both design-basis and severe accidents. The specific accidents consider the types of facilities. Examples of accidents include those resulting from operator errors, spills, criticalities, fires, explosions, airplane crashes, common-cause failures, collocated facilities, severe weather, earthquakes, and transportation. Information on potential accidents includes those that have been postulated and analyzed for similar facilities. The risks of the various stockpile stewardship and management facilities are evaluated in terms of the incremental increase in risk and the cumulative effect of that risk with respect to normal day-to-day risks to which the general population is exposed.

For each alternative, a number of evaluation and beyond evaluation accidents have been identified and are generally referred to as the composite set of accidents. Two subsets of the composite set are also referred to as the composite set of evaluation basis accidents (EBAs) and the composite set of beyond evaluation basis accidents (BEBAs). Impacts are presented for the composite set of accidents to reflect the combined impacts of EBAs and BEBAs. The impacts for the composite set of EBAs are also provided to reflect the impacts of high-frequency/low-consequence accidents. Impacts for the composite set of BEBAs are provided to show the impacts of low-frequency/high-consequence accidents. EBAs are generally in a frequency range greater than 10^{-6} per year, while BEBAs are generally in a frequency range of 10^{-7} to 10^{-6} per year. In some cases, accidents less than 10^{-7} are included in the composite set of BEBAs.

Accident risk to collocated workers was calculated for a hypothetical worker at 1,000 m (3,281 ft) from the facility, or at the site boundary, whichever is closer. For distances less than 1,000 m (3,281 ft), the screening model techniques used in the programmatic level analyses are less effective because of the effects of buildings on meteorology and dispersion. For purposes of this analysis, all workers associated with a specific stockpile management function are assumed to be at risk for the various accident scenarios addressed in this PEIS. Where information is available, risks to involved workers from accidents are presented. It should be noted that the purpose of this PEIS is to assist the decisionmaker in making programmatic site selection decisions. Since the activities are the same for a given stockpile management function regardless of location, the risk to involved workers would be independent of site location and would not be a discriminating factor for programmatic siting decisions. Risk to workers from radiological accidents would be addressed in greater detail in site-specific tiered NEPA documents when more detailed information is available.

Sensitivity Analysis. Adequate data is not available to support a quantitative sensitivity analysis for accident impacts; therefore, a discussion of the subject is not presented in the accident discussion for the management alternatives in this PEIS. However, it is expected that higher case workloads could increase the quantity of hazardous materials at risk in an accident and the accident frequency. Therefore, this could result in a corresponding increase in accident impacts.

Uncertainties. The sequence of analyses performed to generate the radiological impact estimates from normal operation and facility accidents include selection of normal operational modes and accident sequences, estimation of source terms, estimation of environmental transport and uptake of radionuclides, calculation of radiation doses to exposed individuals, and estimation of health effects. There are uncertainties associated with each of these steps. Uncertainties exist in the way the physical systems being analyzed are represented by the computational models and in the data required to exercise the models due to measurement errors, sampling errors, or natural variability.

The analysis is designed to ensure—through judicious selection of release scenarios, models, and parameters—that the results represent the potential risks, and that there is a consistent basis for comparing alternatives. This is accomplished by making conservative assumptions in the calculations at each step.

The risk analysis presented in this PEIS is not a complete risk assessment in the sense of identifying and analyzing all physically possible accidents including those high consequence accidents whose probability is so remote as to render them not reasonably foreseeable. The accident analyses do include, however, a spectrum of reasonably foreseeable accidents including high consequence accidents and their associated risks for the technologies and facilities. These severe accidents have low accident frequencies, often less than 1.0×10^{-6} per year. The accident analyses also include higher frequency accidents (evaluation-basis and other operational accidents) that typically have lower consequences. These evaluation-basis and other operational accidents have accident frequencies that are greater than 1.0×10^{-6} per year.

In summary, the radiological and hazardous chemical impact estimates presented in this document were obtained by:

- Using the best available data
- Considering the processes, events, and accidents that are reasonably foreseeable for the facilities described in this study and the environment
- Making conservative assumptions when there is doubt about the exact nature of the processes and events taking place
- Ensuring the consistency of analysis across alternatives

Emergency Preparedness. Emergency preparedness and planning has the effect of mitigating the consequences of facility accidents. Emergency preparedness plans exist for all sites and are summarized for each site.

4.1.10 Waste Management

A major effort of the Stockpile Stewardship and Management Program has been and would continue to be the minimization of waste generation. The proposed alternatives would incorporate waste minimization and pollution prevention practices to the maximum extent practicable. Waste minimization efforts and the management of Program-related wastes are discussed for each DOE site. Waste management facilities that would support stockpile stewardship and management facilities would treat and package waste into forms that would enable long-term storage or disposal. For sites under consideration that do not have existing or planned onsite low-level waste (LLW) disposal, the number of additional shipments required to transport LLW from the site to a DOE LLW disposal facility is estimated. For example, for purposes of this analysis it is assumed that Pantex would ship its LLW to NTS as per current practice. The risks associated with additional shipments are addressed as part of the intersite transport assessment (section 4.10). Waste management activities that would support the Program are assumed to be per current site practice and are contingent upon decisions to be made through the *Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (DOE/EIS-0200-D, August 1995). Any future waste management facilities that may be required to support the Program would be coordinated with any decisions resulting from the Waste Management PEIS and any respective site-specific NEPA documentation.

The construction and operation of stockpile stewardship and management facilities would generate several types of wastes. Generation points are in some cases different among alternative sites depending upon specific siting of various facilities. Construction wastes are similar to those generated by any construction project of comparable scale. Wastes generated during the operation of stockpile stewardship and management facilities consist of five primary types: transuranic (TRU), low-level, mixed, hazardous, and nonhazardous wastes. The types and amounts of waste vary according to the alternative and facility. For example, the Pit Fabrication Facility is the only facility projected to generate any TRU waste.

The nuclear weapons facilities provide for the short-term stabilization, staging, storage, and management of waste, including the means to minimize waste generation, until DOE either disposes of the waste or places it in long-term storage. To provide a framework for addressing the impacts of waste management for stockpile stewardship and management facilities, descriptive information is presented on the waste management activities anticipated for each DOE site. The volumes of each type of waste generated are estimated by facility and DOE site. These estimates have included waste minimization provisions. The impact assessment addresses the waste types and projected waste volumes from the various stockpile stewardship and management facilities at each site compared to No Action. Impacts are assessed in the context of existing site practices for treatment, storage, and disposal, including the applicable regulatory setting and requirements. Existing permits, compliance agreements, and other site-specific waste management practices were reviewed and analyzed to assess the ability to conduct the required activities.

Decontamination and decommissioning (D&D) activities are also addressed. Such activities depend upon the historic use of the facility and the final disposition of a facility. D&D activities could range from performing a simple radiological survey to completely dismantling and removing a radioactively contaminated facility. The D&D waste volumes from transition facilities no longer required for stockpile stewardship and management missions are estimated.

4.1.11 Environmental Justice

This PEIS assesses the potential for disproportionately high and adverse human health or environmental effects on minority and low-income populations in accordance with Executive Order 12898, *Federal Action to Address Environmental Justice in Minority Populations and Low Income Populations*. Because both the Federal Working Group on Environmental Justice and DOE are still in the process of developing guidance on criteria for identifying effects to these populations, the approach taken in this PEIS analysis may differ somewhat from whatever guidance may be issued.

This PEIS environmental justice analysis addressed selected demographic characteristics of the ROI (80 km [50 mi]) for each of the eight alternative sites. The analysis identified census tracts where racial or ethnic minorities comprise 50 percent, or a simple majority, of the total population in the census tract, or where racial or ethnic minorities comprise less than 50 percent but greater than 25 percent of the total population in the census tract. The analysis also identified low-income communities where 25 percent or more of the population is characterized as living in poverty (yearly income of less than $8,076 for a family of two). Impacts are assessed based on the analysis presented for each resource and issue area for each of the proposed alternatives at each site. Any disproportionately high and adverse human health or environmental effects on minority and low-income populations are discussed.

4.1.12 Cumulative Impacts

Cumulative impacts address the incremental effects of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions (43 FR 55978; 40 CFR 1500-1508).

Other DOE programs (including environmental management missions) and other Federal, state, and local development programs all have the potential to contribute to cumulative effects on DOE sites. "Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7). To the extent information was available for these other actions at a given site, the cumulative impacts are presented.

Continuing Department of Energy Missions. Continuing DOE missions and any reasonably foreseeable changes to these missions are addressed as part of the affected environment baseline. Continuing missions at each site are discussed in the site infrastructure section of the affected environment discussion for each DOE site. These missions provide the baseline against which the stockpile stewardship and management facilities are compared. For example, water requirements for the proposed stockpile stewardship and management facilities are combined with requirements of continuing missions to assess the total impact to water resources.

Environmental Management Missions. Any planned and reasonably foreseeable new or modified waste handling facilities are discussed in the waste management section for each site. In addition, to the extent that other environmental management missions or strategies are planned and defined, they are also discussed as bounding environmental impacts of waste management actions. Specific waste management activities are being addressed in the Waste Management PEIS being prepared by the DOE Office of the Assistant Secretary for Environmental Management (EM).

Other Federal and State Programs. Other Federal and state programs are identified, but only planned, reasonably foreseeable programs are considered. Typical programs in this category include public works projects and military base closures and reuse projects. Potential consequences of any major programs that increase impacts when combined with the stockpile stewardship and management alternatives are presented.

Local Development Programs. Local development programs are not specifically identified. However, socioeconomic projections take into account anticipated regional growth. Local development programs are a part of this growth and are addressed collectively using growth as a substitute. Socioeconomic projections form the baseline for much of the environmental analysis presented in this document.

Approach for Cumulative Impact Assessments. There is no generic methodology for the assessment of cumulative impacts. Therefore, the following approach represents a design for analyzing programmatic cumulative impacts relative to past, present, and probable future activities. It incorporates a wide ranging view of DOE defense programs, environmental management, and other outside interactions. This strategy is integrated with detailed resource-specific assessment methods where appropriate, and can be developed further in site-specific tiered NEPA documentation to ensure compatibility across the DOE Office for the Assistant Secretary for Defense Programs (DP), EM, and other programs.

The rationale for this approach is that this PEIS is a programmatic document. The reference condition for cumulative effects is the No Action alternative. The strategy has four major components:

- Focus analysis primarily on the impacts at each stockpile stewardship and management site where other DP and/or EM activities are reasonably anticipated. Past, baseline, and future DP and EM activities are more clearly defined and have a higher degree of certainty than offsite activities. These activities tend to be much more speculative the further into the future they are planned.

- Address quantitatively cumulative impact analyses associated with offsite activities in site-specific, tiered NEPA documentation.

- Coordinate efforts between DP and EM activities through the Memorandum of Agreement between DP and EM activities.

- Focus on site-specific cumulative effects from stockpile stewardship and management, addressing them in terms of both the temporal and spatial aspects of DP activities, as well as the level, phasing, and site-specific locations of proposed EM facilities and activities. This is appropriate due to the uncertainty and lack of specificity associated with offsite activities that could result in significant incremental, indirect, or synergistic cumulative impacts; these activities are more effectively addressed in site-specific, tiered NEPA documentation.

This method is flexible and allows for the assessment of cumulative impacts to regulated resources at a lower level of analysis due to the protection afforded to them through applicable regulations. In addition, the method recognizes that the focus on a given resource may vary according to site-specific characteristics of the local environment. Where these types of variations are identified, a level of analysis would be performed commensurate to the importance of the potential cumulative impacts on that resource.

4.2 Oak Ridge Reservation

ORR is a Government-owned, contractor-operated reservation located in the State of Tennessee. The regional location of ORR is shown in figure 4.2–1 and the principal facilities at ORR are shown in figure 4.2–2. The prime contractor manages the Y-12 Plant (Y-12), Oak Ridge National Laboratory (ORNL), the K-25 Site (K-25), and most other properties on the reservation. The facilities began operation in 1943 as part of the World War II Manhattan Project. The primary missions at each facility have changed over the past 50 years, with the current missions described in section 3.2.2. Although Y-12 is the main focus area with respect to the proposed actions, baseline environmental information and impact assessment are presented for ORR due to the proximity and potential impacts of nearby facilities, both present and future.

4.2.1 Description of Alternatives

No Action. ORR would continue to perform the missions described in section 3.2.2.

Stockpile Management Alternatives. The secondary and case fabrication mission could be consolidated and downsized, and remain at Y-12. In this scenario, storage of the strategic reserve of uranium would remain at Y-12. The Y-12 secondary and case fabrication mission could also be transferred to either LANL or LLNL. In the event the secondary and case fabrication mission is transferred to the laboratories, the DP missions at Y-12 would be phased out and the facilities transitioned to EM for disposition. In addition, the strategic reserve of uranium in the form of canned subassemblies would be relocated to the weapons assembly/disassembly (A/D) Facility at either Pantex or NTS.

Stockpile Stewardship Alternatives. There are no stockpile stewardship alternatives that include ORR.

4.2.2 Affected Environment

The following sections describe the affected environment at ORR for land resources, air quality, water resources, geology and soils, biotic resources, cultural and paleontological resources, and socioeconomics. In addition, the infrastructure at ORR, the radiation and hazardous chemical environment, and the waste management conditions are described.

4.2.2.1 *Land Resources*

ORR is located on approximately 13,980 hectares (ha) (34,545 acres) within the corporate limits of the city of Oak Ridge, approximately 19 km (12 mi) west of Knoxville, TN. All the land within ORR is owned by the Federal Government and is administered, managed, and controlled by DOE. Generalized land uses at ORR and in the vicinity are shown in figure 4.2.2.1–1.

Land uses within ORR can be grouped into four major land use classifications: industrial, forest/undeveloped, public/quasi-public, and water. The industrial areas account for approximately 4,700 ha (11,700 acres) or approximately 33 percent of the total site area. An additional 490 ha (1,200 acres) are used for a security buffer zone around various facilities. About 320 ha (800 acres) of ORR's land is classified as public land and consists mainly of the 36-ha (90-acre) Clark Center Recreational Park, numerous small public cemeteries, and an onsite public road (OR DOE 1989a:5-10). The remaining area, about 8,700 ha (21,600 acres), consists of forest/undeveloped land, some of which is managed as pine plantations for production of pulpwood and saw timber. The DOE Water Treatment Facility, which provides water to many ORR facilities and the city of Oak Ridge, is located just north of Y-12. There are no prime farmlands on ORR.

In 1980, DOE designated approximately 5,500 ha (13,600 acres) of ORR undeveloped land as a National Environmental Research Park. The park is used by the national scientific community as an outdoor laboratory for environmental science research on the impact of human activities on the eastern deciduous forest ecosystem (DOE 1985a:3,27).

Land bordering ORR is predominately rural and used largely for residences, small farms, forest land, and pasture land. The city of Oak Ridge, along the northeast portion of the site, has a typical urban mix of residential, public, commercial, and industrial land uses. There are four residential areas along the northern boundary of ORR; each has several houses within approximately 30 m (98 ft) of the boundary.

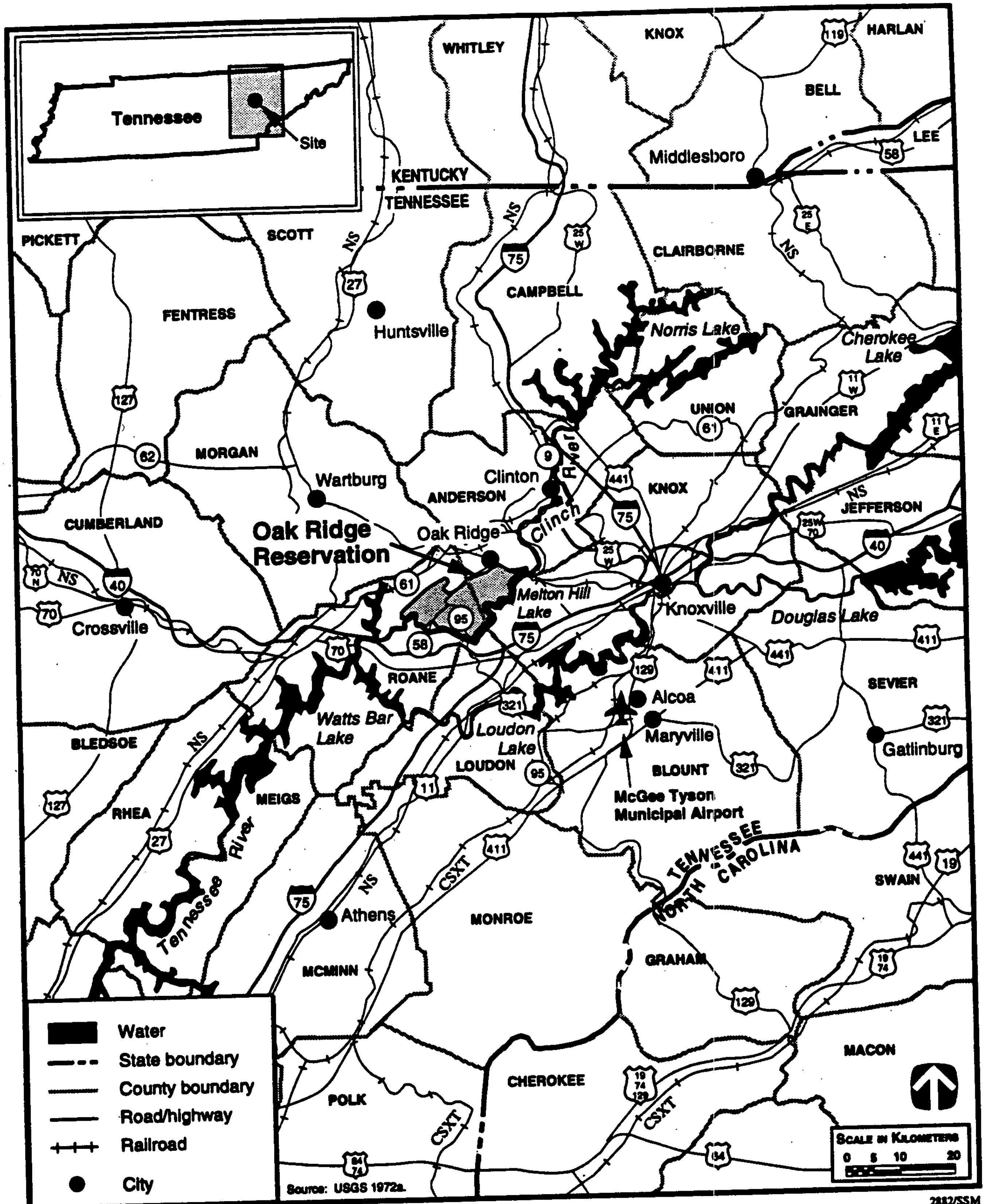


FIGURE 4.2–1.—*Oak Ridge Reservation, Tennessee, and Region.*

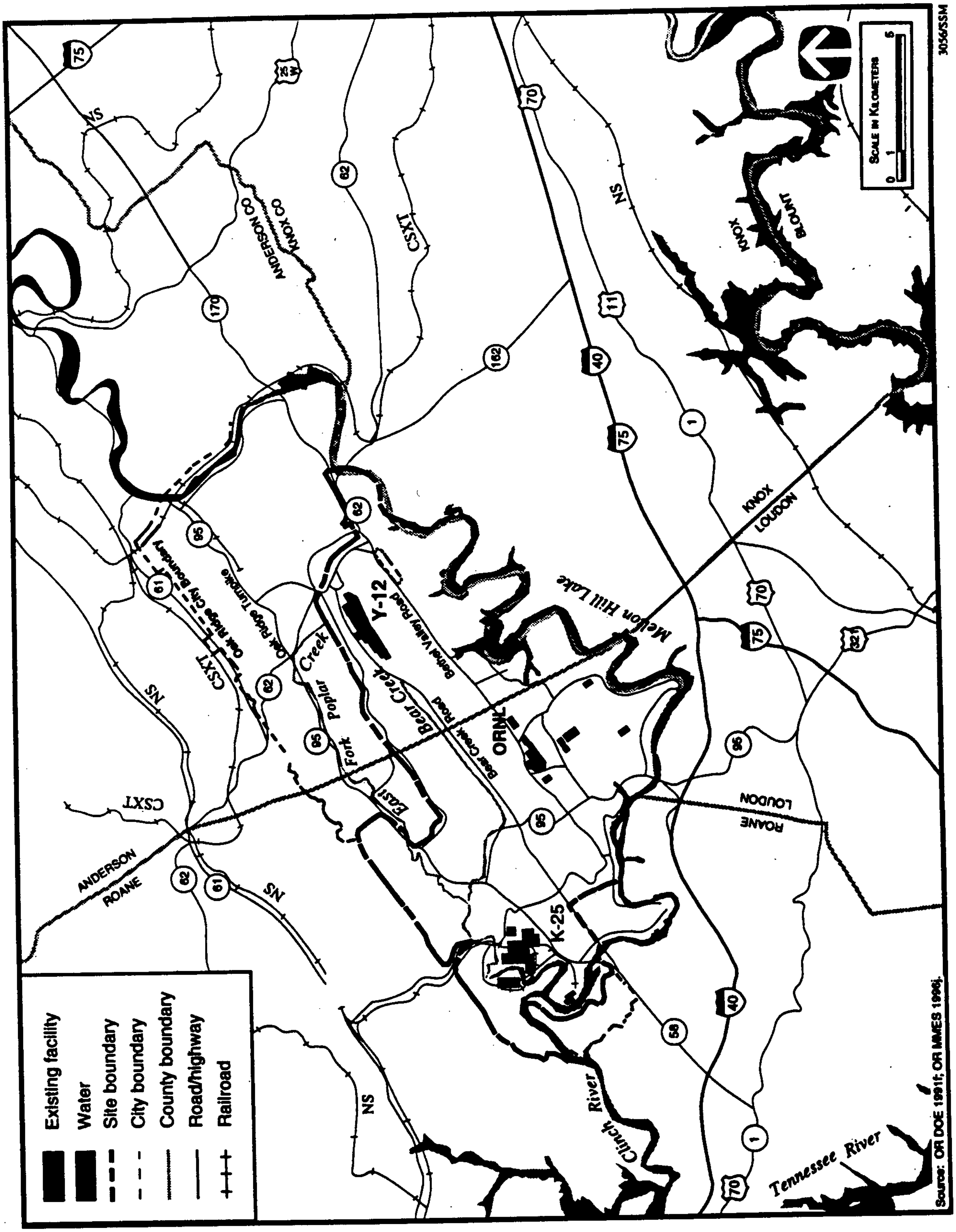


FIGURE 4.2–2.—*Principal Facilities at Oak Ridge Reservation.*

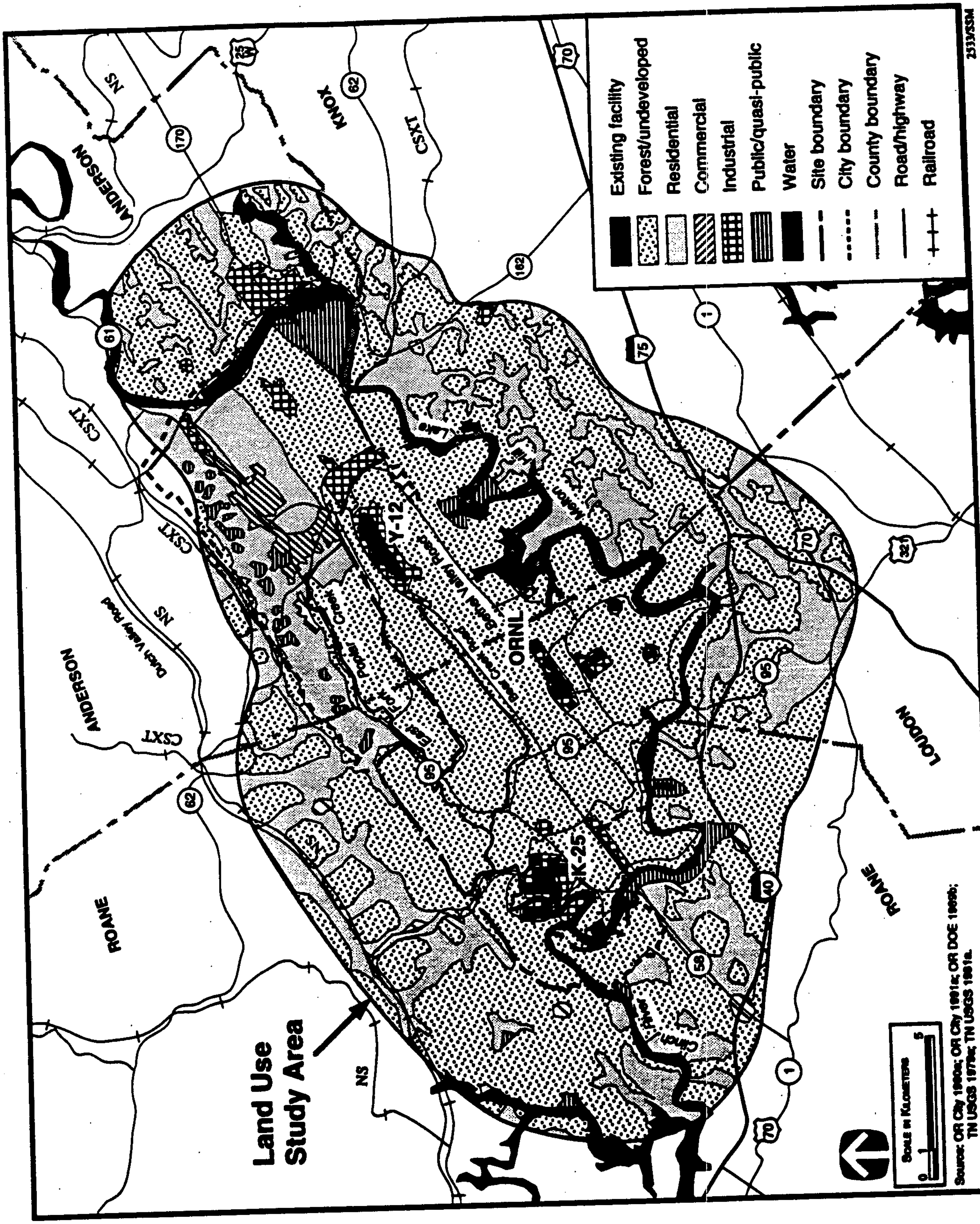


FIGURE 4.2.2.1-1.—*Generalized Land Use at Oak Ridge Reservation and Vicinity.*

Y-12 is largely developed and encompasses 328 ha (811 acres) of which 255 ha (630 acres) are enclosed by security fencing. Y-12 is the primary location used for supporting DP missions, including nuclear components production and surveillance and nuclear production mission assignments. These activities are housed in approximately 425 buildings containing 152,911 square meters (m^2) (5.4 million square feet [ft^2]) of floor space. Y-12 also has approximately 20 buildings, containing 8,495 m^2 (300,000 ft^2) of floor space, that house support activities and several organizations of the DOE Oak Ridge Field Office.

4.2.2.2 *Site Infrastructure*

To support the current missions at ORR, as described in section 3.2.2, an extensive infrastructure exists as shown in table 4.2.2.2–1. These resources support operations at Y-12, ORNL, and K-25.

TABLE 4.2.2.2–1.—*Baseline Characteristics for Oak Ridge Reservation*

Characteristics	Current Value
Land	
Area (ha)	13,980
Roads (km)	71
Railroads (km)	27
Electrical	
Energy consumption (MWh/yr)	726,000
Peak load (MWe)	110
Fuel	
Natural gas (m^3/yr)	95,000,000
Liquid (L/yr)	416,000
Coal (t/yr)	16,300
Steam	
Generation (kg/hr)	150,000
Water	
Usage (MLY)	14,210

Source: OR LMES 1996i.

4.2.2.3 *Air Quality*

The following section describes existing air quality and reviews the meteorology and climatology in the vicinity of ORR. More detailed discussions of the air quality methodologies, input data, and atmospheric dispersion characteristics are presented in appendix section B.3.2.

Meteorology and Climatology. The Cumberland and Great Smoky Mountains have a moderating influence on the climate at ORR. Winters are generally mild and summers warm, with no noticeable extremes in precipitation, temperature, or winds.

The annual average temperature at ORR is 13.7 °Celsius (C) (56.6 °Fahrenheit [F]); the average daily minimum temperature in January is -3.8 °C (25.1 °F), and the average daily maximum temperature in July is 30.4 °C (86.7 °F). The average annual precipitation is approximately 136.6 centimeters (cm) (53.77 inches [in]). Prevailing wind directions at ORR tend to follow the orientation of the valley; up valley, from west to southwest; or down valley, from east to northeast. The average annual wind speed is approximately 2.0 meters per second (m/s) (4.5 miles per hour [mph]) (NOAA 1994c:3). Additional information related to meteorology and climatology at ORR is presented in appendix section B.3.2.

Ambient Air Quality. ORR is located in Anderson and Roane Counties in the eastern Tennessee and southwestern Virginia Interstate Air Quality Control Region (AQCR) 207. As of 1995, the areas within this AQCR were designated by EPA as attainment areas with respect to all National Ambient Air Quality Standards (NAAQS) for criteria pollutants (40 CFR 81.343). Applicable NAAQS and Tennessee State ambient air quality standards are presented in appendix table B.3.1–1.

One Prevention of Significant Deterioration Class I area can be found in the vicinity of ORR. This area, the Great Smoky Mountains National Park, is located approximately 48 km (30 mi) southeast of ORR. Since the promulgation of regulations, no Prevention of Significant Deterioration permits have been required for any emissions source at ORR.

The primary emission sources of criteria pollutants are the steam plants at Y-12, K-25, and ORNL. Other emission sources include fugitive particulates from coal piles, the *Toxic Substances Control Act* (TSCA) incinerator, other processes, vehicles, and temporary emissions from various construction activities (OR DOE 1987a:33-49). Appendix table B.3.2–1 presents emission rates of pollutants from ORR.

Table 4.2.2.3–1 presents the baseline ambient air concentration for criteria pollutants and other pollutants of concern at ORR. As shown in the table, baseline concentrations are in compliance with applicable guidelines and regulations.

4.2.2.4 *Water Resources*

This section describes the surface and groundwater resources at ORR.

Surface Water. The major surface water body in the immediate vicinity of ORR is the Clinch River, which borders the site to the south and west. There are four major subdrainage basins on ORR that flow into the Clinch River and are affected by site operations: Poplar Creek, East Fork Poplar Creek, Bear Creek, and White Oak Creek. Drainage from Y-12 enters both Bear Creek and East Fork Poplar Creek; K-25 drains predominantly into Poplar Creek and Mitchell Branch; and ORNL drains into the White Oak Creek drainage basin (OR DOE 1992c:1-16). Several smaller drainage basins, including Ish Creek, Grassy Creek, Bearden Creek, McCoy Branch, Kerr

TABLE 4.2.2.3–1.—*Comparison of Baseline Ambient Air Concentrations with Most Stringent Applicable Regulations and Guidelines at Oak Ridge Reservation, 1992*

Pollutant	Averaging Time	Most Stringent Regulation or Guideline ($\mu g/m^3$)	Baseline Concentration ($\mu g/m^3$)
Criteria Pollutant			
Carbon monoxide	8-hour	10,000 [a]	5
	1-hour	40,000 [a]	11
Lead	Calendar quarter	1.5 [a]	0.05 [b]
Nitrogen dioxide	Annual	100 [a]	3
Ozone	1-hour	235 [a]	[c]
Particulate matter	Annual	50 [a]	1
	24-hour	150 [a]	2
Sulfur dioxide	Annual	80 [a]	2
	24-hour	365 [a]	32
	3-hour	1,300 [a]	80
Mandated by Tennessee			
Gaseous fluoride (as hydrogen fluoride)	30-day	1.2 [d]	0.2
	7-day	1.6 [d]	0.3
	24-hour	2.9 [d]	<0.6
	12-hour	3.7 [d]	<0.6
	8-hour	250 [d]	0.6
Total suspended particulates	24-hour	150 [d]	2
Hazardous and Other Toxic Compounds			
Chlorine	8-hour	150 [d]	4.1
Hydrogen chloride	8-hour	750 [d]	57
Mercury	8-hour	5 [d]	0.06 [e]
Nitric acid	8-hour	[f]	78
Sulfuric acid	8-hour	100 [d]	20

[a] Federal standard.
[b] Value is maximum for 24-hour period.
[c] No monitoring data available, baseline concentration assumed less than applicable standard.
[d] State standard.
[e] Annual average.
[f] No standard.
Source: 40 CFR 50; OR DOE 1993a; TN DEC 1994a; TN DHE 1991a.

Hollow Branch, and Raccoon Creek, drain directly to the Clinch River. Each drainage basin takes the name of the major stream flowing through the area. Within each basin are a number of small tributaries. The natural surface water bodies in the vicinity of ORR are shown in figure 4.2.2.4–1.

The Clinch River and connected waterways supply all raw water for ORR. The Clinch River has an average flow of 132 cubic meters (m^3)/s (4,647 cubic feet [ft^3]/s) as measured at the downstream side of Melton Hill Dam at mile 23.1. The average flow of Bear Creek near Y-12 is 0.11 m^3/s (3.9 ft^3/s). The average flow at East Fork Poplar Creek is 1.3 m^3/s (45 ft^3/s) (OR USGS 1986a:161,168-169). Y-12 uses approximately 7,530 million liters per year (MLY) (1,989 million gallons per year [MGY]) of water, while ORR uses approximately twice as much (14,760 MLY [3,900 MGY]). The ORR water supply system, which includes the DOE treatment facility and the K-25 treatment facility, has a capacity of 44,347 MLY (11,716 MGY).

At Y-12, there are six treatment facilities with NPDES-permitted discharge points to East Fork Poplar Creek. Y-12 is also permitted to discharge wastewater to the City of Oak Ridge Wastewater Treatment Facility. At ORNL, three NPDES-permitted wastewater treatment facilities discharge into White Oak Creek basin. K-25 operates one sanitary sewage system which discharges to Poplar Creek (OR DOE 1994c:4-17–4-19).

Clinch River water levels in the vicinity of ORR are regulated by a system of dams operated by the Tennessee Valley Authority. Melton Hill Dam controls the flow of the Clinch River along the northeast and southeast sides of ORR. Watts Bar Dam, located on the Tennessee River downstream of the lower end of the Clinch River, controls the flow of the Clinch River along the southeast side of ORR (ORNL 1986a:1-17).

The Tennessee Valley Authority has conducted flood studies along Clinch River, Bear Creek, and East Fork Poplar Creek. Portions of Y-12 lie within the 100- and 500-year floodplains of East Fork Poplar Creek; however, proposed alternative facilities are located outside the 500-year floodplain (ORR 1995a:6).

Surface Water Quality. The streams and creeks of Tennessee are classified by the Tennessee Department of Environment and Conservation and defined in the State of Tennessee Water Quality Standards. Classifications are based on water quality, designated uses, and resident aquatic biota. The Clinch River is the only surface water body on ORR classified for domestic water supply. Most of the streams at ORR are classified for fish and aquatic life, livestock watering, and wildlife (OR DOE 1992c:1-16). White Oak Creek and Melton Branch are the only streams not classified for irrigation. Portions of Poplar Creek, East Fork Poplar Creek, and Melton Branch are not classified for recreation.

Both routine and NPDES-required surface water monitoring programs (over 225 sites) are performed at Y-12 to assess the impacts of the plant effluents upon natural receiving water and to estimate the impacts of these effluents on human health and the environment. At Y-12, Bear Creek, McCoy Branch, Rogers Quarry, and East Fork Poplar Creek receive effluent from treated sanitary wastewater, industrial discharges, cooling water blowdown, stormwater, surface water runoff, and groundwater. The chemical water quality of Bear Creek has been affected by the infiltration of contaminated groundwater. Contaminants included high concentrations of dissolved salts, several metals, chlorinated solvents, and polychlorinated biphenyls (PCBs) (OR DOE 1994d:5-9). DOE is currently involved with remediation of East Fork Poplar Creek under CERCLA because the creek was contaminated by past releases from Y-12. Significant cleanup activities are required onsite and offsite. Contaminants present in East Fork Poplar Creek included mercury, organics, PCBs, and radionuclides (OR DOE 1994d:5-9).

There are 455 NPDES-permitted outfalls associated with the three major facilities at ORR; many of these are stormwater outfalls. Approximately 57,000 NPDES laboratory analyses were completed in 1993, with a compliance rate of over 99 percent. Most excursions were associated with precipitation runoff (OR DOE 1994c:2-13).

As shown in table 4.2.2.4–1, all parameters were below state water quality criteria where the Clinch River leaves ORR. Monitoring data from this sampling site are compared with monitoring data from the Melton Hill Dam sampling site, located

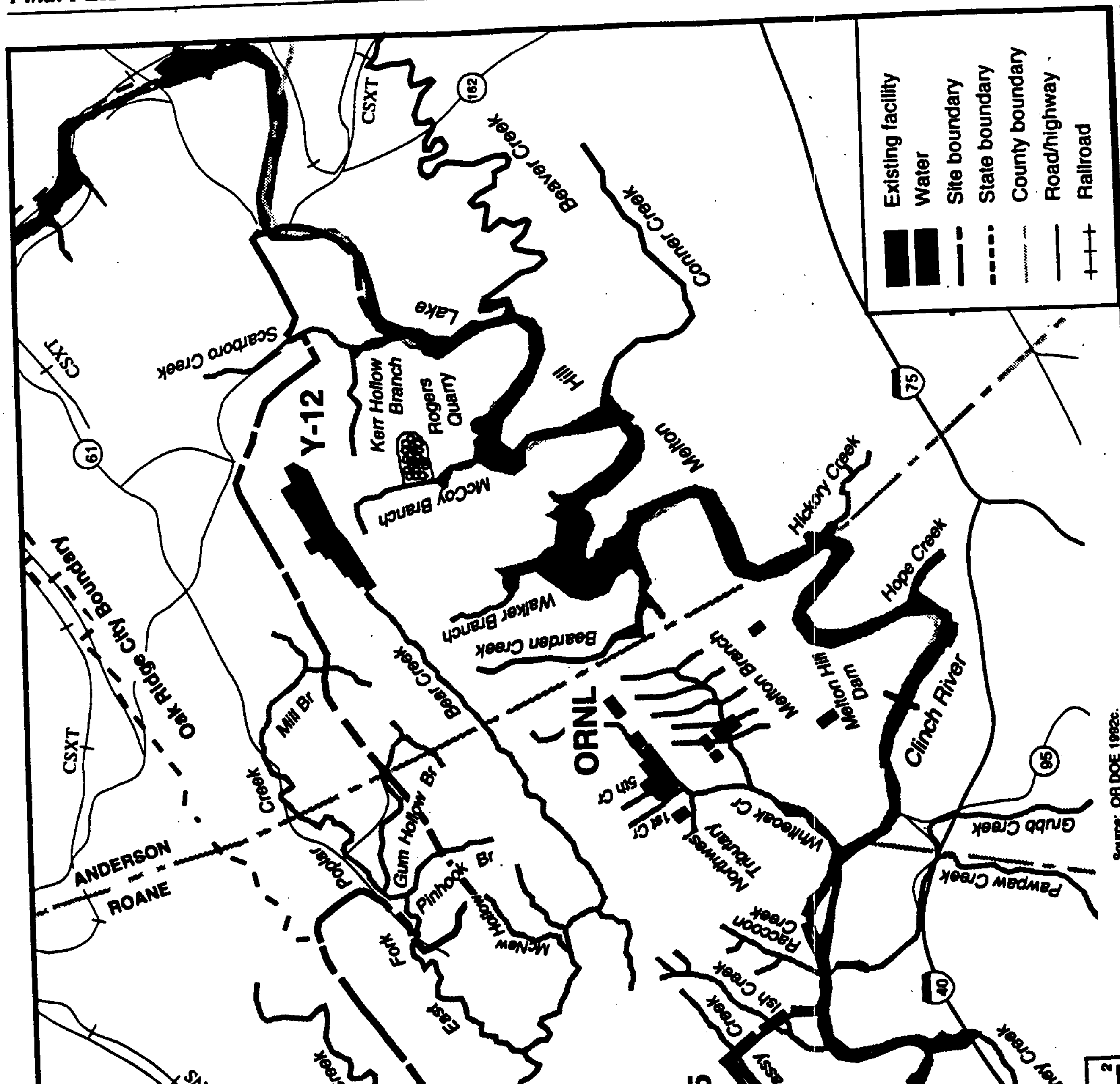


FIGURE 4.2.2.4-1.—*Surface Water Features at Oak Ridge Reservation.*

TABLE 4.2.2.4–1.—*Summary of Surface Water Quality Monitoring of the Clinch River, 1993*

Parameter	Unit of Measure	Water Quality Criteria[a]	Average Water Body Concentration: Downstream from all DOE Inputs	Average Water Body Concentration: Melton Hill Reservoir Above City of Oak Ridge Water Intake
Radiological				
Alpha (gross)	pCi/L	15[b]	0.85 (0.30)	1.7 (0.46)
Beta (gross)	pCi/L	50[c]	4.8 (0.54)	2.9 (0.32)
Cesium-137	pCi/L	120[d]	0.65 (1.2)	NST
Technetium-99	pCi/L	4,000[d]	2.9 (1.1)	NST
Uranium, Total[e]	pCi/L	20[d]	1.6 (0.97)	1.0 (0.50)
Nonradiological				
Chemical oxygen demand	mg/L	NA	~8.2[f]	15
Fluoride	mg/L	4.0[b], 2.0[g]	~0.10[f]	NST
Manganese	mg/L	0.05[h]	0.036	0.91
Nitrate	mg/L	10.0[b]	3.3	
pH	pH units	6.5-8.5[g]	8.0	8.0
Sodium	mg/L	NA	4.1	4.8
Sulfate	mg/L	250[g]	21.0	22.0
Suspended solids	mg/L	NA	~11.0[f]	~6.6
Total dissolved solids	mg/L	500[g]	150	170

[a] For comparison only.
[b] National Primary Drinking Water Regulations (40 CFR 141).
[c] Proposed National Primary Drinking Water Regulations, Radionuclides (56 FR 33050).
[d] DOE Derived Concentration Guides for water (DOE Order 5400.5). Values are based on a committed effective dose equivalent of 100 millirems (mrem) per year; however, because the drinking water maximum contaminant level is based on 4 mrem per year, the number listed is 4 percent of the Derived Concentration Guides.
[e] Minimum of uranium isotopes.
[f] A tilde (~) indicates that estimated values and/or detection limits were used in the calculation.
[g] National Secondary Drinking Water Regulations (40 CFR 143).
Note: NA - not applicable; NST - no sample taken; parentheses () indicate standard error of the mean.
Source: OR DOE 1994f.

upstream of all ORR discharges, and therefore are representative of background water quality. The concentrations downstream of ORR discharges were lower than concentrations upstream in all cases except gross beta and total suspended solids. Concentrations at Melton Hill Dam were also well below applicable water quality criteria.

Surface Water Rights and Permits. In Tennessee, the state's water rights laws are codified in the *Water Quality Control Act*. In effect, the water rights are similar to riparian rights in that the designated usages of a water body cannot be impaired. The only requirement to withdraw water from available supplies would be a U.S. Army Corps of Engineers permit to construct intake structures.

Groundwater. ORR is located in an area of sedimentary rocks of widely varying hydrological characteristics. However, because of the topographic relief and a decrease in bedrock fracture density with depth, groundwater flow is restricted primarily to shallow depths of the saturated zone in the aquitards, and groundwater discharges primarily to nearby surface waters within ORR (OR DOE 1994c:7-5). Depth to groundwater is generally 6 to 9 m (19.7 to

29.5 ft) but is as little as 1.5 m (4.9 ft) in the area of Bear Creek Valley near Highway 95.

Aquifers at ORR include a surficial soil and regolith unit and bedrock aquifers. The surficial aquifer consists of manmade fill, alluvium, and weathered bedrock. Bedrock aquifers occur in carbonates and low-yield sandstones, siltstones, and shales.

There are no Class I sole-source aquifers that lie beneath ORR. All aquifers are considered Class II aquifers (current potential sources of drinking water). Because of the abundance of surface water and its proximity to the points of use, very little groundwater is used at ORR. Only one water supply well exists on ORR; it provides a supplemental water supply to an aquatics laboratory during extended droughts.

Recharge occurs over most of the area but is most effective where overburdened soils are thin or permeable. In the area near Bear Creek Valley, recharge into the carbonate rocks occurs mainly along Chestnut Ridge (OR DOE 1992c:5-5). Shallow groundwater generally flows from the recharge areas to the center of Bear Creek Valley and discharges into Bear Creek and its tributaries.

Groundwater Quality. Groundwater samples are collected quarterly from a representative number of the more than 1,000 monitoring wells throughout ORR. Groundwater samples collected from the monitoring wells are analyzed for a standard suite of parameters and constituents, including trace metals, volatile organic compounds (VOCs), radioactive materials, and pH. Background groundwater quality at ORR is generally good in the near surface aquifer zones and poor in the bedrock aquifer at depths greater than 300 m (984 ft) due to high total dissolved solids.

Groundwater in Bear Creek Valley near Y-12 has been contaminated by hazardous chemicals and radionuclides (mostly uranium) from past weapons production process activities. The contaminated sources include past waste disposal sites, waste storage tanks, spill sites, and contaminated inactive facilities (OR DOE 1994c:7-11,7-16,7-33–7-36).

Groundwater Availability, Use, and Rights. Industrial and drinking water supplies in the area are primarily taken from surface water sources. However, single-family wells are common in adjacent rural areas not served by the public water supply system. Most of the residential supply wells in the immediate area of ORR are south of the Clinch River (OR DOE 1992c:1-15). Most wells used for potable water are located in the deeper principal carbonate aquifer (305 m [1,000 ft]), while the groundwater contamination at Y-12 is primarily found at a depth of approximately 84 m (276 ft).

Groundwater rights in the State of Tennessee are traditionally associated with the Reasonable Use Doctrine (VDL 1990a:725). Under this doctrine, landowners can withdraw groundwater to the extent that they must exercise their rights reasonably in relation to the similar rights of others.

4.2.2.5 *Geology and Soils*

Geology. ORR lies in the Valley and Ridge province of east-central Tennessee. The topography consists of alternating valleys and ridges that have a northeast-southwest trend, with most ORR facilities occupying the valleys. Y-12 is in the Bear Creek Valley. Bear Creek Valley and the adjacent Pine and Chestnut Ridges are underlain by rocks composed of siltstone, silty limestone, and shale with some sandstone. The present topography of the valleys is the result of stream erosion of the softer shales and limestones. The ridges are underlain by the more resistant sandstones and dolomites.

ORR is cut by many inactive faults formed during the late Paleozoic Era. The Oak Ridge area lies at the boundary between seismic Zones 1 and 2 (appendix figure A.1–1). Since the New Madrid earthquakes of 1811 to 1812, at least 26 other earthquakes with a modified Mercalli intensity of III to VI have been felt in the Oak Ridge area. Most of these seismic events have occurred in the Valley and Ridge province. The nearest seismic event occurred in 1930, 8 km (5 mi) from ORR. It had a modified Mercalli intensity of V at the site (OR EG&G 1991a: 3-4). The magnitude of the largest recorded earthquake in eastern Tennessee was 4.6 on the Richter scale. This earthquake occurred in 1973 in Maryville, TN, 34 km (21 mi) southeast of ORR, and had an estimated modified Mercalli intensity of V to VI in the Oak Ridge area (DOE 1996h:4.55). There is no volcanic hazard at ORR. The area has not experienced volcanism within the last 230 million years. Therefore, future volcanism is not expected (DOE 1995i:4-200).

Soils. Bear Creek Valley lies on well to moderately well-drained soils underlain by shale, siltstone, and sandstone. Developed portions of the valley are designated as urban land. Soil erosion from past land uses has ranged from slight to severe. Erosion potential is very high in those areas with slopes greater than 25 percent that have been severely eroded in the past. Erosion potential is lowest in nearly flat-lying permeable soils that have a loamy texture (ORNL 1988b:69). Additionally, wind erosion is slight, shrink-swell potential is low to moderate, and the soils are acceptable for standard construction techniques. There are no prime farmlands on ORR (DOE 1995i:4-188).

4.2.2.6 *Biotic Resources*

The following section describes biotic resources at ORR including terrestrial resources, wetlands, aquatic resources, and threatened and endangered species. A list of the threatened and endangered species that may be found on or in the vicinity of ORR is presented in appendix C.

Terrestrial Resources. Plant communities at ORR are characteristic of the intermountain regions of central and southern Appalachia. Approximately 10 percent of ORR has been developed since it was withdrawn from public access; the remainder of the site has reverted to or been planted with natural vegetation (OR DOE 1989a:3-5). The vegetation of ORR has been categorized into seven plant communities (figure 4.2.2.6–1). Pine and pine-hardwood forest and oak-hickory forest are the most extensive plant communities on ORR, while northern hardwood forest and hemlock-white pine-hardwood forest are the least common forest community types. Nine-hundred eighty-three species, subspecies, and varieties of plants have been identified on ORR (OR NERP 1993b:2).

Animal species found on ORR include 26 species of amphibians, 33 species of reptiles, 169 species of birds, and 39 species of mammals (OR NERP nda:10-17). Animals commonly found on ORR include the American toad (*Bufo americanus*), eastern garter snake (*Thamnophis sirtalis*), Carolina chickadee (*Parus carolinensis*), northern cardinal (*Cardinalis cardinalis*), white-footed mouse (*Peromyscus leucopus*), and raccoon (*Procyon lotor*). Although the whitetail deer (*Odocoileus virginianus*) is the only species hunted onsite (OR DOE 1991c:4-6), other game animals are also present. Raptors, such as the northern harrier (*Circus cyaneus*) and great horned owl (*Bubo virginianus*), and carnivores, such as the gray fox (*Urocyon cinereoargenteus*) and mink (*Mustela vison*), are ecologically important groups on ORR. A variety of migratory birds has been found at ORR. Migrating birds present onsite, as well as their nests and eggs, are protected by the *Migratory Bird Treaty Act*.

Terrestrial habitat within the Y-12 area is dominated by buildings, parking lots, and lawns; thus, little natural vegetation is present. A few small forested areas do exist within the plant boundary along the slope of Chestnut Ridge. Fauna within the Y-12 area are limited by the lack of large areas of natural habitat (OR DOE 1994d:5-13).

Wetlands. Wetlands on ORR include emergent, scrub/shrub, forested wetlands associated with embayments of the Melton Hill and Watts Bar Reservoirs, riparian areas bordering major streams and their tributaries, old farm ponds, and groundwater seeps. Well-developed communities of emergent wetland plants in the shallow embayments of the two reservoirs typically intergrade into forested wetland plant communities, which extend upstream through riparian areas associated with streams and their tributaries. Old farm ponds on ORR vary in size and support diverse plant communities and fauna. Although most riparian wetlands on ORR are forested, areas within utility rights-of-way, such as those in Bear Creek and Melton Valleys, support emergent wetland vegetation (OR NERP 1991a:18,26,41). Two small wetland areas are located near the west end of Y-12 (OR DOE 1994d:5-14). Y-12 is drained by Bear Creek and East Fork Poplar Creek; wetlands occur along portions of both streams.

Aquatic Resources. Aquatic habitat on or adjacent to ORR ranges from small, free-flowing streams in undisturbed watersheds to larger streams with altered flow patterns due to dam construction. These aquatic habitats include tailwaters, impoundments, reservoir embayments, and large and small perennial streams.

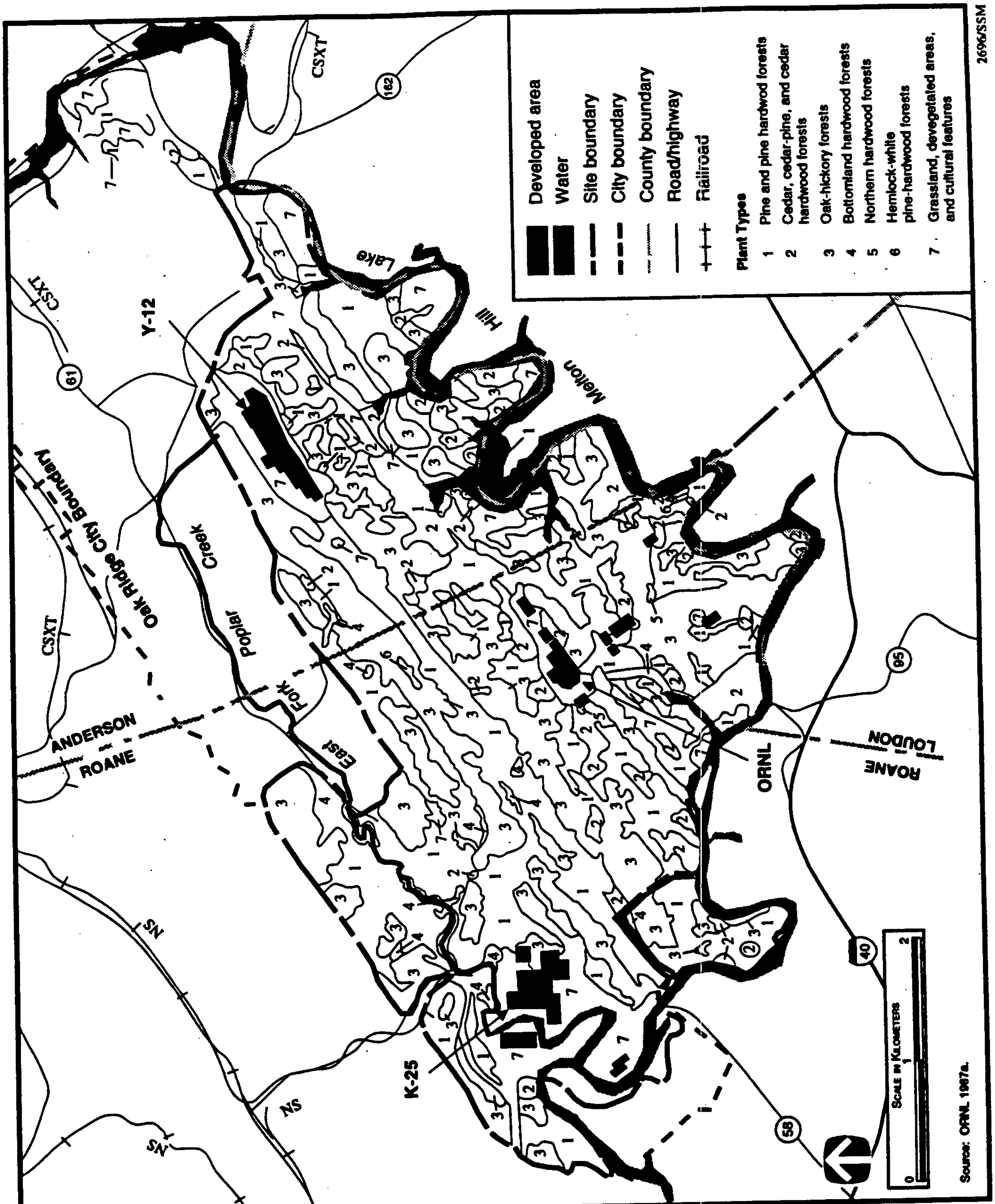


FIGURE 4.2.2.6–1.—*Distribution of Plant Communities at Oak Ridge Reservation.*

Aquatic areas within ORR also include seasonal and intermittent streams.

Sixty-four fish species have been collected on or adjacent to ORR. The minnow family has the largest number of species and is numerically dominant in most streams (ORNL 1988c:O-43). Fish species representative of the Clinch River in the vicinity of ORR are shad and herring (*Clupeidae*), common carp (*Cyprinus carpio*), catfish (*Ictaluridae*), bluegill (*Lepomis macrochirus*), crappie (*Pomoxis spp.*), and drum (*Aplodinotus grunniens*) (ORNL 1981b:138-139). The most important fish species taken commercially in the ORR area are common carp and catfish. Commercial fishing is permitted on the Clinch River downstream from Melton Hill Dam (TN WRA 1995a:1-5). Recreational species consist of crappie, largemouth bass (*Micropterus salmoides*), sauger (*Stizostedion canadense*), sunfish (*Lepomis spp.*), and catfish. Sport fishing is not permitted within ORR.

Y-12 is drained by Bear Creek and East Fork Poplar Creek. While both streams contain adequate physical habitat to maintain and propagate aquatic life throughout their length, species abundance and diversity within both streams have been affected by past Y-12 operation (OR DOE 1994d:5-13).

Threatened and Endangered Species. Eighty-four Federal- and state-listed threatened, endangered, and other special status species may be found on and in the vicinity of ORR (appendix table C–1). Twenty-six of these species have been identified on the site, 17 of which are Federal- and/or state-listed as threatened or endangered. The bald eagle (*Haliaeetus leucocephalus*) is the only Federal-listed species observed on the site (i.e., foraging on Melton Hill and Watts Bar Lakes). The additional state-listed species observed include 14 plant, 1 hawk, and 1 salamander species. No critical habitat for threatened or endangered species, as defined in the *Endangered Species Act* (50 CFR 17.11; 50 CFR 17.12), exists on ORR.

Y-12 does not contain any special status species (OR DOE 1994d:5-14). However, Bear Creek, which drains the western portion of the plant area, contains the Tennessee dace (*Phoxinus tennesseensis*).

4.2.2.7 *Cultural and Paleontological Resources*

Prehistoric Resources. More than 20 cultural resources surveys have been conducted on ORR. About 90 percent of ORR has received at least reconnaissance-level studies; however, less than 5 percent of ORR has been intensively surveyed. Most cultural resources studies have occurred along the Clinch River and adjacent tributaries. Prehistoric sites recorded at ORR include villages, burial mounds, camps, quarries, chipping stations, limited activity locations, and shell scatters. To date, over 45 prehistoric sites have been recorded at ORR, 13 of which may be considered potentially eligible for the NRHP. Most of these sites however have not yet been evaluated.

One site (40RE86), which is located on the Clinch River near K-25, has been determined to be eligible for inclusion on the NRHP. No NRHP-eligible prehistoric sites have been identified at Y-12. One site (40AN6), a lithic scatter, was identified near Scarboro Road east of Y-12, outside the fences. A field review of Y-12 indicated that much of the area had been disturbed and that the potential for NRHP-eligible prehistoric sites was low. Additional prehistoric sites may be identified in the unsurveyed portions of ORR. On May 6, 1994, a Programmatic Agreement concerning the management of historical and cultural properties at ORR was executed among the Oak Ridge Operations Office, the Tennessee State Historic Preservation Officer (SHPO), and the Advisory Council on Historic Preservation. This agreement was administered to satisfy DOE's responsibilities regarding sections 106 and 110 of the *National Historic Preservation Act*, and requires DOE to develop a cultural resources management plan for ORR and to conduct cultural resources surveys as required.

Historic Resources. Historic resources identified at ORR include both archaeological remains and standing structures. Documented log, wood frame, or fieldstone structures include cabins, barns, churches, gravehouses, springhouses, storage sheds, smokehouses, log cribs, privies, henhouses, and garages. Archaeological remains consist primarily of foundations, roads, and trash scatters. Sixty-nine pre-1942 cemeteries were located within the original ORR site (OR Robinson 1950a:130). Because the size of the reservation has been reduced, today there are 32 known cemeteries within ORR. More than 240 historic resources have been recorded at ORR, and 38 of those sites may be considered potentially NRHP eligible.

All structures at ORR have been surveyed for historic significance, and all pre-World War II structures have been evaluated for NRHP eligibility. Freel's Cabin and two church structures, George Jones Memorial Baptist Church and the New Bethel Baptist Church, are listed on the NRHP. These structures date from before the establishment of the Manhattan Project. NRHP sites associated with the Manhattan Project include the Graphite Reactor at ORNL, listed on the NRHP as a National Historic Landmark, and three traffic checkpoints, Bear Creek Road, Bethel Valley Road, and Oak Ridge Turnpike Checking stations. None of these sites is located at Y-12. Many other buildings and facilities at ORR are associated with the Manhattan Project and may be potentially eligible for the NRHP.

Historic building surveys were completed during fiscal year 1994 at K-25 and ORNL. A similar survey was completed at Y-12 in fiscal year 1995. The final document should be finished in fiscal year 1996. Based on this survey, approximately 100 buildings at Y-12 may be NRHP eligible. The secondary and case fabrication alternative involves modifications to 17 buildings at Y-12 (appendix section A–3.2.1). Through consultation with the Tennessee SHPO, Buildings 9215, 9401-3, 9706-2, 9996, 9998, and 9212 have been determined NRHP eligible as contributing properties to the proposed Y-12 Plant National Register Historic District. In addition, Building 9710-2 has been determined to be NRHP eligible. The remaining buildings involved do not possess architectural or historical significance to meet National Register Criteria and therefore are not considered to be contributing properties to the proposed historic district. Additional historic sites may be anticipated in the unsurveyed portions of ORR.

Native American Resources. The Overhill Cherokee occupied portions of the Tennessee, Hiwassee, Clinch, and Little Tennessee River Valleys by the 1700s. Overhill Cherokee villages consisted of a large townhouse, a summer pavilion, and a plaza. Residences had both summer and winter structures. Subsistence was based on hunting, gathering, and horticulture. Most of the Cherokee people were relocated to the Oklahoma territory in 1838; some Cherokee later returned to the area from Oklahoma. Resources that may be sensitive to Native American groups include remains of prehistoric and historic villages, ceremonial lodges, cemeteries, burials, and traditional plant gathering areas. No Native American resources have been identified at Y-12. The Eastern Band of the Cherokee has been consulted concerning activities at ORR.

Paleontological Resources. The majority of geological units with surface exposures at ORR contain paleontological materials. All paleontological materials consist of invertebrate remains, and these assemblages have relatively low research potential (NRC 1987c:122).

4.2.2.8 *Socioeconomics*

Socioeconomic characteristics addressed at ORR include employment and regional economy, population and housing, and public finance. Statistics for employment and regional economy are presented for the regional economic area that encompasses 15 counties in Tennessee around ORR. Statistics for population and housing, and public finance are presented for the ROI, a four-county area in which 91.3 percent of all ORR employees reside: Anderson County (33.1 percent), Knox County (36 percent), Loudon County (5.6 percent), and Roane County (16.6 percent) (appendix table D.1–1). Figure 4.2.2.8–1 presents a map of the counties and selected cities composing the ORR regional economic area and ROI. Supporting data is presented in appendix D.

Regional Economy Characteristics. Selected employment and regional economy statistics for the ORR regional economic area are summarized in figure 4.2.2.8–2. Between 1980 and 1990, the civilian labor force in the regional economic area increased from 355,353 to 412,803 persons, a 16-percent increase (an annual average increase of 1.6 percent). In 1994, unemployment in the regional economic area was 4.9 percent, about the same as for Tennessee (4.8 percent). The region's per capita income of $17,652 in 1993 was approximately 4.3 percent less than the statewide per capita income of $18,439.

As shown in figure 4.2.2.8–2, the composition of the regional economic area economy parallels that of the statewide economy of Tennessee. During 1993, the

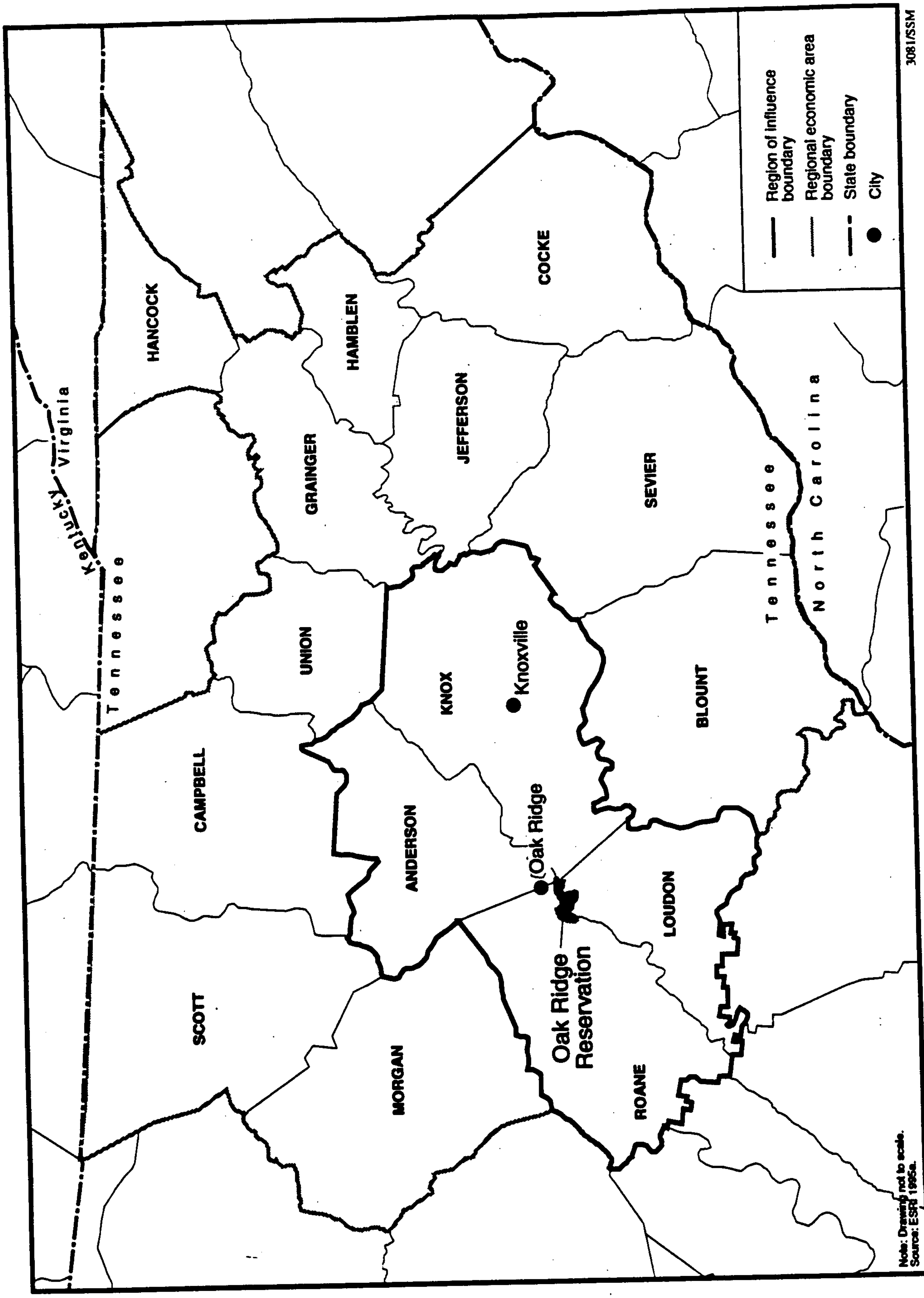
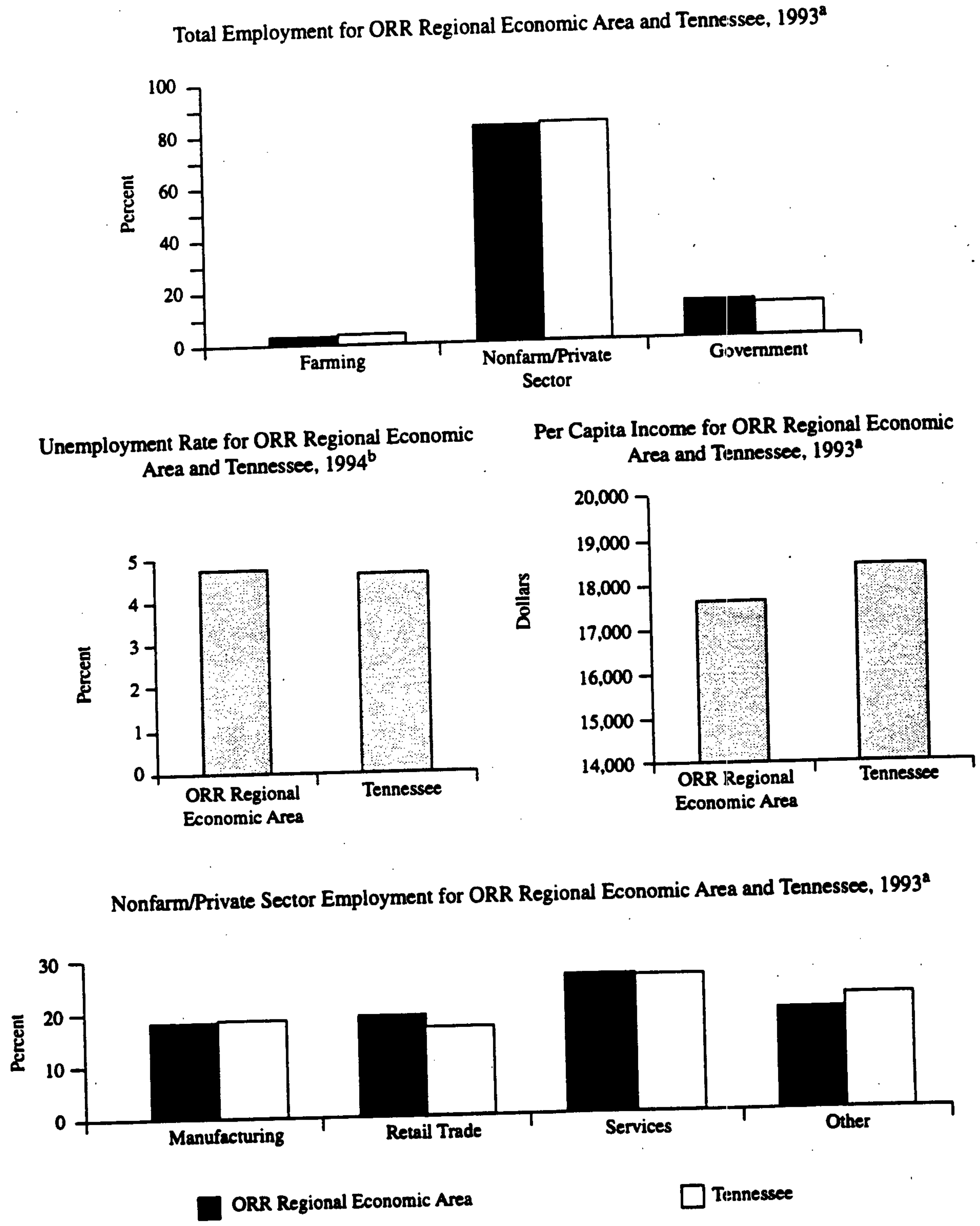


FIGURE 4.2.2.8–1.—*Regional Economic Area and Region of Influence for Oak Ridge Reservation.*



[a]DOC 1995a.
[b]DOL 1995a.

FIGURE 4.2.2.8–2.—*Economy for the Oak Ridge Reservation Regional Economic Area and Tennessee.*

service sector constituted over 26 percent of the region's total employment, followed by retail trade (19 percent) and manufacturing (18 percent). For the entire state, the service sector comprised 26 percent of total employment, manufacturing comprised 19 percent, and retail trade, 17 percent.

Population and Housing. Between 1980 and 1992, the ROI population increased from 464,018 to 499,444. This was an increase of about 7.6 percent (an annual average increase of less than 1 percent). Within the ROI, Loudon County experienced the greatest population increase at 16.4 percent (an annual average increase of a little over 0.7 percent), while Roane County's population decreased by about 0.7 percent (much less than 1 percent annually).

Between 1980 and 1990, the total number of housing units in the ROI increased from 181,299 to 206,067. The 13.8-percent increase (1.4-percent annual average increase) in housing units between 1980 and 1990 was slightly less than the annual average increase for the entire state. The total number of housing units in the ROI for 1992 was estimated to be 213,500. The 1990 ROI homeowner and rental vacancy rates were 1.7 and 8.5 percent, respectively. These rates were comparable to the statewide rates. Population and housing trends are summarized in figure 4.2.2.8–3.

Public Finance. Financial characteristics of the local jurisdictions in the ORR ROI that are most likely to be affected by the proposed action are presented in this section. The data reflect total revenues and expenditures of each jurisdiction's general fund, special revenue funds, and, as applicable, debt service, capital project, and expendable trust funds. Funding for schools in the ROI is provided by the county or city in which they are located. Major revenue and expenditure fund categories for counties and cities are presented in appendix table D.2.3–1. Figure 4.2.2.8–4 summarizes 1994 local governments' revenues and expenditures. Fund balances, which are dollars carried over from previous years, are not included in figure 4.2.2.8–4. All jurisdictions assessed had positive fund balances.

4.2.2.9 *Radiation and Hazardous Chemical Environment*

The following section provides a description of the radiation and hazardous chemical environment at ORR. Also included are discussions of health effects studies, a brief accident history, and emergency preparedness considerations.

Radiation Environment. Major sources of background radiation exposure to individuals in the vicinity of ORR are shown in table 4.2.2.9–1. All annual doses to individuals from background radiation are expected to remain constant over time. Accordingly, the incremental total dose to the population would result only from changes in the size of the population. Background radiation doses are unrelated to ORR operations.

Radionuclides released into the environment from ORR operations provide another source of radiation exposure to individuals in the vicinity of ORR. The radionuclides and quantities released from operations in 1993 are listed in the *Oak Ridge Reservation Environmental Report for 1993* (ES/ESH-47). The doses to the public resulting from these releases and direct radiation are presented in table 4.2.2.9–2. These doses fall within radiological limits (DOE Order 5400.5, *Radiation Protection of the Public and the Environment*) and are small in comparison to background radiation. The releases listed in the 1993 report were used in developing the reference environment (No Action) radiological releases at ORR in 2005 (section 4.2.3.9).

Based on a dose-to-risk conversion factor of 500 cancer deaths per 1 million person-rem ($5x10^{-4}$ fatal cancer per person-rem) to the public (appendix E), the fatal cancer risk to the maximally exposed member of the public due to radiological releases from ORR operations in 1993 is estimated to be approximately $1.5x10^{-6}$. That is, the estimated probability of this person dying of cancer at some point in the future from radiation exposure associated with 1 year of ORR operations is less than 2 chances in 1 million. (Note that it takes several to many years from the time of exposure to radiation for a cancer to manifest itself.)

Based on the same conversion factor, 0.014 excess fatal cancers are projected in the population living within 80 km (50 mi) of ORR from normal operation in 1993. To place this number in perspective, it can be compared with the numbers of fatal cancers expected in this population from all causes. The 1990 mortality rate associated with cancer for the entire U.S. population was 0.2 percent per year

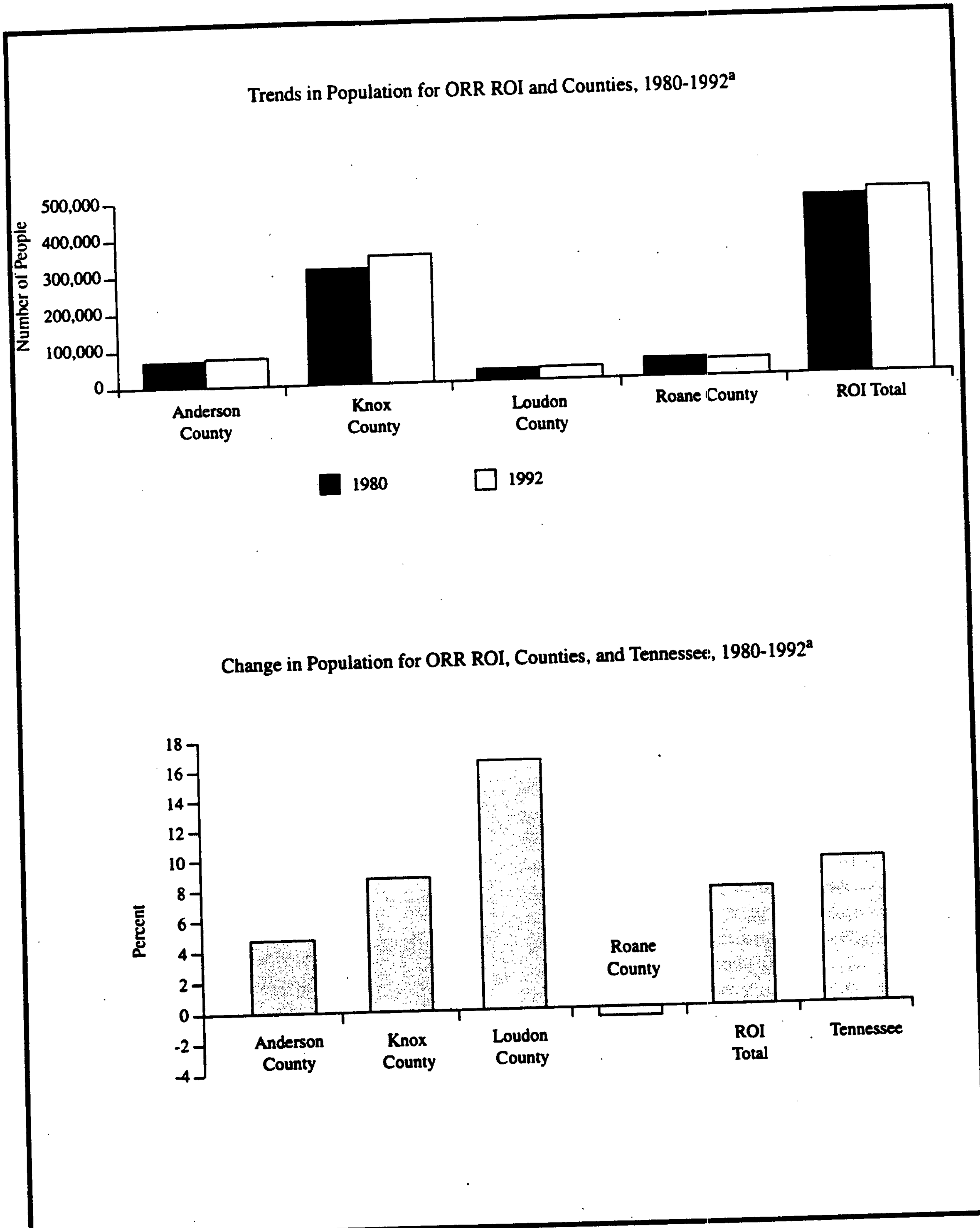
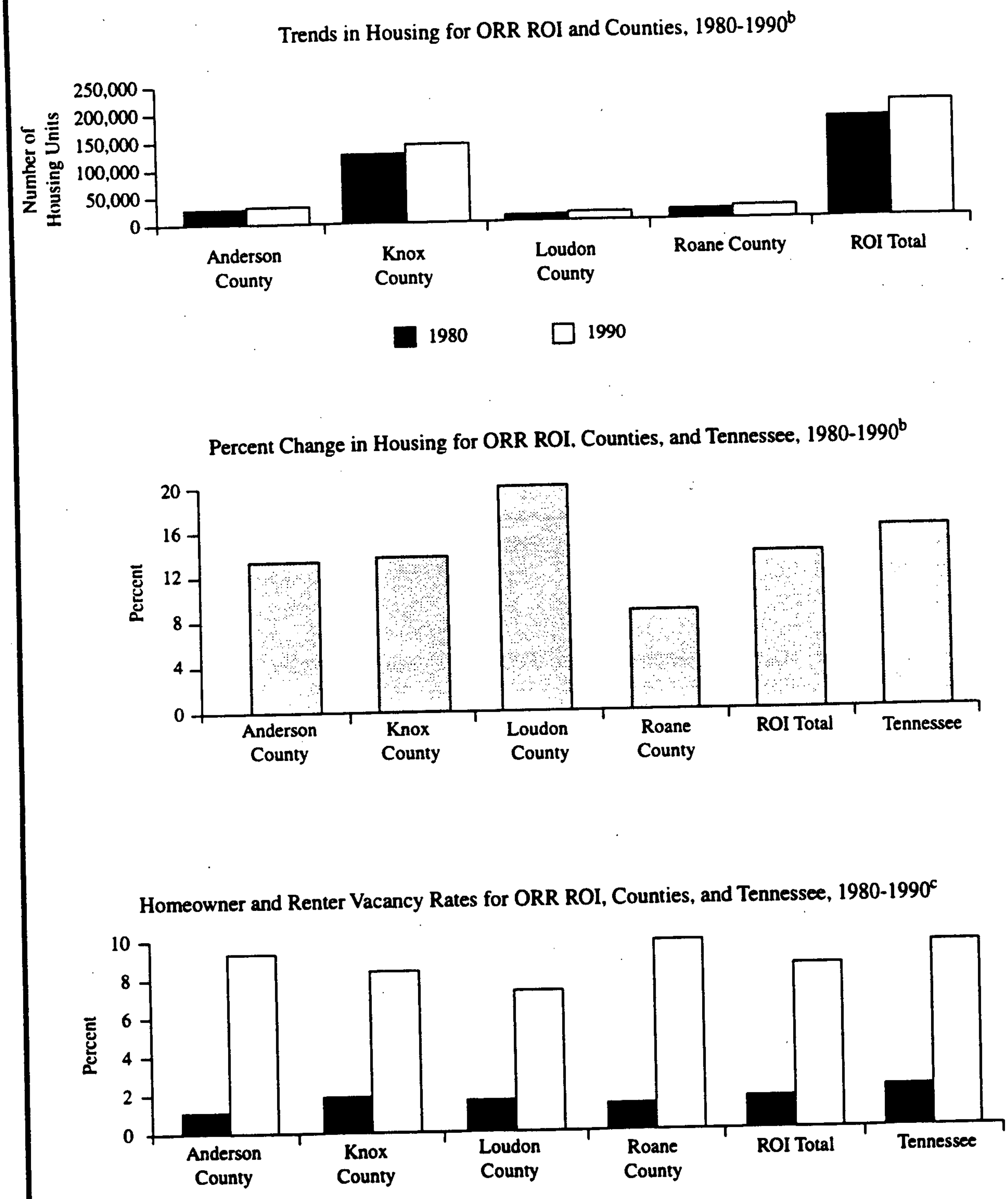
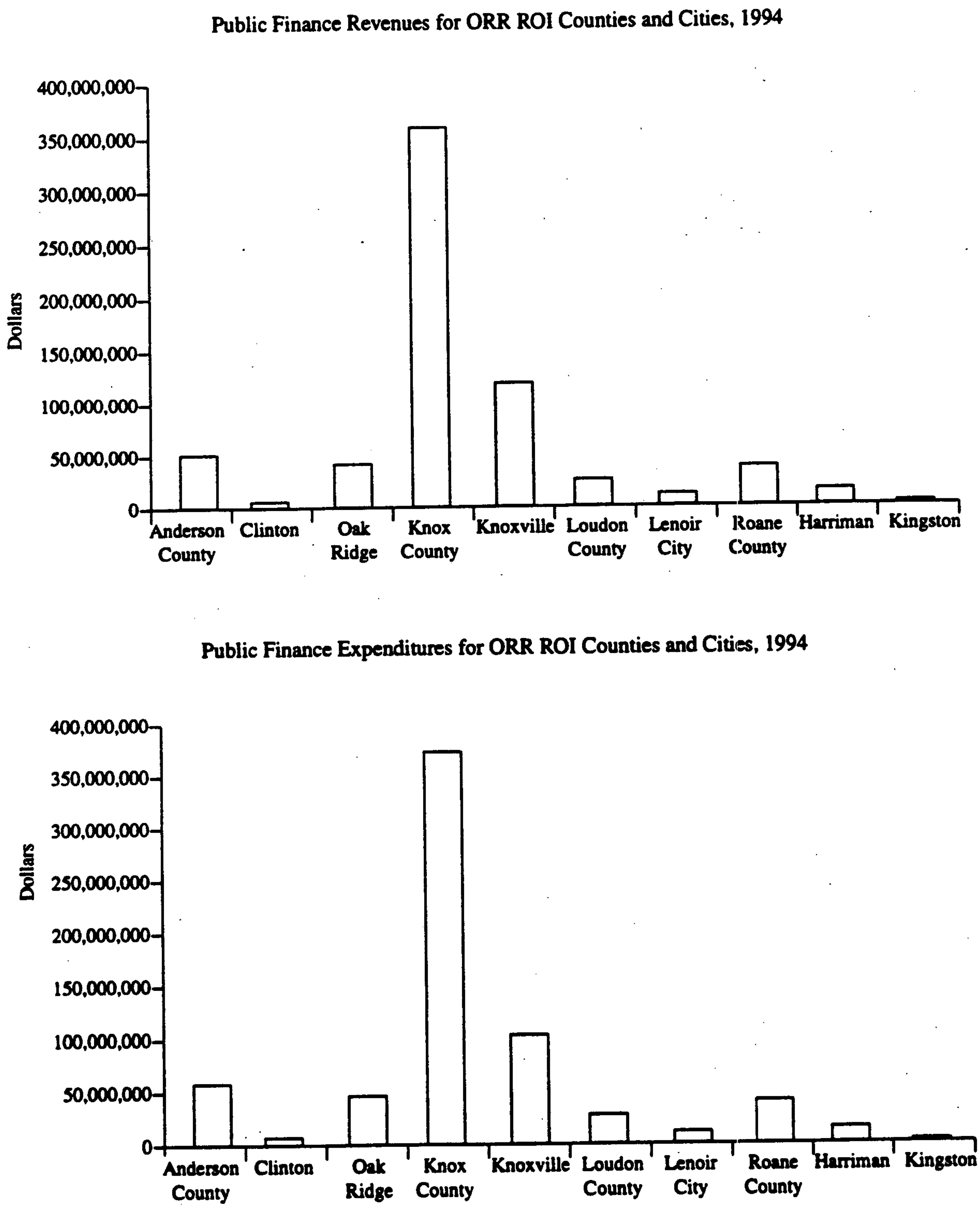


FIGURE 4.2.2.8–3.—*Population and Housing for the Oak Ridge Reservation Region of Influence* [Page 1 of 2].



[a]Census 1983q; Census 1993b.
[b]Census 1982d; Census 1991c.
[c]Census 1991c.

FIGURE 4.2.2.8–3.—*Population and Housing for the Oak Ridge Reservation Region of Influence* **[Page 2 of 2].**



Source: OR City 1995b; OR County 1995a.

FIGURE 4.2.2.8–4.—*Local Government Public Finance for the Oak Ridge Reservation Region of Influence.*

(Almanac 1993a:839). Based on this national rate, the number of fatal cancers from all causes expected to occur during 1993 was 1,760 for the population living within 80 km (50 mi) of ORR. This number of expected fatal cancers is much higher than the estimated 0.014 fatal cancers that could result from ORR operations in 1993. Workers at ORR receive the same dose as the general public from background radiation, but also receive an additional dose from working in the facilities. Table 4.2.2.9–3 presents the average, maximum, and total occupational doses to ORR workers from operations in 1992. These doses fall within radiological limits (10 CFR 835). Based on a dose-to-risk conversion factor of 400 fatal cancers per 1 million person-rem ($4x10^{-4}$ fatal cancers per person-rem) among workers (appendix E), the number of excess fatal cancers to workers from operations in 1992 is estimated to be 0.027. A more detailed presentation of the radiation environment, including background exposures and radiological releases and doses, is presented in the *Oak Ridge Reservation Annual Site Environmental Report for 1993* (ES/ESH-47). The concentrations of radioactivity in various environmental media (e.g., air, water, and soil) in the site region (onsite and offsite) are also presented in the same report.

Chemical Environment. The background chemical environment important to human health consists of the atmosphere, which may contain hazardous chemicals that can be inhaled; drinking water, which may contain hazardous chemicals that can be ingested; and other environmental media with which people may come in contact (e.g., soil through direct contact or via the food pathway). The baseline data for assessing potential health impacts from the chemical environment are presented in previous sections of this PEIS, particularly sections 4.2.2.3 and 4.2.2.4.

TABLE 4.2.2.9–1.—*Sources of Radiation Exposure to Individuals in the Vicinity, Unrelated to Oak Ridge Reservation Operations*

Source	Committed Effective Dose Equivalent (mrem/yr)
Natural Background Radiation	
Cosmic and cosmogenic radiation[a]	27
External terrestrial radiation[a]	28
Internal terrestrial radiation[b]	40
Radon in homes (inhaled)[b]	200
Other Background Radiation[b]	
Diagnostic x rays and nuclear medicine	53
Weapons test fallout	<1
Air travel	1
Consumer and industrial products	10
Total	360

[a] OR DOE 1994c.
[b] NCRP 1987a. Value for radon is an average for the United States.

TABLE 4.2.2.9–2.—*Doses to the General Public from Normal Operation at Oak Ridge Reservation, 1993 (Committed Effective Dose Equivalent)*

Affected Environment	Atmospheric Releases		Liquid Releases		Total	
	Standard[a]	Actual	Standard[a]	Actual	Standard[a]	Actual
Maximally exposed individual (mrem)	10	1.4	4	0.6[b]	100	3.0[c]
Population within 80 kilometers[d] (person-rem)	None	26	None	2.0	100	28.0
Average individual within 80 kilometers[e] (mrem)	None	0.030	None	$2.3x10^{-3}$	None	0.032

[a] The standards for individuals are given in DOE Order 5400.5. As discussed in that order, the 10 mrem per year limit from airborne emissions is required by the CAA, the 4 mrem per year limit is required by the SDWA, and the total dose of 100 mrem per year is the limit from all pathways combined. The 100 person-rem value for the population is given in proposed 10 CFR 834 (58 FR 16268).
[b] Includes a dose of 0.20 mrem from drinking water.
[c] Includes an annual direct radiation dose of 1 mrem to an individual at Poplar Creek or the Clinch River shoreline.
[d] In 1993, this population was approximately 880,000.
[e] Obtained by dividing the population dose by the number of people living within 80 km (50 mi) of the site.
Source: OR DOE 1994c.

Adverse health impacts to the public can be minimized through administrative and design controls to decrease hazardous chemical releases to the environment and achieve compliance with permit requirements (e.g., air emissions and NPDES permit requirements). The effectiveness of these controls is verified by using monitoring information and inspecting mitigation measures. Health impacts to the public may occur during normal operation via inhalation of air containing hazardous chemicals released to the atmosphere by ORR operations. Risks to public health from ingesting contaminated drinking water or direct exposure are also potential pathways.

Baseline air emission concentrations for hazardous air pollutants and their applicable standards are presented in section 4.2.2.3. These concentrations are estimates of the highest existing offsite concentrations and represent the highest concentrations to which members of the public could be exposed. These concentrations are compared with applicable guidelines and regulations. Information about estimating health impacts from hazardous chemicals is presented in appendix E.

Exposure pathways to ORR workers during normal operation may include inhaling the workplace atmosphere, drinking ORR potable water, and other possible contacts with hazardous materials associated with work assignments. The potential health impacts vary from facility to facility and from worker to worker, and there is not enough information available to allow a meaningful estimation and summation of these impacts. However, workers are protected from workplace-specific hazards through appropriate training, protective equipment, monitoring, and management controls. Workers are also protected by ORR's adherence to OSHA and EPA occupational standards that limit atmospheric and drinking water concentrations of potentially hazardous chemicals in the workplace. Appropriate monitoring, which reflects the frequency and amounts of chemicals used in the operation processes, ensures that these standards are not exceeded. Additionally, DOE requirements ensure that conditions in the workplace are as free as possible from recognized hazards that cause or are likely to cause illness or physical harm; therefore, workers' health conditions at ORR are expected to be substantially better than required by the standards.

TABLE 4.2.2.9–3.—*Doses to the Onsite Worker from Normal Operation at Oak Ridge Reservation, 1992*

	Onsite Releases and Direct Radiation	
Affected Environment	**Standard**[a]	**Actual**[b]
Average worker (mrem)	None	4.0
Maximally exposed worker (mrem)	5,000	2,000
Total workers (person-rem)	None	68

[a] 10 CFR 835. DOE's goal is to maintain radiological exposure as low as reasonably achievable.

[b] DOE 1993n:7. The number of badged workers in 1992 was approximately 17,000.

Health Effects Studies. Two epidemiologic studies were conducted to determine whether or not ORR contributed to any excess cancers in the communities surrounding the facility. One study found no excess cancer mortality in the population living in counties surrounding ORR when compared to the control populations located in other nearby counties and elsewhere in the United States. The other study found a slight increase in several types of cancers in the counties near ORR, but none of the increases were statistically significant.

More epidemiologic studies have been conducted to assess the health effects of the population working at ORR than at any other site reviewed for this PEIS. Increased cancer mortalities have been reported and linked to specific job categories, age, and length of employment, as well as the levels of radiation exposure. For a more detailed description of the studies reviewed and the findings, refer to appendix section E.4.

Accident History. There have been no accidents with a measurable impact on the offsite population during nearly 50 years of Y-12 operation at ORR. The most noteworthy accident in Y-12 history was the 1958 criticality accident. The impact from this accident resulted in radiation sickness for a few ORR employees. In 1989, there was a one-time accidental release of xylene into ORR's sewer system with no adverse offsite impacts. Accidental releases of anhydrous hydrogen fluoride occurred in 1986, 1988, and 1992, with few onsite and negligible offsite impacts. The hydrogen fluoride system where these accidents occurred is being modified to reduce the probability of future releases and to minimize the potential consequences if a release does occur (ORR 1992a:6).

Emergency Preparedness. Each DOE site has established an emergency management program. This program has been developed and maintained to ensure adequate response for most accident conditions and to provide response efforts for accidents not specifically considered. The emergency management program incorporates activities associated with emergency planning, preparedness, and response.

DOE has overall responsibility for emergency planning and operations at ORR; however, DOE has delegated primary authority for event response to the operating contractor. Although the contractor's primary response is onsite, it does provide offsite assistance, if requested, under the terms of existing mutual aid agreements. If a hazardous materials event with offsite impacts occurs at a DOE ORR facility, elected officials and local governments are responsible for the state's response efforts. The Governor's Executive Order No. 4 established the Tennessee Emergency Management Agency as the agency responsible for coordinating state emergency services. When a hazardous materials event occurring at DOE facilities is beyond the capability of local government and assistance is requested, the Tennessee Emergency Management Agency Director may direct state agencies to provide assistance to the local governments. To accomplish this task and ensure prompt initiation of emergency response actions, the director may activate the State Emergency Operations Center and Field Coordination Center. City or county officials may activate local emergency operations centers in accordance with existing emergency plans.

4.2.2.10 *Waste Management*

This section outlines the major environmental regulatory structure and ongoing waste management activities for ORR. A more detailed discussion of the ongoing waste management operations is provided in appendix section H.2.1.

DOE is working with Federal and state regulatory authorities to address compliance and cleanup obligations arising from its past operations at ORR and is engaged in several activities to bring its operations into full regulatory compliance. These activities are set forth in negotiated agreements that contain schedules for achieving compliance with applicable requirements and financial penalties for nonachievement of agreed upon milestones. These agreements have been reviewed to assure the proposed actions are allowable under the terms of these agreements.

EPA placed ORR on the National Priorities List (NPL) on November 21, 1989. DOE, EPA Region IV, and the Tennessee Department of Environment and Conservation completed a Federal Facility Agreement effective January 1, 1992, coordinating ORR inactive site assessment and remedial action. Portions of the Federal Facility Agreement are applicable to operating waste management systems. Existing actions being conducted under the *Resource Conservation and Recovery Act* (RCRA) and applicable state laws minimize duplication, expedite response actions, and achieve a comprehensive remediation of the site.

ORR manages a small quantity of spent nuclear fuel and five broad waste categories: TRU, low-level, mixed, hazardous, and nonhazardous. Because there is no spent nuclear fuel or TRU waste associated with any of the proposed activities at ORR, there is no discussion in this PEIS of spent nuclear fuel or TRU waste generation and management at ORR.

Low-Level Waste. LLW generated at Y-12 and K-25 is primarily contaminated with uranium; whereas, at ORNL, LLW consists primarily of mixed fission products. During 1993, Y-12, ORNL, and K-25 generated approximately 1,030 m^3 (272,000 gallon [gal]), 1,540 m^3 (407,000 gal), and 6 m^3 (1,540 gal) of liquid LLW, respectively (OR MMES 1995c:5-12). At Y-12, the Central Pollution Control Facility treats and discharges nonnitrate dilute wastewater, acidic and caustic waste, and plating rinse waters. This facility can also perform pretreatment of nitrate bearing waste streams. The West End Treatment Facility processes nitrate bearing wastewater consisting of nitric acid, nitrate bearing rinse waters, waste coolants, and bio-nitrification sludge. At ORNL, liquid LLW is collected in storage tanks and routed through underground transfer lines to central evaporators for concentration. The concentrate is sent to the Milton Valley storage tanks for storage and the condensate is sent to the Process Waste Treatment

Plant for further treatment prior to further management actions.

During 1993, Y-12, ORNL, and K-25 generated approximately 2,400 m^3 (3,130 cubic yards [yd^3]), 1,720 m^3 (2,250 yd^3), and 1,540 m^3 (2,030 yd^3) of solid LLW, respectively (OR MMES 1995c:5-12). Solid LLW consists primarily of radioactively contaminated construction debris, wood, paper, asbestos, trapping media, personal protection equipment, and process equipment. In addition, Y-12, ORNL, and K-25 also generated 2,335 m^3, 0.3 m^3, and 42 m^3 of contaminated scrap metal, respectively. Depleted and natural uranium machine chips, after oxidation to a stable uranium oxide, are transported to the depleted uranium oxide storage vaults. Uranium sawfines are blended with uranium oxide and placed in the oxide vaults as a short-term storage method. The only LLW disposal facility on ORR is located at ORNL; however, it only accepts LLW generated at ORNL. The declining disposal capacity has created a significant increase in storage requirements. Currently, LLW is shipped to commercial treatment facilities for volume reduction (incineration or supercompaction) or recycle (metal smelting). The resulting residuals are returned to K-25 for storage and shipment to a disposal site.

The management of LLW at ORR has been affected by three recent events: declines in ORR disposal capacity, changes in regulatory and operational conditions, and evolution of the radioactive waste disposal-class concept. The previous strategy classified LLW according to its isotopic content, concentration, and the performance of a disposal facility. In some instances, these classifications are used to describe the type of LLW or a disposal technology. For example, L-I refers to low concentration LLW or a landfill disposal facility, while L-II refers to low-to-moderate concentration LLW or a tumulus disposal facility. A revised classification system has been proposed. Exempt LLW would have contaminant levels sufficiently low to be disposed of in a sanitary or industrial landfill with state concurrence. Disposable LLW would be suitable for disposal at ORR as determined by facility performance assessments. Offsite LLW would be waste which would not meet the criteria of exempt or disposable. The long-range strategy is to rely on the combination of onsite and offsite facilities. Plans for a replacement onsite disposal facility will continue to be pursued with the most likely candidate site for a tumulus disposal facility being Bear Creek Valley. That portion of the LLW that cannot be disposed of onsite consistent with DOE Order 5820.2A, *Radioactive Waste Management*, will be stored until disposal offsite becomes available.

Mixed Low-Level Waste. RCRA mixed, radioactive land disposal-restricted waste is in storage at Y-12, ORNL, and K-25. Because prolonged storage of these wastes exceeded the 1-year limit imposed by RCRA, ORR entered into a Federal Facility Compliance Agreement for RCRA land disposal restriction wastes with EPA on June 12, 1992. The Federal Facility Compliance Agreement recognizes that DOE will continue to generate and store such mixed wastes subject to land disposal restrictions. A Tennessee Department of Environment and Commissioner's Order was issued on September 26, 1995, that requires DOE to comply with the site treatment plan that was developed pursuant to the *Federal Facility Compliance Act* of 1992. The plan contains milestones and target dates for DOE to characterize and treat its inventory of mixed wastes.

In 1993, Y-12, ORNL, and K-25 generated 334,016 kilograms (kg) (736,372 pounds [lb]), 176,925 kg (390,049 lb), and 928,948 kg (2,047,959 lb) of mixed LLW, respectively (OR MMES 1995c:7-7). Liquid mixed wastes at Y-12 consist primarily of nonnitrate bearing wastewaters, contaminated groundwaters, nitrate-bearing wastes, cyanide wastes, contaminated waste oils, acidic wastes, caustic wastes, and contaminated solvents. Solid wastes include both RCRA- and TSCA-mixed wastes. The Central Pollution Control Facility and Plating Rinsewater Treatment Facility treat the nonnitrate bearing wastewaters; whereas, the West End Treatment Facility treats nitrate bearing wastes. Other treatment facilities include the Groundwater Treatment Facility, Waste Coolant Processing Facility, Cyanide Treatment Unit, Uranium Treatment Unit, and Biodenitrification Unit.

Mixed waste at K-25 includes liquids, sludges, and soil contaminated with hazardous and PCB constituents (including waste, oils, spent solvents, paints, and cyanide- or sulfide-bearing reactive wastes), and corrosive and toxic wastes from laboratory processes. Treatment facilities at K-25 include the Central Neutralization Facility and the TSCA Incinerator. The primary waste streams treated at the Central Neutralization Facility include the scrubber effluent from the TSCA Incinerator and process wastewaters from the K-1501 Steam Plant. The K-25 TSCA incinerator has a design capacity to incinerate 907 kg/hour (hr) (2,000 lb/hr) of mixed liquid waste and up to 454 kg/hr (1,000 lb/hr) of solids and sludge (91 kg/hr [200 lb/hr] maximum sludge content). The TSCA incinerator is capable of incinerating both TSCA- and RCRA-mixed waste. DOE guidance currently does not allow incineration of solids or sludges. Because of permit limits (i.e., TSCA, RCRA, and the State of Tennessee), the incinerator is not running at full capacity. In 1993, approximately 2,309 m^3 (610,000 gal) of mixed liquid waste was incinerated (OR MMES 1995c:7-9).

ORNL has no facilities specifically designed for the treatment of mixed wastes. Generators currently neutralize many corrosives before discharge to process drains. Organic mixed wastes are scheduled to be treated at the TSCA Incinerator.

Uranium-contaminated PCB wastes (mixed wastes) are being stored in excess of the 1-year limit imposed by TSCA because of the lack of treatment and disposal capacities. DOE and EPA have signed a Federal Facility Compliance Agreement, effective February 20, 1992, to bring the K-25 site associated with the Uranium Enrichment Program into compliance with TSCA regulations for use, storage, and disposal of PCBs. It also addressed the approximately 10,000 pieces of nonradioactive PCB-containing dielectric equipment associated with the shutdown of diffusion plant operations. An additional Federal Facility Compliance Agreement related to TSCA compliance is currently being discussed by DOE and EPA for ORR.

Hazardous Waste. RCRA-regulated wastes are generated by ORR in laboratory research, electroplating operations, painting operations, descaling, demineralizer regeneration, and photographic processes. Certain other wastes (e.g., spent photographic processing solutions) are processed onsite into a nonhazardous state. Those wastes that are safe to transport and are certified as having no radioactivity added are shipped offsite to RCRA-permitted commercial treatment or disposal facilities. Small amounts of reactive chemical explosives that would be dangerous to transport offsite, such as aged picric acid, are processed onsite in the Chemical Detonation Facility at ORNL.

Y-12 generated approximately 9,920 m^3 (13,000 yd^3) of hazardous waste in 1993 (OR MMES 1995c:6-4). Of this amount approximately 8,840 m^3 (11,600 yd^3) was liquid hazardous waste that was managed as mixed LLW and treated at the Plating Rinsewater Treatment Facility and the Steam Plant Wastewater Treatment Facility. The solid waste was treated offsite. Liquid and solid hazardous waste streams include steam plant wastewaters for treatment, mineral oil contaminated with PCBs, and sludges. All hazardous waste generated at K-25, including all wastes subject to RCRA and TSCA regulations, is managed as mixed LLW.

At ORNL approximately 23,800 m^3 (31,200 yd^3) of liquid hazardous waste was generated in 1993. Bulk nonnitrate acids previously neutralized at the Nonradiological Wastewater Treatment Plant are now sent to the Central Neutralization Facility. No treatment is performed for the approximately 354 m^3 (464 yd^3) of solid hazardous waste at ORNL (OR MMES 1995c:6-5). Some waste is sent to K-25 for storage or incineration, while the remainder (non-RCRA) is sent to a landfill at Y-12. Hazardous waste at K-25 is managed as mixed waste. Hazardous waste is collected and stored until it can be certified under the "no rad added" policy, at which time it is shipped offsite.

Nonhazardous Waste. Nonhazardous wastes are generated from ORR maintenance and utilities. For example, the steam plant produces a nonhazardous sludge. Scrap metals are discarded from maintenance and renovation activities and are recycled, when appropriate. Construction and demolition projects also produce nonhazardous industrial wastes. All nonradioactive medical wastes are autoclaved to render them noninfectious and are sent to the Y-12 sanitary landfill. Remedial action projects also produce wastes requiring proper management. The State of Tennessee-permitted landfill (Construction Demolition Landfill VI) receives nonhazardous industrial materials such as fly ash and construction debris. Asbestos and general refuse are managed in the Industrial and Sanitary Landfill V located at Y-12.

Approximately 52,800 m^3 (69,100 yd^3) of solid industrial and sanitary wastes were generated on

ORR in 1993 (OR MMES 1995c:8-4). Y-12 is the single largest generator of this waste category with 43,900 m^3 (57,600 yd^3). ORNL and K-25 generated approximately 11 and 6 percent, respectively, of the total nonhazardous waste.

4.2.3 Environmental Impacts

4.2.3.1 *Land Resources*

No Action. Under No Action, DOE would continue current and planned activities at ORR as described in section 3.2.2. No additional land-use impacts are anticipated at ORR beyond the effects of existing and future activities that are independent of the proposed action.

Management Alternatives

Downsize Secondary and Case Fabrication. The proposed alternative to downsize and consolidate secondary and case fabrication at Y-12 would involve the modification of existing facilities. The downsize secondary and case fabrication alternative would not impact land use outside the existing Y-12 boundary. Equipment and material laydown and warehousing would be short term and within existing building space or Y-12 developed areas. The proposed activities would be compatible with land-use plans and policies. Impacts to land use are not expected.

The movement of the strategic reserve of highly enriched uranium (HEU) at ORR to another DOE site location (an alternative in the Storage and Disposition Program) would have no adverse impact on ORR land use plans and policies. Vacated storage facilities would be transferred to EM for D&D and disposition.

Phaseout of Secondary and Case Fabrication. The proposed alternative would not affect land use in the short term. Facilities and infrastructure supporting the secondary and case fabrication mission and the strategic reserve of HEU would transition to EM for D&D before disposition. A future scenario may be the potential for the site to accommodate industrial type activities. The subsequent use of the vacated Y-12 secondary and case fabrication facilities and land would be developed in the transition plan prepared by EM. Any potential future use would be required to be compatible with remaining ORR missions and consistent with site development plans.

Sensitivity Analysis. Y-12 would be able to accommodate all operations and support functions for downsizing secondary and case fabrication within existing facilities. The use of those facilities would be sufficient to maintain capacity for the low case. In order to support the high case, additional equipment and floor space in existing buildings would be required. There would be no additional land required.

Potential Mitigation Measures. No mitigation measures are anticipated.

4.2.3.2 *Site Infrastructure*

The ORR site infrastructure resources are capable of accommodating any of the proposed alternatives for which ORR is a candidate, with relatively minor changes in the existing electrical and fuel resources. Table 4.2.3.2–1 presents a comparison of the annual operating infrastructure resource requirements for the alternatives of No Action, secondary and case fabrication, and phaseout of secondary and case fabrication. Existing facilities would only be modified, as required, to accommodate mission objectives; therefore, construction-related impacts would be minimal.

No Action. The No Action alternative would continue to satisfy the secondary and case fabrication mission objectives in the existing Y-12 facilities without modification. The DP missions and functions that would continue under this alternative include dismantling nuclear weapon components, maintaining production capability and stockpile support, storing uranium and lithium materials, processing special nuclear materials, and providing support to design agencies, as requested. Continuing the secondary and case fabrication mission with existing facilities would result in a 13-percent increase in electrical energy consumption and a 4.2-percent increase in energy equivalent fuel consumption relative to current usage. This increase is well within ORR's historic usage and existing infrastructure capacity. No adverse site infrastructure-related effects are anticipated with this alternative.

Management Alternatives

Downsize Secondary and Case Fabrication. The secondary and case fabrication alternative at Y-12 would result in a downsized and consolidated manufacturing operation consisting of five primary production buildings, one shared production facility, and a number of office, utility, and changehouse facilities.

TABLE 4.2.3.2–1.—*Site Infrastructure Requirements and Changes for Stockpile Management Alternatives at Oak Ridge Reservation*

Alternative	Electrical: Energy (MWh/yr)	Electrical: Peak Load (MWe)	Fuel: Liquid (L/yr)	Fuel: Gas (m^3/yr)	Fuel: Coal (t/yr)
Current Resources[a]	726,000	110	416,000	95,000,000	16,300
No Action					
Total site requirement	820,000	124	379,000	99,000,000	17,100
Change from current resources	94,000	14	-37,000	4,000,000	800
Downsize Secondary and Case Fabrication					
Total site requirement	791,000	121.2	629,000	93,000,000	16,600
Change from No Action	-29,000	-2.8	250,000	-6,000,000	-500
Phaseout Secondary and Case Fabrication					
Total site requirement	673,000	102.2	379,000	76,000,000	16,100
Change from No Action	-147,000	-21.8	0	-23,000,000	-1,000

[a] Current resources reflect 1993 usage. ORR available capacity is 13,880,000 MWh/yr for electrical energy with a peak load capability of 2,100 MWe and 250,760,000 m^3/yr for natural gas.

Source: OR LMES 1996i; OR MMES 1996j; ORR 1995a:1; ORR 1995a:3.

This downsizing and consolidation effort would result in a facility that occupies approximately 11 percent of the historical area utilized in support of DP functions. The downsizing would be accomplished by preproducing and purchasing certain materials and services, moving processes, and relocating equipment to facilitate consolidation, and the efficient utilization of resources to maximize the number of buildings that could be vacated and turned over to other programs.

Continuing to perform the secondary and case manufacturing operations at Y-12 with the new production requirements and with downsized and consolidated facilities would not affect onsite or offsite corridors for road, rail, pipelines, transmission, and communication services. However, when compared to the No Action alternative site requirements, the consumptive usage of electrical energy with the downsized facility would decrease by about 3.5 percent, and fuel consumption would decrease by approximately 5.4 percent on an equivalent energy basis. These changes reflect facility operating conditions for the production of a base case, multiple-shift, stockpile size. Since these changes are well within the existing ORR site resource capacity, no adverse site infrastructure related environmental impacts are expected to result from this action.

The movement of the strategic reserve of HEU at ORR to another DOE site location (an alternative in the Storage and Disposition Program) would make available additional storage facilities for transition to EM for D&D and disposition. Impacts to site infrastructure would be negligible because these types of facilities require little infrastructure support and resources.

Phaseout of Secondary and Case Fabrication. The phaseout of the secondary and case fabrication mission at Y-12 would result in an 18-percent decrease in electrical energy consumption and about a 21-percent decrease in fuel consumption (energy equivalent) relative to No Action usage at ORR. No adverse site infrastructure-related environmental effects would result from the phaseout of secondary and case fabrication at ORR.

Sensitivity Analysis. For a high case, stockpile size (multiple-shift) workload, the secondary and case fabrication utility requirements would double, whereas low case (single-shift) facility operation would result in utility resource usage of approximately one-fifth that of base case surge usage.

Potential Mitigation Measures. The downsizing and consolidation or phaseout of secondary and case manufacturing would minimize adverse environmental effects. Facilities vacated by these actions would be decontaminated and decommissioned and released for uses that would potentially be less environmentally intrusive.

4.2.3.3 *Air Quality*

No Action. The No Action air quality analysis utilizes estimated air emissions data from operations at ORR in 2005, assuming continuation of current site missions, to calculate pollutant concentrations at or beyond the ORR site boundary. The emission rates for criteria and toxic/hazardous pollutants for No Action are presented in appendix table B.3.2–1. Table 4.2.3.3–1 presents the No Action pollutant concentrations calculated from the 2005 emission rates. In this table, pollutant concentrations are compared with applicable Federal and state regulations and guidelines. Concentrations are expected to remain within these standards.

TABLE 4.2.3.3–1.—*Estimated Concentrations of Pollutants from No Action and Stockpile Management Alternatives at Y-12 Plant*

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines (μg/m³)	2005 No Action (μg/m³)	Downsize Secondary and Case Fabrication (μg/m³)	Phaseout of Secondary and Case Fabrication (μg/m³)
Criteria Pollutant					
Carbon monoxide	8-hour	10,000[a]	5.1	4.8	4.4
	1-hour	40,000[a]	11.1	10.5	9.6
Lead	Calendar quarter	1.5[a]	0.05	0.05	0.05
Nitrogen dioxide	Annual	100[a]	3.0	2.4	1.8
Ozone	1-hour	235[a]	b	b	b
Particulate matter	Annual	50[a]	1	1	0.9
	24-hour	150[a]	2	1.9	1.8
Sulfur dioxide	Annual	80[a]	2	1.9	1.7
	24-hour	365[a]	32.1	29.8	27.2
	3-hour	1,300[a]	80.2	74.6	68
Mandated by Tennessee					
Total suspended particulates	24-hour	150[c]	2.2	2	2
Gaseous fluorides (as hydrogen fluoride)	30-day	1.2[c]	0.2	0.2	0
	7-day	1.6[c]	0.3	0.3	0
	24-hour	2.9[c]	<0.6	<0.6	0
	12-hour	3.7[c]	<0.6	<0.6	0
	8-hour	250[c]	0.6	0.6	0
Hazardous and Other Toxic Compounds					
Acetic acid	8-hour	d	<0.1	<0.1	0
Chlorine	8-hour	150[c]	4.3	4.3	4.0
Hydrogen chloride	8-hour	750[c]	57.2	48.8	6.1
Methyl alcohol	8-hour	26,200[c]	219.3	137.9	21.6
Nitric acid	8-hour	d	78.0	66.5	8.2
Sulfuric acid	8-hour	d	20.0	17.0	2.6
1,1,1-Trichloroethane	8-hour	191,000[c]	1.9	1.9	0.2

[a] Federal standard.
[b] No monitoring data available; concentration assumed less than applicable standard.
[c] State standard or guideline.
[d] No standard.
Source: 40 CFR 50; OR DOE 1993a; OR DOE 1995g; TN DEC 1994a; TN DHE 1991a.

Management Alternatives

Downsize Secondary and Case Fabrication. The downsize secondary and case fabrication mission at Y-12 would generate criteria and toxic/hazardous emissions resulting from the operation of the plant boiler, component manufacturing, and chemical processes. Reasonably available control technology would be used to minimize pollutant emissions. This would include using high efficiency particulate air (HEPA) filters to contain particulate emissions and providing liquid scrubbing prior to HEPA filtration to remove chemical vapors such as nitric acid. Downsizing of the secondary and case fabrication mission at Y-12 would result in a net reduction of atmospheric pollutants. The emission rates for criteria and toxic/hazardous pollutants for the downsize secondary and case fabrication mission are presented in table B.3.2–1. Table 4.2.3.3–1 presents the resulting concentrations of criteria and toxic/hazardous pollutants from No Action and the downsize secondary and case fabrication mission. The resulting concentrations of criteria and toxic/hazardous pollutants are expected to be within Federal and state regulations and guidelines.

The movement of the strategic reserve of HEU at ORR to another DOE site location (an alternative in the Storage and Disposition Program) would have no impact on air quality because storage facilities and strategic reserve activities have no measurable air emissions.

Phaseout of Secondary and Case Fabrication. Phaseout of the secondary and case fabrication mission at Y-12 would result in a net reduction of criteria and toxic/hazardous emissions. The emission rates for criteria and toxic/hazardous pollutants for the phaseout of the secondary and case fabrication at Y-12 are presented in table B.3.2–1. Table 4.2.3.3–1 presents the resulting concentrations of criteria and toxic/hazardous pollutants from No Action and the phaseout of the secondary and case fabrication mission. The resulting concentrations of criteria and toxic/hazardous pollutants are expected to be within Federal and state regulations and guidelines.

Sensitivity Analysis. Impacts to air quality from either the low or high case scenario of the downsize secondary and case fabrication alternative would result in higher and lower concentrations of criteria and toxic/hazardous pollutants for the high and low cases respectively. The concentrations of pollutants for both cases are expected to remain within applicable Federal and state regulations and guidelines.

Potential Mitigation Measures. No mitigation measures are required for the downsize secondary and case fabrication and phaseout of secondary and case fabrication alternatives at Y-12.

4.2.3.4 *Water Resources*

Environmental impacts associated with the management alternatives at ORR could affect both surface and groundwater resources. The proposed project facilities are located outside any 100- and 500-year floodplain zone (ORR 1995a:6). At ORR, surface water resources, primarily the Clinch River, would be used to meet all construction and operation water requirements. The Clinch River has sufficient flow to support the downsize secondary and case fabrication alternative. A description of the activities that would continue at ORR is provided in section 3.2.2. Table 4.2.3.4–1 presents existing surface water and groundwater resources and the potential changes to water resources at ORR resulting from the proposed alternatives. The total site water resource requirements for each alternative including No Action (base case single-shift operation) are displayed in this table.

Surface Water

No Action. No construction would occur under No Action; therefore, no additional construction water would be used or discharged. Under No Action, surface water withdrawals from the Clinch River are estimated to be 14,760 MLY (3,900 MGY) because of increased operating requirements of existing secondary and case fabrication facilities at ORR. This is an increase of 550 MLY (145 MGY) from the current usage of 14,210 MLY (3,754 MGY). Wastewater discharges to East Fork Poplar Creek from Y-12 would increase to 2,277 MLY (601 MGY), an increase of 71 percent over current discharges. No adverse impacts to surface waters or surface water quality are expected because all discharges would be monitored to comply with the NPDES permit limits. The discharges are also well below historic Y-12 discharge volumes to East Fork Poplar Creek.

TABLE 4.2.3.4–1.—*Potential Changes to Water Resources from Stockpile Management Alternatives at Oak Ridge Reservation*

Affected Resource Indicator	No Action Single-Shift Operation 2005	Downsize Secondary and Case Fabrication Three-Shift Operation	Phaseout Secondary and Case Fabrication
Construction			
Water Availability and Use			
Water source	Surface	Surface	Surface
Total site water operation requirement[a] (MLY)	0[b]	14,760.3	0
Percent change from No Action water use (14,760 MLY)	NA	0.002	0
Percent of Clinch River flow (138 m^3/s)	0	$7.7x10^{-8}$	0
Water Quality			
Wastewater discharge to surface waters[c] (MLY)	0[b]	2,277	0
Percent change from No Action discharges (2,277 MLY)	NA	0.001	0
Operation			
Water Availability and Use			
Water source	Surface	Surface	Surface
Total site water operation requirement (MLY)	14,760	13,820	12,310
Percentage change from No Action water use (14,760 MLY)	NA	-6	-17
Percentage change from current use (14,210 MLY)	4	-3	-13
Percent of Clinch River flow (138 m^3/s)	0.003	0.003	0.003
Water Quality			
Wastewater discharge to surface waters[c] (MLY)	2,277	2,147	1,827
Percent change from No Action wastewater discharges (2,277 MLY)	NA	-5.7	-20
Percent change from 1993 wastewater discharge (1,328 MLY)	71	62	38
Floodplain			
Actions in 100-year floodplains	None	None	NA
Actions in 500-year floodplains	None	None	NA

[a] Total water requirements for construction at Y-12 are based on a 6-year period for secondary and case fabrication.
[b] No construction water would be used and no construction wastewater would be generated. Total site water use and wastewater discharge would be the same as No Action operation.
[c] All discharges to natural drainages require NPDES permits.
Note: NA - not applicable; MLY - million liters per year.
Source: OR LMES 1996i; OR MMES 1996j; ORR 1995a:1.

Management Alternatives

Downsize Secondary and Case Fabrication. Surface water withdrawals and discharges during modification activities to downsize and consolidate secondary and case fabrication activities at ORR would increase by 0.27 MLY (0.07 MGY) and would not adversely affect flow or downstream users. Treated wastewater effluent discharged to surface streams would be monitored to comply with NPDES permit and other discharge requirements. To minimize soil erosion impacts, stormwater management and erosion control measures would be implemented. To support downsize secondary and case fabrication three-shift surge operations, approximately 13,820 MLY (3,651 MGY) would be required for total site operation. This water requirement would support operations to produce surge quantities of secondaries. Production of base case quantities of secondaries and cases would not require any additional water above the amount needed under the No Action alternative. Total site wastewater discharges with downsize secondary and case fabrication would be 2,147 MLY (567 MGY). All discharges would be monitored to comply with NPDES permit limits. Stormwater runoff from the main plant area would be collected in detention ponds, monitored, and, if acceptable, discharged to nearby streams. Stormwater runoff from outside the main plant area would be discharged to nearby streams. No adverse impacts to surface waters or surface water quality are expected.

The movement of the strategic reserve of HEU at ORR to another DOE site location (an alternative in the Storage and Disposition Program) would have no impact on surface or groundwater resources at Y-12.

Phaseout of Secondary and Case Fabrication. Phaseout activities for secondary and case fabrication at Y-12 would decrease water usage at ORR by 2,450 MLY (647 MGY) from No Action. The phaseout would reduce Y-12 discharges from secondary and case fabrication by 100 percent and ORR discharges to approximately 1,827 MLY (482 MGY). The phaseout of the secondary and case fabrication mission at ORR would have no adverse impacts on surface water quality.

Groundwater

No Action. Under No Action, no additional impacts to groundwater resources are anticipated beyond the effects of existing and future activities, which are independent of and not affected by the proposed action. As discussed in section 4.2.2.4, one well currently supplies a small amount of water for a laboratory. Groundwater use is expected to remain constant in 2005.

Groundwater quality data obtained from wells located near the Y-12 facility indicate that groundwater quality has been improved by ongoing restoration activities. Under No Action, current restoration programs would continue. Process and wastewater would continue to be treated at either the Y-12 Centralized Pollution Control Facility or at the Y-12 West End Treatment Facility before being discharged to surface waters. Minimal impacts on groundwater quality are expected due to wastewater releases.

Management Alternatives

Downsize Secondary and Case Fabrication. All water for modification activities and operation of the downsized and consolidated secondary and case fabrication facilities would be taken from the Clinch River, with no plans for withdrawal from groundwater resources. All process, utility, and sanitary wastewater would be treated prior to discharge into East Fork Poplar Creek in accordance with NPDES permits. Minimal impact to groundwater quality is expected.

The movement of the strategic reserve of HEU at ORR to another DOE site location (an alternative in the Storage and Disposition Program) would have no impact on surface or groundwater resources at Y-12.

Phaseout of Secondary and Case Fabrication. By phasing out the secondary and case fabrication mission at Y-12, no adverse impact to groundwater resources is expected. Spill protection systems and plans exist to contain and minimize effects of releases of hazardous substances during transition and D&D activities. Given normal safeguards and precautions, no adverse impacts to groundwater quality are expected to result from secondary and case fabrication phaseout activities. Current environmental restoration programs would not be adversely impacted.

Sensitivity Analysis. The surface water requirements and discharges needed for the high stockpile case are expected to be similar to the low case surge three-shift operation, downsize secondary and case fabrication alternative. The low case scenario would require a slightly smaller amount of surface water (less than 1 percent) than No Action to meet stockpile production requirements. Impacts to surface water or surface water quality would be similar to the downsize secondary and case fabrication alternative for the high case scenario and less for the low case scenario. Groundwater or groundwater quality would not be affected by the high or low case stockpile requirement at ORR.

Potential Mitigation Measures. No mitigation measures beyond standard engineering design have been identified.

4.2.3.5 *Geology and Soils*

The alternatives proposed for ORR would have no impact on geological resources described in section 4.2.2.5. Hazards posed by geological conditions are expected to be minor. Land requirements to support building modification activity would be minimal, and existing Y-12 developed land area in the immediate vicinity of the project would be used. Potential changes to geology and soils associated with the proposed alternatives at ORR are discussed below.

No Action. Under No Action, DOE would continue current and planned activities at ORR. Any impacts to geology and soils would be independent of and unaffected by the proposed action.

Management Alternatives

Downsize Secondary and Case Fabrication. The downsizing and/or consolidation of secondary and case fabrication at Y-12 would not affect geological conditions. Activities required to modify project facilities would not be adversely affected by geological conditions.

No known active faults exist within the boundaries of ORR, and ground rupture as a result of an earthquake is unlikely. Based on the seismic history of the area, a low seismic risk exists at ORR and should not preclude safe modification and operation of the secondary and case fabrication facilities. All facilities would be designed for earthquake-generated ground acceleration in accordance with DOE O 420.1, Facility Safety and accompanying safety guidelines.

Volcanic activity has not occurred in the area for over 200 million years and is extremely unlikely to impact project activities. Landslides or other nontectonic events are highly unlikely to affect project facilities. Slopes and underlying foundation materials are generally stable. Potential health impacts from accidents associated with geological hazards are discussed in section 4.2.3.9.

Building material laydown and warehousing land requirements would be minimal. Space within existing buildings and existing developed Y-12 areas would be used. Project-related parking requirements can be satisfied by existing parking facilities. The properties and conditions of soils place no limitations on modification activities or the safe operation of project facilities.

The movement of the strategic reserve of HEU at ORR to another DOE site location (an alternative in the Storage and Disposition Program) would have no impacts on geology and soils at Y-12.

Phaseout of Secondary and Case Fabrication. The phaseout of secondary and case fabrication at Y-12 would not affect geology and soils. The D&D of vacated facilities would be carried out within the interior sections of the buildings.

Sensitivity Analysis. The high or low case operation scenario would not affect geology and soils.

Potential Mitigation Measures. No mitigation measures are anticipated.

4.2.3.6 *Biotic Resources*

The following sections address impacts to terrestrial resources, wetlands, aquatic resources, and threatened and endangered species on ORR. In general, impacts to these resources are not expected from the proposed alternatives; however, noise and human presence could temporarily disturb wildlife.

No Action. Under No Action, the secondary and case fabrication mission described in section 3.2.2 would continue at Y-12. There would be no changes to current biotic resource conditions at Y-12 or ORR as described in section 4.2.2.6.

Management Alternatives

Downsize Secondary and Case Fabrication. Downsizing and consolidating the Y-12 secondary and case fabrication mission at ORR is not expected to impact biological resources. All activities, including alterations to existing buildings, would take place within developed portions of the Y-12 area. There would be no increase over existing water consumption or discharge.

The movement of the strategic reserve of HEU at ORR to another DOE site location (an alternative in the Storage and Disposition Program) would have no impact on biotic resources at Y-12.

Phaseout of Secondary and Case Fabrication. Phaseout of secondary and case fabrication at Y-12 would not result in adverse impacts to biotic resources. During the phaseout period additional human activity could temporarily disturb wildlife living nearby; however, disturbance would be minimal since Y-12 is presently a heavily used industrial area and nearby wildlife populations have already adapted to its presence. Once all phaseout activities are complete, wildlife use of the area would depend on subsequent land use. Phaseout of DP missions at Y-12 could lessen impacts to the Tennessee dace population in Bear Creek since effluent discharges to the stream would decrease.

Sensitivity Analysis. Implementation of either a low or high case workload would not affect biological resources.

Potential Mitigation Measures. No mitigation measures are anticipated.

4.2.3.7 *Cultural and Paleontological Resources*

For the discussion of impacts, the term cultural resources includes prehistoric, historic, and Native American resources. Cultural and paleontological resources may be affected directly through ground disturbance, building modification, visual intrusion of the project to the historic setting or environmental context of historic sites, visual and audio intrusions to Native American resources, reduced access to traditional use areas, and unauthorized artifact collecting and vandalism. On May 6, 1994, a Programmatic Agreement concerning the management of historical and cultural properties at ORR was executed among the Oak Ridge Operations Office, the Tennessee SHPO, and the Advisory Council on Historic Preservation. This agreement was administered to satisfy DOE's responsibilities regarding Sections 106 and 110 of the *National Historic Preservation Act*, and requires DOE to develop a cultural resources management plan for ORR and to conduct cultural resources surveys, as required.

The area affected by the proposed alternatives is limited to Y-12. No NRHP prehistoric sites have been identified at Y-12. A field review of the area indicated that most of the land was disturbed, making the identification of NRHP-eligible archaeological resources unlikely. A historic buildings survey was conducted across Y-12 in 1995, and approximately 100 structures were identified as being potentially NRHP-eligible. The associated report is currently under preparation and will be finished in the fall 1996. Native American resources of concern to Cherokee tribes in Oklahoma and Tennessee may be affected by some of the proposed alternatives. Fossils present at ORR are of fairly common invertebrates and therefore have low research potential.

No Action. Under No Action, DOE would continue the existing and planned missions at ORR described in section 3.2.2. Any impacts to cultural and paleontological resources from these missions would be independent of and unaffected by the proposed action.

Management Alternatives

Downsize Secondary and Case Fabrication. This alternative involves the use and modification of existing buildings at Y-12. Because all of Y-12 is either developed or disturbed and minimal space would be required for equipment and material laydown and parking during building modification, no impacts to prehistoric, Native American, or paleontological resources are expected. Seven of the facilities (Buildings 9215, 9401-3, 9706-2, 9996, 9998, 9212, and 9710-2) to be modified (appendix section A.3.2.1) under this alternative are NRHP eligible. Any project-related effects would be addressed in tiered NEPA documentation. Impacts to cultural and paleontological resources under the proposed alternative are independent of strategic reserve storage.

The movement of the strategic reserve of HEU at ORR to another DOE site location (an alternative in the Storage and Disposition Program) would not affect cultural and paleontological resources at Y-12.

Phaseout of Secondary and Case Fabrication. The phaseout of secondary and case fabrication at Y-12 may affect some cultural or paleontological resources. The subsequent use of Y-12 would determine potential future impacts to these resources. NRHP-eligible resources would be identified through project-specific inventories and evaluations. Specific concerns about Native American resources would be addressed through consultation with the potentially affected tribes. Any project-related effects would be addressed in tiered NEPA documentation. No impacts to scientifically important paleontological resources are expected.

Sensitivity Analysis. The high and low case production scenarios would have the same impacts to cultural and paleontological resources. The high case scenario would require additional buildings over the base case scenario, but these buildings are currently assigned to the secondary and case mission. Cultural resources would therefore not be affected.

Potential Mitigation Measures. If adverse impacts to NRHP-eligible sites cannot be avoided through project design or siting, then a Memorandum of Agreement may need to be negotiated among DOE, the Tennessee SHPO, and the Advisory Council on Historic Preservation. The Memorandum of Agreement would formalize mitigation measures agreed to by these consulting parties. Mitigation measures could include describing and implementing intensive inventory and evaluation studies, data recovery plans, site treatments, and monitoring programs. The appropriate level of data recovery for mitigation would be determined through consultation with the Tennessee SHPO and the Advisory Council on Historic Preservation in accordance with Section 106 of the *National Historic Preservation Act*. Mitigation measures for specific NRHP-eligible sites would be identified during tiered NEPA documentation.

If adverse impacts to Native American resources cannot be avoided through project design or siting, then acceptable mitigation measures to reduce project effects on them would be determined in consultation with the affected Native American groups. In accordance with the *Native American Graves Protection and Repatriation Act* and the *American Indian Religious Freedom Act*, such mitigations may include, but may not be limited to, appropriate relocation of human remains, planting vegetation screens to reduce visual or noise intrusion, increasing access to traditional use areas, or transplanting or harvesting important Native American plant resources.

4.2.3.8 *Socioeconomics*

No Action. Under the No Action alternative, the existing missions at Y-12 would continue to operate, but with a somewhat smaller workforce. The current total Y-12 workforce of 5,152 would decline to 4,721 by 2005. The composition of the Y-12 workforce in 2005 would include 2,741 employees associated with core stockpile management activities and 1,980 performing support and other nonstockpile management tasks. The Y-12 workforce would remain relatively stable at this level for the duration of the missions. Figure 4.2.3.8–1 presents a breakdown of the Y-12 workforce under the No Action alternative. Projections for the regional economy, employment rates, population and housing, and public finance characteristics are presented in appendix D.

Regional Economy and Employment. Total employment in the regional economic area is projected to grow approximately 1 percent annually between 1995 and 2000, reaching approximately 488,700 in the latter year. After 2001, employment is expected to increase by less than 1 percent annually, reaching approximately 572,100 in 2030. Unemployment in the regional economic area was 4.9 percent in 1994 and is expected to remain at this level into the near future. Per capita income is projected to increase from approximately $18,198 in 1995 to $22,494 in 2030. No Action employment for ORR is expected to reach 15,171 persons by 2005.

Population and Housing. Annual ROI county and city population and housing increases are projected to average slightly less than 1 percent between 1995 and 2005. Between 2006 and 2030, the annual rate of increase is expected to be much less than 1 percent. Population in the ROI is estimated to increase from 519,300 in 1995 to 641,800 in 2030. The total number of housing units in the ROI is projected to increase from 215,100 in 1995 to 265,700 in 2030.

Public Finance. Funding for school districts is provided by the county or city in which the school district is located. Between 2000 and 2005, all ROI county and city total revenues are projected to increase at an annual average of 1.1 percent or less. Total expenditures are projected to increase an annual average of less than 1 percent during the same period. These rates of increase should continue until 2030.

Management Alternatives

Downsize Secondary and Case Fabrication

Under this alternative, the secondary and case fabrication mission would remain at ORR but operate at reduced capacity and with a smaller workforce. Downsizing Y-12 would require some modification to the existing facilities and would involve 14 workers during the peak construction period. The size of the operational workforce would vary over time and would depend on whether DOE implements a single-shift or three-shift operation.

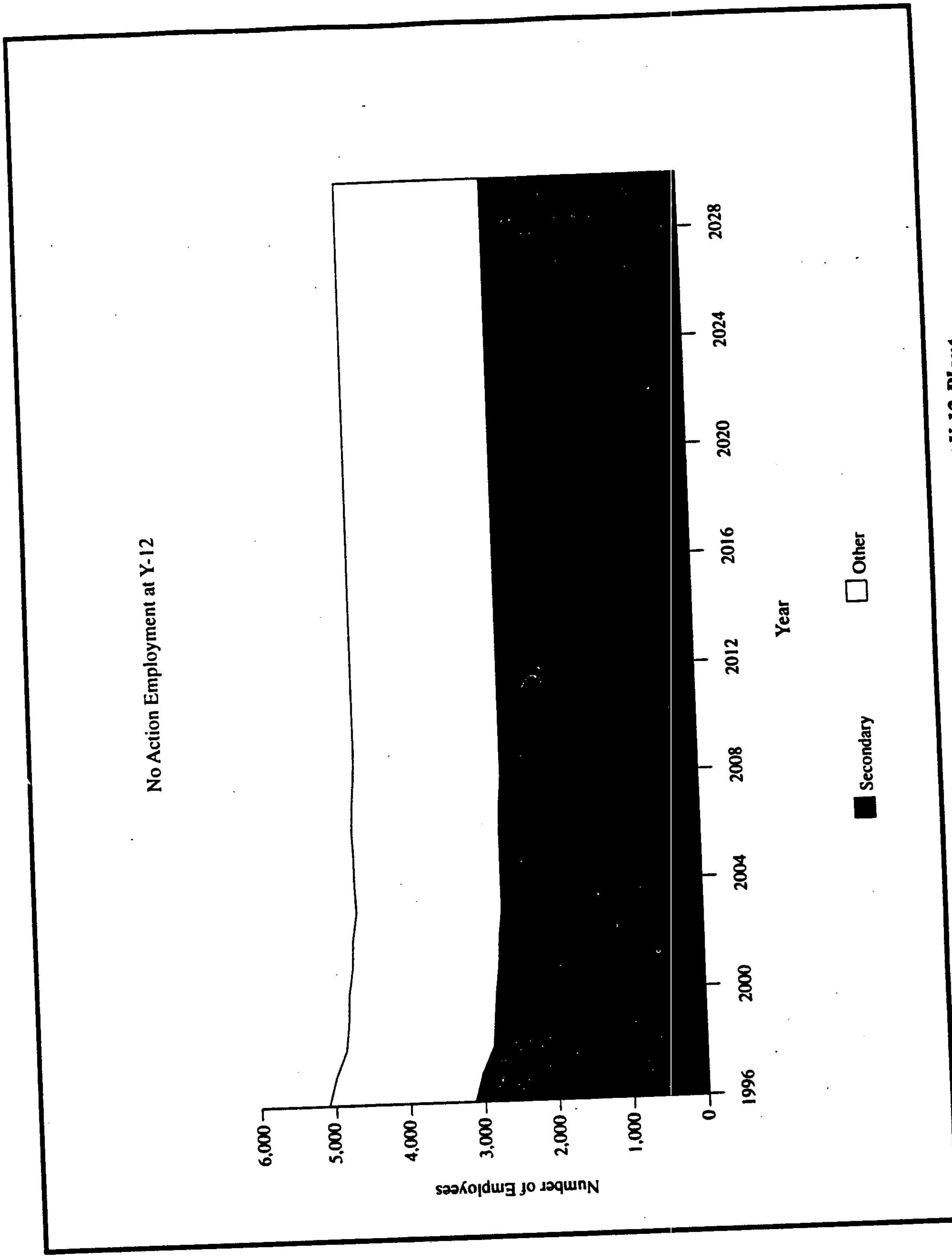


FIGURE 4.2.3.8–1.—*No Action Employment at Y-12 Plant.*

Base Case Single Shift. Under the base case single shift the total Y-12 workforce would decrease in 2005 from the No Action level of 4,721 to 3,916. The composition of the workforce would also change significantly, as shown in figure 4.2.3.8–2. Because the base case single-shift workforce would result in the greatest number of job losses, it serves as the bounding scenario for the socioeconomic analysis. Although the number of workers conducting nonstockpile management activities would remain constant (1,980), the number of core stockpile management workers employed would decrease from 2,741 to 784. In addition, 1,152 workers would be employed to perform landlord responsibilities in preparation for D&D of the facilities vacated by downsizing. Over the period 2005 to 2030, the number of D&D workers would range from a high of 1,522 in 2016 to a low of 557 in 2030. When D&D activities reach a peak in 2016, Y-12 would employ 435 fewer workers than under the No Action alternative.

Base Case Surge (Three Shift). Under the base case surge scenario, the total Y-12 workforce would decrease in 2005 from the No Action level of 4,721 to 4,508. Although the number of nonstockpile management workers and D&D personnel would be the same as under the base case single-shift scenario, a total of 1,376 workers would be required to perform core stockpile management functions in 2005. The core stockpile management workforce would remain relatively stable at this level for the duration of the mission. D&D activities would increase over time such that during the period from 2014 to 2017, the total Y-12 workforce would be slightly larger than the No Action workforce. The total Y-12 workforce size would peak in the year 2016 at 4,807, an increase of 157 over No Action. Figure 4.2.3.8–3 presents a breakdown of the Y-12 workforce under base case surge.

The transfer of HEU strategic reserve from ORR to another DOE site (an alternative in the Storage and Disposition PEIS) would have no impact on site employment. Strategic reserve HEU storage operations are integrated into the secondary and case fabrication mission; therefore, worker numbers would not change if the secondary and case fabrication mission is retained at Y-12, but without the strategic reserve HEU.

Regional Economy and Employment. Modification of the facility would require a total of 14 workers during the peak construction period. An additional 15 jobs would be generated in related industries in the regional economy. Available labor within the region would be sufficient to fill both the direct and indirect jobs generated by the modification activities. Total employment and per capita income would increase slightly from the No Action level projections. Unemployment would remain at the No Action level of 4.9 percent.

Base Case Single Shift. Operations-related employment changes at ORR would begin as the facility modification reaches completion. The workforce at Y-12 would decrease by 805 in the year 2005. Because secondary and case fabrication activities generate more indirect jobs in related industries than do D&D activities, the indirect jobs generated by D&D would be overshadowed by the indirect jobs lost from downsizing. The downsizing of the facility to the base case single-shift mode would, in 2005, result in a loss of approximately 4,200 jobs in the regional economy (805 at Y-12 and about 3,395 offsite indirect jobs).

Total employment in the ORR regional economic area would fall by less than 1 percent as a result of the reduction in workforce. Unemployment would increase from the No Action level of 4.9 percent to 5.6 percent. Per capita income would decrease by less than 1 percent. Changes in total employment and per capita income from the No Action levels are shown in figure 4.2.3.8–4.

Base Case Surge (Three Shift). In 2005, base case surge operations would require 213 fewer workers than would the No Action alternative. As described earlier, many core stockpile management jobs would be replaced by D&D jobs. However, because secondary and case fabrication activities generate more indirect jobs in related industries than do D&D activities, the indirect jobs generated by D&D would be overshadowed by the indirect jobs lost from downsizing. The downsizing of the facility to base case three-shift production in 2005 would eliminate approximately 2,103 jobs in the regional economy (213 at Y-12 and about 1,890 offsite indirect jobs). Even in 2016, when onsite employment would

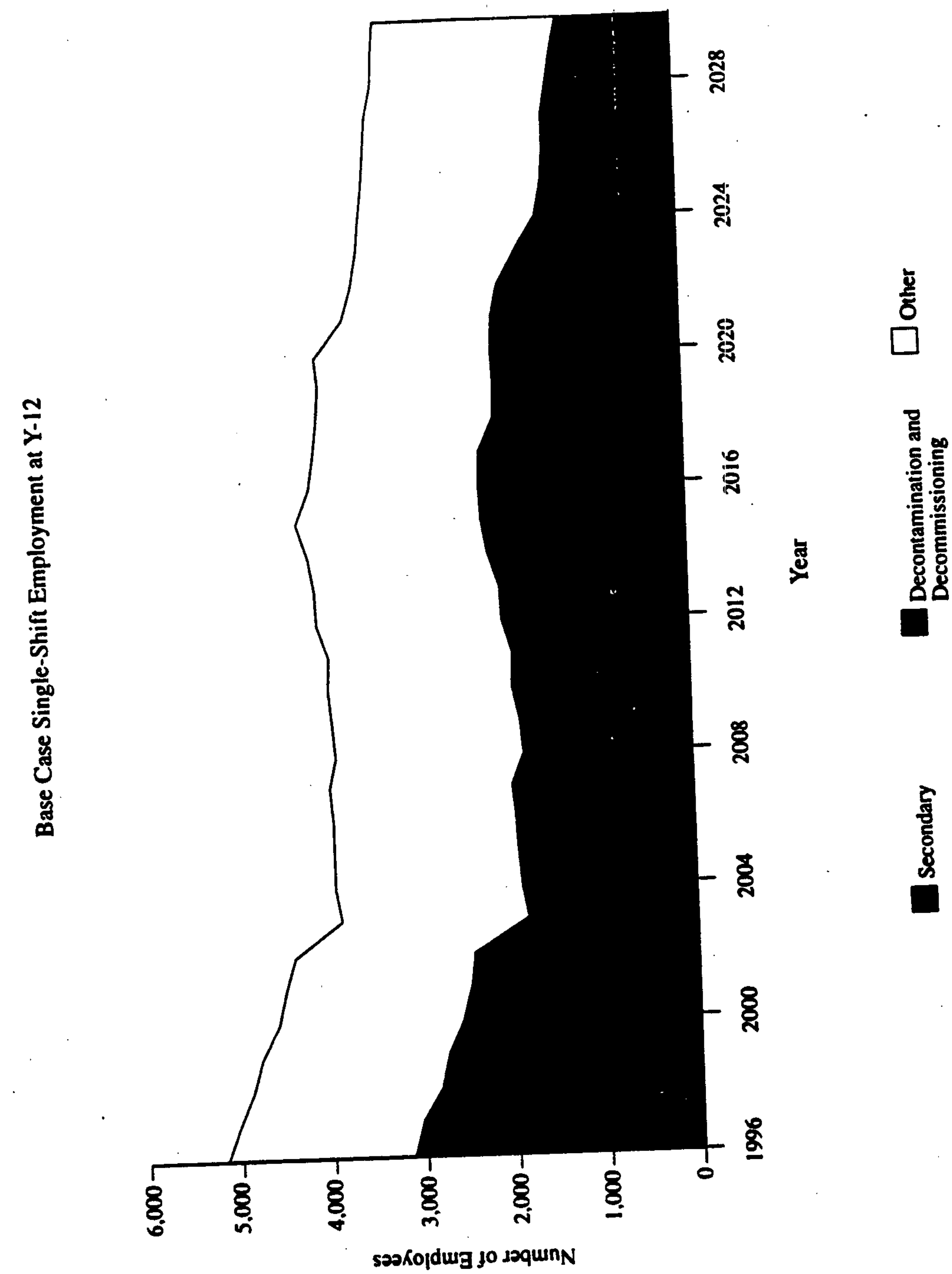


FIGURE 4.2.3.8–2.—*Base Case Single-Shift Employment at Y-12 Plant.*

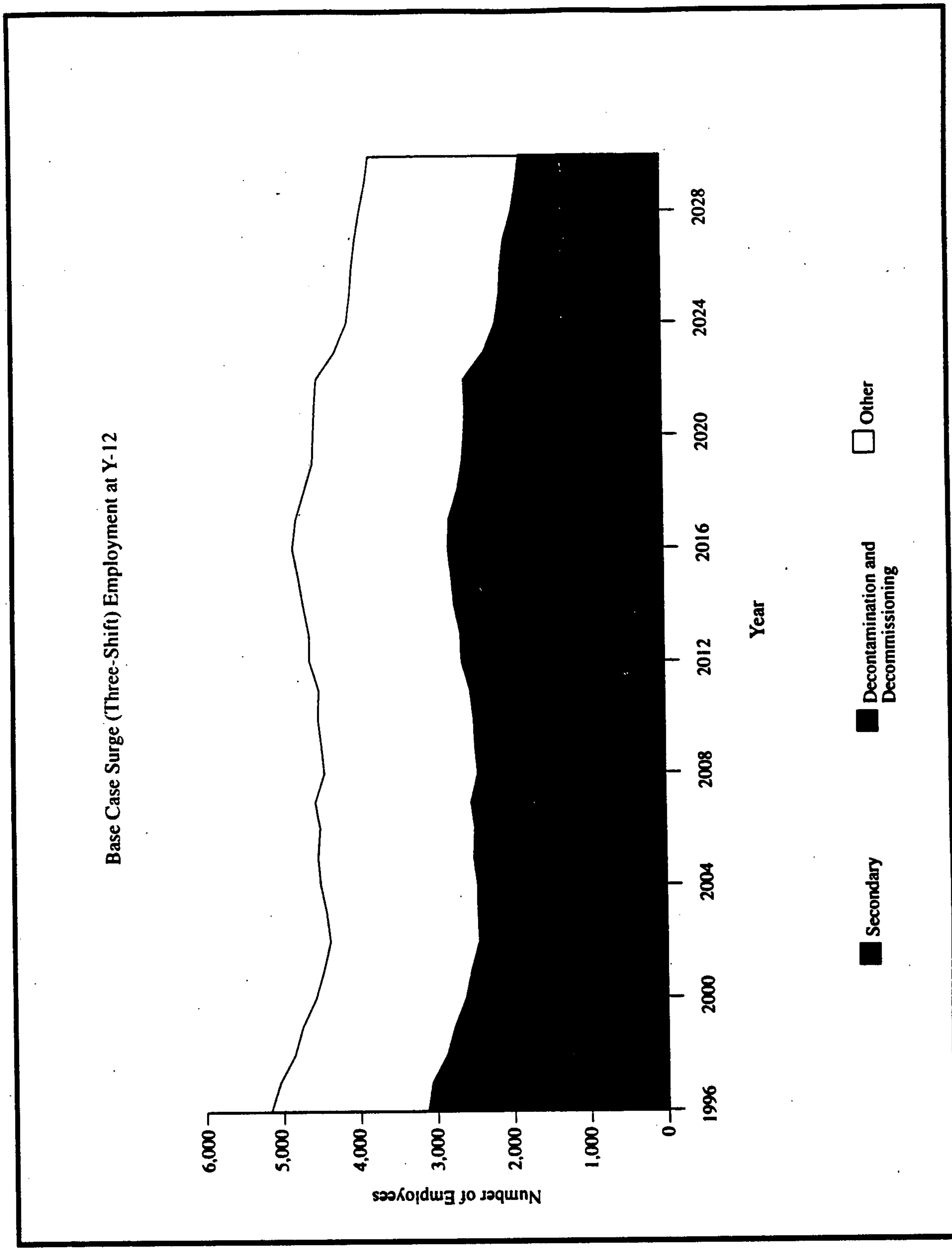
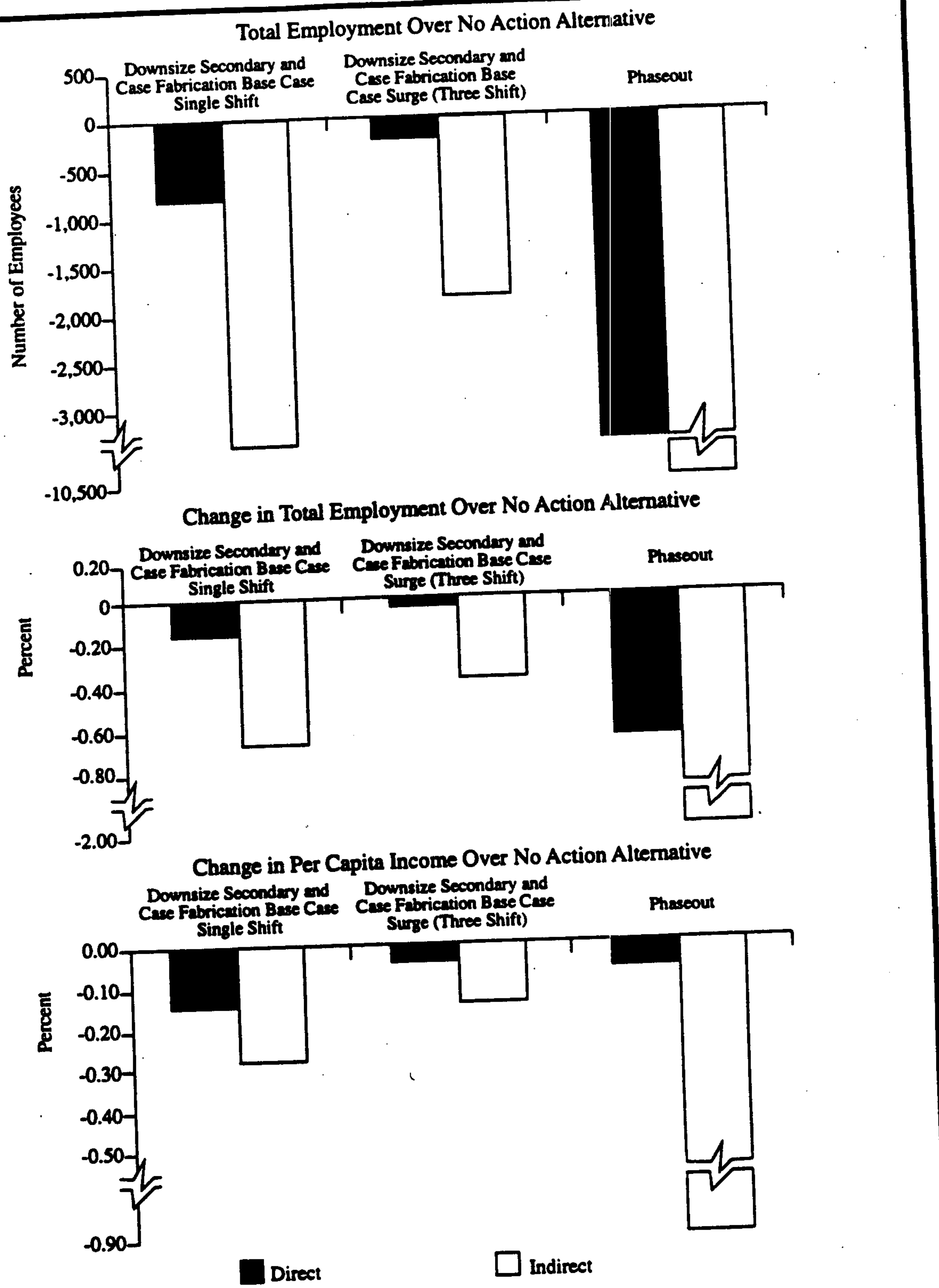


FIGURE 4.2.3.8–3.—*Base Case Surge Employment at Y-12 Plant.*



Note: No Action projections are baseline for comparing proposed alternatives.

Source: Socio 1996b.

FIGURE 4.2.3.8–4.—*Employment and Income Changes Resulting from Management Alternatives in the Oak Ridge Reservation Regional Economic Area, 2005.*

exceed the No Action alternative workforce, there would be a net loss of approximately 1,210 jobs to the regional economy.

Total employment for the ORR regional economic area would fall by less than 1 percent under this alternative. Unemployment would increase from the No Action level of 4.9 percent to 5.2 percent. Per capita income would decrease by less than 1 percent. Changes in total employment and per capita income from the No Action levels are shown in figure 4.2.3.8–4.

Population and Housing. Population in the ORR ROI during peak modification activities for Secondary and Case Fabrication Facility base case single shift and base case surge (three shift) would not increase over No Action projections. There would be enough workers available in the region to fill the direct and indirect jobs generated by the modifications to the facilities.

Base Case Single Shift. There could be some change in population and housing as a result of the downsizing of the facility. Some workers and their families might out-migrate from the ROI. This would result in, at most, slightly less than a 2-percent decrease in the ROI population. Some currently occupied housing units would become vacant or the housing construction rate would decrease as a result of the out-migration. Estimates of ROI population and required housing vacancies for full operation at ORR are shown in figure 4.2.3.8–5.

Base Case Surge (Three Shift). There could be some change in population and housing as a result of the downsizing of the facility. Some workers and their families might out-migrate from the ROI. This would result in, at most, slightly less than a 1-percent decrease in the ROI population. Some currently occupied housing units would become vacant or the housing construction rate would decrease as a result of the out-migration. Estimates of ROI population and required housing vacancies for full operation at ORR are shown in figure 4.2.3.8–5.

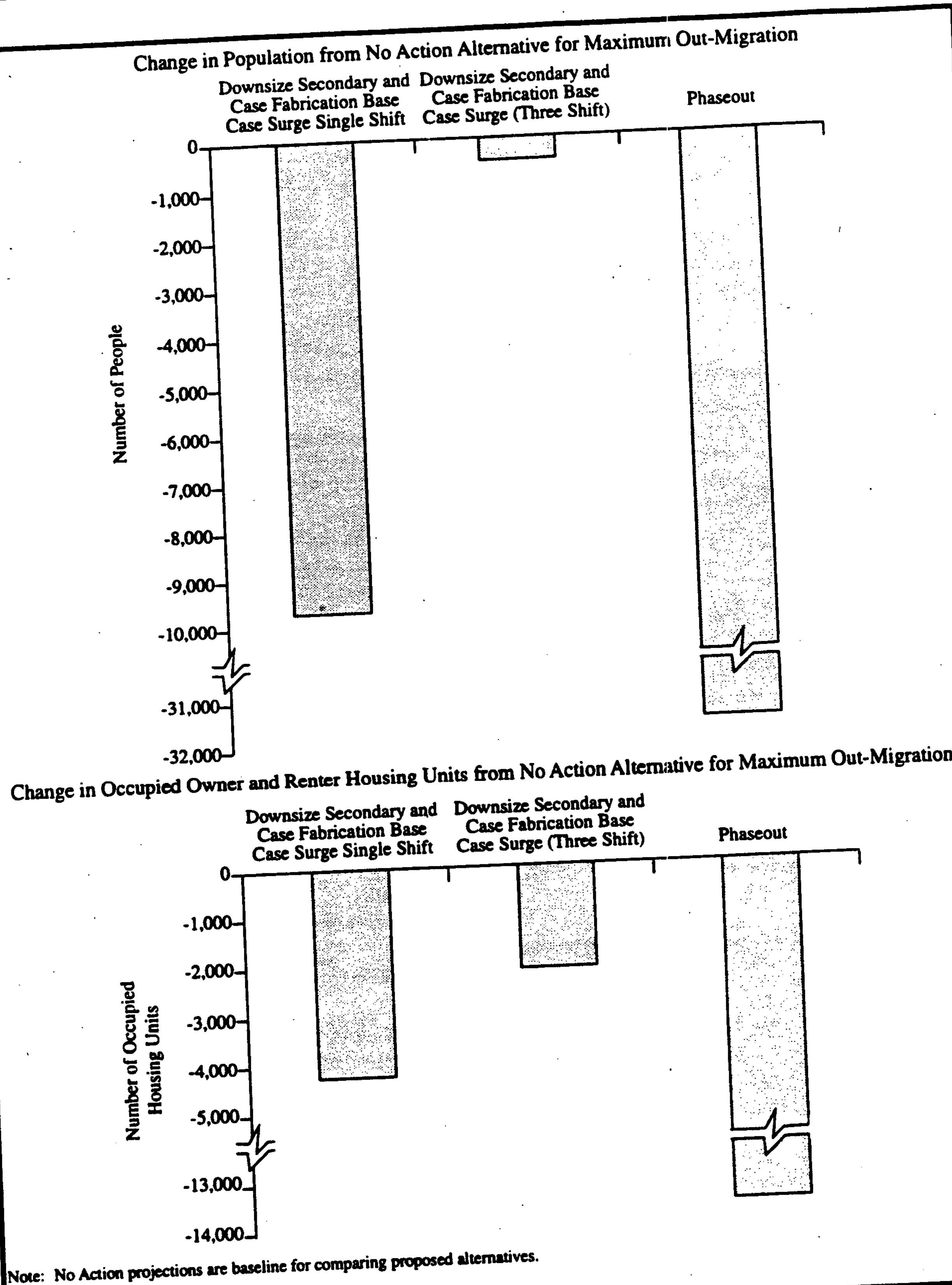
Public Finance. Modifications required to downsize the secondary and case fabrication facility base case single shift and base case surge (three shift) would not require in-migrating workers. Therefore, changes to local finances compared to No Action projections would be due to income increases and would be negligible.

Base Case Single Shift. Downsizing the facility could result in the out-migration of workers from the ROI, which would cause a loss of income and population that would affect revenues and expenditures in the ROI. Changes in revenues and expenditures compared to No Action projections due to downsizing of the facility for single-shift operation are shown in figure 4.2.3.8–6. In 2005, the percent decrease in total ROI revenues and expenditures from No Action projections would be approximately 1.9 and 1.1 percent, respectively.

Base Case Surge (Three Shift). Downsizing the facility could result in the out-migration of workers from the ROI, which would cause a loss of income and population that would affect revenues and expenditures in the ROI. Changes in revenues and expenditures compared to No Action projections due to downsizing of the facility for three-shift operation are shown in figure 4.2.3.8–7. In 2005, the percent decrease in total ROI revenues and expenditures from No Action projections would be approximately 0.9 and 0.5 percent, respectively.

Phaseout of Secondary and Case Fabrication. Phaseout of the stockpile management mission at Y-12 would eliminate all core stockpile management and support jobs at Y-12. The only remaining jobs would be those associated with D&D activities. Consequently, Y-12 employment in 2005 would total 1,385 compared to the No Action level of 4,721, a loss of 3,336 jobs. Figure 4.2.3.8–8 shows the breakdown of Y-12 employment under phaseout.

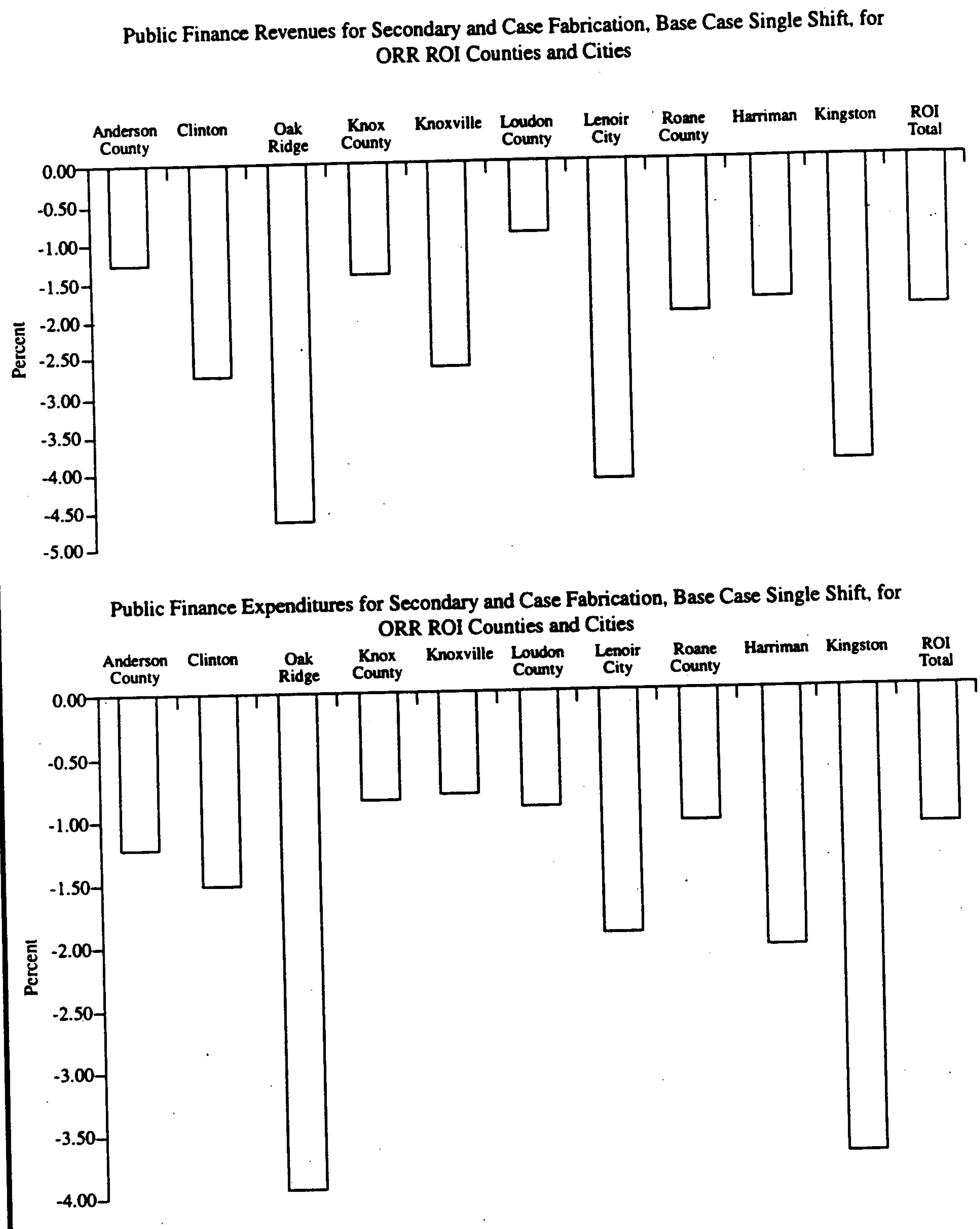
Regional Economy and Employment. By 2005, all of the core stockpile management jobs would be eliminated and the workforce would decrease by 3,336. Because secondary and case fabrication activities generate more indirect jobs in related industries than do D&D activities, the indirect jobs generated by D&D would be overshadowed by the indirect jobs lost from phaseout. Accordingly, the phaseout of secondary and case fabrication at Y-12 in 2005 would result in a loss of about 13,470 jobs in the regional economy (3,336 at Y-12 and about 10,134 offsite indirect jobs). It should be noted that under the phaseout alternative in 2017, the D&D workforce would increase to 2,307 and stabilize at approxi-



Note: No Action projections are baseline for comparing proposed alternatives.

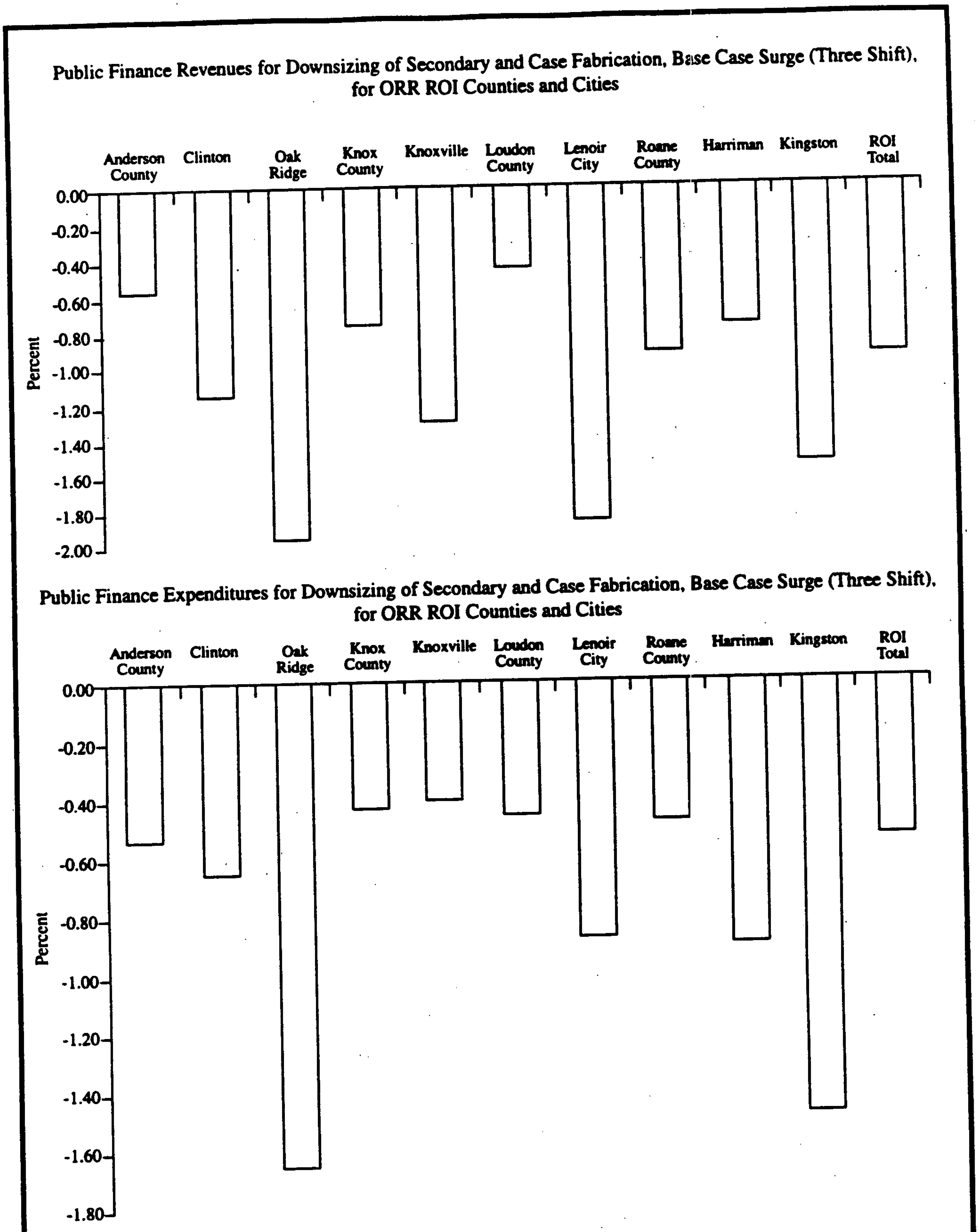
Source: Socio 1996b.

FIGURE 4.2.3.8–5.—*Population and Housing Changes Resulting from Management Alternatives in the Oak Ridge Reservation Region of Influence, 2005.*



Source: Socio 1996b.

FIGURE 4.2.3.8–6.—***Percent Change from No Action Alternative in County and City Total Revenues and Expenditures in the Oak Ridge Reservation Region of Influence with Downsizing Secondary and Case Fabrication, Base Case Single Shift, 2005.***



Source: Socio 1996b.

FIGURE 4.2.3.8–7.—***Percent Change from No Action Alternative in County and City Total Revenues and Expenditures in the Oak Ridge Reservation Region of Influence with Downsizing Secondary and Case Fabrication, Base Case Surge, 2005.***

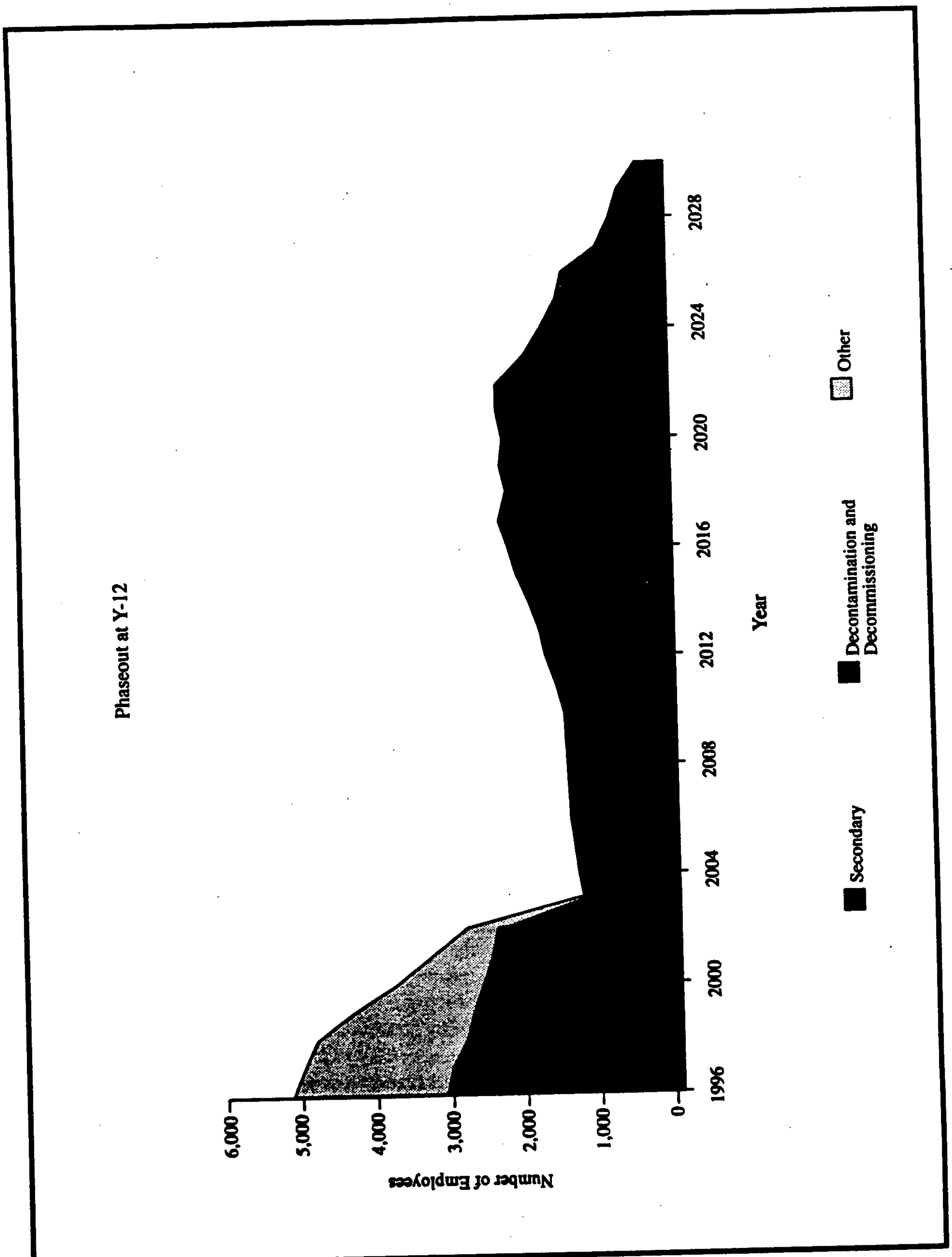


FIGURE 4.2.3.8–8.—*Phaseout at Y-12 Plant.*

mately 2,300 workers through the year 2022. During the period from 2023 to 2030, the workforce would be gradually phased out as D&D tasks are completed.

The reduction in workforce in 2005, would decrease total employment in the ORR regional economic area by less than 3 percent. Unemployment would increase from the No Action level of 4.9 percent to 7.4 percent. Per capita income would decrease by a little over 1 percent. Changes in total employment and per capita income from the No Action levels are shown in figure 4.2.3.8–4.

Population and Housing. There could be some changes in population and housing as a result of the phaseout. Some displaced workers and their families might out-migrate from the ROI. This would result in, at most, a decrease of about 5.5 percent in the ROI population. Some currently occupied housing units would become vacant as a result of the out-migration and the housing construction rate would be reduced. ROI population projections and owner and renter housing units for phaseout of the secondary and case fabrication mission at ORR are shown in figure 4.2.3.8–5.

Public Finance. Phaseout of the secondary and case fabrication mission would cause a loss of income and population that would affect ROI revenues and expenditures. In 2005, the total ROI revenues and expenditures would be reduced below No Action projections by approximately 6.2 and 3.6 percent, respectively. Revenue decreases for communities in the ORR ROI would range from 2.8 percent in Loudoun County to 16.3 percent in Oak Ridge. Decreases in expenditures would range from 2.5 percent in Knoxville to 13.7 percent in Oak Ridge. Changes for each ROI county and city are shown in figure 4.2.3.8–9.

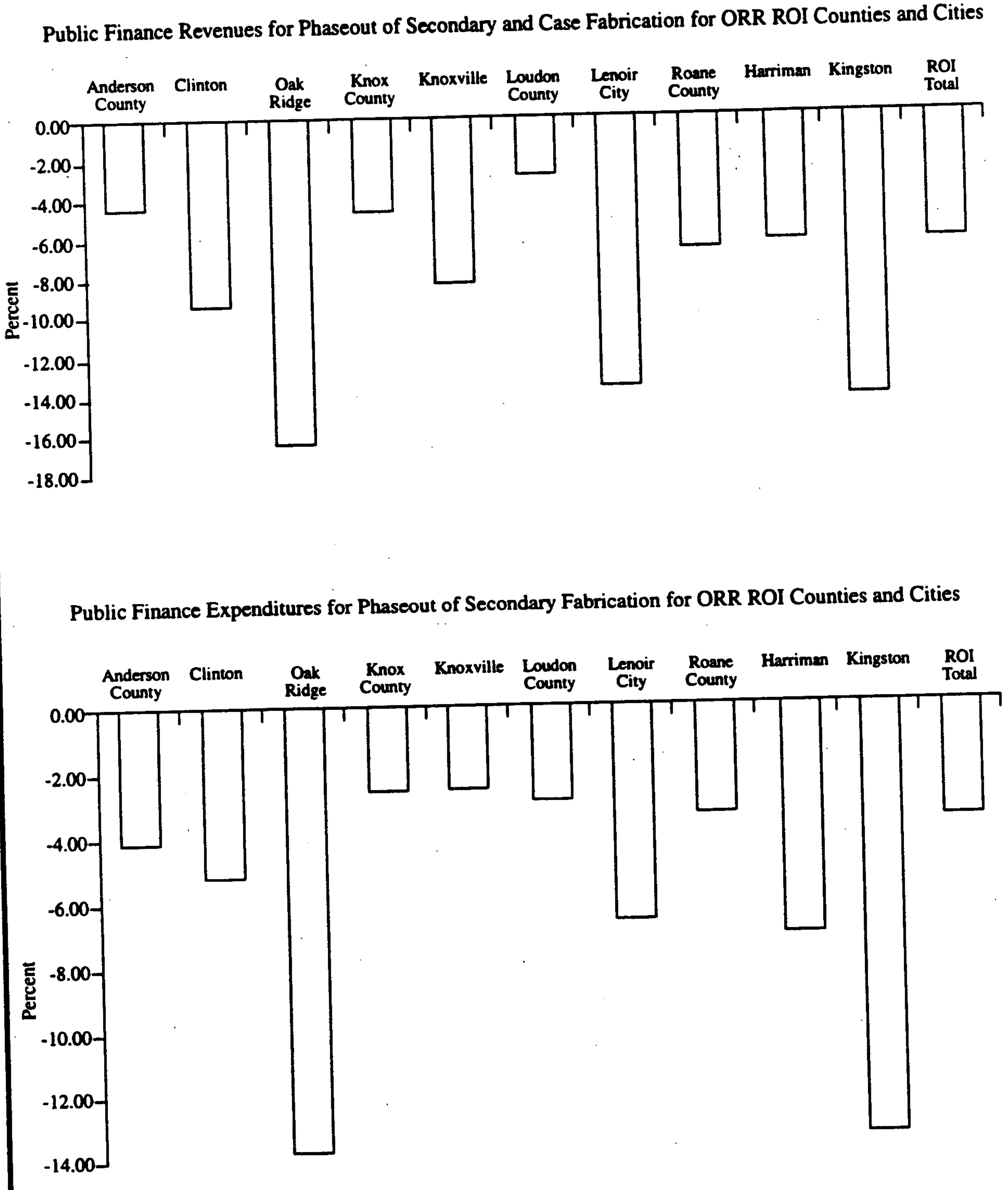
Sensitivity Analysis. The number of construction workers required to modify the Secondary and Case Fabrication Facility for the high and low case would be the same as the other scenarios. Operation of the Secondary and Case Fabrication Facility for the high case mode would require fewer core stockpile management workers than for the base case surge mode, but more than for the base case single-shift operation. Accordingly, more jobs would be phased out under the high case scenario than under the base case surge scenario, but fewer than under base case single-shift mode. The magnitude of socioeconomic impacts would fall between the base case surge and the base case single-shift options. The workforce size for the low case would be the same as for the base case single-shift mode. Therefore, the socioeconomic impacts would be the same.

Potential Mitigation Measures. In the event of a phaseout of DP activities at ORR, adverse socioeconomic impacts could result in the affected regional economic region. To mitigate potential socioeconomic impacts, Section 3161 of the *National Defense Authorization Act* (Public Law 102-484) requires DOE to develop a plan for restructuring the workforce for a defense nuclear facility whenever a change in workforce is necessary. The legislation also directs DOE to consult with local, state, and national stakeholders in developing the plan.

DOE has initiated a number of actions to respond to the legislative requirements, including the creation of the Office of Worker and Community Transition. In February 1996, the Office issued interim planning guidance in developing plans to help mitigate unavoidable impacts from workforce restructuring. Although the guidance is not prescriptive, it sets forth DOE policy on mitigating economic impacts of restructuring. For example, the guidance states that whenever possible, the impacts of workforce reductions should be minimized through the use of early retirement and normal attrition. Where appropriate, employees should be retrained for work in environmental restoration and waste management. The guidance also recommends that terminated employees receive assistance in obtaining reemployment through out-placement services, appropriate retraining, and educational services. To the extent practical, DOE and its contractor should offer a hiring preference to terminated employees. The DOE guidance also suggests that the affected communities should receive assistance to mitigate impacts to the public infrastructure and finances.

4.2.3.9 *Radiation and Hazardous Chemical Environment*

This section describes the radiological and hazardous chemical releases and their associated impacts that could result from No Action and the proposed alternatives at ORR. Within this section, impacts resulting from the base case scenario are quantitatively



Source: Socio 1996b.

FIGURE 4.2.3.8–9.—*Percent Change from No Action Alternative in County and City Total Revenues and Expenditures in the Oak Ridge Reservation Region of Influence with Phaseout of Secondary and Case Fabrication, 2005.*

discussed and a sensitivity analysis of the high and low case scenarios is qualitatively discussed.

Summaries of radiological impacts at ORR to the public and to workers associated with normal operation are presented in tables 4.2.3.9–1 and 4.2.3.9–2, respectively. Radiological and chemical accident impacts are given in figure 4.2.3.9–1 and tables 4.2.3.9–3 and 4.2.3.9–4. The impact assessment methodology is described in section 4.1.9 and further supplementary methodological information is presented in appendixes E and F.

Normal Operation. There would be no radiological releases during the modification of any facilities to support the Stockpile Stewardship and Management Program. However, limited hazardous chemical releases (e.g., small spills of diesel fuel from equipment refueling) may occur due to building modification activities for the base case scenario and may increase slightly for the high case scenario. The concentrations of these releases are expected to be well within the regulated exposure limits and would not result in any adverse health effects.

Water from processes containing hazardous chemicals is not discharged directly into surface water or groundwater that serves as potable water. Process water that may contain hazardous chemicals is treated before discharge. Furthermore, discharges of wastewater through NPDES-permitted outfalls that can be attributed to the activities associated with the secondary and case fabrication mission at ORR are expected to be below NPDES limits. Water quality would not be adversely affected. Thus, the primary pathway considered for the public and the onsite worker is the air pathway.

For normal operation at ORR, all possible hazardous chemicals were examined for further analysis based on their toxicity, concentration, and frequency of use. The HI is a summation of the HQ for all chemicals. The HQ is the value used as an assessment of noncancer toxic effects of chemicals (e.g., kidney or liver dysfunction). The HI is independent of cancer risk, which is calculated only for those chemicals identified as carcinogens. The HI was calculated for the No Action chemicals and all management alternative (secondary and case fabrication) chemicals emitted at the site. An HI of ≤ 1.0 indicates that all noncancer exposure values meet OSHA standards; if the cancer risk is $\leq 1 \times 10^{-6}$ (the default value, not a regulatory standard), no further analysis is indicated. A cancer risk of $\leq 1 \times 10^{-6}$ is considered acceptable by EPA (40 CFR 300.430) because this incidence of cancers cannot be distinguished from the cancer risk for an individual member of the population. Information pertaining to OSHA-regulated exposure limits and toxicity profiles for all hazardous chemicals described in this PEIS may be found in the *Chemical Health Effects Technical Reference* (TTI 1996b).

No Action

Radiological Impacts. Potential radiological impacts to the public resulting from the No Action alternative are presented in table 4.2.3.9–1. These impacts are representative of the aggregate total that is estimated to exist from ORR remaining site contributions (such as K-25, ORNL, and other non-DP Y-12 activities) and from single-shift base case operations at Y-12. Total impacts are provided for comparison with applicable regulations governing total site operations. To place doses to the public from the No Action alternative into perspective, comparisons are made to natural background radiation. As shown in table 4.2.3.9–1, the total dose to the maximally exposed member of the public from annual total site operations is within radiological limits and would be 3.0 mrem for the No Action alternative. The annual population dose within 80 km (50 mi) in 2030 would be 40.2 person-rem. The incremental impacts incurred from three-shift base case operation are small when compared to those existing for the normal baseline site operation (see table 4.2.3.9–1).

Total site doses to onsite workers from normal operation for the No Action alternative are presented in table 4.2.3.9–2. The average annual dose to involved workers for this alternative would be 2.2 mrem. The dose to the entire facility workforce (involved workforce) would be 2.2 person-rem. As stated in the methodology section 4.1.9, worker doses were referenced from the Radiation Exposures for DOE and DOE Contractor Employees 1992 Database, which report doses from similar types of operations; the presented noninvolved worker impacts were not modeled due to the unavailability of certain site-specific information.

Based on the radiological impacts associated with normal operation under the No Action alternative, all

TABLE 4.2.3.9–1.—*Potential Radiological Impacts to the Public Resulting from Normal Operation of Stockpile Management Alternatives at Oak Ridge Reservation*

Affected Environment	No Action Single-Shift Operation	Downsize Secondary and Case Fabrication Three-Shift Operation	Secondary and Case Fabrication Phaseout
	Total Site[a]	Total Site[a]	Total Site[a]
Maximally Exposed Individual (Public)			
Atmospheric Release			
Dose[b] (mrem/yr)	1.4	1.6	1.4
Percent of natural background[c]	0.47	0.54	0.47
25-year fatal cancer risk	1.7×10^{-5}	2.0×10^{-5}	1.7×10^{-5}
Liquid Release			
Dose[b] (mrem/yr)	0.6	0.6	0.6
Percent of natural background[c]	0.20	0.20	0.20
25-year fatal cancer risk	7.4×10^{-6}	7.4×10^{-6}	7.4×10^{-6}
Atmospheric and Liquid Releases[d]			
Dose[b] (mrem/yr)	3.0	3.2	3.0
Percent of natural background[c]	1.0	1.1	1.0
25-year fatal cancer risk	3.7×10^{-5}	3.9×10^{-5}	3.7×10^{-5}
Population Within 80 Kilometers			
Atmospheric and Liquid Releases in 2030			
Dose (person-rem)	40.2[e]	40.8[e]	40.0[e]
Percent of natural background[c]	1.3×10^{-2}	1.3×10^{-2}	1.3×10^{-2}
25-year fatal cancers	0.51	0.52	0.51

[a] Includes impacts from K-25, ORNL, and other non-DP Y-12 activities.
[b] The applicable radiological limits for an individual member of the public from total site operations are 10 mrem per year from the air pathways, 4 mrem from the drinking water pathway, and 100 mrem per year from all pathways combined (DOE Order 5400.5).
[c] Natural background radiation levels to the average individual is 295 mrem per year; to the population within 80 km in 2030 is estimated to be 315,300 person-rem.
[d] Includes an annual direct radiation dose of 1 mrem to an individual at Poplar Creek or the Clinch River shoreline.
[e] Includes Y-12 Interim Storage.
Source: OR DOE 1994c; OR DOE 1994d.

resulting doses would be within radiological limits and are well below levels of natural background radiation. The associated risks of adverse health effects to the public and to workers would be small.

Hazardous Chemical Impacts. Hazardous chemical impacts to the public resulting from normal operation under the No Action base case one-shift operation at ORR are presented below. Analyses to support the values presented in this section are provided in appendix table E.3.4–1. This PEIS does not purport to provide the level of detail needed to go beyond a conservative screening process for hazardous chemicals. As such, the analysis in this PEIS for the No Action alternative should not be relied upon as a basis for judging the sites as having a hazardous chemical health concern. The model used to calculate HI and cancer risk in this PEIS only establishes a baseline for comparison of alternatives among sites. This baseline is then used to determine the extent to which each alternative adds or subtracts from the No Action HI and cancer risk to the public at each site.

The HI for the maximally exposed member of the public at ORR resulting from normal onsite operation under the No Action alternative would be 0.0395, and the cancer risk would be zero. The HI to the onsite worker would be 0.154 and the cancer risk would be zero.

TABLE 4.2.3.9–2.—*Potential Radiological Impacts to Workers Resulting from Normal Operation of Stockpile Management Alternatives at Oak Ridge Reservation*

Affected Environment	No Action Single-Shift Operation	Downsize Secondary and Case Fabrication Three-Shift Operation	Secondary and Case Fabrication Phaseout
Involved Workforce[a]			
Average worker dose[b] (mrem/yr)	2.2	2.2	0
25-year fatal cancer risk	$2.2x10^{-5}$	$2.2x10^{-5}$	0
Total dose (person-rem/yr)	2.2	0.38	0
Noninvolved Workforce[c]			
Average worker dose[b] (mrem/yr)	5.1	5.1	5.1
25-year fatal cancer risk	$5.1x10^{-5}$	$5.1x10^{-5}$	$5.1x10^{-5}$
Total dose (person-rem/yr)	72	72	72
Total Site Workforce[d]			
Dose (person-rem/yr)	75	73	72
25-year fatal cancers	0.75	0.73	0.72

[a] The involved worker is a worker associated with operation of the secondary and case fabrication facilities. The estimated numbers of involved workers are 174 for the downsize alternative and 1,000 for the No Action alternative, respectively.

[b] The radiological limit for an individual worker is 5,000 mrem/yr (10 CFR 835). The dose presented for the involved workforce is only that incremental dose received from the secondary and case fabrication mission. The total dose received by the involved workforce would be higher than that received by the noninvolved workforce from these operations.

[c] The noninvolved worker is a worker on site but not associated with operations of the secondary and case fabrication facilities in question. The estimated number of noninvolved workers is 14,200 at ORR.

[d] The total site workforce is the sum of the numbers of involved and noninvolved workers. The estimated number of workers at ORR in the total site workforce is 14,400 for the downsize alternative and 15,200 for the No Action alternative, respectively.

Source: DOE 1993n:7; OR DOE 1994d.

Management Alternatives

Downsize Secondary and Case Fabrication

Radiological Impacts. Radiological impacts to the public resulting from the downsize secondary and case fabrication alternative are presented in table 4.2.3.9–1. These impacts are representative of the aggregated total which is estimated to exist from ORR remaining site contributions (i.e., K-25, ORNL, and other non-DP Y-12 activities) and from three-shift base case operation at Y-12. Total impacts are provided to compare with applicable regulations governing total site operations. To place doses to the public from this alternative into perspective, comparisons are made to natural background radiation. As shown in table 4.2.3.9–1, the total dose to the maximally exposed member of the public from annual total site operations is within radiological limits and would be 3.2 mrem for this alternative. The annual dose to the population within 80 km (50 mi) in 2030 would be 40.8 person-rem. The incremental impacts incurred from three-shift base case operations are very small when compared to those existing for the normal site operation (see table 4.2.2.9–2). Total site doses to onsite workers from normal operation for the downsize secondary and case fabrication alternative are presented in table 4.2.3.9–2. The average annual dose to involved workers for this alternative would be 2.2 mrem. The dose to the entire facility workforce (i.e., involved workforce) would be 0.38 person-rem. As stated in the methodology section 4.1.9, worker doses were referenced from the Radiation Exposures for DOE and DOE Contractor Employees 1992 Database which report doses for similar types of operations; the presented noninvolved worker impacts were not modeled due to the unavailability of certain site-specific information. There may also be small risks for construction workers involved with downsizing activities that involve performing tasks in close proximity to potentially contaminated areas. The estimated reduction in impacts from not storing the secondary and case strategic reserve at Y-12 would be negligible.

The contribution to radiological impacts from the storage of the HEU strategic reserve at ORR is included within the downsize secondary and case fabrication mission. Radiological impacts incurred from storage of the strategic reserve are extremely small, therefore total site impacts would not be affected if the strategic reserve was not located at Y-12.

Hazardous Chemical Impacts. Hazardous chemical impacts to the public and to the onsite worker resulting from normal operation due to downsizing and/or consolidating the secondary and case fabrication mission at Y-12 are presented below. The HI and cancer risk would remain constant over 25 years of operation provided exposures remain the same. Analyses to support the values presented in this section are provided in appendix table E.3.4–2.

The incremental HI for the maximally exposed member of the public would be 0.056, and the incremental cancer risk would be zero as a result of downsizing and/or consolidating the secondary and case fabrication mission at ORR. The incremental HI for the onsite worker would be 0.178, and the incremental cancer risk would be zero as a result of downsizing and/or consolidating the secondary and case fabrication mission.

The HIs for the public and onsite worker are within acceptable health levels. The cancer risks to the public and onsite worker are within the default value level of 1×10^{-6}.

Phaseout of Secondary and Case Fabrication

Radiological Impacts. Radiological impacts to the public resulting from the phaseout of secondary and case fabrication mission at Y-12 are presented in table 4.2.3.9–1. These impacts are representative of the aggregate total which is estimated to exist from ORR remaining site contributions (i.e., K-25, ORNL, and other non-DP Y-12 activities). Total impacts are provided to compare with applicable regulations governing total site operations. To place doses to the public from this alternative into perspective, comparisons are made to natural background radiation. As shown in table 4.2.3.9–1, the total dose to the maximally exposed member of the public from annual total site operations is within radiological limits and would be 3.0 mrem for this alternative. The dose to the annual population within 80 km (50 mi) dose in 2030 would be 40.0 person-rem.

Total site doses to onsite workers from normal operation after the phaseout of the secondary and case fabrication mission at Y-12 are presented in table 4.2.3.9–2. The annual dose to the entire facility workforce is estimated to be 72 person-rem. As stated in the methodology section 4.1.9, worker doses were referenced from Radiation Exposures for DOE and DOE Contractor Employees 1992 Database which report doses for similar types of operations; the presented noninvolved worker impacts were not modeled due to the unavailability of certain site-specific information. There may also be small risks for construction workers involved with phaseout activities from performing tasks in close proximity to potentially contaminated areas.

Based on the radiological impacts associated with normal site operations, all resulting doses would be within radiological limits and are well below levels of natural background radiation. The associated risks of adverse health effects to the public and to workers would be small.

Hazardous Chemical Impacts. The HIs for the public and the onsite worker would be reduced to 0, and the cancer risks to the public and the onsite worker would remain at zero as a result of the phaseout of the secondary and case fabrication mission (see appendix table E.3.4–3). Therefore, there are no adverse health effects or cancer risks to the public or the onsite worker due to this alternative.

Sensitivity Analysis. Radiological impacts may be subject to certain degrees of variance resulting from either high or low case operations. For the high case scenario, impacts to both the public and worker would be similar to the three-shift base case operations. For the low case scenario, impacts to the public and workers would be similar to the single-shift base case operations.

Based on the radiological impacts associated with normal operation of this alternative, all resulting doses would be within radiological limits and are well below levels of natural background radiation. The associated risks of adverse health effects to the public and to workers would be small.

Operation under the high case scenario may increase emissions of hazardous chemicals. Since HIs for the public and onsite workers are well within acceptable health levels and cancer risks are zero, increased emissions with high case operations are not expected to be sufficient to adversely effect HI and cancer risks at ORR. The low case scenario would not have any appreciable effect on hazardous chemical emissions at ORR and would not have any impact upon HI and cancer risks to the public and onsite worker.

Potential Mitigation Measures. Radioactive and chemical airborne emissions to the general population and onsite exposures to workers could be reduced by implementing the latest technology for process and design improvements. For example, to reduce public exposure to emissions, improved building and work area control methods could be used to remove radioactivity from releases to the environment. Similarly, the use of remote, automated, and robotic production methods are examples of techniques that are being developed which would reduce worker exposure (see section 3.5.2).

Facility Accidents. The proposed actions have the potential for accidents that may impact the health and safety of workers and the public. The potential for reasonably foreseeable accidents and associated consequences that have been evaluated are summarized in this section and described in more detail in appendix F. The methodology used in the assessment is described in section 4.1.9. A list of documents reviewed for applicable accident data is provided in appendix table F.1.1–1. The potential impacts from accidents, ranging from high-consequence/low-probability to low-consequence/high-probability events, have been evaluated in terms of potential cancer fatalities that may result for noninvolved workers and the public. The risk of cancer fatalities has also been evaluated to provide an overall measure of accident impacts and is calculated by multiplying the accident annual frequency (or probability) of occurrence by the consequences (number of cancer fatalities). Figure 4.2.3.9–1 shows the risk of latent cancer fatalities in the population within 80 km (50 mi) that may result from accidents. Specifically, the curves in the figure show the probability (vertical axis) that the number of cancer fatalities in the offsite population within 80 km (50 mi) (horizontal axis) will be exceeded. The curves reflect the probability of the accident. For example, the probability that an HEU accident will result in more than one cancer fatality is 10^{-6} per year.

In addition to the potential impacts to noninvolved workers and the offsite population, there are potential

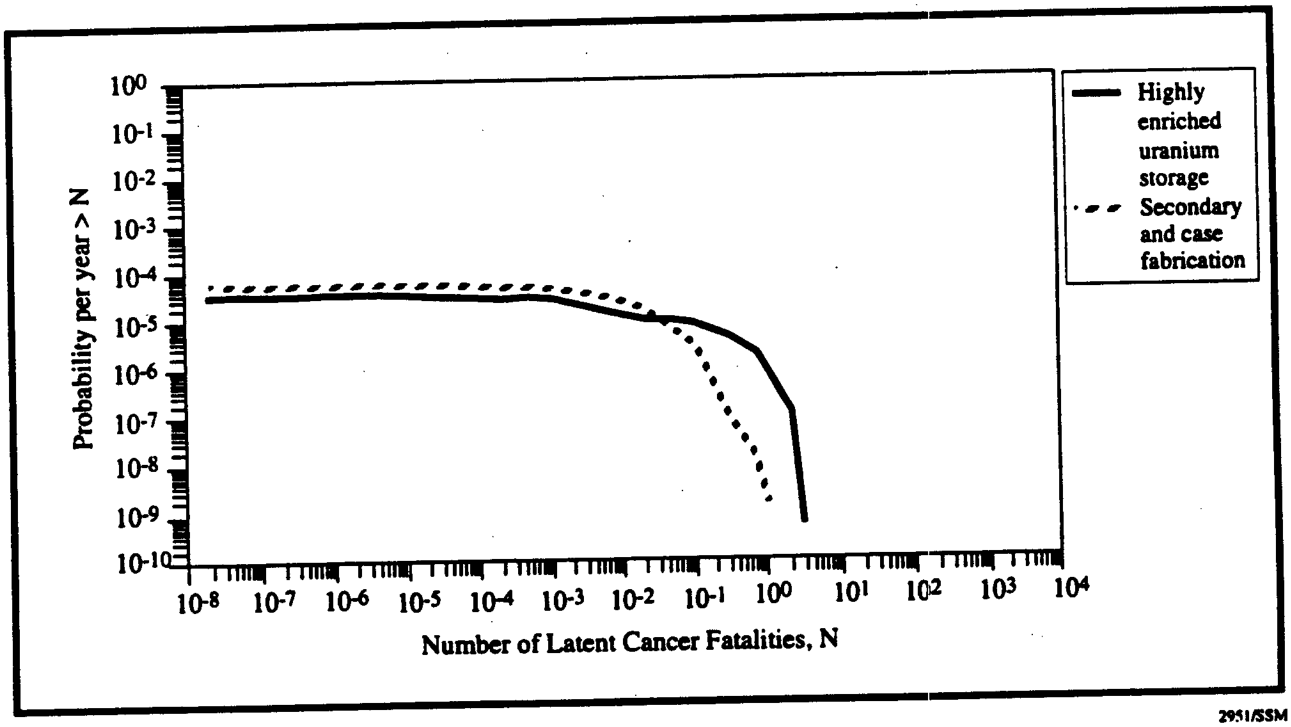


FIGURE 4.2.3.9–1.—*Combined Evaluation Basis Accidents and Beyond Evaluation Basis Accidents—Cancer Fatalities Complementary Cumulative Distribution Functions for Stockpile Management Alternatives at Oak Ridge Reservation.*

impacts to involved workers who would be located in the facilities associated with the proposed action. Quantitative statements of these impacts cannot be made until design details are developed further, at which time the number and location of facility workers, and protective and mitigating features can be estimated to support accident impact analyses. However, depending on the type of accident, facility workers in close proximity to the point of the accident could receive high levels of exposure to radiation, hazardous chemicals, and potentially fatal impacts.

The movement of the strategic reserve of HEU at ORR to another DOE site location (an alternative in the Storage and Disposition Program) would have the effect of eliminating all risks of accidents at ORR associated with these reserves over the long term. However, over the short term, there would exist risks of accidents to workers and the public during handling and transportation operations for the movement of the reserves. These short term risks of accidents would be addressed in tiered safety documentation, such as a safety analysis report, that would be prepared prior to the movement of the reserves.

No Action. Under the No Action alternative, secondary and case fabrication would continue to be performed at the ORR site with no changes to facilities and operations. Potential accidents and their consequences under existing conditions have previously been addressed in facility safety documentation according to requirements in DOE orders.

Management Alternatives

Downsize Secondary and Case Fabrication. A set of potential accidents has been postulated for the downsize secondary and case fabrication alternative for which there may be releases of radioactive materials that may impact onsite workers and the offsite population. The potential accidents analyzed are described in appendix F. The probability distribution showing the range of cancer fatalities that may result for the composite set of accidents identified in appendix F is shown in figure 4.2.3.9–1. The curve reflects the probability of the accidents occurring. The impacts for the composite set of EBAs and BEBAs are shown in table 4.2.3.9–3. If an accident were to occur, there would be an estimated 0.02 cancer fatalities in the population within 80 km (50 mi) of the site. A noninvolved worker located 619 m (2,030 ft) (at the site boundary) from the accident would have an increased likelihood of cancer fatality of 1.1×10^{-4}. For the maximally exposed individual located at the site boundary, there would be an increased likelihood of cancer fatality of 1.3×10^{-4}. The risk for the combined EBA and BEBA composite set of accidents, reflecting both the probability of the accident occurring and the consequences, are also shown in table 4.2.3.9–3. For the same worker, the maximally exposed individual, and the population, the risks, taking into account the probability of accidents, would be 6.4×10^{-9}, 8.0×10^{-9}, and 1.2×10^{-6} cancer fatalities per year, respectively. Table 4.2.3.9–3 also shows the impacts for EBAs and BEBAs only. There is also a potential for chemical accidents and impacts as shown in table 4.2.3.9–4.

Storage of Strategic Uranium Reserves. A set of potential accidents has been postulated for the storage of strategic uranium reserves for which there may be releases of radioactive materials that may impact workers and the offsite population. The potential accidents analyzed are described in appendix F. The probability distribution showing the range of cancer fatalities that may result for the composite set of accidents identified in appendix F is shown in figure 4.2.3.9–1. The curve reflects the probability of the accidents occurring. The impacts for the composite set of EBAs and BEBAs are shown in table 4.2.3.9–3. If an accident were to occur, there would be an estimated 0.14 cancer fatalities in the population within 80 km (50 mi) of the site. A noninvolved worker located 619 m (2,030 ft) (at the site boundary) from the accident would have an increased likelihood of cancer fatality of 7.3×10^{-4}. For the maximally exposed individual located at the site boundary, there would be an increased likelihood of cancer fatality of 9.1×10^{-4}. The risks for the composite set of accidents, reflecting both the probability of the accident occurring and the consequences, are also shown in table 4.2.3.9–3. For the same worker, the maximally exposed individual, and the population, the risks would be 2.2×10^{-8}, 2.7×10^{-8}, and 4.1×10^{-6} fatalities per year, respectively. No BEBAs have been identified for storage of strategic uranium reserves. Table 4.2.3.9–3 also shows the impacts for EBAs and BEBAs only.

TABLE 4.2.3.9–3.—*Impacts of Accidents for Downsize Secondary and Case Fabrication and Storage of Uranium Strategic Reserves at Oak Ridge Reservation*

Parameter	Downsize Secondary and Case Fabrication			Storage of Uranium Strategic Reserves		
	EBA	BEBA	EBA and BEBA Combined	EBA	BEBA	EBA and BEBA Combined
Composite Accident Frequency (Per Year)	$6.0x10^{-5}$	$5.0x10^{-7}$	$6.0x10^{-5}$	$4.0x10^{-5}$	[a]	$4.0x10^{-5}$
Consequences						
Noninvolved Worker						
Cancer fatality[b]	$1.0x10^{-4}$	$9.7x10^{-4}$	$1.1x10^{-4}$	$7.3x10^{-4}$	[a]	$7.3x10^{-4}$
Risk (cancer fatality per year)	$5.9x10^{-9}$	$4.9x10^{-10}$	$6.4x10^{-9}$	$2.2x10^{-8}$	[a]	$2.2x10^{-8}$
Maximally Exposed Individual						
Cancer fatality[b]	$1.2x10^{-4}$	$1.2x10^{-3}$	$1.3x10^{-4}$	$9.1x10^{-4}$	[a]	$9.1x10^{-4}$
Risk (cancer fatality per year)	$7.4x10^{-9}$	$6.0x10^{-10}$	$8.0x10^{-9}$	$2.7x10^{-8}$	[a]	$2.7x10^{-8}$
Population Within 80 Kilometers[c]						
Cancer fatality[d]	0.018	0.18	0.02	0.14	[a]	0.14
Risk (cancer fatalities per year)	$1.1x10^{-6}$	$9.1x10^{-8}$	$1.2x10^{-6}$	$4.1x10^{-6}$	[a]	$4.1x10^{-6}$

[a] There are no BEBAs for storage of uranium strategic reserves.

[b] Probability (increased likelihood) of cancer fatality to a hypothetical member of the public located at the site boundary or to a noninvolved worker as a result of exposure to the indicated dose if an accident occurred.

[c] For the offsite population of 1,096,144, the average probability of cancer fatality/risk of cancer fatality (per year) for the combined EBA and BEBA is $1.8x10^{-8}/1.1x10^{-12}$ and $1.3x10^{-7}/3.7x10^{-12}$, respectively, for the listed alternative(s), downsized secondary fabrication, and storage of strategic uranium reserves.

[d] Number of cancer fatalities in the population within 80 km (50 mi) as a result of exposure to the indicated dose if the accident occurs.

Note: All values are mean values; BEBA - beyond evaluation basis accidents; EBA- evaluation basis accidents.

Source: Results shown are derived from accident analyses in appendix F.

TABLE 4.2.3.9–4.—*Impacts of Chemical Accidents for Downsize Secondary and Case Fabrication at Oak Ridge Reservation*

Accident Description	Accident Frequency (Per Year)	IDLH	TLV-STEL	TLV-TWA	Concentration to: Noninvolved Worker (mg/m³)	Concentration to: Individual at Site Boundary (mg/m³)	Potential Impacts of Exceeding: IDLH Limits[a]	Potential Impacts of Exceeding: TLV Limits[a]
Fire and Release of Lithium Oxide	10^{-6} to 10^{-4}				>520	520	Irreversible health effects	Burns to the eyes, skin, mouth, and esophagus; muscular twitches; mental confusion; and blurred vision
Concentration[a] (mg/m³)		55		0.025				
Distances[b] (m)		80 to 2,900		45 to >$9x10^4$				
Area (m²)		$6.0x10^5$		>$6.2x10^8$				
Population[c]		290		>130,000				
Hydrogen Fluoride Release	10^{-6} to 10^{-4}				>79	79	Irreversible health effects	Irritation or burning to skin, eyes, nose, and throat; pulmonary edema and bronchitis
Concentration[a] (mg/m³)		36	5	2.5				
Distances[b] (m)		1,000	3,500	5,500				
Area (m²)		$8.7x10^4$	$9.2x10^5$	$2.2x10^6$				
Population[c]		22	530	1,500				
Hydrogen Cyanide Release	10^{-6} to 10^{-4}				>49	49	Irreversible health effects	Nausea, vomiting, gasping for breath, weakness, and at high levels, asphyxiation and death
Concentration[a] (mg/m³)		56	5					
Distances[b] (m)		570	2,600					
Area (m²)		$3.0x10^4$	$5.1x10^5$					
Population[c]		0	240					

[a] NIOSH 1990a.
[b] From facility (downwind); exceedance begins at facility, 0, unless indicated otherwise.
[c] Offsite individuals exposed to concentration exceeding limit.
Note: IDLH - immediately dangerous to life or health; TLV - threshold limit value; STEL - short-term exposure limit; TWA - time-weighted average.
Source: Model result (see appendix F).

Phaseout of Secondary and Case Fabrication. A phaseout of the secondary and case fabrication mission at ORR would have the effect of eliminating any potential for accidents over the long term related to secondary and case fabrication and uranium storage activities. However, there would be a potential for accidents during the phaseout process that could impact workers and the public. These potential accidents and their consequences are addressed in each affected facility's safety analysis report and/or safety documentation applicable to the phaseout process.

4.2.3.10 *Waste Management*

This section summarizes the impacts on waste management at ORR under No Action and for each of the proposed alternatives that would include the phaseout of secondary and case fabrication. There is no spent nuclear fuel, high-level waste (HLW), or TRU waste associated with the fabrication of secondaries and cases. Table 4.2.3.10–1 lists the projected waste generation rates and treatment, storage, and disposal capacities under No Action for ORR. Projections for No Action are based on single-shift operation and were derived from 1994 environmental data, with the appropriate adjustments made for those changing operational requirements where the volume of wastes generated are identifiable. The projection does not include wastes from future, yet uncharacterized, environmental restoration activities.

Table 4.2.3.10–2 provides the total estimated operational waste volumes projected to be generated at ORR as a result of both downsizing and consolidating, and phasing out the secondary and case fabrication mission. The net increase/decrease over No Action is provided below in parentheses. The waste volumes generated and the resultant waste effluent from the downsized Secondary and Case Fabrication Facility can be found in table 3.4.4.2–3 and are based on surge operations (three shifts). Facilities that would support the Stockpile Stewardship and Management Program would treat and package all waste generated into forms that would enable long-term storage and/or disposal in accordance with the *Atomic Energy Act*, RCRA, and other applicable statutes as outlined in appendix section H.1.2.

The waste volumes given in table 4.2.3.10–2 include the storage of the strategic reserve of HEU. The volume of waste associated with the storage of the strategic reserve HEU is very small (less than 0.01 percent) in relation to the total amount of wastes generated from the secondary and case fabrication mission and is an even smaller percentage of the total ORR waste generation volume. Therefore, the continued storage of the strategic reserve HEU would have a negligible impact on waste management at ORR. The impact of continuing to store the strategic reserve HEU as part of the total inventory of nonsurplus HEU at ORR is also addressed in the Storage and Disposition PEIS (DOE/EIS-0229-D). In addition, the Storage and Disposition PEIS analyzes moving the HEU to another DOE site location. Since the HEU is already packaged, it is expected that any waste generated from repackaging, health physics, and analytical chemistry activities would be very small in comparison to the total wastes generated at ORR. Therefore, the moving of HEU would also have a minimal impact on ORR waste management.

No Action. Under No Action, spent nuclear fuel, TRU, low-level, mixed, hazardous, and nonhazardous wastes would continue to be generated at ORR from the missions outlined in section 3.2.2. ORR would continue to store HEU, and treat, store, and dispose of its waste legacy and newly generated wastes in current and planned facilities.

Liquid LLW would be solidified, neutralized, and allowed to evaporate in existing and planned facilities as described in appendix section H.2.1. Some liquid waste would also be incinerated. Solid LLW would be compacted and stored onsite at K-25 and ORNL. Contaminated scrap metal would be processed by smelting by a commercial vendor for beneficial reuse where possible, including the DOE Shielding Block Program or be size-reduced for disposal. Liquid hazardous wastes would continue to be treated onsite with any hazardous residuals sent offsite to a RCRA-permitted disposal facility. Solid hazardous waste would continue to be shipped offsite to a RCRA-permitted disposal facility. Limited onsite treatment of solid hazardous waste may occur in the future at the K-1435 TSCA Incinerator.

Solid mixed waste would be treated and disposed of according to the ORR Site Treatment Plan which was developed pursuant to the *Federal Facility Compliance Act* of 1992. Liquid mixed wastes would also be incinerated at the TSCA Incinerator. The resulting

TABLE 4.2.3.10–1.—*Projected Waste Management Under No Action at Oak Ridge Reservation* [Page 1 of 2]

Category	Annual Generation (m^3)	Treatment Method	Treatment Capacity (m^3/yr)	Storage Method	Storage Capacity (m^3)	Disposal Method	Disposal Capacity (m^3)
Low-Level							
Liquid	3,500[a]	Activated sludge, solidification, and incineration	292,000	Stored onsite	3,230	NA	NA
Solid	9,150	Compaction, smelting, and incineration by commercial vendor	30,600	Stored onsite	76,800	Onsite for ORNL only. Onsite and offsite LLW disposal for K-25 and Y-12 under evaluation.	3,590 (ORNL only)
Mixed Low-Level[b]							
Liquid	93,100	Neutralization, incineration, and activated sludge	226,000[c]	Stored in tanks and drums	99,800	NA	NA
Solid	589	Incineration or offsite commercial vendors	Planned	Staged and stored for shipment	132,000	Offsite	NA
Hazardous							
Liquid	6,440[d]	Neutralization, settlement, and offsite	919,000	Stored in tanks and staged for shipment	751	Offsite	NA
Solid	13[e]	Offsite planned	None	Staged for shipment	296	Offsite	NA
Nonhazardous (Sanitary)							
Liquid	1,660,000	Offsite and extended aeration - activation	3,170,000	None	NA	NPDES outfall	NA
Solid	76,200	Compaction	43,900	None	NA	Landfill (onsite) Landfill (offsite)	1,100,000

TABLE 4.2.3.10–1.—*Projected Waste Management Under No Action at Oak Ridge Reservation* [Page 2 of 2]

Category	Annual Generation (m^3)	Treatment Method	Treatment Capacity (m^3/yr)	Storage Method	Storage Capacity (m^3)	Disposal Method	Disposal Capacity (m^3)
Nonhazardous (Other)							
Liquid	620,000[f]	Evaporation, settling, and neutralization	1,760,000[g]	None	NA	NPDES outfall	NA
Solid	400[h]	None	NA	None–scrap metal stockpiled	NA	Landfill (K-25, Y-12, and SWSA6)	119,000[i]

[a] Some waste included in solid LLW.
[b] Includes RCRA, PCB, and RCRA/PCB waste.
[c] Some waste included in LLW.
[d] Some hazardous waste is treated as mixed LLW.
[e] Some solid hazardous waste included in solid mixed LLW.
[f] Some nonhazardous waste included in solid LLW.
[g] Some waste is included in sanitary waste.
[h] Some nonhazardous waste included in solid LLW.
[i] Some waste is included in sanitary waste and Y-12 solid disposal.

Note: NA - not applicable; the generation rate, treatment, and storage data for the three sites at ORR were combined.

Source: OR DOE 1993a; OR DOE 1995g; OR LMES 1996i; OR MMES 1995c.

TABLE 4.2.3.10–2.—*Estimated Annual Generated Waste Volumes for Stockpile Management Alternatives at Oak Ridge Reservation*

Category	No Action[a] (m^3)	Downsize Secondary and Case Fabrication[b] (m^3)	Phaseout of Secondary and Case Fabrication (m^3)
Low-Level			
Liquid	3,500	3,290 (-210)	2,970 (-530)
Solid	9,150	8,420 (-722)	7,310 (-1,840)
Mixed Low-Level			
Liquid	93,100	90,800 (-2,300)	87,400 (-5,700)
Solid	589	531 (-58)	439 (-150)
Hazardous			
Liquid	6,440	6,440 Included in mixed LLW	6,440 Included in mixed LLW
Solid	13	13 Included in mixed LLW	13 Included in mixed LLW
Nonhazardous (Sanitary)			
Liquid	1,660,000	1,530,000 (-130,000)	1,210,000 (-450,000)
Solid	76,200	67,300 (-8,900)	53,800 (-22,400)
Nonhazardous (Other)			
Liquid	620,000	620,000 (-5)	620,000 (-5)
Solid	400	10,300[c] (-100)	320 (-80)

[a] The No Action volumes are from table 4.2.3.10–1 and are based on single-shift operation.
[b] Waste generation volumes for secondary and case fabrication at Y-12 are from table 3.4.4.2–3 and are based on surge operations (three shifts).
[c] Includes 10,000 m^3 of recyclable wastes.
Note: Waste generation volumes have been rounded to three significant figures. Waste effluent volumes (i.e., after treatment and volume reduction), which are used in the narrative description of the impacts, are also found in table 3.4.4.2–3.
Source: OR LMES 1996i; OR MMES 1996j.

waste would then be stored in a RCRA-permitted facility in Department of Transportation (DOT)-approved containers until it is shipped to an offsite DOE disposal facility. Some of this waste would be placed in interim storage until new technologies for treatment and disposal are identified and evaluated.

A new industrial pretreatment facility for liquid discharges from Y-12 to the city of Oak Ridge sanitary system would be constructed under the terms of their Industrial Pretreatment Permit. Nonhazardous sanitary and nonradioactive process waste liquids would be treated in conventional sewage treatment plants. The resultant solids would be disposed of with solid nonhazardous waste in a permitted landfill to handle projected future waste volumes.

Management Alternatives

Downsize Secondary and Case Fabrication. Modification activities and operation of a downsized or consolidated Secondary and Case Fabrication Facility would have an impact on existing and planned ORR waste management activities by decreasing the generation of low-level, mixed low-level, hazardous, and nonhazardous wastes from the amounts projected for No Action. There are adequate existing and planned waste treatment and storage facilities at ORR to manage all wastes generated from the fabrication of secondaries and cases.

Waste generated during the 6-year modification period would consist of approximately 8.2 m^3/yr (10.7 yd^3/yr) of solid LLW from contaminated steel and concrete, solid mixed low-level, solid hazardous, and nonhazardous wastes. Liquid and solid nonhazardous wastes generated during modification activities would include concrete and steel waste construction materials, sanitary wastewater, and other solid nonhazardous wastes. The low-level contaminated concrete would be placed in appropriate containers and shipped to a DOE LLW disposal facility. The low-level contaminated steel would go to the Contaminated Scrap Metal Yard where it would be shipped to an offsite contractor for processing for beneficial reuse where possible, including use in the DOE Shielding Block Program. An estimated 1 m^3/yr (1.3 yd^3/yr) of solid mixed LLW would be managed in accordance with the ORR Site Treatment Plan. Approximately 2 m^3/yr (2.7 yd^3/yr) of solid hazardous wastes would be packaged in DOT-approved containers and shipped offsite to commercial RCRA-permitted treatment and disposal facilities. Twenty seven cubic meters per year (7,040 gal/yr) of sanitary wastewater would be disposed of through the use of portable toilets of the existing sanitary system. The steel construction material, 4.1 t/yr (4.5 tons/yr), would be tested to ensure that no hazardous or radioactive contamination is present, and then recycled as scrap material before completing construction. The 3.4 m^3/yr (4.4 yd^3/yr) of concrete, 2.6 m^3/yr (3.4 yd^3/yr) of solid sanitary wastes, and 2.1 m^3/yr (2.7 yd^3/yr) of other solid nonhazardous wastes would be disposed of by the construction contractor.

Approximately 320 m^3 (84,500 gal) of liquid LLW from contaminated wastewater and spent coolant from operation of the downsized or consolidated Secondary and Case Fabrication Facility would be treated at the West End Treatment Facility and the Central Pollution Control Facility (OR MMES 1995j:7-6). The Waste Feed Preparation Facility would reduce the volume of and package for offsite treatment solid LLW composed of contaminated scrap metal; depleted uranium oxide, sawfines, and chips; air filters; HEPA filters; and uranium-contaminated graphite. Contracts are already in place with private vendors to incinerate or supercompact the waste. Approximately 572 m^3 (749 yd^3) of ash and supercompacted bales would be stored at K-25 while awaiting disposal. Assuming a land usage factor of 3,300 m^3/ha (1,750 yd^3/acre), this would require 0.2 ha/yr (0.4 acres/yr) of LLW disposal area at ORR. If onsite disposal at ORR is not possible, approximately 34 LLW shipments to a DOE disposal facility would be required.

The 3,400 m^3 (898,000 gal) of liquid mixed LLW from spent coolant and mopwater, machine coolant, nitric acid solutions, waste oil, wastewater, miscellaneous acids, and plating rinsewater would be managed in accordance with the ORR Site Treatment Plan, which was developed to comply with the *Federal Facility Compliance Act* of 1992. Approximately 92 m^3 (120 yd^3) of solid mixed LLW, to include sludge from chemical recovery, gloves and wipes, floor sweepings, oily sludge, and salt from salt baths, would also be managed in accordance with the ORR Site Treatment Plan. The ORR Site Treatment Plan currently includes the use of the TSCA Incinerator at K-25, the Plating Rinsewater Treatment Facility, the Waste Coolant Processing Facility, and private vendors.

Miscellaneous organics, waste oil, miscellaneous chemicals, washdown water, plating solutions, dye penetrant water, used mineral oil, sodium hypochlorite, spent coolant and mopwater, waste nitric acid, plating rinsewater, dirty motor oil, solvents, and photographic wastes would be the sources of liquid hazardous wastes. Sources of solid hazardous wastes would include miscellaneous solid chemicals, gloves, floor sweepings, filters, oily sludge, air filters, shop waste, rags and wipes, and medical waste. Hazardous waste would be stabilized and packaged in DOT-approved containers for shipment to RCRA-permitted facilities using DOT-registered transporters. As shown in table 4.2.3.10–2, hazardous waste quantities for Y-12 are included with mixed LLW quantities.

Wastewater would not be discharged offsite. Sanitary wastewater treated effluent would be used as makeup to the cooling tower. Utility wastewater final blowdown would be evaporated to dry waste. Solid nonhazardous wastes would consist primarily of trash, waste paper, scrap metal, air filters, personnel respirators, plastic bags, medical wastes, and gloves. Nonrecyclable portions, 7,670 m^3 (10,000 yd^3) of

TABLE 4.2.3.10–3.—*Estimated Decontamination and Decommissioning Wastes at Oak Ridge Reservation*

Category	Downsize Secondary and Case Fabrication (m^3)	Phaseout of Secondary and Case and Fabrication (m^3)
Low-Level		
Liquid	1,810	47,900
Solid	2,210	27,400
Mixed Low-Level		
Liquid	None	None
Solid	None	None
Hazardous		
Liquid	18,000	33,900
Solid	8,580	17,500
Nonhazardous (Sanitary)		
Liquid	920	4,620
Solid	3,680	7,380
Nonhazardous (Other)		
Liquid	None	None
Solid	None	None

Note: Waste generation volumes have been rounded to three significant figures.
Source: ORR 1995a:3.

this waste would be sent to one of the Y-12 sanitary/industrial landfills. A new state-permitted landfill at Y-12 has a life expectancy of 40 years. Nonhazardous classified wastes would be disposed of at Industrial Landfill IV.

Waste would be generated from D&D activities associated with the downsizing and consolidation of the secondary and case fabrication mission. Total waste volumes from these activities over a 30-year period are shown in table 4.2.3.10–3.

Phaseout of Secondary and Case Fabrication. The phaseout of the secondary and case fabrication mission at Y-12 would have a small positive impact on ORR waste management activities by ultimately reducing the generation of low-level, mixed, and nonhazardous wastes. Approximately 530 m^3 (140,000 gal) of liquid and 1,840 m^3 (2,410 yd^3) of solid LLW would no longer be generated. An estimated 5,700 m^3 (1,510,000 gal) of liquid mixed and 150 m^3 (196 yd^3) of solid mixed LLW would no longer be generated and treated according to the ORR Site Treatment Plan. The decrease in nonhazardous waste generation would occur over time as facilities that are no longer needed are deactivated. As with the downsize secondary and case fabrication alternative, wastes would be generated from D&D activities associated with the phaseout of the secondary and case fabrication mission. Total waste volumes from these activities over a 30-year period are also shown in table 4.2.3.10–3.

Sensitivity Analysis. The waste volumes generated from the downsized and consolidated Secondary and Case Fabrication Facility required to support a larger stockpile level (high case) operating on a single-shift basis are bounded by the base case under surge operations. Thus, there are no additional waste management impacts associated with the Secondary and Case Fabrication Facility that would support a high case stockpile operating at single shift. The volumes generated from the Secondary and Case Fabrication Facility required to support a low case stockpile would be reduced by a factor of at least three.

Potential Mitigation Measures. Waste quantities or waste forms could undergo additional reductions by utilizing emerging technologies, thereby further reducing or mitigating impacts. Pollution prevention and waste minimization would be considered in determining the final actions of the Stockpile Stewardship and Management Program at ORR. Utilization of existing and planned treatment and storage facilities would be maximized to further reduce impacts.

4.2.3.11 *Environmental Justice*

As discussed in section 4.14, impacts, if any, to surrounding communities would most likely result from toxic or hazardous air pollutants and radiological emissions. Section 4.2.3.9, which describes public and occupational health impacts from normal operation, shows that potential radiological and chemical air emissions and releases are lower than regulatory limits. However, the cumulative effect of continuous (or intermittent over time) very low exposures could have some impact on human health or the environment. Any adverse human health or environmental impacts that may occur would affect people living within communities located near ORR. The analysis of the demographics data presented in appendix D for the communities surrounding ORR indicates that even if there were any adverse health impacts to these communities, they would not appear to disproportionately affect minority or low-income populations.

4.3 SAVANNAH RIVER SITE

SRS was established in 1950 as a nuclear materials production site and occupies approximately 80,130 ha (198,000 acres) south of Aiken, SC. The current DP mission at SRS is to process tritium and conduct tritium recycling and filling in support of nuclear weapons stockpile requirements. Section 3.2.3 provides a description of all the DOE missions and support facilities at SRS. The location of SRS within the South Carolina and Georgia region is illustrated in figure 4.3–1, and the principal facilities at SRS are shown in figure 4.3–2.

4.3.1 Description of Alternatives

No Action. SRS would continue to perform the missions described in section 3.2.3.

Stockpile Management Alternatives. The pit fabrication and intrusive modification pit reuse mission (hereafter referred to as pit fabrication) could be located at SRS. Nonintrusive modification pit reuse is an inherent capability of this mission. No facilities at SRS would be phased out as a result of any of the proposed alternatives discussed in the PEIS.

Stockpile Stewardship Alternatives. There are no stockpile stewardship alternatives that include SRS.

4.3.2 Affected Environment

The following sections describe the affected environment at SRS for land resources, air quality, water resources, geology and soils, biotic resources, cultural and paleontological resources, and socioeconomics. In addition, the infrastructure, radiation and hazardous chemical environment, waste management conditions, and current intersite transportation issues at SRS are described.

4.3.2.1 *Land Resources*

SRS occupies approximately 80,130 ha (198,000 acres) in portions of Aiken, Allendale, and Barnwell Counties in southwestern South Carolina, approximately 20 km (12 mi) southeast of Augusta, GA. All of the land within SRS is owned by the Federal Government and is administered, managed, and controlled by DOE. Generalized land uses at SRS and in the vicinity are shown in figure 4.3.2.1–1.

SRS land uses can be grouped into three major categories: forest/undeveloped, water, and developed facility locations. Approximately 77,300 ha (191,000 acres) of SRS (approximately 96 percent) are undeveloped. Of this undeveloped area, approximately 72 percent is forested. A forest management program has been in effect at SRS since 1952, when it was formed through an interagency agreement between DOE (then the Atomic Energy Commission) and the U.S. Forest Service (WSRC 1993a:317). The majority of the woodlands area (53 percent of the total site) is in revenue producing, managed timber production. There are no prime farmlands on SRS.

In 1972, DOE designated all of SRS as a National Environmental Research Park. The National Environmental Research Park is used by the national scientific community to study the impact of human activities on the cypress swamp and southeastern pine and hardwood forest ecosystems (DOE 1985a:1).

Land use bordering SRS is primarily forest and agricultural, although there is a substantial amount of open water and nonforested wetland along the Savannah River Valley. Incorporated and industrial areas are the only other significant land uses in the vicinity. There is a small amount of urban and residential development bordering SRS. The closest residences include several located to the west, north, and northeast that, while within 61 m (200 ft) of the site boundary, are 13 to 16 km (8 to 10 mi) from the center of the site where the majority of SRS industrial activity is located.

SRS has been divided into several operating areas based on the type of production process occurring within an area. Facilities proposed to support the pit fabrication alternative at SRS are located in the F- and H-Areas. The 232-H Building in the H-Area would house pit fabrication, while plutonium processing would be housed in F-Canyon facilities in F-Area. Both areas are largely developed with many facilities historically associated with chemical and physical processes used to separate uranium, plutonium, and fission products. The F-Area chemical separations facilities are located near the center of SRS between Upper Three Runs Creek to the north and Fourmile Branch to the south. The H-Area facilities are also located near the center of SRS, approx-

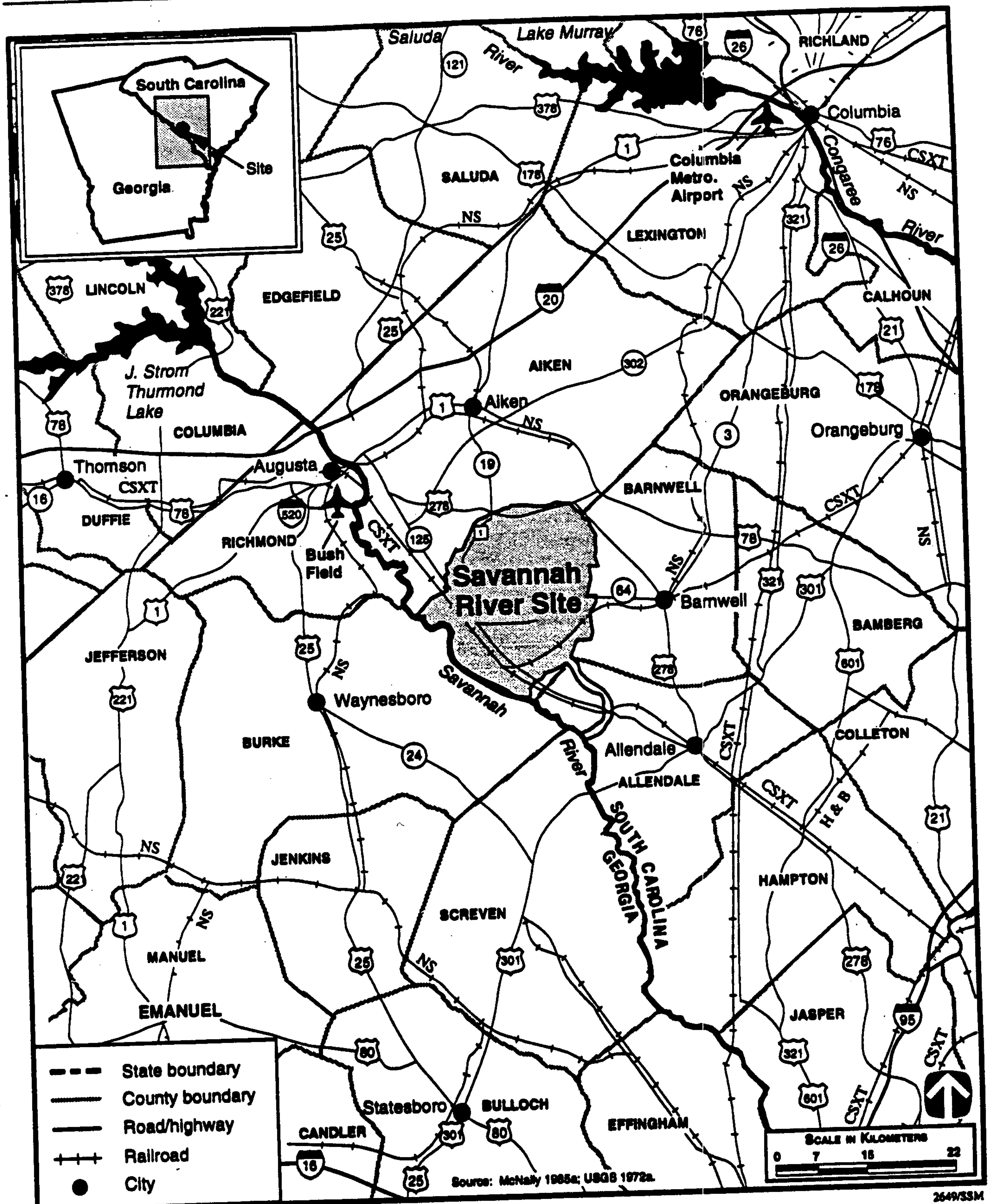


FIGURE 4.3–1.—*Savannah River Site, South Carolina, and Region.*

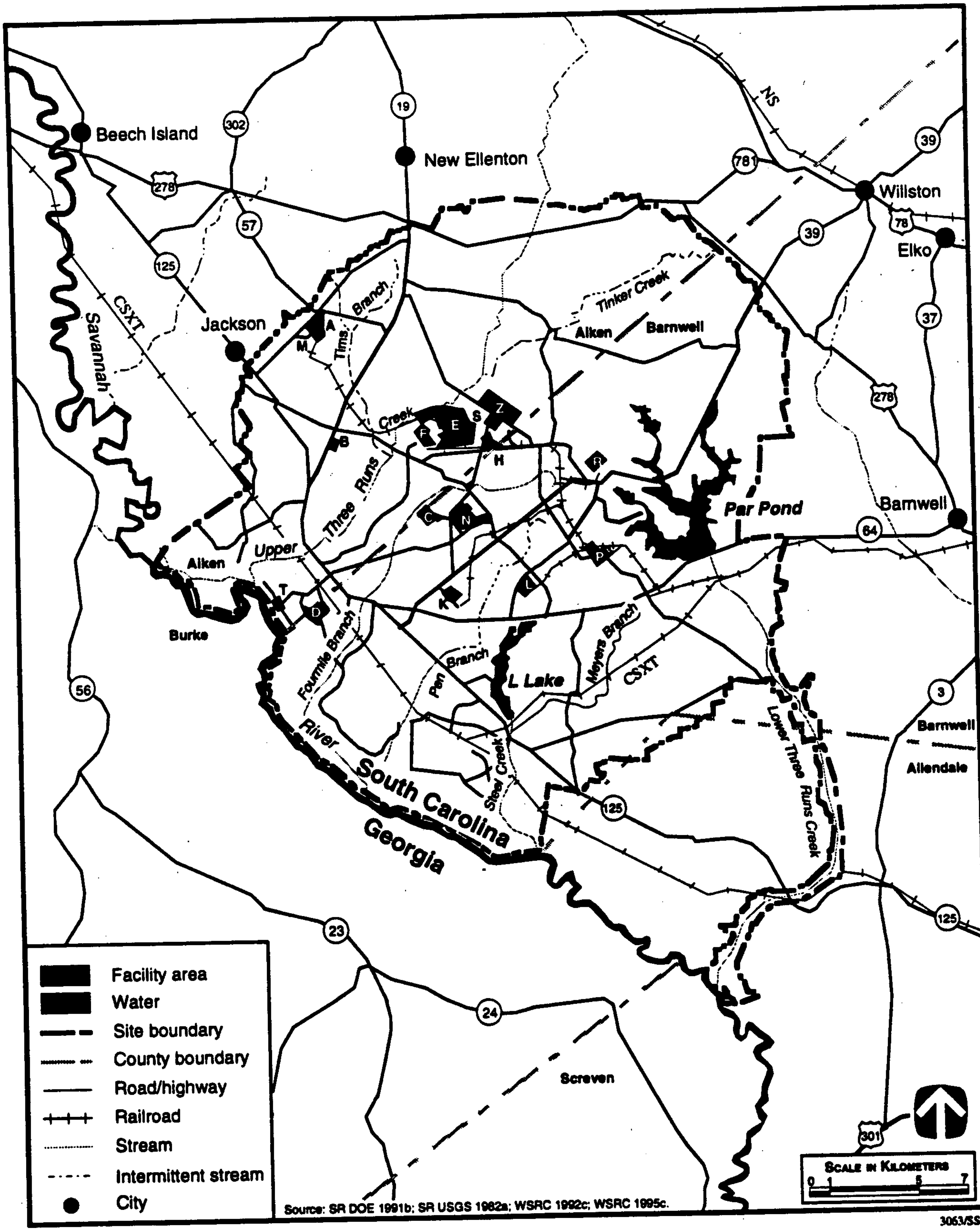


FIGURE 4.3–2.—*Principal Facility Areas at Savannah River Site.*

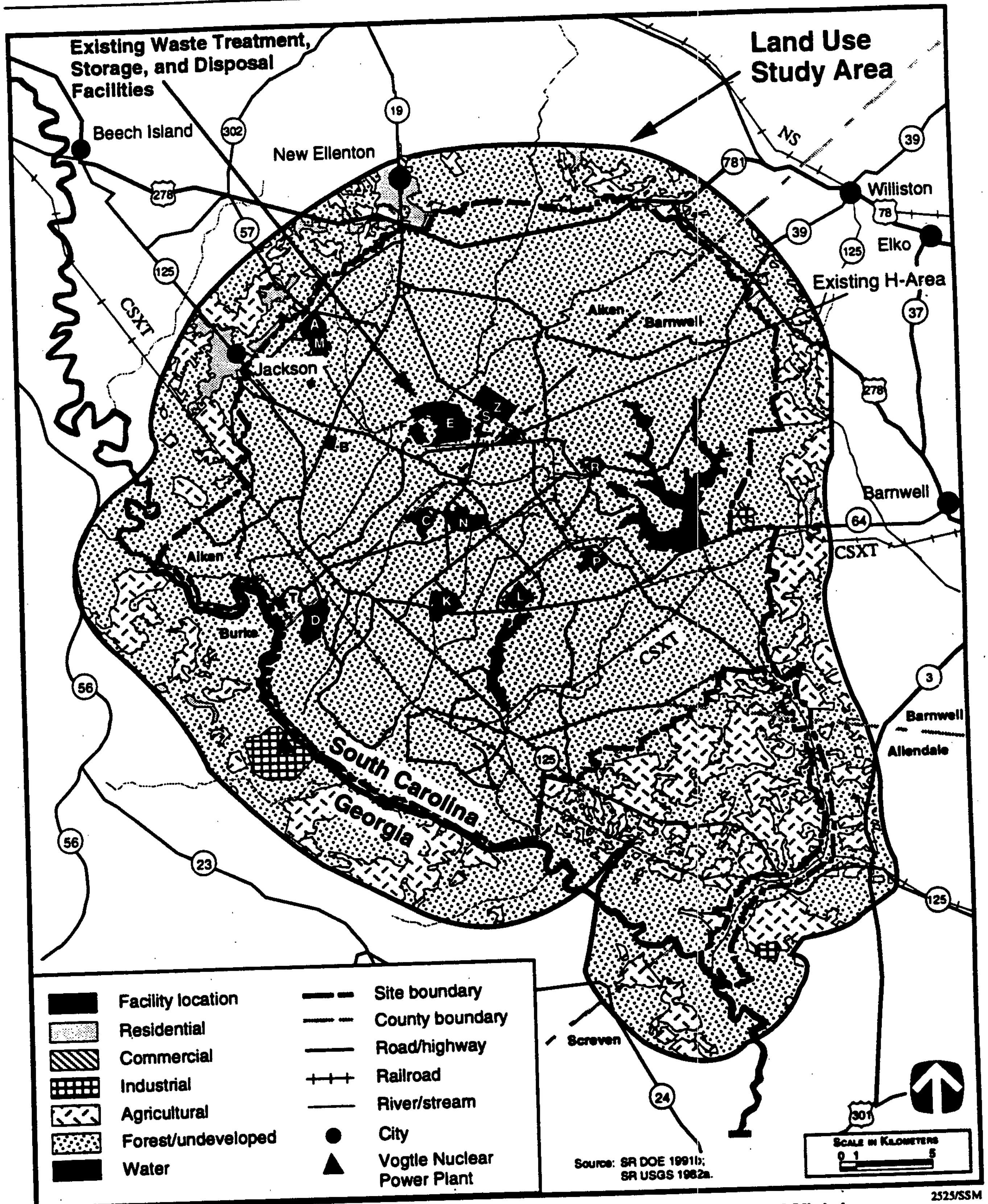


FIGURE 4.3.2.1–1.—*Generalized Land Use at Savannah River Site and Vicinity.*

imately 8 km (5 mi) southeast of the 700 Administration Area.

4.3.2.2 *Site Infrastructure*

SRS contains extensive production, service, and research facilities. Not all of these facilities are in operation or are needed today. To support current missions and functions, an infrastructure exists as shown in table 4.3.2.2–1. The road infrastructure is needed for extensive intrasite transportation requirements. The railroad infrastructure is required to support large-volume deliveries of coal and oversized structural components. SRS does not have a connection to the local natural gas lines.

TABLE 4.3.2.2–1.— ***Baseline Characteristics for Savannah River Site***

Characteristics	Current Value
Land	
Area (ha)	80,130
Roads (km)	230
Railroads (km)	103
Electrical	
Energy consumption (MWh/yr)	659,000
Peak load (MWe)	130
Fuel	
Natural gas (m^3/yr)	0
Liquid (L/yr)	28,400,000
Coal (t/yr)	210,000
Steam	
Generation (kg/hr)	85,000

Source: DOE 1995p.

4.3.2.3 *Air Quality*

The following section describes existing air quality including a review of the meteorology and climatology in the vicinity of SRS. More detailed discussions of the air quality methodologies, input data, and atmospheric dispersion characteristics are presented in appendix section B.3.3.

Meteorology and Climatology. The SRS region has a temperate climate with short, mild winters and long, humid summers. Throughout the year, the region is frequently affected by the warm and moist maritime air masses. The annual average temperature at SRS is 17.3 °C (63.2 °F); the average daily minimum temperature in January is 0.0 °C (32.0 °F); the average daily maximum temperature is 33.2 °C (91.7 °F) in July. The average annual precipitation at SRS is 113.4 cm (44.66 in) (NOAA 1994c:3). Precipitation is distributed fairly evenly throughout the year, with the highest precipitation in summer and the lowest in autumn. There is no predominant wind direction at SRS. The average annual wind speed at Augusta National Weather Service Station is 2.9 m/s (6.5 mph) (NOAA 1994c:3).

Ambient Air Quality. SRS is located near the center of the Augusta-Aiken Interstate AQCR 153. As of 1995, the areas within SRS and its surrounding counties were in attainment with respect to the NAAQS for criteria pollutants (40 CFR 50; 40 CFR 81.311; 40 CFR 81.341). Applicable NAAQS and the ambient air quality standards for South Carolina and Georgia are presented in appendix table B.3.1–1.

Since the promulgation of Prevention of Significant Deterioration regulations (40 CFR 52.21) in 1977, Prevention of Significant Deterioration permits have not been required for any new SRS emission sources nor modifications required to existing permits. There are no Prevention of Significant Deterioration Class I areas within 100 km (62.1 mi) of SRS.

The emissions inventory from sources at SRS for criteria pollutants is presented in appendix table B.3.3–1. Historically, the primary emission sources of criteria air pollutants at SRS are the nine coal-burning and four fuel oil-burning boilers that produce steam and electricity (A-, D-, H-, K-, and P-Areas), the fuel and target fabrication facilities (M-Area), and processing facilities (F- and H-Areas). Other emissions and sources include fugitive particulates from coal piles and coal-processing facilities, vehicles, and temporary emissions from various construction-related activities.

Hazardous/toxic air pollutant standards have been adopted by the State of South Carolina Department of Health and Environmental Control. No ambient standards for hazardous/toxic air pollutants have been proposed or established by the State of Georgia.

Table 4.3.2.3–1 presents the baseline ambient air concentration for criteria pollutants and other pollutants of concern at SRS. As shown in the table,

TABLE 4.3.2.3–1.—*Comparison of Baseline Ambient Air Concentrations with Most Stringent Applicable Regulations and Guidelines at Savannah River Site, 1990*

Pollutant	Averaging Time	Most Stringent Regulation or Guideline ($\mu g/m^3$)	Baseline Concentration ($\mu g/m^3$)
Criteria Pollutant			
Carbon monoxide	8-hour	10,00 [a]	22
	1-hour	40,00 [a]	171
Lead	Calendar quarter	1.5 [a]	<0.0004
Nitrogen dioxide	Annual	100 [a]	5.7
Ozone	1-hour	235 [a]	[b]
Particulate matter	Annual	50 [a]	3
	24-hour	150 [a]	50.6
Sulfur dioxide	Annual	80 [a]	14.5
	24-hour	365 [a]	196
	3-hour	1,300 [a]	823
Mandated by South Carolina			
Gaseous fluorides (as hydrogen fluoride)	30-day	0.8 [c]	0.09
	7-day	1.6 [c]	0.39
	24-hour	2.9 [c]	1.04
	12-hour	3.7 [c]	1.99
Total suspended particulates	Annual	75 [c]	12.6
Hazardous and Other Toxic Compounds			
Acrolein	24-hour	1.25 [c]	0.016
Benzene	24-hour	150 [c]	31.711
Bis (chloromethyl) ether	24-hour	0.03 [c]	0.002
Cadmium oxide	24-hour	0.25 [c]	0.021
Chlorine	24-hour	75 [c]	7.63
Chloroform	24-hour	250 [c]	4.957
Cobalt	24-hour	0.25 [c]	0.206
3,3-Dichlorobenzidine	24-hour	0.15 [c]	0.002
Formic acid	24-hour	225 [c]	2.42
Manganese	24-hour	25 [c]	0.821
Mercury	24-hour	0.25 [c]	0.014
Nickel	24-hour	0.5 [c]	0.271
Nitric acid	24-hour	125 [c]	50.96
Parathion	24-hour	0.5 [c]	0.007
Phosphoric acid	24-hour	25 [c]	0.462

[a] Federal and state standard.
[b] No monitoring data available; baseline concentration assumed to be less than applicable standard.
[c] State standard.
Source: 40 CFR 50; SC DHEC 1991a; SC DHEC 1992b; SR DOE 1995b.

baseline concentrations are in compliance with applicable guidelines and regulations.

4.3.2.4 *Water Resources*

This section describes the surface and groundwater resources at SRS.

Surface Water. The most prominent hydrologic feature at SRS is the Savannah River, which borders the southwest portion of the site for 32 km (19.9 mi) (figure 4.3.2.4–1). Six major streams flow through SRS to the Savannah River: Upper Three Runs Creek, Beaver Dam Creek, Fourmile Branch, Pen Branch, Steel Creek, and Lower Three Runs Creek. Upper Three Runs has two tributaries, Tims Branch and Tinker Creek; Pen Branch has one tributary, Indian Grave Branch; and Steel Creek has one tributary, Meyers Branch (SR DOE 1990a:3-14). Surface water run-off in the vicinity of the H-Area flows into Upper Three Runs Creek and Fourmile Branch.

SRS withdraws surface water from Savannah River mainly for industrial cooling purposes. A small quantity is also removed for drinking water supplies. In 1994, 140,000 MLY (36,984 MGY) of surface water was supplied from the Savannah River. Most of the water withdrawn is eventually returned to the Savannah River through its onsite tributaries. Streams, especially Fourmile Branch, that received discharges from reactors in the past are still recovering from scouring or erosion impacts. The Fourmile Branch drainage basin also receives effluents from C-, F-, and H-Areas. The average flow of the Savannah River is 283 m^3/s (9,990 ft^3/s). The lowest recorded flow, 183 m^3/s (6,500 ft^3/s), occurred during a drought period from 1985 to 1988 (SR DOE 1990a:3-18).

The Savannah River supplies potable water to several municipalities (SR DOE 1995e:3-8). Upstream from SRS, the river supplies domestic and industrial water to Augusta, GA, and North Augusta, SC. Approximately 130 river mi (209 km) downstream from SRS, the river supplies domestic and industrial water needs for the Cherokee Hill Waste Treatment Plant at Port Wentworth, GA, and for Beaufort and Jasper Counties in South Carolina.

There are two manmade water bodies on SRS: L-Lake, which discharges to Steel Creek; and Par Pond, which empties into Lower Three Runs Creek (SR DOE 1995b:3-15-3-21). There are approximately 190 Carolina bays scattered throughout the site. Carolina bays are naturally occurring closed depressions that may hold water (SR NERP 1989a:9). There are no direct discharges to the bays; however, they do receive some stormwater runoff.

Average annual treated sanitary discharge volume from SRS to the Savannah River is approximately 700 MLY (185 MGY), which is approximately 50 percent of the new Centralized Sanitary Wastewater Treatment Facility capacity. Wastewater from the treatment plant is discharged to Fourmile Branch. The F/H Effluent Treatment Facility treats industrial wastewater generated in the F- and H-Areas, where the proposed alternative activities would be located. The treated wastewater is released to Upper Three Runs Creek in accordance with NPDES regulations. The design capacity of the F/H Effluent Treatment Facility is 600 MLY (159 MGY). However, the maximum permitted treatment capacity is 400 MLY (106 MGY). Currently, the facility treats approximately 16 MLY (4.23 MGY).

The proposed alternative activities would be located in the F- and H-Areas, which are located outside of the 100-year floodplain zones (SR DOE 1995b:3-17). Information on the location of 500-year floodplains at SRS is currently not available. A site-specific floodplain assessment would be required before implementing any Program alternatives at SRS.

Surface Water Quality. In the vicinity of SRS, the Savannah River and onsite streams are classified as freshwater suitable for primary and secondary contact recreation and drinking water (after conventional treatment in accordance with the requirements of the South Carolina Department of Health and Environmental Control), fishing and the survival and propagation of a balanced indigenous and aquatic community of fauna and flora, and industrial and agricultural uses (SC DHEC 1992a:29). Table 4.3.2.4–1 lists the 1993 surface water monitoring results for the Savannah River.

SRS has two NPDES permits which regulate industrial wastewater discharge from 81 outfalls and 1 general stormwater discharge permit that covers 48 outfalls. SRS collects and analyzes water from these outfalls to ensure compliance with NPDES permit

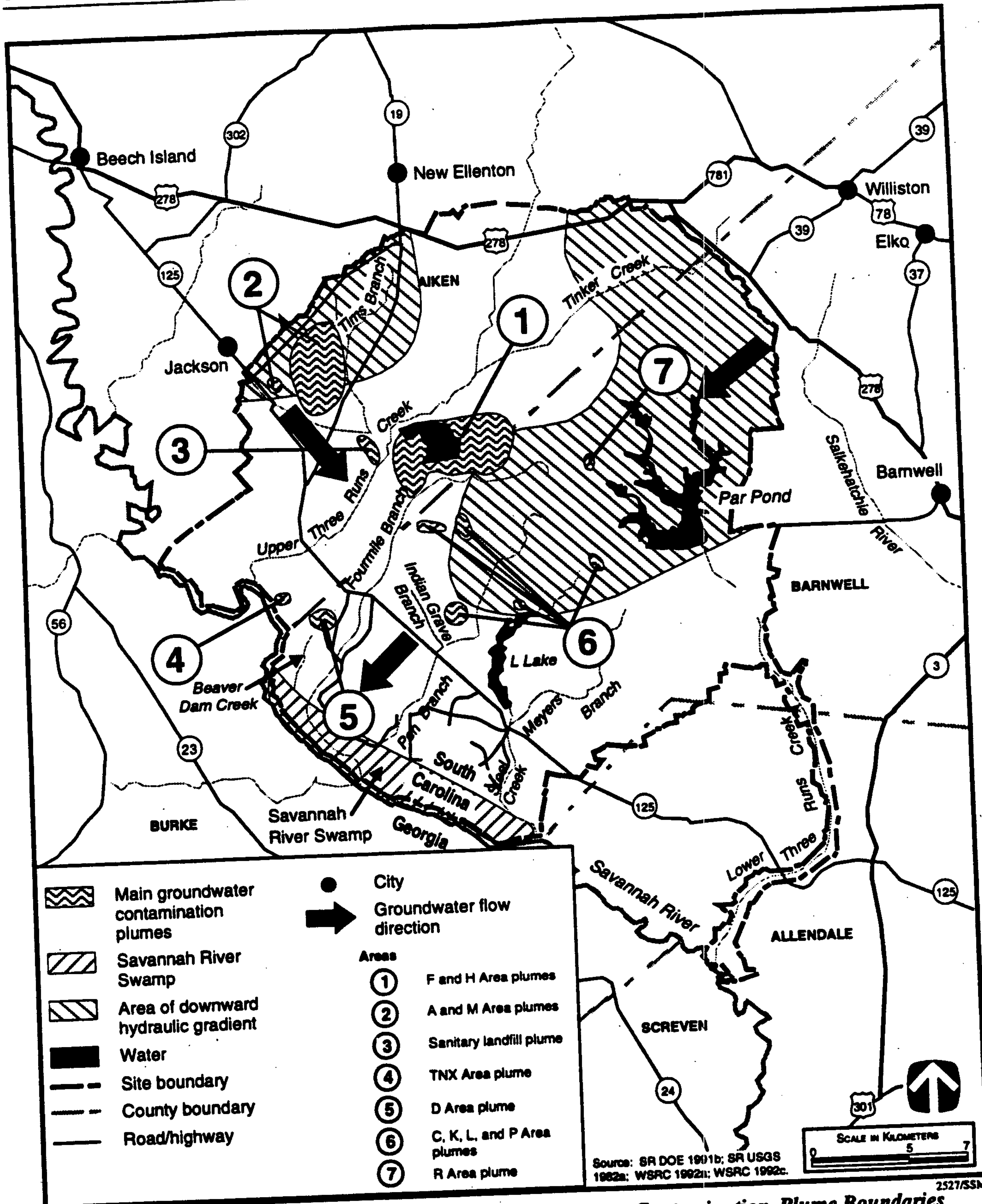


FIGURE 4.3.2.4–1.—*Surface Water Features and Groundwater Contamination Plume Boundaries at Savannah River Site.*

TABLE 4.3.2.4–1.—***Summary of Surface Water Quality Monitoring at Savannah River Site, 1993***

Parameter	Unit of Measure	Water Quality Criteria[a]	Minimum and Maximum Water Body Concentration
Radiological			
Alpha (gross)	pCi/L	15[b]	ND – 0.325
Beta (nonvolatile)	pCi/L	50[c]	0.959 – 3.12
Plutonium-238	pCi/L	1.6[d]	ND – 0.00174
Plutonium-239	pCi/L	1.2[d]	ND – 0.0012
Strontium-89, 90	pCi/L	400[d]	0.009 – 0.22
Tritium	pCi/L	80,000[d]	66 – 1,920
Nonradiological			
Alkalinity	mg/L	NA	13 – 24
Aluminum	mg/L	0.05-0.2[e]	0.182 – 0.838
Ammonia nitrogen	mg/L	NA	0.02 – 0.11
Calcium	mg/L	NA	3.25 – 5.09
Chemical oxygen demand	mg/L	NA	ND
Chromium	mg/l	0.1[b, f]	ND
Conductivity	µmhos/cm	NA	54 – 106
Dissolved oxygen	mg/L	>5[f]	6.2 – 10.5
Iron	mg/L	0.3[e]	0.516 – 1.15
Lead	mg/L	0.015[b]	ND – 0.003
Magnesium	mg/L	NA	1.11 – 1.34
Manganese	mg/L	0.05[e]	0.04 – 0.064
Nitrogen (as NO_2/NO_3)	mg/L	NA	0.18 – 0.31
pH	pH units	6.5-8.5[e]	6.0 – 6.7
Phosphate P	mg/L	NA	ND
Sodium	mg/L	NA	5.28 – 12.7
Sulfate	mg/L	250[e]	4 – 9
Suspended solids	mg/L	NA	5 – 16
Temperature	°C	<32.2[f]	9.1 – 25.7
Total dissolved solids	mg/L	500[e]	49 – 90
Zinc	mg/L	5[e]	ND – 0.012[g]

[a] For comparison only, except for parameters which have South Carolina water quality criteria.
[b] National Primary Drinking Water Regulations (40 CFR 141).
[c] Proposed National Primary Drinking Water Regulation, Radionuclides (56 FR 33050).
[d] DOE's Derived Concentration Guides for water (DOE Order 5400.5). Values are based on a committed effective dose equivalent of 100 mrem per year; however, because the drinking water maximum contaminant level is based on 4 mrem per year, the number listed is 4 percent of the Derived Concentration Guides.
[e] National Secondary Drinking Water Regulations (40 CFR 143).
[f] South Carolina State water quality criteria.
[g] Average concentrations were not calculated because of an insufficient amount of sampling. The maximum concentration is listed.

Note: NA - not applicable; ND - none detected; all nonradiological data from station R-10, downstream of SRS; all radiological data from station R-3B (below Vogtle Electric Generating Plant).

Source: SR DOE 1995c.

limits. Of the 8,000 analyses performed at the industrial outfalls in 1993, 10 exceeded permit limits, for a compliance rate of 99.9 percent. Noncompliances were noted mainly for pH and total suspended solids, with one noncompliance each for oil and grease and biological oxygen demand. In all cases, either corrective actions or administrative reviews were undertaken in an effort to prevent future noncompliances (WSRC 1994d:4-75).

Surface Water Rights and Permits. Surface water rights for the Savannah River are determined by the Doctrine of Riparian Rights. Under this doctrine, users of water must not adversely impact quantity or quality of water availability for downstream users.

Groundwater. Several aquifer system naming schemes have been used at SRS. For this document, the shallowest aquifer will be called the water table. The water table is underlain by a leaky "Green Clay" aquitard, which separates the water table from the Congaree aquifer. Below the Congaree aquifer is the leaky Ellenton aquitard, below which is the Cretaceous (also known as the Tuscaloosa) aquifer. In general, groundwater beneath the site flows slowly laterally towards streams and swamps and into the Savannah River at rates ranging from centimeters to several hundred meters per year. The depth to which onsite streams cut into the soils controls the horizontal movement of groundwater. The valleys of the smaller perennial streams receive discharge from the shallow saturated geologic formations. The valleys of major tributaries of the Savannah River (such as Three Runs Creek) drain formations of intermediate depth. The valley of the Savannah River drains deep formations.

Groundwater flow at some locations on the site (such as F- and H-Areas and certain sections of K-Area) is predominantly upward through the aquitard from the deeper aquifer to the shallow aquifer (figure 4.3.2.4–1). In other areas including A-, M-, L-, and P-Areas the vertical component of groundwater flow is downward. Horizontal groundwater flow occurs at the M-Area (to the west-northwest in the shallow aquifer and subsequent flow to the south toward Upper Three Runs Creek in the intermediate aquifer), K-Area disassembly basin (toward Pen Branch and L-Lake), P-Area disassembly basin (toward Steel Creek), F-Canyon Building (toward Upper Three Runs Creek and Fourmile Branch), and H-Canyon Building (toward Upper Three Runs Creek and its tributaries).

The Cretaceous aquifer is an abundant and important water resource for the SRS region. Some of the local cities (e.g., Aiken) also obtain groundwater from the Cretaceous aquifer, but most of the rural population in the SRS region obtains its water from either the Congaree or water table. All groundwater at SRS is classified by the EPA as a Class II water source (i.e., a current potential source of drinking water). Depth to groundwater ranges from at or near ground surface (near streams) to 46 m (151 ft).

Groundwater Quality. Groundwater data have been obtained from SRS monitoring wells for the past several years. Groundwater quality at SRS ranges from excellent (soft and slightly acidic) to below EPA drinking water standards for several constituents in the vicinity of some waste sites. Industrial solvents, metals, tritium, and other constituents used or generated at SRS are present at elevated levels in the shallow aquifers beneath 5 to 10 percent of SRS (SR DOE 1995c:3-13). These aquifers are not used for SRS operations or drinking water; however, they do discharge to site streams and eventually enter the Savannah River. Most contaminated groundwater at SRS flows beneath facilities; the sources of the contaminants reflect the operations and chemical processes performed at those facilities. At F- and H-Areas, contaminants in the groundwater include tritium and other radionuclides, metals, nitrates, and chlorinated and volatile organics. Area plumes are shown in figure 4.3.2.4–1. At A- and M-Areas, groundwater contaminants include chlorinated volatile organics, radionuclides, metals, and nitrates. At the reactors (C-, K-, L-, and P-Areas), tritium, other radionuclides, and lead are present in the groundwater. At the D-Area, groundwater contaminants include VOCs, chromium, nickel, lead, zinc, iron, sulfate and tritium. At the TNX Area, VOCs, lead, nitrate, and uranium are present in the groundwater (SR DOE 1995c:3-13).

Radioactive constituents (tritium, cesium-137, iodine-131, ruthenium-106, and strontium-89 and -90) above drinking water standards have been detected in F-Area monitoring wells (SR DOE 1995c:3-13). Studies of flow directions, infiltration rates, and operating history indicate that the source of the contamination is from an isolated incident that occurred more than 35 years ago. Groundwater contamination found beneath the H-Canyon reflects the widespread use of tritium in the H-Area. The tritium present in the groundwater is not directly from H-Canyon activities, but rather results from past use of the nearby H-Area seepage basins and the subsequent migration of contaminants beneath the H-Canyon. Results of groundwater quality measurements from wells located in the H-Area and comparison with standards or criteria for selected quality parameters are presented in table 4.3.2.4–2.

As shown in table 4.3.2.4–2, when compared to national primary and secondary maximum contaminant levels, parameter concentrations are within acceptable limits except for pH in one of the wells. The elevated pH is most likely due to the well completion with grout and not from actual groundwater impacts.

Groundwater Availability, Use, and Rights. Groundwater is a domestic, municipal, and industrial water source throughout the Upper Coastal Plain. Most municipal and industrial water supplies in Aiken County are from the Cretaceous aquifer. Domestic water supplies are primarily from the Congaree aquifer and the water table. In Barnwell and Allendale Counties, the Congaree aquifer supplies some municipal users. At SRS, most groundwater is obtained from the Cretaceous aquifer, with a few wells pumping from the Congaree aquifer. Every major operating area at SRS has groundwater supply wells; total groundwater production from these wells is approximately 13,300 MLY (3,500 MGY), similar to the volume pumped for industrial and municipal production within 16 km (9.9 mi) of the site (SRS 1995a:1).

Groundwater rights in South Carolina are traditionally associated with the absolute ownership rule.

TABLE 4.3.2.4–2.—*Groundwater Quality Monitoring at Savannah River Site, 1994*

Parameter	Unit of Measure	Water Quality Criteria and Standards[a]	Well Number HAA-4B	Well Number HCA-4C
Radiological				
Alpha (gross)	pCi/L	15[b]	2.1	<0.5
Beta (nonvolatile)	pCi/L	50[c]	0.2	0.7
Tritium	pCi/L	80,000[d]	6,300	1,600
Nonradiological				
Barium	mg/L	2[b]	0.0397	0.0695
Chloride	mg/L	250[e]	2.69	1.75
Iron	mg/L	0.3[e]	0.004	0.0057
Lead	mg/L	0.015[b]	0.003	0.003
Manganese	mg/L	0.05[e]	0.002	0.0052
Nitrate	mg/L	10[b]	0.333	0.74
pH	pH units	6.5-8.5[e]	8.1	9.03
Sulfate	mg/L	250[e]	2.54	3.08
Total dissolved solids	mg/L	500[e]	132	39
Total phosphates	mg/L	NA	0.05	0.46

[a] For comparison only.
[b] National Primary Drinking Water Regulations (40 CFR 141).
[c] Proposed National Primary Drinking Water Regulations; Radionuclides (56 FR 33050).
[d] DOE Derived Concentration Guides for water (DOE Order 5400.5). Number used is 4 percent of Derived Concentration Guides.
[e] National Secondary Drinking Water Regulations (40 CFR 143).
Note: NA - not applicable; all data are from wells located in the proposed stockpile stewardship and management activity area (Area H).
Source: SRS 1995a:11.

Originating in English common-law doctrine, the owners of land overlying a groundwater resource are allowed to withdraw from their wells all the water they wish for whatever purpose they desire. The water withdrawn can be used for any purpose on or off the owner's land (VDL 1990a:725). However, the *Water Use Reporting and Coordination Act* requires all users of 379,000 L or more per day (100,000 gal or more per day) (136 MLY [35.9 MGY]) of water to report their withdrawal rates to the South Carolina Water Resources Commission. SRS exceeds this amount of groundwater use, and must report its withdrawal rates to the commission.

4.3.2.5 *Geology and Soils*

Geology. SRS is located in the Aiken Plateau portion of the Upper Atlantic Coastal Plain east of the Fall Line, a major physiographic and structural feature that separates the Piedmont and the Coastal Plain, in southeastern South Carolina.

The plateau is highly dissected, with narrow, steep-sided valleys separated by broad flat areas. There is evidence from subsurface mapping and seismic surveys that suggests the presence of faults beneath SRS. The largest of these faults is the Pen Branch fault. However, there is no evidence of movement within the last 38 million years along this fault.

SRS lies within seismic Zone 2 (appendix figure A.1–1). Since 1985 only three earthquakes, all of Richter magnitude 3.2 or less, have occurred in the immediate area of SRS. None of these earthquakes produced any damage at SRS. Historically, two large earthquakes occurred within 300 km (186 mi) of SRS. The larger of these two earthquakes, the Charleston earthquake of 1886, had a magnitude in the 6.5 to 7.5 range. Earthquakes capable of producing structural damage to any buildings are not likely to occur in the vicinity of SRS (SR duPont 1988a:9). There is no volcanic hazard at SRS. The area has not experienced volcanism within the last 230 million years (DOE 1995i:4-383).

Soils. The soils of the F- and H-Areas are mainly well drained and somewhat excessively drained with a loamy subsoil. They have a thick, sandy surface layer and subsurface layer and a loamy subsoil that is 1 to 2 m (3.3 to 6.6 ft) below the surface in some areas (SR USDA 1990a:6,7,128). Many of the soils are subject to erosion, flooding, ponding, and cutbank caving. The soils at SRS are considered acceptable for standard construction techniques. There are no prime farmlands on SRS (DOE 1995i:4-372).

4.3.2.6 *Biotic Resources*

The following section describes biotic resources at SRS including terrestrial resources, wetlands, aquatic resources, and threatened and endangered species. A list of the threatened or endangered species that may be found on or in the vicinity of SRS is presented in appendix C.

Terrestrial Resources. Most of SRS has remained undeveloped since it was established in 1950. Only about 5 percent of the site is occupied by DOE facilities. Five major plant communities have been identified at SRS (figure 4.3.2.6–1). Of these, the largest plant community is the loblolly-longleaf-slash pine community, which covers approximately 65 percent of the site. This community type, as well as upland hardwood-scrub oak, is found primarily in upland areas. Swamp forests and bottomland hardwood forests are found along the Savannah River and the numerous streams that traverse SRS. More than 1,300 taxa of vascular plants have been identified on the site (DOE 1992e:4-126; DOE 1995p:4-47).

Because of the variety of plant communities on the site, as well as the region's mild climate, SRS supports a diversity and abundance of wildlife including 43 amphibian, 58 reptile, 213 bird, and 54 mammal species. Common species at SRS include the slimy salamander (*Plethodon glutinosus*), eastern box turtle (*Terrapene carolina*), Carolina chickadee (*Parus carolinensis*), common crow (*Corvus brachyrhynchos*), eastern cottontail (*Sylvilagus floridanus*), and gray fox (*Urocyon cinereoargenteus*) (DOE 1992e:4-128; WSRC 1993b:3-5,3-39). A number of game animals are found on SRS; however, only the whitetail deer (*Odocoileus virgineanus*) and feral hog (*Sus scrofa*) are hunted onsite. Raptors, such as the Cooper's hawk (*Accipiter cooperii*) and black vulture (*Coragyps atratus*), and carnivores, such as the gray fox and raccoon (*Procyon lotor*), are ecologically important groups on SRS. A variety of migratory birds has been found at SRS. Migratory birds and their nests and eggs are protected by the *Migratory Bird Treaty Act*. Eagles are similarly protected by the *Bald and Golden Eagle Protection Act*.

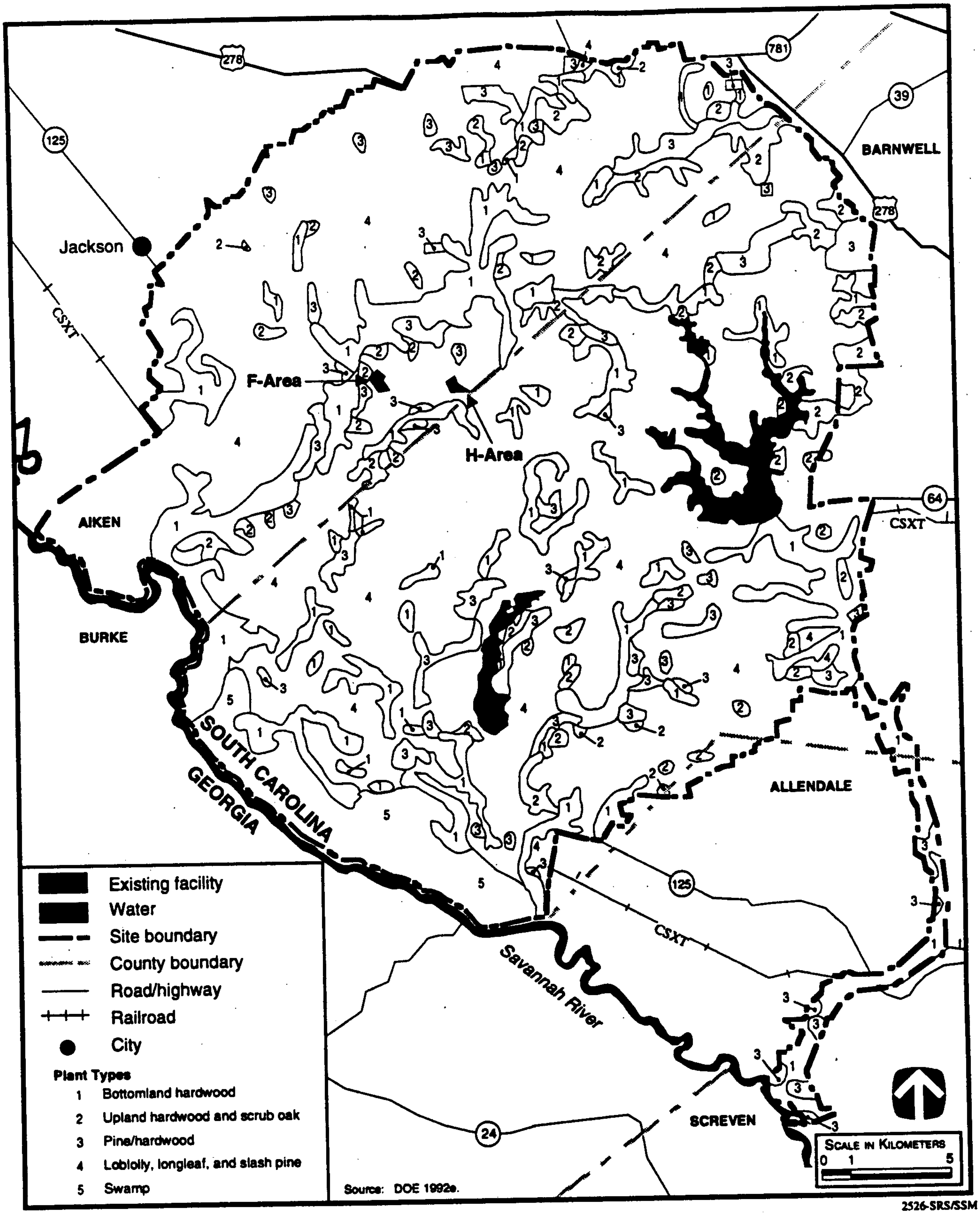


FIGURE 4.3.2.6–1.—*Distribution of Plant Communities at Savannah River Site.*

The F- and H-Areas are industrialized areas. They are surrounded primarily by evergreen forests with areas of grassland, scrub-shrub, and barren land also present. Bottomland hardwood forest is located along Fourmile Branch and Upper Three Runs Creek (and their tributaries) located to the south and north of these areas, respectively (WSRC 1993b:2-14). While wildlife associated with these areas would include species tolerant of human disturbance, animals found in surrounding areas would be expected to be similar to those animals found in comparable habitats elsewhere on SRS.

Wetlands. SRS contains 19,800 ha (49,000 acres) of wetlands, most of which are associated with flood plains, streams, and impoundments. Wetland cover types on the site may be divided into the following categories: bottomland hardwoods, cypress-tupelo, scrub-shrub, emergent, and open water (WSRC 1993b:4-6). The most extensive wetland type on SRS is swamp forest (3,800 ha [9,390 acres]) associated with the Savannah River floodplain. Past releases of cooling water effluent into site streams and the Savannah River swamp have resulted in shifts in plant community composition. Changes have included the replacement of bald cypress by scrub-shrub and emergent vegetation in the swamp and the reduction in bottomland forests along streams (WSRC 1989e:3-4).

Carolina bays, a type of wetland unique to the southeastern United States, are also found on SRS. Approximately 190 Carolina bays have been identified on the site. These natural shallow depressions occur on interstream areas of SRS and range from lakes to shallow marshes, herbaceous bogs, shrub bogs, or swamp forests (SR NERP 1989a:9).

Wetlands found in the vicinity of the F- and H-Areas are primarily associated with Fourmile Branch and Upper Three Runs Creek and their tributaries. These wetlands have been classified as bottomland hardwood (WSRC 1993b:4-12).

Aquatic Resources. Aquatic habitat on SRS includes manmade ponds, Carolina bays, reservoirs, and the Savannah River and its tributaries. There are more than 50 manmade impoundments located throughout the site that mainly support populations of bass (*Centrarchidae*) and sunfish (*Lepomis spp.*) (SR DOE 1982a:4-22). Fewer than 20 Carolina bays have permanent fish populations. Species present in these bays include redfin pickerel (*Esox americanus americanus*), mud sunfish (*Acantharchus pomotis*), lake chubsucker (*Erimyzon sucetta*), and mosquitofish (*Gambusia affinis*) (SR NERP 1989a:37). Par Pond and L-Lake support similar fish populations, including largemouth bass (*Micropterus salmoides*), black crappie (*Pomoxis nigromaculatus*), and various species of pan fish. Sport and commercial fishing are not allowed on SRS (DOE 1992e:4-132).

The Savannah River is used for both commercial and sport fishing. Important commercial species are American shad (*Alosa sapidissima*), hickory shad (*Alosa mediocris*), and striped bass (*Morone saxatilis*), all of which are anadromous. The most important warm water game fish species of the Savannah River are bass, pickerel (*Esox spp.*), crappie (*Pomoxis spp.*), bream (*Lepomis spp.*), and catfish (*Ictaluridae*). In the past, water intake structures for the C- and K-Reactors and D-Area power house caused an annual estimated entrainment of about 10 percent of the fish eggs and larvae passing the intake canals during the spawning season. In addition, estimated impingement losses were about 7,600 fish per year (SR DOE 1987b:3-31,C-61). There are no longer any major water withdrawals for the reactors, and entrainment and impingement have dropped accordingly.

Streams in the vicinity of the F- and H-Areas include Fourmile Branch and Upper Three Runs Creek and their tributaries. Fish species present in Fourmile Branch near these areas include dusky shiner (*Notropis cummingsae*), creek chubsucker (*Erimyzon oblongus*), yellow bullhead (*Ictalurus natalis*), and spotted sunfish (*Lepomis punctatus*). Recent studies found that the outcropping of groundwater from the F- and H-Area seepage basins has not resulted in adverse changes in the structure of the aquatic community below the outcropping zone (WSRC 1993b:12-53,12-56).

Fish species present in Upper Three Runs Creek in the vicinity of the F- and H-Areas include dusky shiner, yellowfin shiner (*Notropis lutipinnis*), redbreast sunfish (*Lepomis auritus*), and bluegill (*Lepomis macrochirus*). Recent studies of fish communities above and below the stream in the vicinity of the F- and H-Areas indicated that no measurable community level impacts were associated with contaminants outcropping from these areas (WSRC 1993b:10-59,10-60).

Threatened and Endangered Species. Sixty-one Federal- and state-listed threatened, endangered, and other special status species may be found on and in the vicinity of SRS (appendix table C–2). Fifty-seven of these species have records of occurrence on the site, 12 of which are Federal- and/or state-listed as threatened or endangered. The Federal-listed species recorded onsite include both subspecies of the peregrine falcon (*Falco peregrinus anatum* and *F.p. tundrius*), bald eagle (*Haliaeetus leucocephalus*), red-cockaded woodpecker (*Picoides borealis*), wood stork (*Mycteria americana*), Kirtland's warbler (*Dendroica kirtlandii*), American alligator (*Alligator mississippiensis*), shortnose sturgeon (*Acipenser brevirostrum*), and smooth coneflower (*Echinacea laevigata*). Additional state-listed species observed onsite include the Rafinesque's big-eared bat (*Plecotus rafinesquii*), Appalachian Bewick's wren (*Thryomanes bewickii altus*), and common ground dove (*Columbina passerina*). No critical habitat for threatened or endangered species, as defined in the *Endangered Species Act* (50 CFR 17.11; 50 CFR 17.12), exists on SRS.

The F- and H-Areas contain no habitat for any of the Federal-listed threatened or endangered species found on SRS. Smooth coneflower could exist in open woodlands or roadbanks in the vicinity. None of the special status plant species listed in appendix table C–2 have been recorded near the F- and H-Areas. Although the pine forest adjacent to these areas could provide habitat for certain special status species, no such species are known to be present, and field surveillance would be required to verify the presence of any sensitive species.

4.3.2.7 *Cultural and Paleontological Resources*

Prehistoric Resources. An extensive archaeological survey program began at SRS in 1974 consists of numerous field studies such as reconnaissance surveys, shovel test transects, and intensive site tests and excavations. More than 60 percent of SRS has received some level of cultural resources evaluation involving both prehistoric and historic resources. More than 800 prehistoric sites or sites with prehistoric components have been identified; however, fewer than 8 percent have been evaluated for NRHP eligibility. To date, 67 prehistoric and historic sites are considered potentially eligible for listing on the NRHP. Prehistoric site types at SRS consist of villages, base camps, limited activity sites, quarries, and workshops.

All activities at SRS associated with the proposed pit fabrication mission would occur in the F- and H-Areas. Portions of both have been surveyed for cultural resources. Both contain potentially NRHP-eligible prehistoric sites. Both areas have tracts which are disturbed as a result of grading and construction. A Programmatic Agreement was signed by the Savannah River Operations Office, DOE, the South Carolina SHPO, and the Advisory Council on Historic Preservation on August 24, 1990. The purpose of the agreement is to ensure that appropriate measures are taken to inventory, evaluate, protect, and enhance archaeological sites at SRS. In addition, an Archaeological Resource Management Plan for SRS is in place.

Historic Resources. Types of historic sites include farmsteads, tenant dwellings, mills, plantations and slave quarters, rice farming dikes, dams, cattle pens, ferry locations, towns, churches, schools, cemeteries, commercial building locations, and roads. Approximately 400 historic sites or sites with historic components have been identified within SRS; approximately 10 percent have been evaluated for NRHP eligibility.

Systematic historic building surveys have not yet been conducted at SRS. As part of the Cold War mission, SRS has been involved with tritium operations and other nuclear material production for more than 30 years. As such, some of the facilities at SRS may be eligible for listing on the NRHP.

Native American Resources. Native American groups with traditional ties to the area include the Apalachee, Cherokee, Chickasaw, Creek, Shawnee, Westo, and Yuchi. At different times, each of these Native American groups was encouraged by the English to settle in the area to provide protection from the French, Spanish, or other Native American groups. Main villages of both the Cherokee and Creek were located southwest and northwest of SRS, but both groups may have used the area for hunting and gathering activities. During the early 1800s, most of the remaining Native Americans residing in the region were relocated to the Oklahoma territory.

Native American resources in the region include remains of villages or townsites, ceremonial lodges, burials, cemeteries, and areas containing traditional plants used for religious ceremonies. Literature reviews and consultations with Native American representatives reveal that there are some concerns related to the *American Indian Religious Freedom Act* within the central Savannah River Valley; however, no specific sites at SRS have been identified. The Yuchi Tribal Organization, the National Council of the Muskogee Creek, the Indian People's Muskogee Tribal Town Confederate, the Pee Dee Indian Association, the Ma Chis Lower Alabama Creek Indian Tribe, and the United Keetoowah Band of the Cherokees have expressed concerns for sensitive Native American resources at SRS. The Yuchi and the Muskogee Creek expressed concern for areas containing several plants traditionally used in ceremonies (SR DOE 1991e:19,21).

Paleontological Resources. Paleontological materials at SRS include fossil plants, numerous invertebrate fossils, deposits of giant oysters (*Crassostrea gigantissima*), mollusks, and bryozoa. All paleontological materials from SRS are marine invertebrate deposits and, with the exception of the giant oysters, are relatively common fossils; therefore, the assemblages have relatively low research potential.

4.3.2.8 *Socioeconomics*

Socioeconomic characteristics addressed at SRS include employment and regional economy, population and housing, and public finance. Statistics for employment and regional economy are presented for the regional economic area that encompasses 15 counties around SRS in Georgia and South Carolina. Statistics for population and housing and public finance are presented for the ROI, a four-county area in which 87.3 percent of all SRS employees reside: Aiken County (51.9 percent) and Barnwell County (7.3 percent) in South Carolina, and Columbia County (10.6 percent) and Richmond County (17.5 percent) in Georgia (appendix table D.1–2). Figure 4.3.2.8–1 presents a map of the counties and selected cities comprising the SRS regional economic area and ROI. Supporting data are presented in appendix D.

Regional Economy Characteristics. Selected employment and regional economy statistics for the SRS regional economic area are summarized in figure 4.3.2.8–2. Between 1980 and 1990, the civilian labor force in the regional economic area increased from 204,563 to 248,239, a 21.4-percent increase (annual average of 2.1 percent). In 1994, unemployment in the regional economic area was 6.7 percent, which was slightly higher than South Carolina's and more than 1 percent higher than in Georgia. The region's per capita income of $17,212 in 1993 was approximately 2.1 percent greater than South Carolina's per capita income of $16,861 and 10.6 percent lower than Georgia's per capita income of $19,249.

As shown in figure 4.3.2.8–2, the regional economic area, South Carolina, and Georgia have similar employment patterns. The service sector accounts for the largest share of total employment in the region (22 percent), Georgia (25 percent), and South Carolina (22 percent). Manufacturing employment, however, accounted for 20 percent of the total employment in the region and South Carolina, but only accounted for 15 percent of the total employment in Georgia.

Population and Housing. Between 1980 and 1992, the ROI population grew from 347,241 to 425,100. The 22.4-percent increase (annual average of 2.2 percent) was lower than the 24.0-percent increase in Georgia's population, but higher than the 15.4-percent increase in South Carolina's population. Within the ROI, the Columbia County population increased by 82.0 percent, while Barnwell County's population only increased by 6.2 percent.

The 25.5-percent increase in housing units between 1980 and 1990, was about 2 percent greater than South Carolina, and was approximately 5 percent less than the increase in Georgia. The total number of housing units estimated for 1992 was 160,500. The 1990 homeowner vacancy rate in the ROI, 2.2 percent, was comparable to the homeowner vacancy rates experienced by South Carolina and Georgia. The rental vacancy rate for the ROI counties, nearly 10 percent, was approximately 2 percent less than the

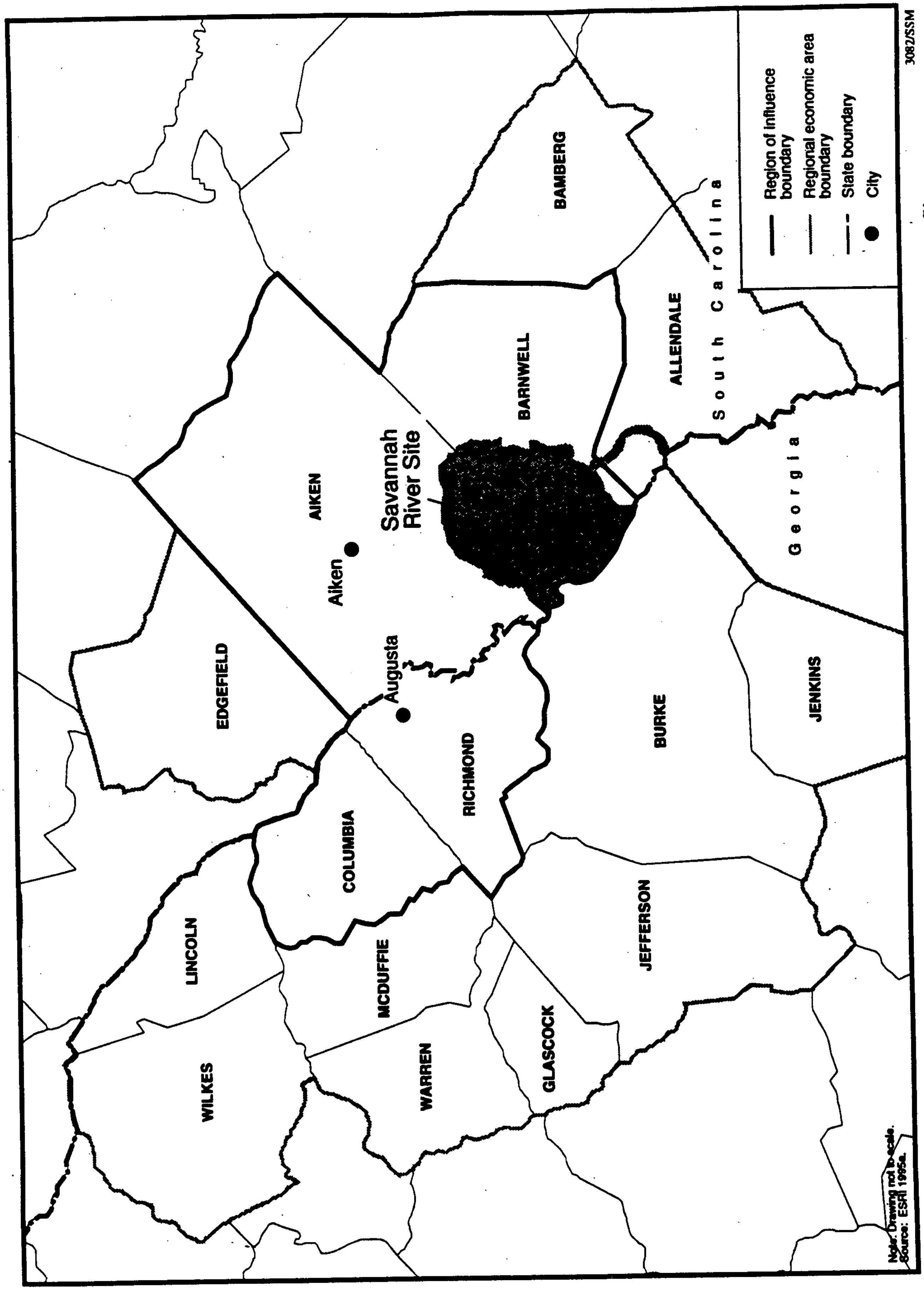


FIGURE 4.3.2.8–1.—*Regional Economic Area and Region of Influence for Savannah River Site.*

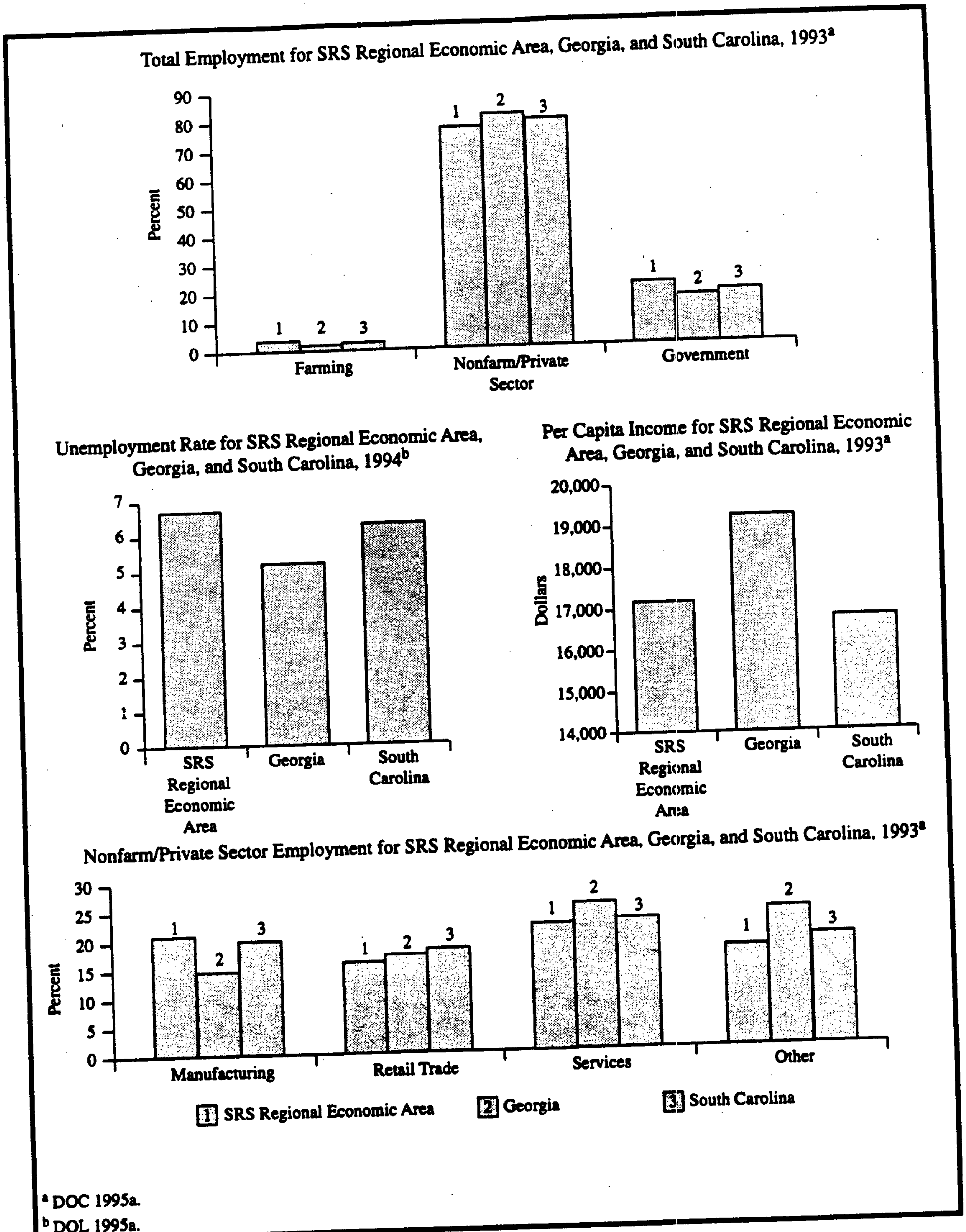


FIGURE 4.3.2.8–2.—*Economy for the Savannah River Site Regional Economic Area, Georgia, and South Carolina.*

rental vacancy rates for both states. Population and housing trends are summarized in figure 4.3.2.8–3.

Public Finance. Financial characteristics of the local jurisdictions in the SRS ROI that are most likely to be affected by the proposed action are presented in this section. The data reflect total revenues and expenditures of each jurisdiction's general fund, special revenue funds, and, as applicable, debt service, capital project, and expendable trust funds. School district boundaries may or may not coincide with county or city boundaries, but the districts are presented under the county where they primarily provide services. Major revenue and expenditure fund categories for counties, cities, and school districts are presented in appendix tables D.2.3–2 and D.2.3–3. Figure 4.3.2.8–4 summarizes 1994 local governments' revenues and expenditures. Fund balances, which are dollars carried over from previous years, are not included in figure 4.3.2.8–4. All jurisdictions assessed had positive fund balances.

4.3.2.9 *Radiation and Hazardous Chemical Environment*

The following section provides a description of the radiation and hazardous chemical environment at SRS. Also included are discussions of health effects studies, emergency preparedness considerations, and a brief accident history.

Radiation Environment. Major sources of background radiation exposure to individuals in the vicinity of SRS are shown in table 4.3.2.9–1. All annual doses to individuals from background radiation are expected to remain constant over time. The incremental total dose to the population would result only from changes in the size of the population. Background radiation doses are unrelated to SRS operations.

Releases of radionuclides to the environment from SRS operations provide another source of radiation exposure to individuals in the vicinity of SRS. The radionuclides and quantities released from SRS operations in 1993 are listed in the *Savannah River Site Environmental Report for 1993* (WSRC-TR-94-075). The doses to the public resulting from these releases are presented in table 4.3.2.9–2. These doses fall within radiological limits (DOE Order 5400.5) and are small in comparison to background radiation. The releases listed in the 1993 report were used to develop the reference environment (No Action) radiological releases at SRS in 2005 (section 4.3.3.9).

TABLE 4.3.2.9–1.—*Sources of Radiation Exposure to Individuals in the Vicinity, Unrelated to Savannah River Site Operations*

Source	Committed Effective Dose Equivalent (mrem/yr)
Natural Background Radiation	
Cosmic and cosmogenic radiation[a]	29
External terrestrial radiation[a]	29
Internal terrestrial radiation[b]	40
Radon in homes (inhaled)[b]	200
Other Background Radiation[b]	
Diagnostic x rays and nuclear medicine	53
Weapons test fallout	<1
Air travel	1
Consumer and industrial products	10
Total	363

[a] Derived from information given in WSRC 1994d.
[b] NCRP 1987a. Value for radon is an average for the United States.

Based on a dose-to-risk conversion factor of 500 cancer deaths per 1 million person-rem (5.0×10^{-4} fatal cancer per person-rem) to the public (appendix E), the fatal cancer risk to the maximally exposed member of the public from radiological releases from SRS operations in 1993 is estimated to be approximately 1.6×10^{-7}. That is, the estimated probability of this person dying of cancer at some point in the future from radiation exposure associated with 1 year of SRS operations is less than 2 chances in 10 million. (Note that it takes several to many years from the time of exposure to radiation for a cancer to manifest itself.)

Based on the same conversion factor, 1.1×10^{-2} excess fatal cancers are projected in the population living within 80 km (50 mi) of SRS from normal operation in 1993. To place this number into perspective, it can be compared with the number of fatal cancers expected in this population from all causes. The 1990 mortality rate, associated with cancer, for the entire

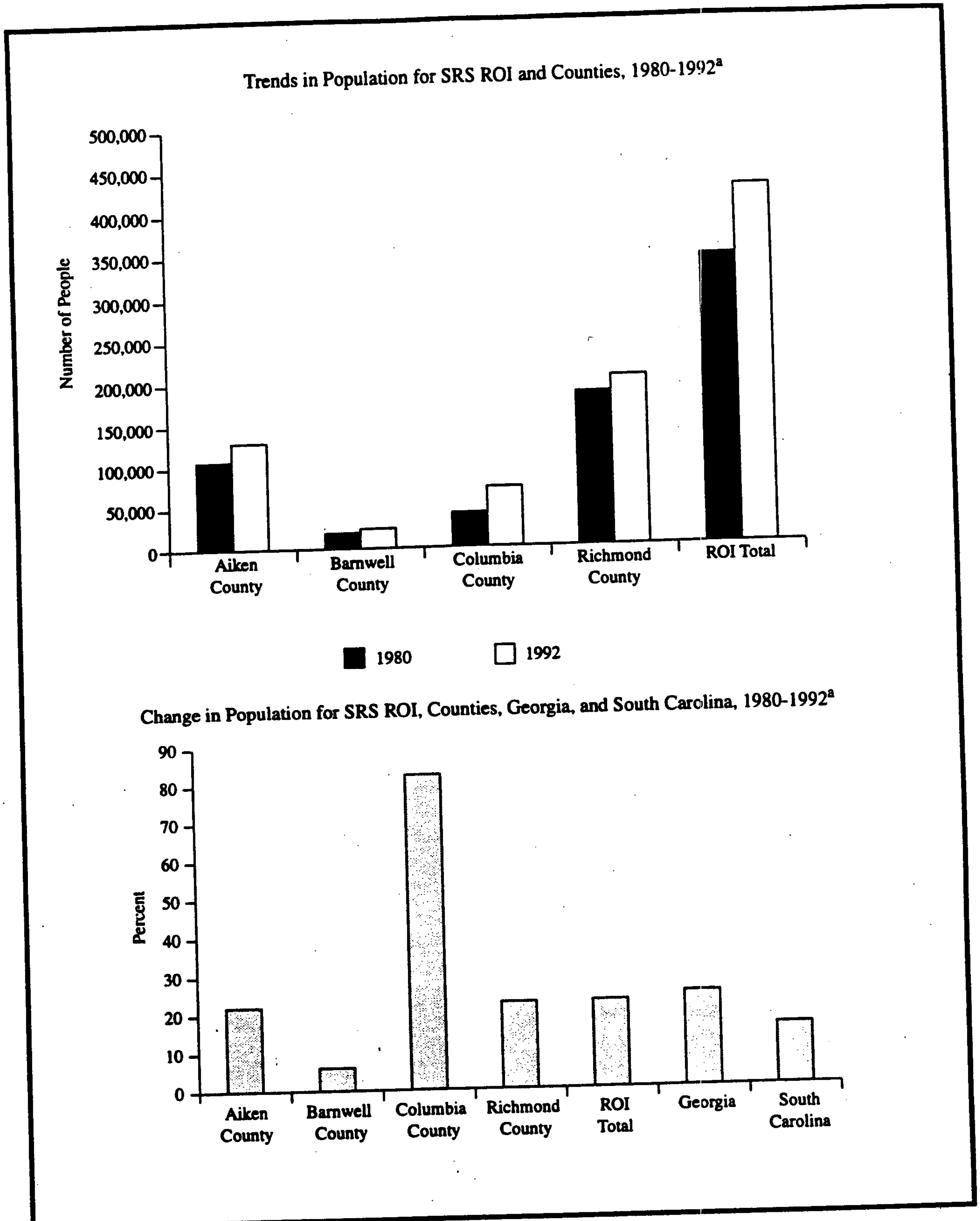
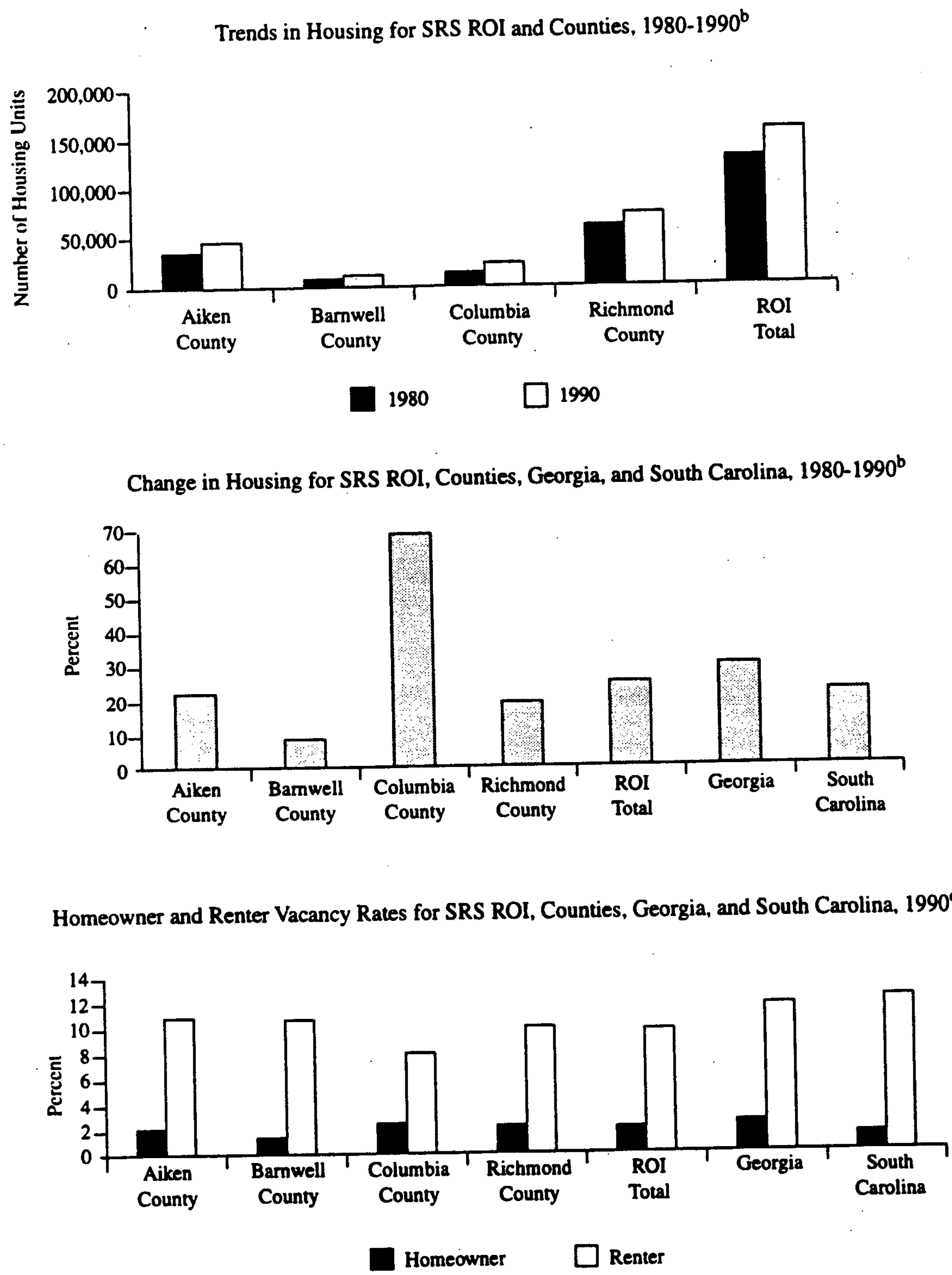


FIGURE 4.3.2.8–3.—*Population and Housing for the Savannah River Site Region of Influence* **[Page 1 of 2].**



[a] Census 1983b; Census 1983c; Census 1993c; Census 1993e.
[b] Census 1982c; Census 1982j; Census 1991a; Census 1991b.
[c] Census 1991a; Census 1991b.

FIGURE 4.3.2.8–3.—*Population and Housing for the Savannah River Site Region of Influence* [Page 2 of 2].

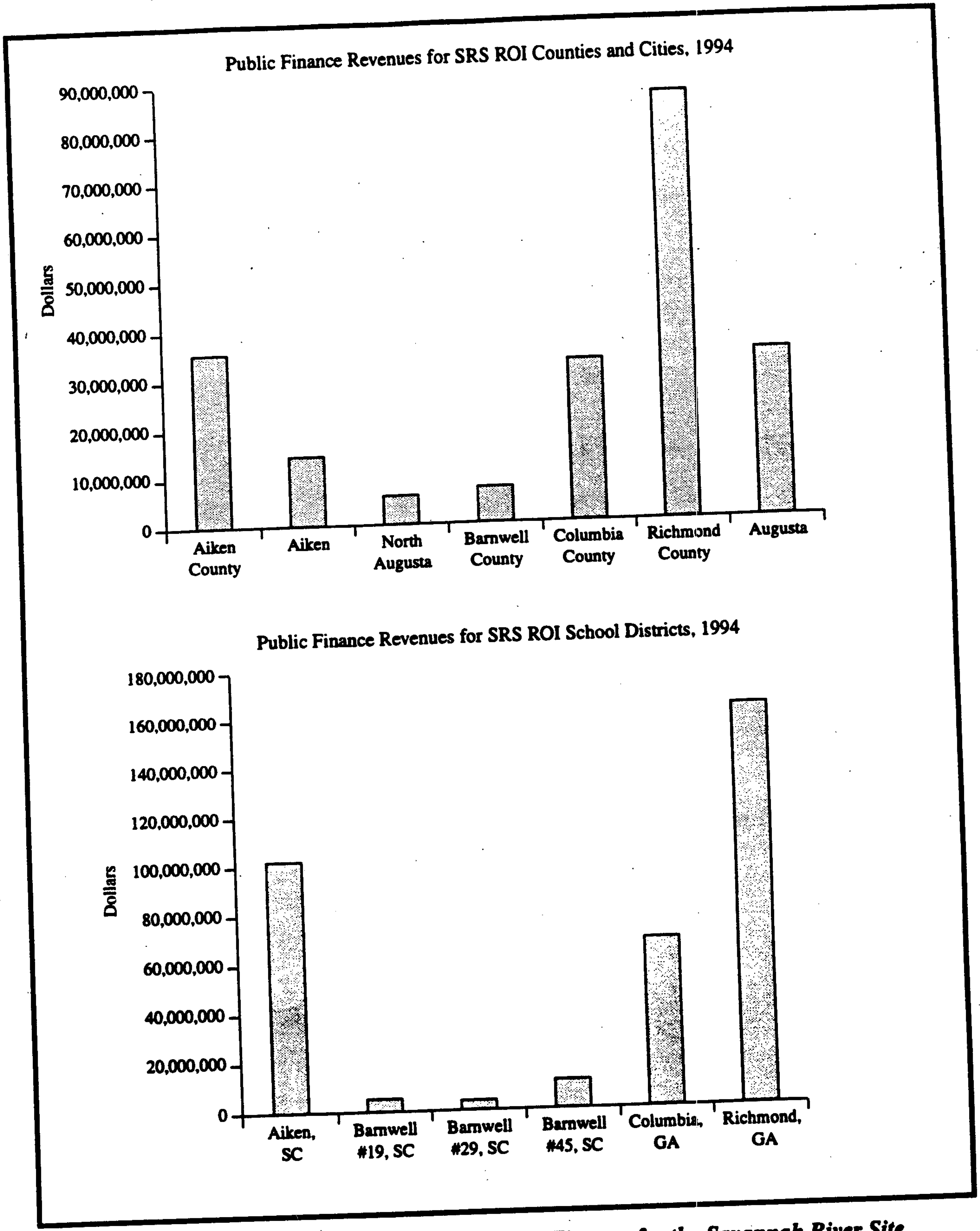
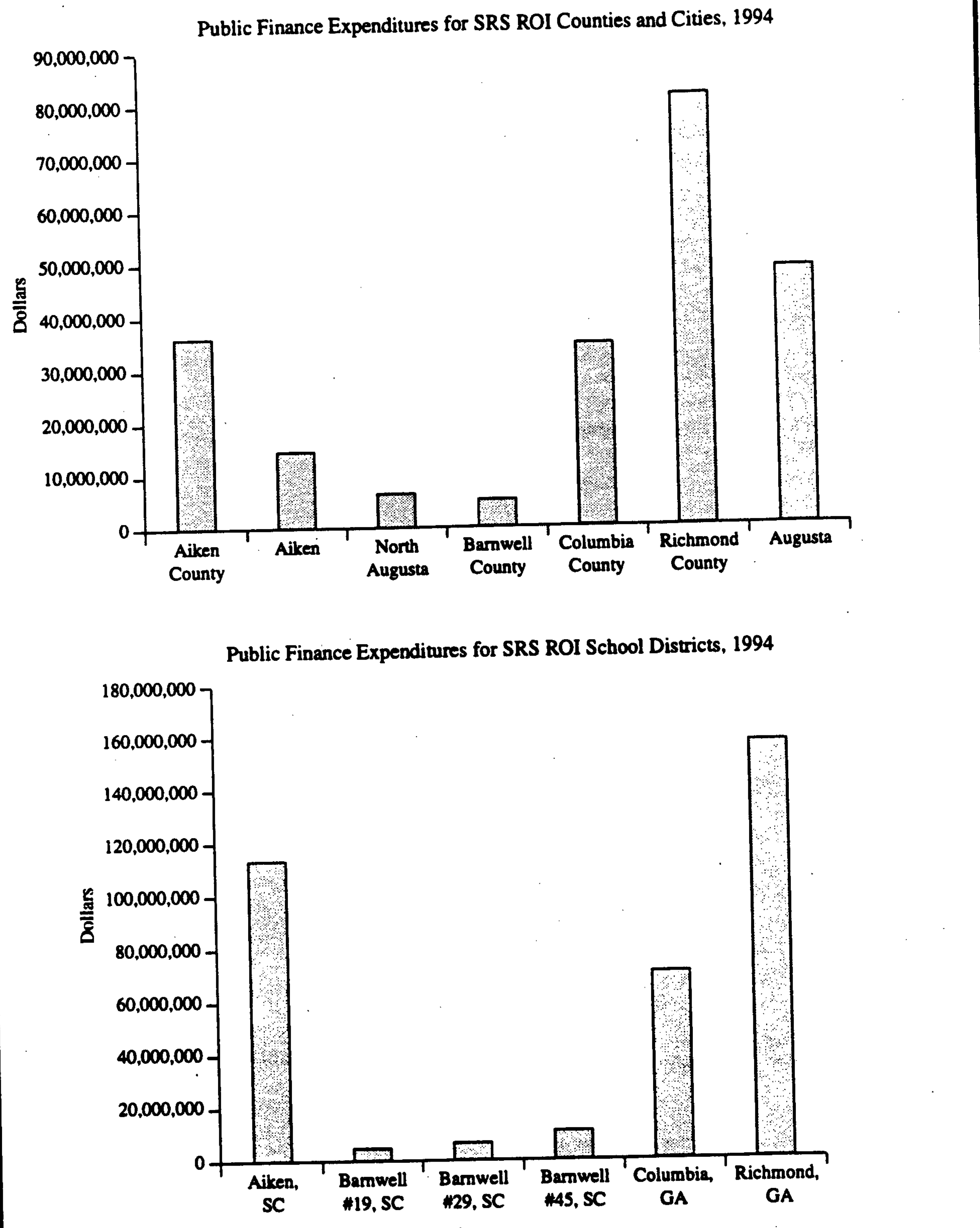


FIGURE 4.3.2.8–4.—*Local Government Public Finance for the Savannah River Site Region of Influence* [Page 1 of 2].



Source: SR City 1995a; SR County 1995a; SR School 1995b.

FIGURE 4.3.2.8–4.—*Local Government Public Finance for the Savannah River Site Region of Influence* [Page 2 of 2].

TABLE 4.3.2.9–2.—*Doses to the General Public from Normal Operation at Savannah River Site, 1993 (Committed Effective Dose Equivalent)*

Affected Environment	Atmospheric Releases		Liquid Releases		Total	
	Standard[a]	Actual	Standard[a]	Actual[b]	Standard[a]	Actual
Maximally exposed individual (mrem)	10	0.18	4	0.14	100	0.32
Population within 80 kilometers[c] (person-rem)	None	20.0	None	1.5	100	21.5
Average individual within 80 kilometers[d] (mrem)	None	0.032	None	0.003	None	0.035

[a] The standards for individuals are given in DOE Order 5400.5. As discussed in that order, the 10 mrem per year limit from airborne emissions is required by the CAA, the 4 mrem per year limit is required by the SDWA, and the total dose of 100 mrem per year is the limit from all pathways combined. The 100 person-rem value for the population is given in proposed 10 CFR 834 (58 FR 16268).

[b] The actual dose value conservatively includes all water pathways, not just the drinking water pathway. The population dose includes contributions to Savannah River users downstream of SRS to the Atlantic Ocean.

[c] In 1993, this population was approximately 620,100.

[d] Obtained by dividing the population dose by the number of people living within 80 km (50 mi) of the site.

Source: WSRC 1994d.

U.S. population was 0.2 percent per year (Almanac 1993a:839). Based on this national mortality rate, the number of fatal cancers from all causes expected during 1993 in the population living within 80 km (50 mi) of SRS was 1,240. This number of expected fatal cancers is much higher than the estimated 1.1×10^{-2} fatal cancers that could result from SRS operations in 1993.

Workers at SRS receive the same dose as the general public from background radiation, but also receive an additional dose from working in the facilities. Table 4.3.2.9–3 includes the average, maximum, and total occupational doses to SRS workers from operations in 1993. These doses fall within radiological limits (10 CFR 835). Based on a dose-to-risk conversion factor of 400 fatal cancers per 1 million person-rem (4.0×10^{-4} fatal cancers per person-rem) among workers (appendix E), the number of excess fatal cancers to SRS workers from operations in 1992 is estimated to be 0.14.

A more detailed presentation of the radiation environment, including background exposures and radiological releases and doses, is presented in the *Savannah River Site Environmental Report for 1993* (WSRC-TR-94-075). The concentrations of radioactivity in various environmental media (e.g., air, water, and soil) in the onsite and offsite regions are also presented in this reference.

TABLE 4.3.2.9–3.—*Doses to the Onsite Worker from Normal Operation at Savannah River Site, 1993*

Affected Environment	Onsite Releases and Direct Radiation	
	Standard[a]	Actual[b]
Average worker (mrem)	None	17.9
Maximally exposed worker (mrem)	5,000	3,000
Total workers (person-rem)	None	350

[a] 10 CFR 835. DOE's goal is to maintain radiological exposures as low as reasonably achievable.

[b] DOE 1993n:7. The number of badged workers in 1992 was approximately 19,500.

Chemical Environment. The background chemical environment important to human health consists of the atmosphere, which may contain toxic chemicals that can be inhaled; drinking water, which may contain toxic chemicals that can be ingested; and other environmental media with which people may come in contact (e.g., soil through direct contact or via the food pathway). The baseline data for assessing potential health impacts from the chemical environment are presented in sections 4.3.2.3 and 4.3.2.4.

Adverse health impacts to the public can be minimized through administrative and design controls to decrease hazardous chemical releases to the environment and to achieve compliance with permit requirements (i.e., air emissions and NPDES permit requirements). The effectiveness of these controls is verified by using monitoring information and inspecting mitigation measures. Health impacts to the public may occur during normal operation at SRS via inhalation of air containing hazardous chemicals released to the atmosphere by SRS operations. Contaminated drinking water and direct exposure may also put public health at risk.

Baseline air emission concentrations for hazardous air pollutants and their applicable standards are presented in section 4.3.2.3. These concentrations are estimates of the highest existing offsite concentrations and represent the highest concentrations to which members of the public could be exposed. These concentrations are compared with applicable guidelines and regulations. Information about estimating health impacts from hazardous chemicals is presented in appendix E.

Exposure pathways to SRS workers during normal operation may include inhaling the workplace atmosphere, drinking SRS potable water, and other possible contacts with hazardous materials associated with work assignments. The potential for health impacts varies from facility to facility and from worker to worker, and there is not enough information available to allow a detailed estimation and summation of these impacts. However, the workers receive appropriate training, protective equipment, monitoring, and management controls to protect them from workplace-specific hazards. Workers are also protected by SRS adherence to OSHA and EPA occupational standards that limit concentrations of potentially hazardous chemicals in the workplace atmosphere and drinking water. Appropriate monitoring, which reflects the frequency and amounts of chemicals used in the operation processes, ensures that these standards are not exceeded. Additionally, DOE requirements ensure that conditions in the workplace are as free as possible from recognized hazards that cause or are likely to cause illness or physical harm. Therefore, worker health conditions at SRS are expected to be substantially better than required by the standards.

Health Effects Studies. Two published epidemiological studies have been conducted on the general population in communities surrounding SRS. A study conducted in 1984 of the population living within 80 km (50mi) of SRS found no excess risk of any type of cancer or other diseases compared with the reference population. A statistically significant excess in leukemia deaths was observed among hourly workers at SRS employed at least 5 years, but less than 15 years. For a more detailed description of the studies reviewed and the findings, refer to appendix section E.4.

Accident History. From 1974 to 1988, there was a series of releases from the tritium facilities at SRS. These releases have been traced to aging equipment in the tritium processing facility and are one of the reasons for constructing a replacement tritium facility at SRS. A detailed description and study of these incidents and their consequences to the offsite population has been documented by SRS. Between 1974 and 1988, there were 13 inadvertent tritium releases. The most significant releases were in 1981, 1984, and 1985 when 32,934; 43,800; and 19,403 curies of tritiated water vapor, respectively, were released (WSRC 1991a:4). In the period between 1989 and 1992, there were 20 inadvertent releases, all with little or no offsite dose consequences. The largest of these recent releases occurred in 1992 when 12,000 curies (Ci) of tritium were released. In 1993, an inadvertent release of plutonium-238 and -239 took place. Westinghouse Savannah River Corporation emergency response models estimated a hypothetical exposure of 0.0019 mrem at the site boundary (WSRC 1994d:182).

Emergency Preparedness. Each DOE site has established an emergency management program that would be activated in the event of an accident. This program has been developed and maintained to ensure adequate response for most accident conditions and to provide response efforts for accidents not specifically considered. The emergency management program incorporates activities associated with emergency planning, preparedness, and response. The Emergency Preparedness Facility at SRS provides overall direction and control for onsite responses to emergencies and coordinates with Federal, state, and local agencies and officials on the technical aspects of the emergency.

The SRS Emergency Operations Facility consists of several centers, described below, that provide distinct emergency response support functions. The SRS Operations Center coordinates the initial response to all SRS emergencies and is equipped to function as the heart of SRS's emergency response communications network. The Technical Support Center provides command and control of emergency response activities for the affected facility or operational area. The Emergency Operations Center provides command and control of emergency response activities for SRS locations outside of the affected area. The Security Management Center coordinates activities relating to the security and safeguarding of materials by providing security staff in the affected area and contractor management in the Emergency Operations Center. The Dose Assessment Center is responsible for assessing the health and environmental consequences of any airborne or aqueous releases of radioactive or toxic chemicals and recommends onsite and offsite protective actions to other centers.

4.3.2.10 *Waste Management*

This section outlines the major environmental regulatory structure and ongoing waste management activities at SRS. A more detailed discussion of ongoing waste management operations is provided in appendix section H.2.2.

DOE is working with Federal and state regulatory authorities to address compliance and cleanup obligations arising from its past operations at SRS. DOE is engaged in several activities to bring its operations into full regulatory compliance. These activities are set forth in negotiated agreements that contain schedules for achieving compliance with applicable requirements and financial penalties for nonachievement of agreed upon milestones. These agreements have been reviewed to assure the proposed action is allowable under the terms of these agreements.

EPA has placed SRS on the NPL and has identified approximately 150 potential operable units. In accordance with CERCLA, DOE entered into a Federal Facility Agreement with EPA and the State of South Carolina, effective January 15, 1993, to coordinate cleanup activities at SRS under one comprehensive strategy. The Federal Facility Agreement, titled the RCRA Facility Investigation Remedial Investigation Program Plan, combines the RCRA Facility Investigation Program Plan under RCRA with a CERCLA cleanup program.

SRS has an aggressive waste minimization program in progress to vastly improve the operation of existing and planned liquid and solid waste generation, treatment, and storage facilities. A disciplined approach to these activities is being developed based on technology and experience from the commercial nuclear industry. This approach has already reduced the generation of TRU waste by 48 percent, LLW by 13 percent, mixed waste by 96 percent, and hazardous waste by 58 percent (DOE 1993e:I-18). SRS generates and manages the following waste categories: high-level, TRU, low-level, mixed, hazardous, and nonhazardous. A discussion of the waste management operations associated with each of these categories follows.

High-Level Waste. Liquid HLW at SRS is made up of many waste streams generated during the recovery and purification of TRU products and unburned fissile material from spent reactor fuel elements. In 1993, SRS generated approximately 1,561 m^3 (412,400 gal) of liquid HLW (SR DOE 1994c:4). As illustrated in appendix figure H.2.2–1, these wastes are separated by waste form, radionuclide, and heat content prior to their transfer to underground storage tanks in F- and H-Area tank farms. Processes that treat liquid HLW include separation, evaporation, and ion exchange. Evaporation produces a cesium-contaminated condensate. Cesium is removed from the condensate, resulting in a LLW stream which is treated in the F/H-Area Effluent Treatment Facility. The remaining HLW stream salts are precipitated, and some can be decontaminated. The resulting decontaminated salt solution is sent with residues from the F/H-Area Effluent Treatment Facility to the Defense Waste Processing Z-Area Saltstone Facility where it is mixed with a blend of cement, fly ash, and blast furnace slag to form grout. The grout is pumped into disposal vaults where it hardens for permanent disposal as solid LLW. The remaining high-level salt and sludge will be permanently immobilized as a glass solid cast in stainless steel containers at the Defense Waste Processing Facility Vitrification Plant. The stainless-steel containers will be decontaminated to DOT standards, welded closed, and temporarily stored onsite for eventual transport to and disposal in a permanent Federal repository.

Future HLW generation would result from processing and stabilization of spent fuel sent to SRS for long-term storage as a result of 61 FR 9441 (published in the *Federal Register* on March 8, 1996), or from remediation or material recovery activities performed in F- and H-Canyons.

Transuranic Waste. Under the Federal Facility Compliance Agreement on RCRA Land Disposal Restrictions signed by EPA and DOE on March 13, 1991, SRS is required to prepare TRU waste for shipment. SRS will begin discussions with the South Carolina Department of Health and Environmental Control on alternative treatment options in January 1998 if the Secretary of Energy does not decide to operate the Waste Isolation Pilot Plant (WIPP) by that time. If a delayed opening date for WIPP is determined, DOE will propose modifications to the SRS Site Treatment Plan for approval by the State of South Carolina. Status on the WIPP readiness schedule will be included in these modifications. Certified TRU waste is stored on TRU waste storage pads until it can be shipped to WIPP, once that facility can demonstrate compliance with the requirements of 40 CFR 191 and 40 CFR 268, or to another TRU waste disposal facility should WIPP prove unsatisfactory. Should additional treatment be necessary for disposal at WIPP, SRS would develop the appropriate treatment capability. In 1993, SRS generated no liquid TRU and 391 m^3 (511 yd^3) of solid TRU waste (SR DOE 1994c:4). All TRU waste currently generated is stored in containers on aboveground pads.

The Experimental TRU Waste Assay Certification Facility began operation in 1986 to certify newly generated TRU waste. It since has been shut down. A new TRU Waste Characterization/Certification Facility is planned and would provide extensive containerized waste processing and certification capabilities. The facility is needed to prepare TRU waste for treatment and to certify TRU waste for disposal at WIPP. Drums that can be certified for shipment to WIPP are placed in interim storage on concrete pads in E-Area. Buried and stored wastes containing concentrations of TRU nuclides between 10 and 100 nCi/g are referred to as alpha-contaminated LLW. This alpha-contaminated LLW is managed like TRU waste because its physical and chemical properties are similar, and because similar procedures will be used to determine its final disposition. Because all of the TRU waste placed on the aboveground pads prior to January 1990 is suspected of having hazardous constituents, a RCRA Part B permit application has been submitted for the TRU waste storage pads and the Experimental TRU Waste Assay/Certification Facility. The waste is currently being stored under RCRA interim status.

Low-Level Waste. The bulk of liquid LLW is aqueous process waste including effluent cooling water, decontaminated salt solutions, purge water, water from storage basins for irradiated reactor fuel or target elements, distillate from the evaporation of process waste streams, and surface water runoff from areas where there is a potential for radioactive contamination. Liquids are processed to remove and solidify the radioactive constituents and to release the balance of the liquids to permitted discharge points within standards established by the regulatory permit. Solid LLW includes operating plant and laboratory waste, contaminated equipment, reactor and reactor fuel hardware, irradiated targets, and spent deionizer resin from reactor coolant treatment. For 1993, SRS generated approximately 14,100 m^3 (18,440 yd^3) of solid LLW (SR DOE 1994c:4). Solid LLW is separated by radiation levels into low and intermediate categories. Solid LLW that radiates less than 200 mrem/hr at 5 cm (1.97 in) from the unshielded container is considered low-activity waste. If it radiates greater than 200 mrem/hr at 5 cm (1.97 in), it is considered intermediate-activity waste. Intermediate activity tritium waste is intermediate-activity waste with greater than 10 Ci of tritium per container. The disposal mode for solid LLW is disposal in earthen trenches and concrete vaults. Saltstone generated in the solidification of decontaminated salts extracted from HLW is disposed of as LLW in separate vaults, and is the highest volume of solid LLW disposed of at SRS. Disposal facilities are projected to meet solid LLW storage requirements, including LLW from offsite DOE facilities such as Pinellas, for the next 20 years.

Mixed Low-Level Waste. In 1993, SRS generated an estimated 115 m^3 (30,380 gal) of liquid mixed and 18 m^3 (24 yd^3) of solid mixed LLW (SR DOE 1994c:4). The Federal Facility Compliance Agreement signed by EPA and DOE on March 13, 1991, addresses SRS compliance with RCRA land disposal restrictions pertaining to past, ongoing, and future generation of mixed LLW (mostly solvents, dioxin, and California List wastes contaminated with tritium). SRS is allowed to continue to operate, generate, and store mixed wastes subject to land disposal restrictions. In return, SRS will report to EPA the characterization of all solid waste streams disposed of in land disposal units at SRS and has submitted its waste minimization plan to EPA for review. Schedules for measures to provide compliance through construction of the Consolidated Incineration Facility and the Hazardous Waste/Mixed Waste Storage Facility are included in the Federal Facility Compliance Agreement.

The Consolidated Incineration Facility will treat mixed LLW and hazardous waste. The hazardous waste/mixed waste disposal vaults are scheduled to be available in 2002. Mixed waste is currently placed in interim storage in the E-Area Solid Waste Disposal Facility and in two buildings in G-Area. These RCRA-permitted facilities will be used until completion of the Consolidated Incineration Facility and the Hazardous Waste/Mixed Waste Storage Facility. The *Federal Facility Compliance Act* of 1992 requires DOE facilities storing mixed wastes to develop site-specific treatment plans and to submit the plans for approval. The Federal Facility Compliance Agreement formed the basis for the SRS proposed site treatment plan.

Hazardous Waste. In 1993, SRS generated approximately 74 m^3 (97 yd^3) of hazardous wastes (SR DOE 1994c:4). Lead, mercury, cadmium, 1,1,1-trichloroethane, leaded oil, trichlorotrifluoroethane, benzene, and paint solvents are typical additional hazardous wastes generated at SRS. All hazardous wastes are stored onsite in RCRA- and DOT-approved containers in three RCRA-permitted hazardous waste storage buildings on three interim status storage pads in B- and N-Areas. Most of the waste is shipped offsite to commercial RCRA-permitted treatment and disposal facilities using DOT-certified transporters. Eight to 9 percent of the hazardous waste (organic liquids, sludge, and debris) will be incinerated in the Consolidated Incineration Facility. Hazardous chemicals are stripped from aqueous liquids collected during groundwater monitoring in the M-Area Air Stripper, with the treated wastewater discharged in accordance with NPDES criteria.

Nonhazardous Waste. In 1993, SRS generated an estimated 700,000 m^3 (184,900,000 gal) of liquid and 6,670 m^3 (8,720 yd^3) of solid sanitary wastes (SR DOE 1994c:4). In 1994, the centralization and upgrading of the sanitary wastewater collection and treatment systems at Savannah River were completed. The program included the replacement of 14 of 20 aging treatment facilities scattered across the site with a new 3,975 m^3/day (1.05 million gallons per day [MGD]) central treatment facility connecting them with a new 28.9-km (18-mi) primary sanitary collection system. The collection system intercepts wastewater at points prior to discharge into old sanitary wastewater treatment facilities.

The new Central Treatment Facility treats sanitary wastewater by the extended aeration activated sludge process utilizing the oxidation ditch method. The treatment facility separates the wastewater into two forms, clarified effluent and sludge. The liquid effluent is further treated by nonchemical methods of ultraviolet light disinfection to meet NPDES discharge limitations. The sludge goes through a volume reduction process to reduce pathogen levels to meet proposed land application criteria (40 CFR 503). The remaining existing sanitary wastewater treatment facilities are being upgraded as necessary to meet demands by replacing existing chlorination treatment systems with nonchemical ultraviolet light disinfection systems to meet NPDES limitations. Municipal solid waste generated at SRS is sent to a permitted offsite disposal facility. DOE is evaluating a proposal to participate in an interagency effort to establish a regional solid waste management center at SRS.

SRS addressed the offsite shipments in *Environmental Assessment for the Transportation and Disposal of Savannah River Site Generated Municipal Solid Waste at an Off-Site Disposal Facility* (DOE/EA-0989, August 1994) and described the environmental impacts of a regional center in *Environmental Assessment for the Construction and Operation of the Three Rivers Authority Waste Management Center at the Savannah River Site* (DOE/EA-1079, October 1995).

4.3.3 Environmental Impacts

4.3.3.1 *Land Resources*

No Action. Under No Action, DOE would continue current and planned activities at SRS as described in section 3.2.3. No additional land use impacts are anticipated at SRS beyond the effects of existing and future activities which are independent of the proposed action.

Management Alternatives

Pit Fabrication. Existing facilities at H- and F-Areas, would be modified to support the pit fabrication mission at SRS. The total facility building space affected during modification would be approximately 23,226 m^2 (250,002 ft^2). No additional land would be used to implement the new mission at SRS. The temporary use of approximately 2 ha (5 acres) for equipment and material laydown and construction worker parking would be needed. Existing vacant building space and developed areas would be used for these activities. Operation of the pit fabrication facilities would be compatible with and would not affect existing or proposed future land use at SRS. No land use impacts are expected.

Sensitivity Analysis. SRS would be able to accommodate all operations and support functions for pit fabrication with modification of existing facilities. Modification of the existing facilities would be sufficient to maintain capacity for both the high and low case production scenarios.

Potential Mitigation Measures. No mitigation measures are anticipated.

4.3.3.2 *Site Infrastructure*

The pit fabrication mission at SRS would require modifications to existing facilities in H- and F-Areas. The existing SRS infrastructure would be capable of supporting the new mission without major modifications. A comparison of site infrastructure and facilities resource changes for the No Action and the pit fabrication alternative is shown in table 4.3.3.2–1.

No Action. SRS would continue current operations as described in section 3.2.3. Site infrastructure requirements under No Action are not expected to change from current usage. Additional impacts to the site infrastructure from No Action are not expected.

Management Alternatives

Pit Fabrication. Existing buildings in H- and F-Areas would be modified to support the pit fabrication activities. The SRS infrastructure would be capable of supporting the pit fabrication activities without major modifications. Adequate electrical energy is available at the site and from the regional power grid. The pit fabrication activities would increase electric power, oil, and coal use by 2 percent or less over No Action and be well within available resource supplies for the site.

Sensitivity Analysis. For the high stockpile size case, the size of the facility would have to be increased

TABLE 4.3.3.2–1.—*Site Infrastructure Requirements and Changes for Stockpile Management Alternatives at Savannah River Site*

Alternative	Electrical: Energy (MWh/yr)	Electrical: Peak Load (MWe)	Fuel: Liquid (L/yr)	Fuel: Gas (m^3/yr)	Fuel: Coal (t/yr)
Current Resources	659,000	130	28,400,000	NA	210,000
No Action (2005)					
Total site requirement	659,000	130	28,400,000	NA	210,000
Change from current resources	0	0	0	NA	0
Pit Fabrication					
Total site requirement	668,700	131.6	28,428,400	NA	211,090
Change from No Action	9,700	1.6	28,400	NA	1,090

Note: NA - not applicable.
Source: DOE 1995p; WSRC 1995c.

slightly, resulting in a minor impact to the SRS infrastructure. The low stockpile case is adequately covered by the capability-based capacity of the base case facility.

Potential Mitigation Measures. No mitigation measures are anticipated.

4.3.3.3 *Air Quality*

No Action. No Action air quality utilizes estimated air emissions data from operations at SRS in 2005, assuming continuation of current site missions, to calculate pollutant concentrations at or beyond the SRS site boundary. The emission rates for criteria and toxic/hazardous pollutants for No Action are presented in appendix table B.3.3–1. Table 4.3.3.3–1 presents the No Action pollutant concentrations calculated from the 2005 emission rates. In this table, pollutant concentrations are compared with applicable Federal and state regulations and guidelines. Concentrations are expected to remain within these standards.

Management Alternatives

Pit Fabrication. Gaseous emissions of criteria air pollutants would be generated from the pit fabrication mission. These emissions would result from the combustion of fossil fuel for generation of electricity and steam. The emission rates for criteria pollutants for the pit fabrication mission are presented in appendix section B.3.3. Table 4.3.3.3–1 presents the concentrations of criteria and toxic/hazardous pollutants resulting from No Action combined with those generated from operation of the pit fabrication mission. The resulting concentrations of criteria and toxic/hazardous pollutants are expected to be within Federal and state regulations and guidelines.

Sensitivity Analysis. Impacts to air quality from either the low or high case scenario of the pit fabrication alternative would result in higher and lower concentrations of criteria and toxic/hazardous pollutants for the high and low cases, respectively. The concentrations of pollutants for both cases are expected to remain within applicable Federal and state regulations and guidelines.

Potential Mitigation Measures. No mitigation measures are required for the pit fabrication alternative at SRS.

4.3.3.4 *Water Resources*

Environmental impacts associated with the construction and operation of the potential stockpile management facilities at SRS could affect surface and groundwater resources. The proposed facilities would be located outside the 100-year floodplain. The location of the 500-year floodplain at SRS is undefined; however, a site-specific assessment would be required before implementing the pit fabrication mission at SRS. Groundwater would be used for construction and operation of the facilities. A description of the functions to be transferred to SRS is presented in section 3.2.3. Table 4.3.3.4–1 presents existing surface and groundwater resources and the potential impact of the alternatives. The total site water resource requirements for each alternative including No Action are displayed in this table.

Surface Water

No Action. Under No Action, no additional impacts to surface water resources are anticipated beyond the effects of existing and future activities, which are independent of and unaffected by the proposed action. No construction or modification activities would occur; therefore, no additional construction water would be required or discharged. During operation, wastewater discharged to surface waters would decrease 3 MLY (0.79 MGY) from the current discharge rate of 703 MLY (186 MGY). The No Action discharges listed in table 4.3.3.4–1 include projected wastewater discharges from the proposed tritium supply facility. As a result of a reduction in discharges to site streams, water quality may improve.

Management Alternatives

Pit Fabrication. Due to the location of the proposed pit fabrication and intrusive modification pit reuse mission, the stream most likely to receive surface water discharge during modification activities and operation is Fourmile Branch. Figure 4.3.2.4–1 shows

TABLE 4.3.3.3–1.—***Estimated Concentrations of Pollutants from No Action and Stockpile Management Alternatives at Savannah River Site***

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines (μg/m³)	2005 No Action (μg/m³)	Pit Fabrication (μg/m³)
Criteria Pollutant				
Carbon monoxide	8-hour	10,000[a]	22	22.9
	1-hour	40,000[a]	171	175.4
Lead	Calendar quarter	1.5[a]	0.0004	0.0004
Nitrogen dioxide	Annual	100[a]	5.7	6.4
Ozone	1-hour	235[a]	[b]	[b]
Particulate matter	Annual	50[a]	3	3
	24-hour	150[a]	50.6	51.5
Sulfur dioxide	Annual	80[a]	14.5	14.8
	24-hour	365[a]	196	211.6
	3-hour	1,300[a]	823	923.9
Mandated by South Carolina				
Gaseous fluorides (as hydrogen fluoride)	30-day	0.8[c]	0.09	0.09
	7-day	1.6[c]	0.39	0.39
	24-hour	2.9[c]	1.04	1.04
	12-hour	3.7[c]	1.99	1.99
Total suspended particulates	Annual	75[c]	12.6	12.6
Hazardous and Other Toxic Compounds				
Acrolein	24-hour	1.25[c]	0.016	0.016
Benzene	24-hour	150	31.711	31.711
Bis (chloromethyl) ether	24-hour	0.03[c]	0.002	0.002
Cadmium oxide	24-hour	0.25[c]	0.021	0.021
Chlorine	24-hour	75[c]	7.630	7.630
Chloroform	24-hour	250[c]	4.957	4.957
Cobalt	24-hour	0.25[c]	0.206	0.206
3,3-Dichlorobenzidene	24-hour	0.15[c]	0.002	0.002
Formic acid	24-hour	225[c]	2.420	2.420
Manganese	24-hour	25[c]	0.821	0.821
Mercury	24-hour	0.25[c]	0.014	0.014
Nickel	24-hour	0.50[c]	0.271	0.271
Nitric acid	24-hour	125[c]	50.960	50.960
Parathion	24-hour	0.50[c]	0.007	0.007
Phosphoric acid	24-hour	25[c]	0.462	0.462

[a] Federal and state standard.
[b] No monitoring data available, concentration assumed to be less than applicable standards.
[c] State standard or guideline.
Source: 40 CFR 50; SC DHEC 1991a; SC DHEC 1992b; SR DOE 1995b; WSRC 1995c.

TABLE 4.3.3.4–1.—*Potential Changes to Water Resources from Stockpile Management Alternatives at Savannah River Site*

Affected Resource Indicator	No Action Single-Shift Operation 2005	Pit Fabrication Three-Shift Operation
Construction		
Water Availability and Use		
Water source	Ground	Ground
Total site water operation requirements[a] (MLY)	0[b]	13,255
Percent change from No Action water use (13,249 MLY)	NA	0.05
Water Quality		
Wastewater discharge to surface waters[c] (MLY)	0[b]	703
Percent change from No Action wastewater discharge (700 MLY)	NA	0.4
Operation		
Water Availability and Use		
Water source	Ground	Ground
Total site water operation requirement (MLY)	13,249	13,295
Percent change from No Action water use	NA	0.35
Percent change from current use (12,490 MLY)	6	6
Water Quality		
Wastewater discharge to surface waters[c] (MLY)	700	746
Percent change from No Action wastewater discharge (700 MLY)	0	6.6
Percent change from current wastewater discharge (703 MLY)	-0.4	6.1
Floodplain		
Actions in 100-year floodplain	NA	None
Actions in 500-year floodplain	NA	Uncertain

[a] Total water requirements for construction at SRS are based on a 5-year time period for pit fabrication.
[b] No construction water would be used or construction wastewater generated. Total site water use and wastewater discharged would be the same as No Action operation.
[c] All discharges to natural drainages require NPDES permits.
Note: NA - not applicable; MLY - million liters per year.
Source: SRS 1995a:1; WSRC 1995c.

F- and H-Areas and their location with respect to Fourmile Branch. During both modification and operation periods, the new Central Sanitary Treatment Facility at SRS would treat wastewater. During modification activities of the Pit Fabrication Facility, no surface water withdrawals would be made. Approximately 3 MLY (0.79 MGY) of treated sanitary wastewater would be released to surface water during the modification phase. During operation, approximately 46 MLY (12 MGY) of treated wastewater would be discharged. All discharges would be monitored to comply with NPDES permit limits and other discharge requirements. Impacts from runoff during construction and operation would be temporary and manageable.

Groundwater

No Action. Under No Action, no additional impacts to groundwater resources are anticipated beyond the effects of existing and future activities which are independent of and not affected by the proposed action. A description of the activities that would continue at SRS is discussed in section 3.2.3. No construction would occur under No Action; therefore, no additional groundwater for construction would be used. Groundwater withdrawals for operation of existing facilities and the proposed tritium supply facility at SRS are expected to increase from 12,490 MLY (3,300 MGY) to 13,249 MLY (3,500 MGY) by 2005.

Section 4.3.2.4 describes existing groundwater conditions at SRS.

Management Alternatives

Pit Fabrication. Approximately 6 MLY (1.58 MGY) of groundwater would be required for the 5-year building modification period. The additional construction water would represent less than a 0.05-percent increase over the projected SRS No Action groundwater withdrawal of 13,249 MLY (3,500 MGY). This amount, compared to the projected SRS No Action level, is not expected to cause a significant increase in drawdown. Groundwater required for modification activities and operation and the percent increase in projected water use are shown in table 4.3.3.4–1. Groundwater required for operation (13,295 MLY [3,512 MGY]) would represent a 0.35-percent increase over the projected groundwater withdrawal.

Groundwater Quality. During modification and operation of the pit fabrication facilities, there are no plans for direct discharge to groundwater. All discharges to surface waters would be monitored to comply with NPDES permit limits and other discharge requirements. As a result, impacts to groundwater quality at SRS are not expected.

Sensitivity Analysis. The effluent discharges to surface water resulting from the high case are expected to be similar to the volumes generated by the base case surge three-shift pit fabrication operation. The low case scenario would discharge a slightly higher volume of treated effluent compared to the No Action volume. Additional impacts to surface and groundwater quality from the high and low case production scenarios would be negligible.

Potential Mitigation Measures. The use of surface water instead of groundwater for potable water and operation of support facilities would reduce groundwater use.

4.3.3.5 *Geology and Soils*

Modification of existing facilities at SRS for pit fabrication would have no impact on geological resources. Hazards posed by geological conditions at SRS are minor. Building material laydown would use approximately 2 ha (5 acres) within existing developed areas in the immediate vicinity of the building modification activities. Potential changes to geology and soils associated with the pit fabrication alternative at SRS are discussed below.

No Action. Under No Action, DOE would continue existing and planned activities at SRS. Any impacts to geology and soils from No Action activities would be independent of and unaffected by the proposed action.

Management Alternatives

Pit Fabrication. No potential project impacts to geological conditions would be expected. Modification of existing facilities would be compatible with existing geological conditions. Based on the seismic history of the area, a low seismic risk exists at SRS and should not preclude safe modification and operation of the project facilities. All modifications to facilities would meet standards for earthquake-generated ground acceleration in accordance with DOE O 420.1 and accompanying safety guides.

Volcanic activity is not a factor anywhere in the region and is extremely unlikely to impact project activities. It is also highly unlikely that landslides, sinkhole development, or other nontectonic movements would affect project activities. Slopes and underlying foundation materials are stable. Potential health impacts from accidents associated with geological hazards are discussed in section 4.3.3.9.

Because modification activities would occur within existing structures, no adverse impacts to soils are anticipated. Although stormwater runoff could occur occasionally during building modification activities, soil impacts are not anticipated with standard construction erosion and sediment control measures. The properties and conditions of soils in the project area place no limitation on modification activities. No soil disturbance during operation is expected.

Sensitivity Analysis. The high or low case operation scenario would not affect geology and soils.

Potential Mitigation Measures. No mitigation measures are anticipated.

4.3.3.6 *Biotic Resources*

The following sections address impacts to terrestrial resources, wetlands, aquatic resources, and threatened and endangered species on SRS. Impacts to these resources are not expected from the proposed alternatives; however, noise and human presence could temporarily disturb wildlife.

No Action. Under No Action, the missions described in section 3.2.3 would continue at SRS. There would be no changes to current biotic resource conditions at the site as described in section 4.3.2.6.

Management Alternatives

Pit Fabrication. The pit fabrication mission at SRS would utilize existing facilities within the boundaries of the F- and H-Areas. Wastewater would be released through existing NPDES-permitted discharges. Operation of pit fabrication facilities at SRS would not be expected to impact biotic resources.

Sensitivity Analysis. Implementation of either a low or high case workload would not affect biological resources.

Potential Mitigation Measures. No mitigation measures are anticipated.

4.3.3.7 *Cultural and Paleontological Resources*

For the discussion of impacts, the term cultural resources includes prehistoric, historic, and Native American resources. Cultural and paleontological resources may be affected directly though ground disturbance, building modifications, visual intrusion of the project to the historic setting or environmental context of historic sites, visual and audio intrusions to Native American resources, reduced access to traditional use areas, and unauthorized artifact collecting and vandalism. The proposed alternatives involve only modifications to existing facilities and no ground disturbance. Some NRHP-eligible historic structures may be affected by the proposed action. Site-specific surveys and evaluations would be conducted in conjunction with tiered NEPA documentation. Because the proposed alternative involves only modifications to existing facilities, no impacts to prehistoric, Native American, or paleontological resources are anticipated. DOE has a Programmatic Agreement with the South Carolina SHPO and the Advisory Council on Historic Preservation to ensure that appropriate measures are taken to inventory, evaluate, protect, and enhance archaeological resources at SRS. An Archaeological Resources Management Plan is also in place.

No Action. Under No Action, DOE would continue the existing and planned missions at SRS described in section 3.2.3. Any impacts to cultural and paleontological resources from these missions would be independent of and unaffected by the proposed action.

Management Alternatives

Pit Fabrication. This alternative involves the modification of existing facilities in the F- and H-Areas. Existing developed areas would be used for equipment and material laydown and parking. None of the buildings to be modified under this alternative have been evaluated for NRHP eligibility. NRHP resources would be identified through project-specific surveys and evaluations. Any project-related effects to historic resources would be addressed in tiered NEPA documentation. No impacts to prehistoric, Native American, or paleontological resources are anticipated.

Sensitivity Analysis. The high and low case scenarios would have the same impacts to cultural and paleontological resources. The base case pit fabrication production facilities can accommodate both high and low case scenarios.

Potential Mitigation Measures. If NRHP-eligible sites cannot be avoided through project design or siting, and would be adversely affected, then a Memorandum of Agreement would need to be negotiated among DOE, the South Carolina SHPO, and the Advisory Council on Historic Preservation. The Memorandum of Agreement would formalize mitigation measures agreed to by these consulting parties. Mitigation measures could include describing and implementing intensive inventory and evaluation studies, data recovery plans, site treatments, and monitoring programs. The appropriate level of data recovery for mitigation would be determined through consultation with the South Carolina SHPO and the Advisory Council on Historic Preservation in accordance with Section 106 of the *National Historic Preservation Act*. Mitigation measures for specific

NRHP-eligible sites would be identified during tiered NEPA documentation.

4.3.3.8 *Socioeconomics*

No Action. Under No Action, the existing missions at SRS, as described in section 3.2.3, would continue. No new employment or in-migration of workers would be required. Projections for regional economy and employment rates, population and housing changes, and public finance characteristics are presented in appendix D.

Regional Economy and Employment. Total employment in the regional economic area is projected to grow approximately 1 percent annually between 1995 and 2000, reaching approximately 259,400 persons in the latter year. Between 2001 and 2020, employment is expected to increase by less than 1 percent annually, reaching approximately 315,800 persons. Site employment at SRS is expected to be 19,288 in 2005. Unemployment in the regional economic area was 6.7 percent in 1994 and is expected to remain at this level into the near future. Per capita income is projected to increase from approximately $17,789 to $23,041 between 1995 and 2030.

Population and Housing. Annual ROI county and city population and housing growth is projected to average about 1 percent between 1995 and 2000, and then slow to less than 1 percent. Annual increases between 2006 and 2030 are expected to be less than 1 percent. The ROI population is projected to increase from 447,300 in 1995 to 579,400 in 2030. The total number of housing units in the ROI is projected to increase from 168,900 in 1995 to 218,600 in 2030.

Public Finance. Between 2000 and 2005, all ROI county, city, and school district total revenues and expenditures are projected to increase at an annual average of 1 percent or less. These rates of increase should continue until 2030.

Management Alternatives

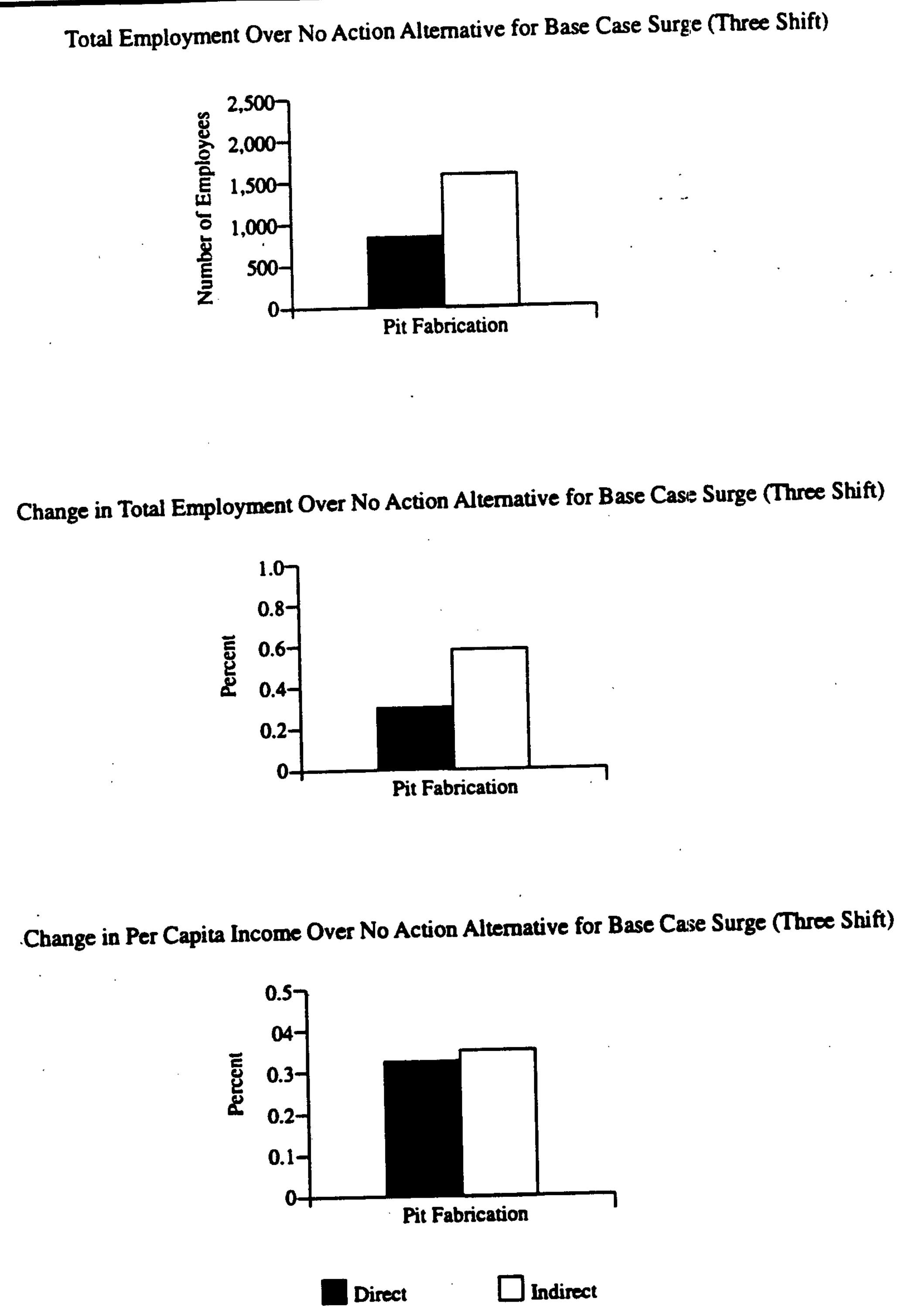
Pit Fabrication

Regional Economy and Employment. Modification-related activities for the Pit Fabrication Facility would require 288 direct workers during the peak construction year and would generate 228 additional indirect jobs in the regional economic area. Total employment for the SRS regional economic area would increase by less than 1 percent. This increase would reduce regional unemployment from 6.7 percent under No Action estimates to approximately 6.5 percent. Per capita income for the SRS regional economic area would increase very slightly over No Action projections as a result of modification activities for the Pit Fabrication Facility.

Facility operation-related employment at SRS would begin phasing in as the modification phase neared completion. Operation of the facility in the base case surge mode would require about 813 direct workers and would generate 1,594 additional indirect jobs in the regional economic area. As a result of the operation of the Pit Fabrication Facility, total employment for the SRS regional economic area would increase annually by slightly less than 1 percent. This increase would reduce unemployment from 6.7 percent under No Action estimates to approximately 6 percent. Per capita income for the SRS regional economic area would increase by less than 1 percent over No Action projections. Changes in employment and per capita income resulting from operation of the facility are shown in figure 4.3.3.8–1.

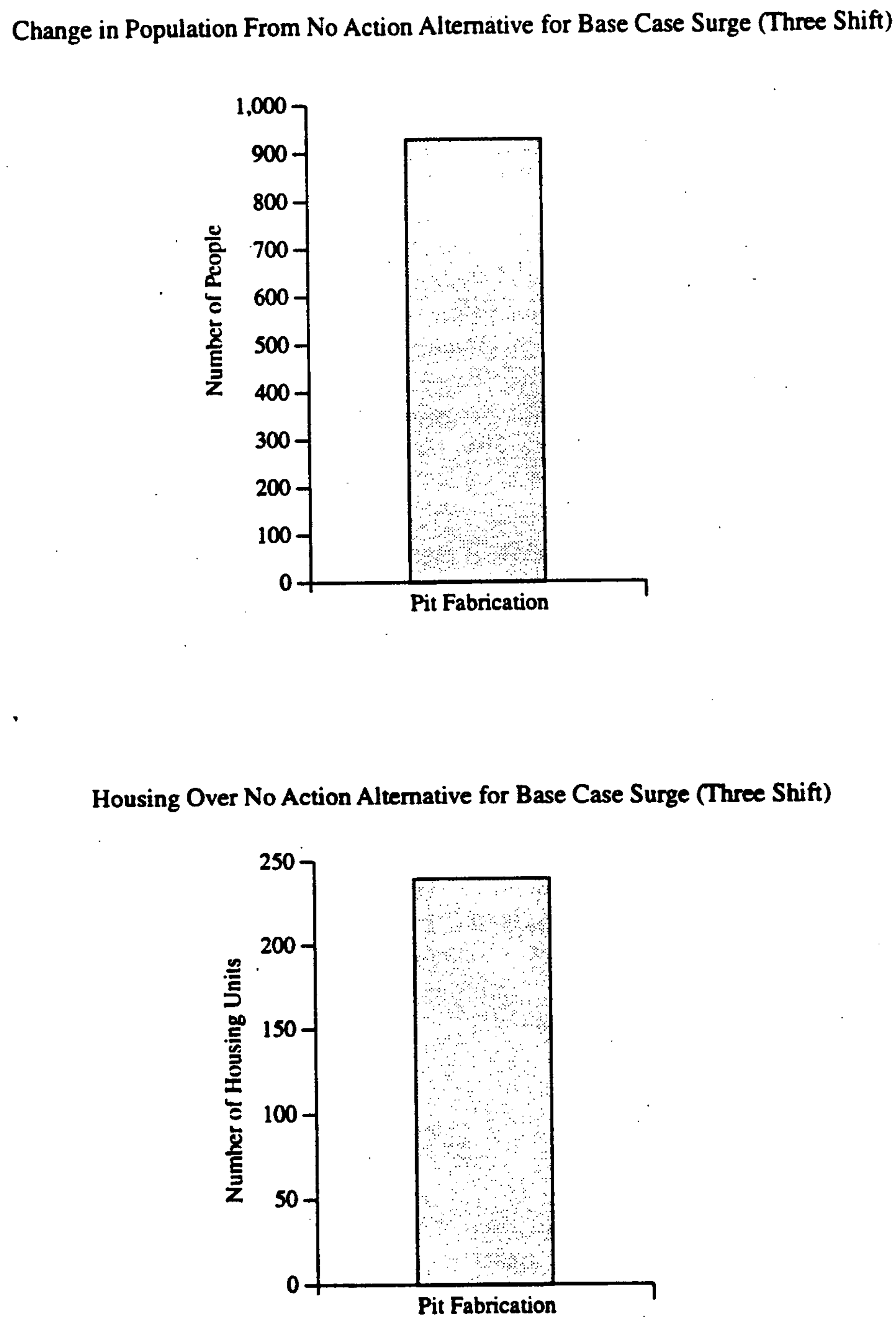
Population and Housing. Population in the SRS ROI during peak construction would not increase over No Action projections. Enough workers would be available in the regional economic area and ROI to fill all of the direct and indirect jobs created by the modification phase of the facility.

Projections indicate that there would not be enough available workers to fill all of the direct operation jobs. Up to 360 workers would in-migrate to fill vacant positions at the Pit Fabrication Facility. However, the actual number of in-migrating workers would likely be much lower due to downsizing activities at SRS that would make available some current SRS employees who might qualify for transfer to the Pit Fabrication Facility. ROI population and total housing units over No Action for full operation at SRS are shown in figure 4.3.3.8–2. If the maximum number of in-migrating workers were needed for full operation, about 240 additional housing units would however, need to be constructed over the No Action estimates. Based on past con-



Note: No Action projections are baseline for comparing proposed alternatives.
Source: Socio 1996b.

FIGURE 4.3.3.8–1.—***Employment and Income Changes Resulting from Management Alternatives in the Savannah River Site Regional Economic Area, 2005.***



Note: No Action projections are baseline for comparing proposed alternatives.
Source: Socio 1996b.

FIGURE 4.3.3.8–2.—*Population and Housing Changes Resulting from Management Alternatives in the Savannah River Site Region of Influence, 2005.*

struction rates, new construction would be sufficient to meet this demand.

Public Finance. Modification of the Pit Fabrication Facility would not require in-migrating workers. Therefore, changes to local finances compared to No Action projections would be due to income increases and would be negligible.

Changes in revenues and expenditures compared to No Action projections due to operation of the Pit Fabrication Facility are shown in figure 4.3.3.8–3. At full operation, the percent increase in total ROI revenues and expenditures would increase above No Action projections by approximately 0.2 and 0.14 percent, respectively.

Sensitivity Analysis. There would be no change in the number of construction workers required to complete the Pit Fabrication Facility for either the high or low case. Operation of the Pit Fabrication Facility for high case production would require fewer workers than would base case surge production. This decrease in workers would generate fewer additional indirect jobs. For the low case, worker requirements would decrease further resulting in slightly smaller increases in regional economy, population and housing, and public finance than in either the base case surge or high case levels. These changes would be negligible.

Potential Mitigation Measures. No mitigation measures are anticipated.

4.3.3.9 *Radiation and Hazardous Chemical Environment*

This section describes the radiological and hazardous chemical releases and their associated impacts that could result from No Action and the proposed alternatives at SRS. Within this section, impacts resulting from the base case scenario are quantitatively discussed, and a sensitivity analysis of the high and low case scenarios is qualitatively discussed.

Summaries of the prevailing radiological impacts at SRS to the public and to workers associated with normal operation are presented in tables 4.3.3.9–1 and 4.3.3.9–2, respectively; radiological and chemical accident impacts are presented in figure 4.3.3.9–1 and tables 4.3.3.9–3 and 4.3.3.9–4. The impact assessment methodology is described in section 4.1.9 and further supplementary methodological information is presented in appendixes E and F.

Normal Operation. There would be no radiological releases during the construction/modification of any facilities to support the pit fabrication mission. However, limited hazardous chemical releases (e.g., small spills of diesel fuel from equipment refueling) may occur due to building modification activities for the low and base case scenarios and may increase slightly for the high case scenario. The concentrations of these releases are expected to be well within the regulated exposure limits and would not result in any adverse health effects.

Water from processes containing hazardous chemicals is not discharged directly into surface water or groundwater that serves as potable water. Process water that may contain hazardous chemicals is treated before discharge. Furthermore, discharges of wastewater through NPDES-permitted outfalls, which can be attributed to the activities associated with the pit fabrication mission at ORR, are expected to be below NPDES limits. Water quality would not be adversely affected. Thus, the primary pathway considered for the public and the onsite worker is the air pathway.

For normal operation at SRS, all possible hazardous chemicals were examined for further analysis based on their toxicity, concentration, and frequency of use. The HI is a summation of the HQ for all chemicals. The HQ is the value used as an assessment of noncancer toxic effects of chemicals (e.g., kidney or liver dysfunction). The HI is independent of cancer risk, which is calculated only for those chemicals identified as carcinogens. The HI was calculated for the No Action chemicals and all management alternative (secondary fabrication) chemicals emitted at the site. An HI of ≤ 1.0 indicates that all noncancer exposure values meet OSHA standards; if the cancer risk is $\leq 1 \times 10^{-6}$ (the default value, not a regulatory standard), no further analysis is indicated. A cancer risk of $\leq 1 \times 10^{-6}$ is considered acceptable by EPA (40 CFR 300.430) because this incidence of cancers cannot be distinguished from the cancer risk for an individual member of the population. Information pertaining to OSHA-regulated exposure limits and toxicity profiles for all hazardous chemicals

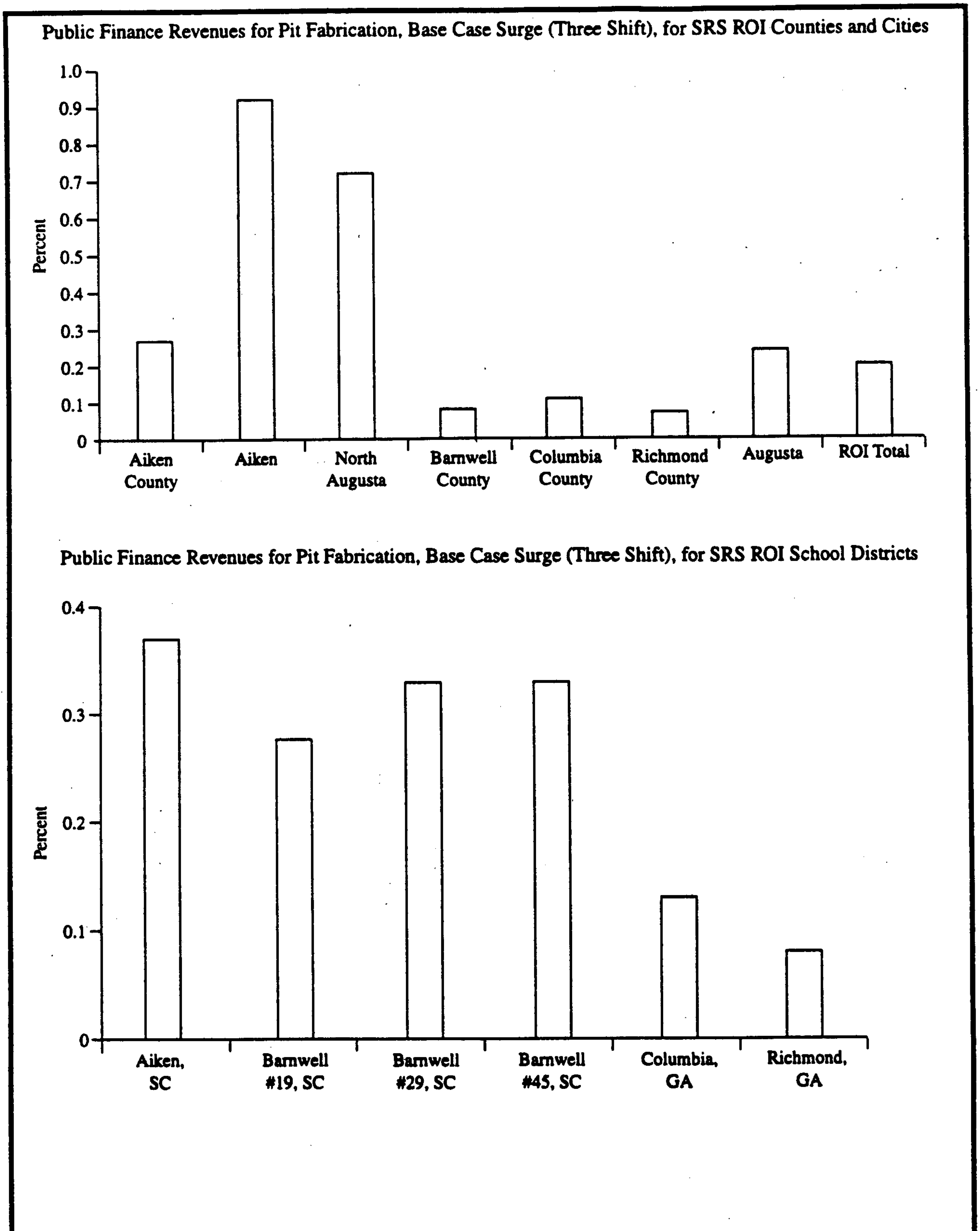


FIGURE 4.3.3.8–3.—***Percent Change from No Action Alternative in County, City, and School District Total Revenues and Expenditures in the Savannah River Site Region of Influence with Pit Fabrication, Base Case Surge, 2005*** **[Page 1 of 2].**

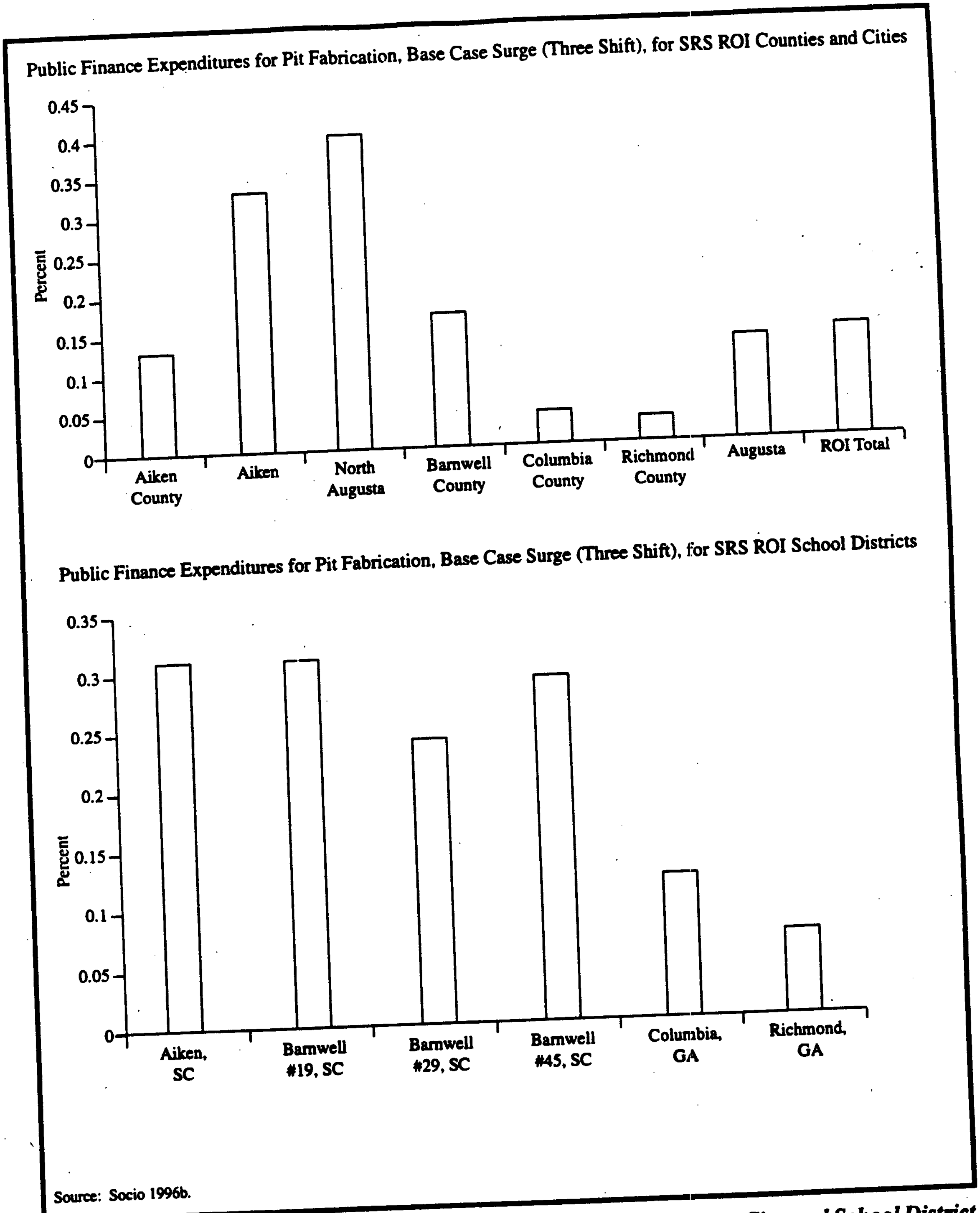


FIGURE 4.3.3.8–3.—*Percent Change from No Action Alternative in County, City, and School District Total Revenues and Expenditures in the Savannah River Site Region of Influence with Pit Fabrication, Base Case Surge 2005* [Page 2 of 2].

described in this PEIS may be found in the *Chemical Health Effects Technical Reference* (TTI 1996b).

No Action

Radiological Impacts. Radiological impacts to the public resulting from the No Action alternative are presented in table 4.3.3.9–1. These impacts are representative of the aggregated total which is estimated to exist from all future baseline operational SRS contributions. Total impacts are provided to compare to applicable regulations governing total site operations. To place doses to the public incurred from the No Action alternative into perspective, comparisons are made to natural background radiation. As shown in table 4.3.3.9–1, the total dose to the maximally exposed member of the public from annual total site operations is within radiological limits and would be 0.32 mrem for the No Action alternative. The annual population dose (within 80 km [50 mi]) in 2030 would be 21.6 person-rem.

Total site doses to onsite workers from normal operation for the No Action alternative are presented in table 4.3.3.9–2. The estimated annual dose to the entire facility for this alternative would be 349 person-rem. As stated in the methodology section 4.1.9, worker doses were referenced from the Radiation Exposures for DOE and DOE Contractor Employees 1992 Database, which reports doses for similar types of operations. The presented noninvolved worker impacts were not modeled due to the unavailability of certain site-specific information.

Based on the radiological impacts associated with normal operation under the No Action alternative, all

TABLE 4.3.3.9–1.—*Potential Radiological Impacts to the Public Resulting from Normal Operation of Stockpile Management Alternatives at Savannah River Site*

Affected Environment	No Action Total Site[a]	Pit Fabrication Three-Shift Operation Total Site[a]
Maximally Exposed Individual (Public)		
Atmospheric Release		
Dose[b] (mrem/yr)	0.18	0.18
Percent of natural background[c]	0.062	0.062
25-year fatal cancer risk	2.3×10^{-6}	2.3×10^{-6}
Liquid Release		
Dose[b] (mrem/yr)	0.14	0.14
Percent of natural background[c]	0.045	0.045
25-year fatal cancer risk	1.7×10^{-6}	1.7×10^{-6}
Atmospheric and Liquid Releases		
Dose[b] (mrem/yr)	0.32	0.32
Percent of natural background[c]	0.10	0.10
25-year fatal cancer risk	4.0×10^{-6}	4.0×10^{-6}
Population Within 80 Kilometers		
Atmospheric and Liquid Releases in 2030		
Dose (person-rem)	21.6[d]	21.6[d]
Percent of natural background[c]	9.6×10^{-3}	9.6×10^{-3}
25-year fatal cancers	0.27	0.27

[a] Includes impacts from all site operations.

[b] The applicable radiological limits for an individual member of the public from total site operations are 10 mrem/yr from the air pathways, 4 mrem/yr from the drinking water pathway, 100 mrem/yr from all pathways combined (DOE Order 5400.5).

[c] Natural background radiation levels to average individual is 298 mrem/yr; to the population within 80 km (50 mi) in 2030 is 216,700 person-rem.

[d] Includes Defense Waste Processing Facility and Foreign Reactor Spent Fuel.

Note: Annual incremental doses of 1.0×10^{-5} mrem to the maximally exposed individual and 5.9×10^{-4} person-rem to the population are incurred from the pit fabrication alternative.

Source: WSRC 1994d; WSRC 1995c.

TABLE 4.3.3.9–2.—***Potential Radiological Impacts to Workers Resulting from Normal Operation of Stockpile Management Alternatives at Savannah River Site***

Affected Environment	No Action	Pit Fabrication Three-Shift Operation
Involved Workforce[a]		
Average worker dose[b] (mrem/yr)	NA	380
25-year fatal cancer risk	NA	3.8×10^{-3}
Total dose (person-rem/yr)	NA	156
Noninvolved Workforce[c]		
Average worker dose[b] (mrem/yr)	17.9	17.9
25-year fatal cancer risk	1.8×10^{-4}	1.8×10^{-4}
Total dose (person-rem/yr)	349	349
Total Site Workforce[d]		
Dose (person-rem/yr)	349	505
25-year fatal cancers	3.5	5.0

[a] The involved worker is a worker associated with operation of the pit fabrication facilities. The estimated number of involved workers is 411 for the pit fabrication alternative.

[b] The radiological limit for an individual worker is 5,000 mrem/yr (10 CFR 835).

[c] The noninvolved worker is an onsite worker unassociated with operation of the pit fabrication facilities in question. The estimated number of noninvolved workers is 19,500 for the pit fabrication alternative at SRS.

[d] The total site workforce is the sum of the number of involved and noninvolved workers. The estimated number of workers in the total site workforce is 19,911 for the pit fabrication alternative and 19,500 for No Action at SRS.

Note: NA - not applicable.

Source: DOE 1993n:7; LANL 1995b:6; WSRC 1995a.

resulting doses would be within radiological limits and are well below levels of natural background radiation. The associated risks of adverse health effects to the public and to workers would be small.

Hazardous Chemical Impacts. Hazardous chemical impacts to the public resulting from normal operation under No Action at SRS are presented below. Analyses to support the values presented in this section are provided in appendix table E.3.4–4. This PEIS does not purport to provide the level of detail needed to go beyond a conservative screening process for hazardous chemicals. As such, the analysis in this PEIS for the No Action alternative should not be relied upon as a basis for judging if sites have a hazardous chemical health concern. The model used to calculate HI and cancer risk in this PEIS only establishes a baseline for comparison of alternatives among sites. This baseline is then used to determine the extent to which each alternative adds or subtracts from the No Action HI and cancer risk to the public at each site.

The HI for the maximally exposed member of the public at SRS resulting from normal operation under the No Action alternative would be 5.16×10^{-3} and the cancer risk would be 1.31×10^{-7}. The HI for the onsite worker would be 1.16, and the cancer risk would be 1.94×10^{-4}.

The HI for the public is within acceptable health levels. The HI for onsite workers (1.16) exceeds the cumulative HQ screening level (the HI) of 1.0, but not necessarily the individual OSHA standards for specific effects. The cancer risk to the public is within the acceptable EPA default level of 1×10^{-6}. The cancer risk to the onsite worker (1.94×10^{-4})is not within the acceptable EPA default level of 1.0×10^{-6}.

The HI for the onsite worker is due to the high emissions from 5 of the 13 hazardous chemicals listed in appendix table E.3.4–4 under the No Action alternative at SRS. To determine the actual potential impacts, an analysis according to organ/tissue specific effects (i.e., second tier analysis) was performed. Preliminary analysis according to affected tissues/organs shows that only two noncancer endpoints: respiratory (the HI is equal to approximately 0.72) and central nervous system (the HI is equal to approximately 0.30) effects exceed the default level. Cancer risks for leukemia, lung, and kidney exceed the acceptable range of 10^{-4} to 10^{-6} based on specific chemicals and applications based on the initial second tier screen. However, all of these effects are localized to not more than three areas on SRS (G-, H-, and T-areas) and the relevant emissions come mostly from five point sources (buildings). Only the H-Area (Building WG-2) appears to have an HI for workers that exceeds the default level. There appears to be only one noncancer adverse effect associated with the exceedance: the HI is equal to approximately 4.71 for respiratory system effects. However, the potential chemical health effects and cancer risks to workers presented here does not take into consideration the OSHA and DOE operations health and safety measures required to be followed by workers in these areas. Chemicals identified as principal contributors for the noncancer and cancer risks are nitric acid, bis-chloromethyl ether, benzene, and chloroform.

To protect site workers, the SRS Industrial Hygiene Program is implementing the program requirements identified in DOE O 440.1, *Worker Protection Management for DOE Federal and Contractor Employees*, which provides for identification, evaluation, and control of chemical hazards within the workplace. Compliance with the SRS Industrial Hygiene Program requirements of WRSC 4Q, *Industrial Hygiene Manual*, ensure that facility workers are adequately protected against chemical, physical, or biological agents that cause or are likely to cause sickness, impaired health, or significant discomfort. The Industrial Hygiene Program requires that occupational exposures to hazardous substances remain below the public exposure limits set by OSHA. Compliance with this requirement is assured by a combination of engineering and workplace controls as well as the use of personal protective equipment.

Since 1990, SRS has implemented a number of programs designed to reduce the use of products that have hazardous components. For example, SRS has centralized efforts to find substitutes for products containing hazardous constituents and to ensure that those substitutes are purchased whenever possible.

Management Alternatives

Pit Fabrication

Radiological Impacts. Radiological impacts to the public resulting from the pit fabrication alternative are presented in table 4.3.3.9–1. These impacts are representative of the aggregated total which is estimated to exist from all future baseline operational SRS contributions and from three-shift base case operations for pit fabrication at the site. Total impacts are provided to demonstrate compliance with applicable regulations governing total site operations. To place doses to the public from this alternative into perspective, comparisons are made to natural background radiation. As shown in table 4.3.3.9–1, the total dose to the maximally exposed member of the public from annual total site operations is within radiological limits and would be 0.32 mrem for this alternative. The annual population dose within 80 km (50 mi) in 2030 would be 21.6 person-rem. The incremental impacts incurred from three-shift base case operations are negligible when compared to those existing for the normal baseline site operations (see table 4.3.3.9–1).

Total site doses to onsite workers from normal operation for the pit fabrication alternative are presented in table 4.3.3.9–2. The average annual dose to involved workers for this alternative would be 380 mrem. The total annual dose to the entire facility workforce (involved workforce) would be 156 person-rem. As stated in the methodology section 4.1.9, worker doses were referenced either from alternative-specific data reports or from the Radiation Exposures for DOE and DOE Contractor Employees 1992 Database which reports doses for similar types of operations; the presented noninvolved worker impacts were not modeled due to the unavailability of certain site-specific information. There may also be small risks to construction workers who are involved with tasks that are in close proximity to potentially contaminated areas.

Hazardous Chemical Impacts. Hazardous chemical impacts to the public and to the onsite worker resulting from normal operation due to the pit fabrication mission, which includes intrusive and nonintrusive modification of pit reuse, are presented below. The HI and cancer risk would remain constant over 25 years of operation provided exposures remain the same. Analyses to support the values presented in this section are provided in appendix table E.3.4–5.

The incremental HI for the maximally exposed member of the public would be 1.83×10^{-6}, and the incremental cancer risk would be zero as a result of the pit fabrication alternative at SRS. The incremental HI for the onsite worker would be 2.99×10^{-4}, and the incremental cancer risk would be zero as a result of the pit fabrication alternative.

The incremental effects of the pit fabrication alternative would not change the No Action hazardous chemical impacts. The total HI for the maximally exposed member of the public would be 5.16×10^{-3} and the cancer risk would be 1.31×10^{-7}. The total HI for the onsite worker would be 1.16 and the cancer risk would be 1.94×10^{-4}.

Sensitivity Analysis. Radiological impacts may be subject to certain degrees of variance resulting from either high or low case operations. For the high case scenario, impacts to both the public and worker would be similar to the three-shift base case operations. For the low-case scenario, impacts to the public and workers would be expected to fall within the increment (range) projected between that of No Action and the pit fabrication alternative (i.e., an increase of approximately zero mrem/year to the maximally exposed individual, an increase of approximately zero person-rem/year to the population within 80 km (50 mi), and an increase of less than 156 person-rem/year to the total site workforce).

Based on the radiological impacts associated with normal operation of this alternative, all resulting doses would be within radiological limits and are well below levels of natural background radiation. The associated risks of adverse health effects to the public and to workers would be small.

Based on workload requirements at SRS, operations under the low case scenario are similar to the base case scenario and would not have any appreciable effect on hazardous chemical emissions. Therefore, operations under the low case scenario would not have any impact upon the HI and cancer risks to the public and onsite workers.

Based on workload requirements at SRS, operations under the high case scenario would be five-fold greater than the base case scenario and may substantially increase emissions of hazardous chemicals. Increases in hazardous chemical emissions under the high case scenario would have an adverse impact on the HI and cancer risks to the onsite worker.

Potential Mitigation Measures. Radioactive airborne emissions to the general population and onsite exposures to workers could be reduced by implementing the latest technology for process and design improvements. For example, to reduce public exposure from emissions, improved building and work area control methods could be used to remove radioactivity from releases to the environment. Similarly, the use of remote, automated, and robotic production methods are examples of techniques that are being developed to reduce worker exposure (see section 3.5.1). Mitigation measures needed to reduce or eliminate the emissions of all hazardous chemicals due to pit fabrication alternative operations would be the same as those described for No Action.

Facility Accidents. The proposed actions have the potential for accidents that may impact the health and safety of workers and the public. The potential for, and associated consequences of, reasonably foreseeable accidents that have been evaluated are summarized in this section and described in more detail in appendix F. The methodology used in the assessment is described in section 4.1.9. A list of documents reviewed for applicable accident data is provided in appendix table F.1.1–1. The potential impacts from accidents, ranging from high-consequence/low-probability to low-consequence/high-probability events, have been evaluated in terms of potential cancer fatalities that may result for noninvolved workers and the public. The risk of cancer fatalities has also been evaluated to provide an overall measure of accident impacts and is calculated by multiplying the accident annual frequency (or probability) of occurrence by the consequences (number of cancer fatalities). Figure 4.3.3.9–1 shows the risk of latent cancer fatalities in the population within 80 km (50 mi) that may result from accidents for the alternatives. Specifically, the curve in the figure shows the probability (vertical axis) that the number of cancer fatalities in the offsite population within 80 km (50 mi) (horizontal axis) will be exceeded. The curve does reflect the probability of the accident.

In addition to the potential impacts to noninvolved workers and the offsite population, there are potential impacts to involved workers who would be located in the facilities associated with the proposed action. Quantitative statements of these impacts cannot be made until design details are developed further at which time the number and location of facility workers can be estimated to support accident impact analyses. However, depending on the type of accident, facility workers in close proximity to the point of the accident could receive high levels of exposure to radiation and hazardous chemicals, with potentially fatal impacts.

No Action. Under the No Action alternative all existing conditions would continue at SRS with no changes to facilities and operations. For existing conditions, potential accidents and their consequences have previously been addressed in facility safety documentation according to requirements in DOE orders.

Management Alternatives

Pit Fabrication. A set of potential accidents has been postulated for the pit fabrication alternative for which there may be releases of radioactive materials or other hazardous effects that may impact onsite workers and the offsite population. The accident impacts of greatest interest are those associated with pit fabrication and/or intrusive modification. Any potential accident impacts associated with nonintrusive modification would be bounded by the pit fabrication and intrusive modification accident impacts. The potential accidents analyzed are described in appendix F. The probability distribution showing the range of cancer fatalities that may result for the composite set of accidents identified in appendix F is shown in figure 4.3.3.9–1. For example, the probability of a pit fabrication accident causing more than 0.1 cancer fatality is approximately 10^{-8} per year. The curve reflects the probability of the accidents occurring. The consequences of the composite set of accidents are shown in table 4.3.3.9–3.

If an accident were to occur, there would be an estimated 5.4×10^{-5} cancer fatalities in the population within 80 km (50 mi) of the site. A noninvolved worker located 1,000 m (3,281 ft) from the accident on the site would have an increased likelihood of cancer fatality of 3.5×10^{-7}. A maximally exposed individual located at the site boundary would have an increased likelihood of cancer fatality of 7.3×10^{-9}. The risks for the combined EBA and BEBA composite set of accidents, reflecting both the probability of the accident occurring and the consequences, are also shown in table 4.3.3.9–3. For the same worker, maximally exposed individual, and population, the risks would be 1.8×10^{-8}, 3.8×10^{-10}, and 2.8×10^{-6} cancer fatalities per year, respectively. Table 4.3.3.9–3 also shows the impacts of EBAs and BEBAs only. There is also a potential of chemical accident impacts as shown in table 4.3.3.9–4.

4.3.3.10 *Waste Management*

This section summarizes the impacts on waste management at SRS under No Action and for the pit fabrication alternative. There is no spent nuclear fuel or

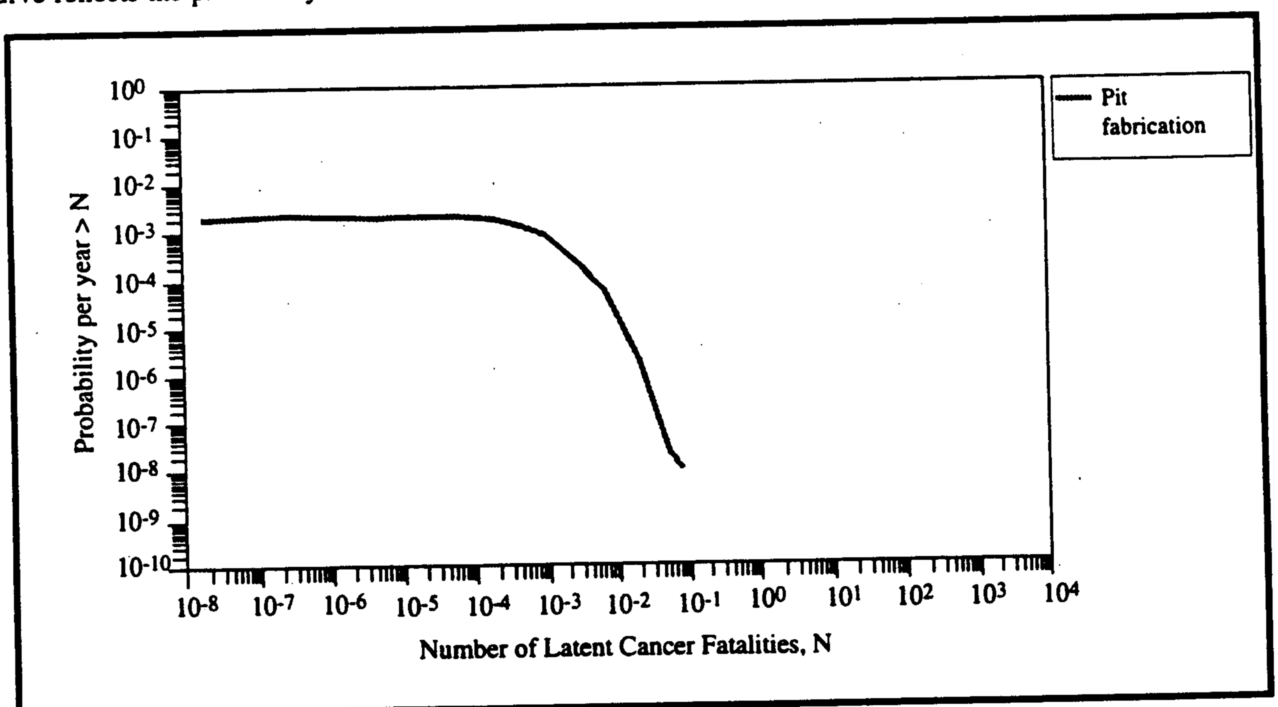


FIGURE 4.3.3.9–1.—*Combined Evaluation Basis Accidents and Beyond Evaluation Basis Accidents—Cancer Fatalities Complementary Cumulative Distribution Functions for Stockpile Management Alternatives at Savannah River Site.*

TABLE 4.3.3.9–3.—*Impacts of Accidents for Pit Fabrication and Intrusive and Nonintrusive Modification Pit Reuse at Savannah River Site*

Parameter	Pit Fabrication		
	EBA	BEBA	EBA and BEBA Combined
Composite Accident Frequency (Per Year)	0.05	$1.0x10^{-6}$	0.05
Consequences			
Noninvolved Worker			
Cancer fatality[a]	$3.4x10^{-7}$	$3.3x10^{-5}$	$3.5x10^{-7}$
Risk (cancer fatality per year)	$1.8x10^{-8}$	$3.3x10^{-11}$	$1.8x10^{-8}$
Maximally Exposed Individual			
Cancer fatality[a]	$7.3x10^{-9}$	$4.4x10^{-7}$	$7.3x10^{-9}$
Risk (cancer fatality per year)	$3.8x10^{-10}$	$4.4x10^{-13}$	$3.8x10^{-10}$
Population Within 80 Kilometers[b]			
Cancer fatalities[c]	$5.4x10^{-5}$	$3.2x10^{-3}$	$5.4x10^{-5}$
Risk (cancer fatalities per year)	$2.8x10^{-6}$	$3.2x10^{-9}$	$2.8x10^{-6}$

[a] Probability (increased likelihood) of cancer fatality to a hypothetical member of the public located at the site boundary or to a noninvolved worker as a result of exposure to the indicated dose if the accident occurred.

[b] For the offsite population of 747, 836, the average probability of cancer fatality/risk of cancer fatality (per year) for the combined EBA and BEBA is $7.2x10^{-11}/3.7x10^{-12}$ for the listed alternative.

[c] Number of cancer fatalities in the population within 80 km (50 mi) of the site as a result of exposure to the indicated dose if the accident occurs.

Note: All values are mean values; BEBA - beyond evaluation basis accidents; EBA - evaluation basis accidents.

Source: Results shown are derived from accident analyses in appendix F.

HLW associated with pit fabrication, which includes intrusive and nonintrusive modification pit reuse. However, the liquid TRU waste, categorized as high-specific activity waste at SRS, would be treated in accordance with the SRS HLW management plan. As illustrated in appendix figure H.2.2–1, this would result in solid HLW glass logs and solid LLW in the form of saltstone. Table 4.3.3.10–1 lists the projected waste generation rates and treatment, storage, and disposal capacities under No Action. Projections for No Action were derived from 1994 environmental data, with the appropriate adjustments made for those changing operational requirements where the volume of wastes generated are identifiable. The projection does not include wastes from future, yet uncharacterized, environmental restoration activities.

Table 4.3.3.10–2 provides the total estimated operational waste volumes projected to be generated at SRS as a result of the pit fabrication alternative. The net increase over No Action is provided in parentheses. The waste volumes generated and the resultant waste effluent from pit fabrication can be found in table 3.4.3.3–3 and are based on surge operations (three shifts). Facilities that would support the pit fabrication mission would treat and package all waste generated into forms that would enable long-term storage and/or disposal in accordance with the *Atomic Energy Act*, RCRA, and other applicable statutes as outlined in appendix section H.1.2.

No Action. Under No Action, high-level, TRU, low-level, mixed, hazardous, and nonhazardous wastes, and spent nuclear fuel would continue to be managed from the missions outlined in section 3.2.3. SRS would continue to store its inventory of plutonium, and treat, store, and dispose of its legacy and newly generated wastes in current and planned facilities. The processing of legacy wastes would require new facilities, since the necessary treatment, storage, and disposal facilities either do not exist or are nearing capacity. Spent nuclear fuel is not discussed because there is no spent nuclear fuel associated with pit fabrication.

TRU waste already packaged to WIPP waste acceptance criteria would either be stored or would have been shipped. Vitrification is planned to reduce waste

TABLE 4.3.3.9–4.—*Impacts of Chemical Accidents for Pit Fabrication at Savannah River Site*

Accident Description	Accident Frequency (Per Year)	IDLH	TLV-STEL	TLV-TWA	Concentration to: Noninvolved Worker (mg/m³)	Concentration to: Individual at Site Boundary (mg/m³)	Potential Impacts of Exceeding: IDLH Limits[a]	Potential Impacts of Exceeding: TLV Limits[a]
Confined Release of Nitric Acid	10^{-6} to 10^{-4}				1.1	0.027	Irreversible health effects	Irritations of the eyes, mucous membranes and skin, delayed pulmonary edema, and bronchitis and dental erosion
Concentration[a] (mg/m³)		260	10	5				
Distance[b] (m)		23	260	400				
Area (m²)		$7.3x10^1$	$7.4x10^3$	$1.6x10^4$				
Population[c]		0	0	0				
Unconfined Release of Nitric Acid	10^{-6}				28	0.68	Irreversible health effects	Irritations of the eyes, mucous membranes and skin, delayed pulmonary edema, and bronchitis and dental erosion
Concentration[a] (mg/m³)		260	10	5				
Distance[b] (m)		240	1,900	3,000				
Area (m²)		$6.9x10^3$	$3.1x10^5$	$7.2x10^5$				
Population[c]		0	0	0				

[a] NIOSH 1990a.
[b] From facility (downwind); exceedance begins at facility, 0 meters.
[c] Offsite individuals exposed to concentration exceeding limit.
Note: IDLH - immediately dangerous to life or health; TLV - threshold limit value; STEL - short-term exposure limit; TWA - time-weighted average.
Source: Model result (appendix F).

TABLE 4.3.3.10–1.—*Projected Waste Management Under No Action at Savannah River Site* [Page 1 of 2]

Category	Annual Generation (m^3)	Treatment Method	Treatment Capacity (m^3/yr)	Storage Method	Storage Capacity (m^3)	Disposal Method	Disposal Capacity (m^3)
High-Level							
Liquid	126	Absorption, evaporation, and vitrification	42,400[a,b]	Tank farm	133,000	None	None
Solid	127 glass logs[c]	None	None	Shielded vault	2,286 glass logs[d]	To repository	NA
Transuranic							
Liquid	None	Vitrification	559	None	None	NA	NA
Solid	338	Sorting, shredding, and vitrification	2,280	TRUPACT II containers	30,100[e]	None – WIPP in the future	NA
Low-Level							
Liquid	74,000	Chemical, filtration, and saltstone	503,000[f]	Ponds, tanks-awaiting processing	NA	NPDES discharge after treatment	NA
Solid	16,400	Compaction, shredding, smelting, vitrification, incineration, soil sorting	73,000	Vaults	3,330[g]	Burial vaults and trenches	2,240,000[h]
Mixed Low-Level							
Liquid	1,330	Chemical, filtration, saltstone	516,000[i]	Tanks, ponds, containers in buildings	20,700	None	None
Solid	7,700	Incineration, vitrification, and stabilization	24,200	DOT containers (solid), facility	173,000	To solid LLW burial onsite	9,679
Hazardous							
Liquid	1,260	Incineration, stabilization, pumping and treating	2,860	Planned RCRA facility	Included in solid	Offsite RCRA facilities	NA
Solid	15,100	Incineration offsite	9,500	Planned RCRA facility	2,618	Offsite RCRA facility	NA

TABLE 4.3.3.10–1.—*Projected Waste Management Under No Action at Savannah River Site* [Page 2 of 2]

Category	Annual Generation (m^3)	Treatment Method	Treatment Capacity (m^3/yr)	Storage Method	Storage Capacity (m^3)	Disposal Method	Disposal Capacity (m^3)
Nonhazardous (Sanitary)							
Liquid	703,000	Filtration, stripping, and settling	1,450,000	Flowing ponds	NA	NPDES discharge	Planned
Solid	61,200	Incineration and compaction	Expandable as required	None	None	Onsite lined pit	Planned
Nonhazardous (Other)							
Liquid	Included in sanitary	Included in sanitary	Included in sanitary	Included in sanitary	Included in sanitary	Included in sanitary	Included in sanitary
Solid	Included in sanitary	NA	NA	NA	NA	NA	NA

[a] Evaporation and ion-exchange capacity. Capacity to process salt solutions and sludge for vitrification is 24,600 m^3/yr. Capacity to vitrify salts and sludges is 18,800 m^3/yr.
[b] Treatment removes the high-level constituents (salt and sludge) from the liquids. The salt and sludge are vitrified.
[c] From vitrification of salts and sludges, not new waste.
[d] Planned construction will add capacity for an additional 2,286 logs in 2007.
[e] Expandable.
[f] Includes F/H-Area Effluent Treatment Facility.
[g] Long-lived waste.
[h] Includes saltstone vaults.
[i] Includes F/H-Area Effluent Treatment Facility, Savannah River Technology Center Ion Exchange Treatment, and Consolidated Incineration Facility.

Note: NA - not applicable.

Source: 60 FR 28680; DOE 1995kk; SR DOE 1993c; SR DOE 1994b; SR DOE 1994c; SR DOE 1995b; SR DOE 1995c; SR MMES 1993a; SRS 1995a:2;WSRC 1995a; WSRC 1995b; tables H.2.2–2; H.2.2–3; H.2.2–5; H.2.2–6; H.2.2–8; H.2.2–9; H.2.2–10; H.2.2–11.

TABLE 4.3.3.10–2.—*Estimated Annual Generated Waste Volumes for Stockpile Management Alternatives at Savannah River Site*

Category	No Action[a] (m^3)	Pit Fabrication[b] (m^3)
Transuranic		
Liquid	None	28 (+28)
Solid	338	467[c] (+129)
Mixed Transuranic		
Liquid	None	None (0)
Solid	Included in TRU	11 (+11)
Low-Level		
Liquid	74,000	74,100 (+80)
Solid	16,400	16,500 (+88)
Mixed Low-Level		
Liquid	1,330	1,330 (0)
Solid	7,700	7,700 (0)
Hazardous		
Liquid	1,260	1,260 (+0.5)
Solid	15,100	15,100 (0)
Nonhazardous (Sanitary)		
Liquid	703,000	749,000 (+46,200)
Solid	61,200	62,700 (+1,450)
Nonhazardous (Other)		
Liquid	Included in sanitary	Included in sanitary
Solid	Included in sanitary	1,450[d] (+1,450)

[a] The No Action volumes are from table 4.3.3.10–1.
[b] Waste generation volumes were derived from table 3.4.3.3–3 and are based on surge operations (three shifts).
[c] Includes 65 m^3 of intermediate LLW managed as TRU but disposed of as LLW in the intermediate-level LLW vaults onsite.
[d] Recyclable wastes.
Note: Waste generation volumes were rounded to three significant figures. Waste effluent volumes (i.e., after treatment and volume reduction) that are used in the narrative description of the impacts are also found in table 3.4.3.3–3.

volume. SRS TRU waste is expected to occupy 3 percent of the WIPP capacity. If shipments to WIPP are delayed, additional storage facilities would be designed and constructed as needed. Should WIPP prove to be an unacceptable facility, TRU wastes would be stored in accordance with all applicable requirements until a new repository becomes available. Mixed waste which has been incinerated and stabilized would be disposed of onsite as LLW, according to the SRS Site Treatment Plan which was developed to comply with the *Federal Facility Compliance Act* of 1992.

Liquid LLW would be sent to collection tanks that would be batch transferred to treatment and storage facilities onsite, such as the Effluent Treatment Facility or the Tank Farm. Liquid LLW concentrate would be processed into saltstone. Solid LLW would continue to be compacted and disposed of by burial onsite in engineered trenches or vaults, depending on the LLW category. The planned burial ground expansion in the E-Area is expected to accommodate the current waste disposal requirements through 2024. Additional waste disposal facilities would be constructed as needed to ensure compliance. The Consolidated Incineration Facility would also be utilized to reduce the volume of LLW requiring disposal.

The majority (85 to 89 percent) of SRS hazardous wastes would be sent offsite for treatment and disposal. SRS does not plan to construct facilities solely for the treatment of hazardous wastes. However, facilities planned for the treatment of mixed wastes would be utilized to the extent capacity is available. Some selected organic hazardous wastes would be incinerated in the Consolidated Incineration Facility. A facility would be constructed to provide containment for the decontamination of debris and metals to be recycled onsite or sold as scrap.

Liquid sanitary waste would be conveyed to existing domestic wastewater treatment facilities. The treated sanitary and process wastewater would be discharged through NPDES outfalls, and the resultant solids would be disposed of with solid nonhazardous waste in an onsite or offsite permitted landfill.

Management Alternatives

Pit Fabrication. Construction and operation of a Pit Fabrication Facility would impact existing and planned SRS waste management facilities and activities by increasing the generation of TRU, low-level, mixed, hazardous, and nonhazardous wastes. An optional plutonium recovery process would generate high-specific activity liquid waste at SRS that would be treated in accordance with the SRS HLW management plan. The resultant waste forms include 0.61 glass logs composed of comingled TRU waste from pit fabrication and legacy HLW, and LLW saltstone.

Approximately 65 m^3/yr (84 yd^3/yr) of TRU waste and 11 m^3/yr (15 yd^3/yr) of mixed TRU waste would be packaged and placed on concrete pads for interim storage where it would await shipment to WIPP, once that facility can demonstrate compliance with requirements of 40 CFR 191 and 40 CFR 268, or to another TRU waste disposal facility should WIPP prove unsatisfactory. Nine additional trucks per year, or if applicable, five regular train shipments per year or two dedicated train shipments per year, would be required to transport the additional project-related wastes.

An additional 65 m^3/yr (84 yd^3/yr) of intermediate-level (LLW) waste (appendix section A.3.3.2) would be generated and managed as TRU waste because it presents similar handling characteristics. However, it would be disposed of onsite in the Intermediate-Level Vaults. Assuming a land usage factor of 8,600 m^3/ha (4,500 yd^3/acres), this would require 0.008 ha/yr (0.02 acres/yr) of disposal area.

A small quantity of liquid mixed LLW containing silver may be generated from the radiography process. The silver would be removed and stored as mixed waste for further processing or recovery. The liquid would then be treated in the F/H-Area Effluent Treatment Facility and discharged.

An estimated 80 m^3 (21,000 gal) of liquid LLW would be generated from glove box operations and in the separation of plutonium recovery liquids. This waste would be processed through the F/H-Area Effluent Treatment Facility, or evaporated and the resultant concentrate processed into saltstone. Incinerable portions of solid LLW would be treated in the Consolidated Incineration Facility before disposal onsite. After treatment and volume reduction, 34 m^3 (44 yd^3) of solid LLW would require 0.004 ha/yr (0.01 acres/yr) of LLW disposal area in the E-Area disposal facility.

A small amount of hazardous waste would be generated, accumulated onsite, and shipped offsite to a RCRA-permitted treatment and disposal facility. While SRS has not planned new facilities for hazardous waste treatment, the option exists to treat these wastes in the mixed waste treatment facilities where excess capacity is available.

Nonhazardous wastes would be recycled where feasible. Liquid sanitary waste could be treated in the centralized liquid sanitary waste treatment facility. Solid wastes would be shipped offsite to a commercial disposal facility.

Sensitivity Analysis. The impact of the high case single-shift operation would not be significantly different from that of the base case multiple-shift operation. Liquid TRU waste generation would be unchanged and solid TRU and mixed-TRU waste would increase somewhat. LLW generation would be similar, and hazardous and solid sanitary waste would be unchanged. Liquid sanitary waste generation would decrease slightly. Operating at the low case would decrease liquid TRU, liquid LLW, and liquid sanitary waste. Generation rates would be unchanged for the other waste categories.

Potential Mitigation Measures. Waste quantities or waste forms could undergo additional reductions by utilizing emerging technologies. Pollution prevention and waste minimization would be incorporated in determining the final actions of the Stockpile Stewardship and Management Program at SRS.

4.3.3.11 *Environmental Justice*

As discussed in section 4.14, any impacts to surrounding communities would most likely result from toxic or hazardous air pollutants and radiological emissions. Section 4.3.3.9, which describes public and occupational health impacts from normal operation, shows that potential chemical air emissions and releases are not within the generally accepted threshold of regulatory concern. This information is based on the conservative programmatic assumptions and modeling detailed in appendix E. Any adverse human health or environmental impacts that may occur would affect people living within communities located near SRS. The analysis of the demographic data presented in appendix D for the communities surrounding SRS indicate that if there were any adverse health impacts to these communities, they would not appear to disproportionately affect minority or low-income populations.

4.4 KANSAS CITY PLANT

Kansas City Plant (KCP) is situated on approximately 57 ha (141 acres) of the 121-ha (300-acre) Bannister Federal Complex located within incorporated city limits, 19 km (11.8 mi) south of the downtown center of Kansas City, MO (figure 4.4–1). Of this area, 49 ha (121 acres) are allocated to DOE, and 8 ha (19.8 acres) are on loan from the General Services Administration. Figure 4.4–2 shows the principal DOE facilities at the Bannister Federal Complex. The plant shares the Bannister Federal Complex site with other Federal agencies: the General Services Administration, the Department of Defense (DOD) Finance and Accounting Service, the Federal Aviation Administration, the National Archives and Records Center, and the Internal Revenue Service, among others. Section 3.2.4 provides a description of the DOE missions and support facilities at KCP.

4.4.1 Description of Alternatives

No Action. KCP would continue to perform the missions described in section 3.2.4.

Stockpile Management Alternatives. The nonnuclear fabrication mission could be consolidated and downsized and remain at KCP. The KCP nonnuclear fabrication mission could also be split up and transferred to SNL, LANL, and LLNL. In the event the nonnuclear fabrication mission was transferred to the laboratories, the DP missions at KCP would be phased out and the facilities turned over to EM for disposition.

Stockpile Stewardship Alternatives. There are no stockpile stewardship alternatives that include KCP.

4.4.2 Affected Environment

The following sections describe the affected environment at KCP for land resources, geology and soils, biotic resources, cultural and paleontological resources, and socioeconomics. In addition, the infrastructure, radiation and hazardous chemical environment, waste management conditions, and current intersite transportation issues at KCP are described.

4.4.2.1 *Land Resources*

KCP consists of 57 ha (141 acres) and is located within the boundaries of the 121 ha (300 acre) Bannister Federal Complex. The Bannister Federal Complex is located approximately 19 km (12 mi) south of the downtown area of Kansas City, MO. Generalized land uses at the Bannister Federal Complex (including KCP) and in the vicinity are shown in figure 4.4.2.1–1. KCP currently contains approximately 297,000 m^2 (3.2 million ft^2) of floorspace, with approximately 82 percent located within the large Federal office/industrial building that dominates the site. KCP, as well as the remainder of the Bannister Federal Complex, is compactly developed with limited open space.

No residential structures are within the Bannister Federal Complex. The General Services Administration operates a child care center onsite just north of the main DOE building and west of the DOE-controlled parking area.

Land use within a 3.2 km (2 mi) radius of the Bannister Federal Complex is urban. Of this land, 41 percent is residential (containing approximately 14,200 dwelling units), 42 percent is open space (25 percent consists of city-owned recreational lands; the remainder is vacant property), 6 percent is commercial, 6 percent is publicly owned (Federal, state, and local government), and 5 percent is industrial. The closest residence to the Bannister Federal Complex is approximately 6 m (20 ft) away at its northernmost boundary; however, this residence is approximately 165 m (0.10 mi) northwest of the closest DOE-controlled property. A multi-family development west of the Bannister Federal Complex is approximately 125 m (410 ft) away from the nearest DOE-controlled property.

Future city land use plans call for expanding the Indian Creek Greenway through future acquisition of vacant private property, which would increase the amount of permanent open space around the Bannister Federal Complex. There are no prime farmlands on the Bannister Federal Complex. The Bannister Federal Complex does not contain any public recreation facilities. A U.S. Marine Corps baseball diamond and the General Services Administration child care center playground are located at the northwest corner.

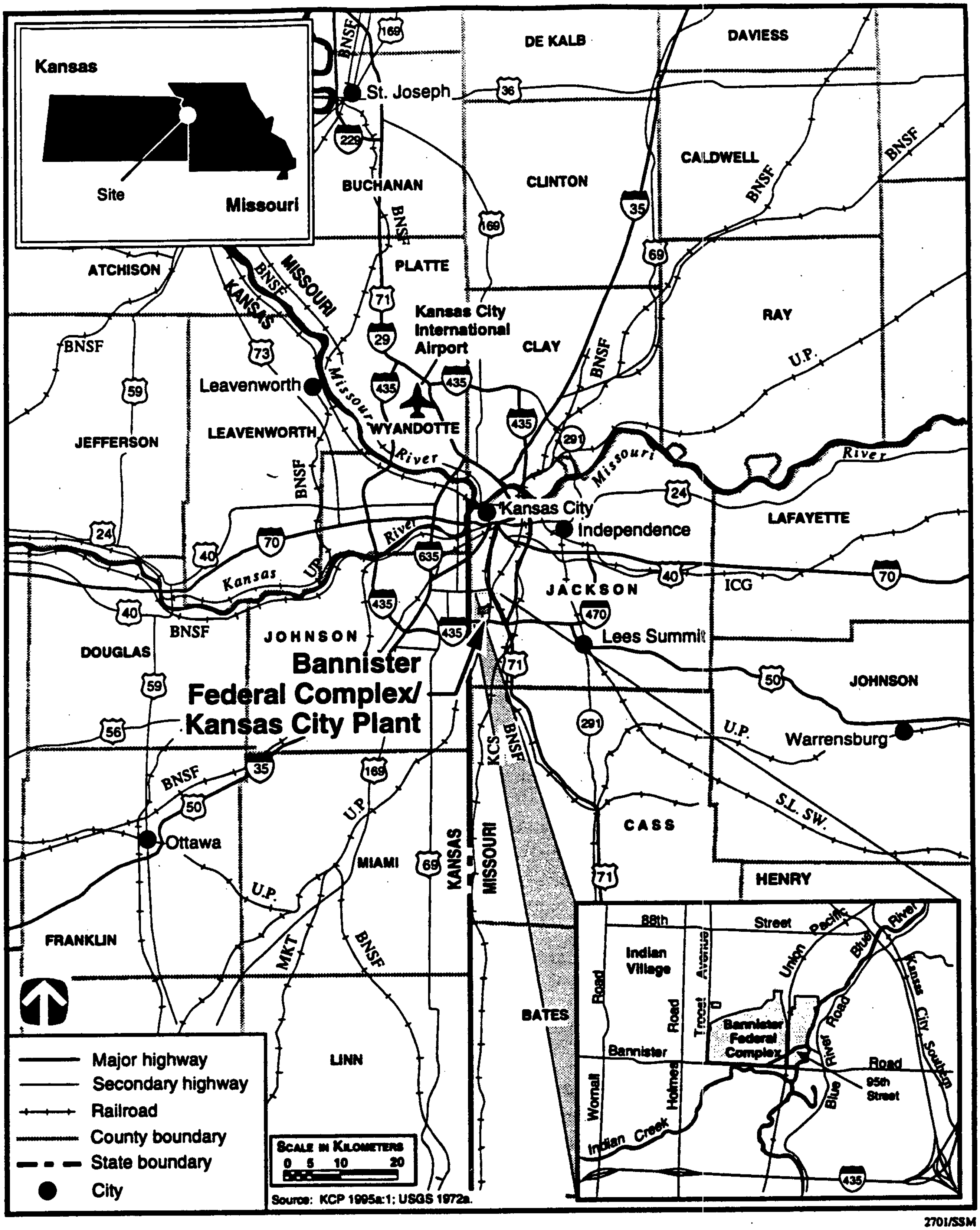


FIGURE 4.4–1.—*Bannister Federal Complex/Kansas City Plant, Missouri, and Region.*

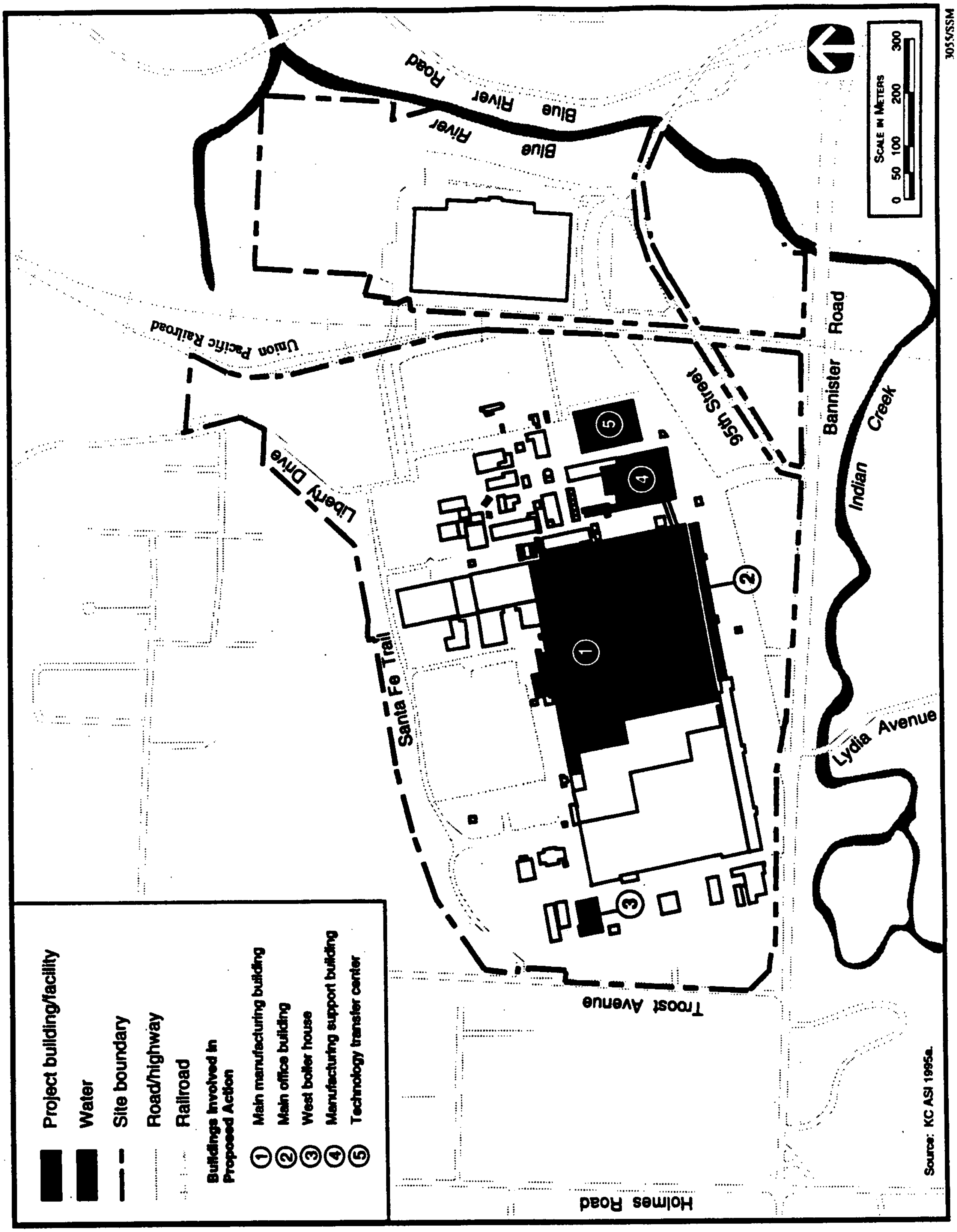


FIGURE 4.4–2.—*Principal Facilities at the Bannister Federal Complex/Kansas City Plant.*

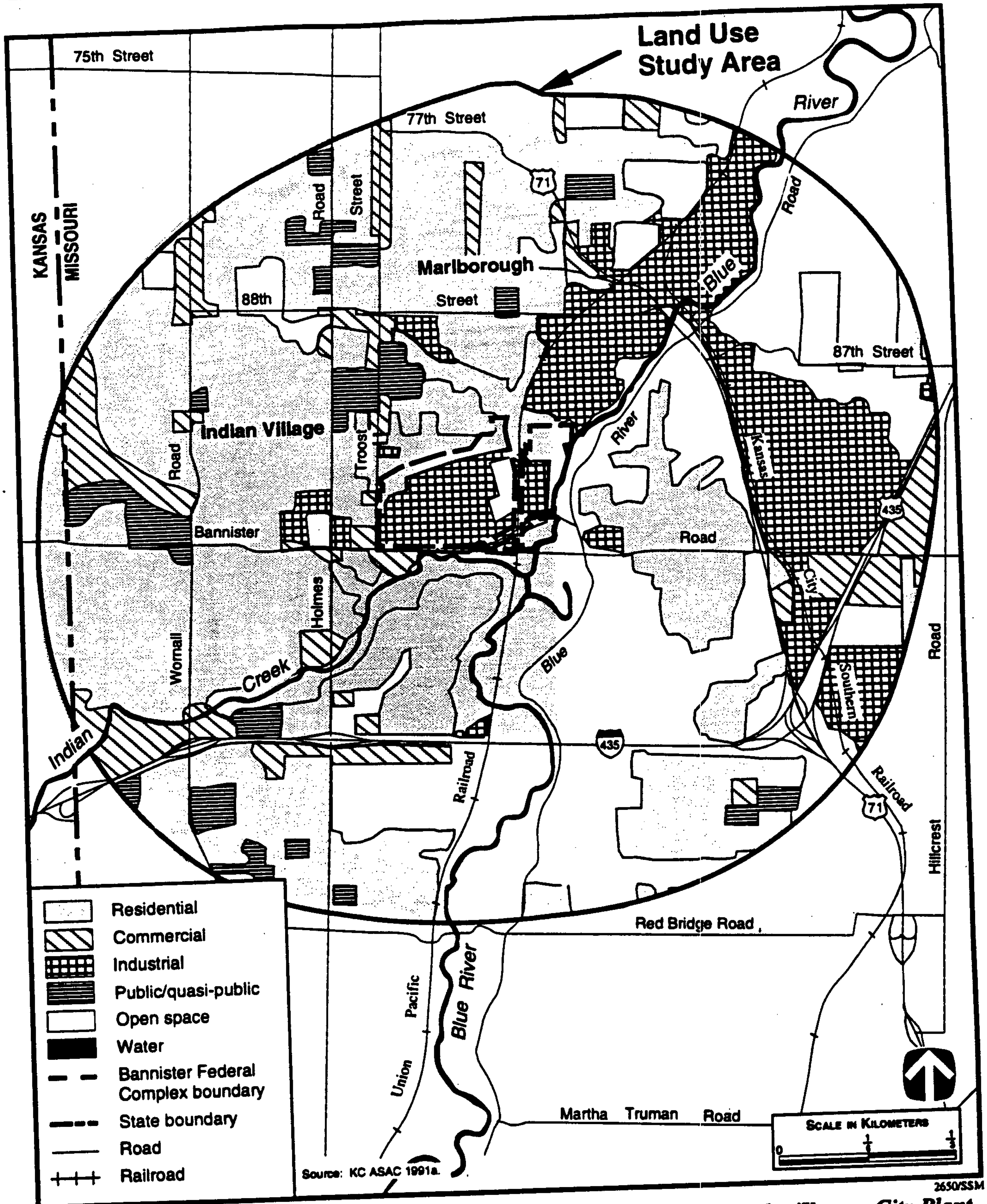


FIGURE 4.4.2.1–1.—*Generalized Land Use at the Bannister Federal Complex/Kansas City Plant and Vicinity.*

4.4.2.2 *Site Infrastructure*

Section 3.2.4 describes the current missions at KCP. To support these missions, an infrastructure exists as shown in table 4.4.2.2–1.

TABLE 4.4.2.2–1.—*Baseline Characteristics for Kansas City Plant*

Characteristics	Current Value
Land	
Area (ha)	57
Roads (km)	26
Railroads (km)	0
Electrical	
Energy consumption (MWh/yr)	129,886
Peak load (MWe)	24.2
Fuel	
Natural gas (m^3/yr)	15,151,078
Liquid (L/yr)	9,058
Coal (t/yr)	0
Steam	
Generation (kg/hr)	50,000

Source: KCP 1995a:1

4.4.2.3 *Air Quality*

The following section describes existing air quality, including a review of the meteorology and climatology in the vicinity of KCP. More detailed discussions of the air quality methodologies, input data, and atmospheric dispersion characteristics are presented in appendix section B.3.4.

Meteorology and Climatology. The climate at the Bannister Federal Complex and in the surrounding region is characterized as humid and continental, with warm summers, moderately cold winters, and moderate annual precipitation. The annual average temperature in the area, as measured at the Kansas City National Weather Service station, is 12.0 °C (53.6 °F); temperatures vary from an average daily minimum of -8.5 °C (16.7 °F) in January to an average daily maximum of 31.5 °C (88.7 °F) in July. Annual average precipitation is 95.6 cm (37.62 in) with most precipitation occurring between April and October. About 51 cm (20.1 in) of snowfall are typically recorded per year. Maximum monthly precipitation measured at the Kansas City National Weather Service station ranged from 6.8 cm (2.66 in) in January to 39.3 cm (15.47 in) in July. The annual average windspeed is approximately 4.8 m/s (10.8 mph) (NOAA 1994a:3).

Ambient Air Quality. The Bannister Federal Complex is located in the Metropolitan Kansas City Intrastate AQCR 94. This AQCR is designated as attainment by the EPA for all criteria pollutants (40 CFR 81.326). The Missouri State ambient air quality standards for criteria pollutants, which are the same as the NAAQS, are listed in appendix table B.3.1–1.

Missouri has been delegated authority by EPA to enforce standards for the hazardous air pollutants regulated under NESHAP. The Missouri Department of Natural Resources uses guidelines for acceptable ambient air levels for air toxic pollutants in evaluating new sources and modifications to sources. The hazardous/toxic air pollutants described in this section are those currently emitted at KCP.

The principal sources of criteria air pollutants are four boilers serving the Bannister Federal Complex. Appendix table B.3.4–1 presents an emissions inventory of these sources. Hazardous/toxic air pollutants are emitted from various process sources at the Bannister Federal Complex. Complex emissions data are summarized in appendix table B.3.4–1.

Ambient air quality conditions at KCP for 1994 are shown in table 4.4.2.3–1. With the exception of the ozone (1-hour) standard and the annual particulate matter standard, ambient air quality concentrations in the Bannister Federal Complex area do not exceed applicable guidelines or regulations. The maximum measured ozone background concentration is approximately 103 percent of the 1-hour standard. The majority of the ozone concentration is attributed to chemical reactions involving vehicular traffic and not emissions from KCP. The maximum measured particulate matter background concentration is approximately 170 percent of the annual standard.

4.4.2.4 *Water Resources*

This section describes the surface and groundwater resources at KCP.

Surface Water. KCP is located near the confluence of the Blue River and Indian Creek (figure 4.4.2.4–1).

TABLE 4.4.2.3–1.—*Comparison of Baseline Ambient Air Concentrations with Most Stringent Applicable Regulations and Guidelines at Kansas City Plant, 1994*

Pollutant	Averaging Time	Most Stringent Regulation or Guideline (μg/m³)	Baseline Concentration (μg/m³)
Criteria Pollutant			
Carbon monoxide	8-hour	10,000[a]	4,872
	1-hour	40,000[a]	7,772
Lead	Calendar quarter	1.5[a]	[b]
Nitrogen dioxide	Annual	100[a]	36.6
Ozone	1-hour	235[a]	242.9
Particulate matter	Annual	50[a]	84.8
	24-hour	150[a]	[c]
Sulfur dioxide	Annual	80[a]	14.8
	24-hour	365[a]	<59.8
	3-hour	1,300[a]	59.8
Hazardous and Other Toxic Compounds			
Acetone	24-hour	161[d]	3.78
Chromium	24-hour	1.36[d]	0.09
Cyanide	8-hour	66.67[d]	0.18
Ethyl benzene	24-hour	118[d]	0.43
Formaldehyde	24-hour	0.33[d]	0.09
Hydrogen chloride	24-hour	2.03[d]	0.26
Isopropyl alcohol	8-hour	13,066.7[d]	25.57
Methanol	24-hour	7.13[d]	0.09
Methyl ethyl ketone	24-hour	32.1[d]	1.37
Methyl isobutyl ketone	24-hour	55.7[d]	0.26
Perchloroethylene	24-hour	922[d]	2.49
Toluene	24-hour	10.2[d]	4.30
Toluene-2, 4-diisocyanate	24-hour	0.10[d]	0.09
Trichloroethylene	24-hour	36.5[d]	22.33
Trichloroethane	24-hour	1,040[d]	0.34
Xylene	8-hour	5,800[d]	4.10

[a] Federal standard.
[b] No monitoring data available; baseline concentration assumed less than applicable standard.
[c] No monitoring data available.
[d] State guideline.
Source: 40 CFR 50; KC ASI 1995a; MO DNR 1992a.

Individual drainage basins exist for each, but both the Blue River and Indian Creek are included in the Blue River basin. KCP lies on the divide between the two drainage basins, both of which receive surface runoff and cooling water discharge from the plant. Flow in Indian Creek during the summer is primarily effluent from the sewage treatment plant located on Indian Creek upstream of KCP (KC ABA 1986a:II-25). No surface water is withdrawn at KCP. The Kansas City, MO, municipal water supply system provides all drinking and process water for KCP. The water usage at KCP averages approximately 1,934 MLY (511 MGY).

Four NPDES outfalls at KCP, numbered 001 through 004, discharge a combination of stormwater and one-pass cooling water. Outfall 001 discharges to the Blue River and outfalls 002, 003, and 004 discharge into Indian Creek. There are six unpermitted stormwater outfalls at the Federal complex under the

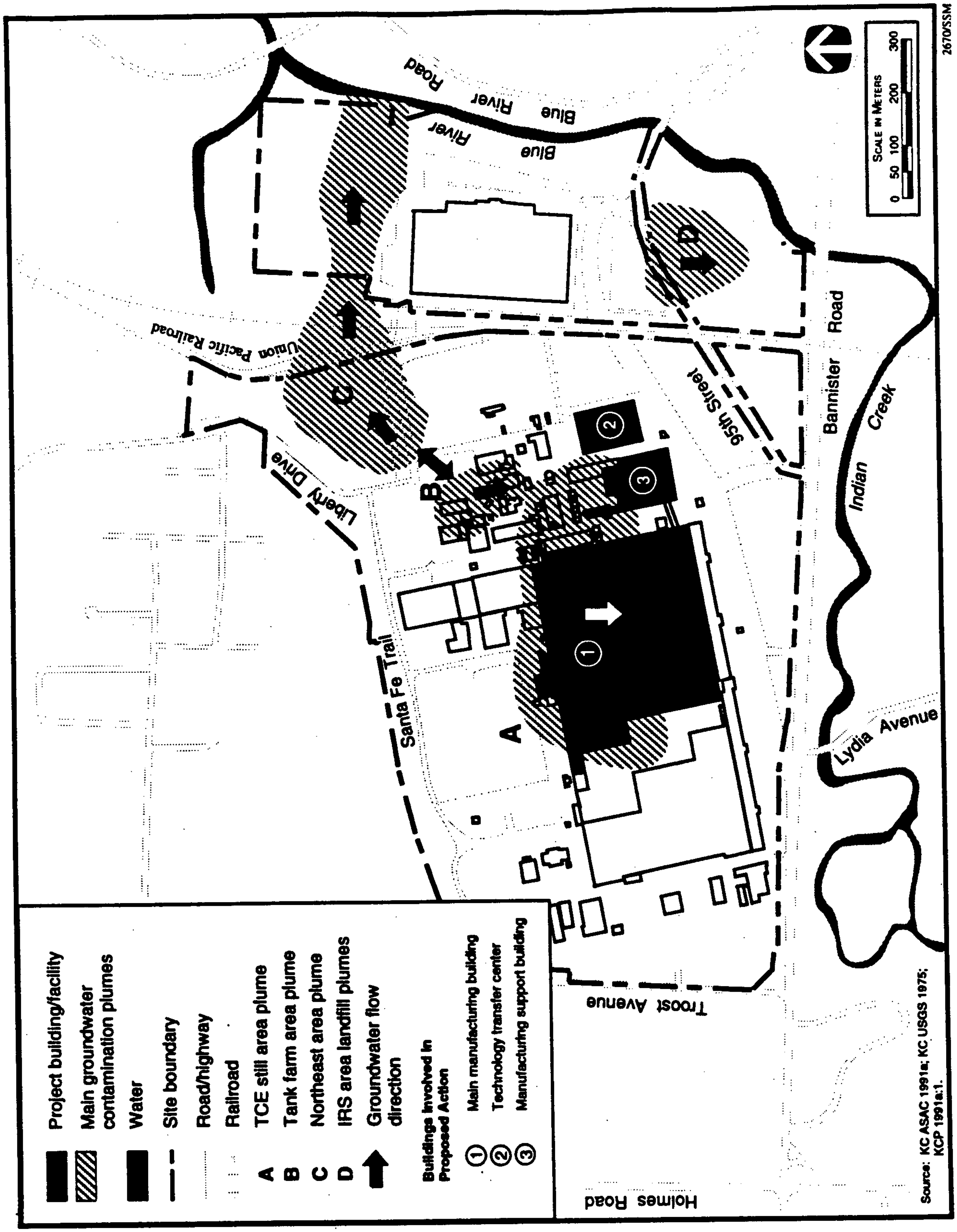


FIGURE 4.4.2.4–1.—*Surface Water Features and Groundwater Contamination Plume Boundaries at Kansas City Plant.*

responsibility of the General Services Administration: two discharge stormwater to the Blue River, and four discharge stormwater from nonindustrial areas of the Bannister Federal Complex to Indian Creek.

Industrial wastewater is pretreated onsite at the 2,080 MLY (550 MGY) capacity Industrial Wastewater Processing Facility. In 1994, KCP discharged approximately 884 MLY (233.5 MGY) to the Industrial Wastewater Processing Facility. Following pretreatment, effluent is monitored and discharged in combination with KCP sanitary wastewater to the Kansas City Municipal Wastewater Treatment Plant. In 1994, sanitary wastewater generation from KCP was estimated at 429 MLY (113.3 MGY).

The quality of the effluent discharged from KCP to the Kansas City Municipal Wastewater Treatment Plant is regulated by a Kansas City, MO, Discharge Permit; city ordinances administered by the Kansas City, MO, Water and Pollution Control Department; and U.S. EPA Pretreatment Standards for the metal-finishing category (40 CFR 433.17). Regulatory compliance is monitored at the Industrial Wastewater Processing Facility. Table 4.4.2.4–1 presents a summary of the parameters monitored, a comparison

TABLE 4.4.2.4–1.—*Combined Sanitary Sewer Effluent Monitoring at Kansas City Plant*

	Regulatory Standards (mg/L)				Total Estimated Quantity Released	
		Metal Finishing[a]				
Parameter	Kansas City, MO Ordinance	Average	Daily Maximum	Kansas City Plant Annual Average (mg/L)	1993 (kg)	1994 (kg)
Biochemical oxygen demand (5 day)	300	c	c	194.8	168,742	139,541
Boron	1.0	c	c	0.21	181.77	150.32
Cadmium	2.0[b]	0.006	0.009	0.00062	0.54	0.45
Chlorinated hydrocarbons (G)	0.160	c	c	0.0362	31.38	25.95
Chromium (H)	5.0[b]	c	c	0.0076	6.62	5.47
Chromium (T)	10.0[b]	0.14	0.22	0.0002	0.17	0.14
Copper	2.0[b]	0.18	0.29	0.01531	13.26	10.96
Cyanide (G)	2.0	0.65	1.2	0.00858	7.43	6.14
Iron	15.0[b]	c	c	[illegible]74	497.27	411.21
Lead	0.1[b]	0.038	0.06	[illegible]171	1.48	1.22
Mercury	c	c	c	[illegible]008	0.07	0.05
Nickel	3.0[b]	0.19	0.32	ND	ND	ND
PCBs	0.01[a]	c	c	ND	ND	ND
pH (G)	6.0-10.0	c	c	7.9	NA	NA
Phenol (G)	10.0	c	c	0.0253	21.94	18.14
Silver	None	0.078	0.09	ND	ND	ND
Soluble oil (G)	100.0	c	c			
Sulfides	10.0[b]	c	c	0.155	134.26	111.02
Temperature (G)	150 °F	c	c		NA	NA
Total suspended solids	360.0	c	c	64.89	56,202	46,476
Total toxic organics	None		0.27	0.05695	49.33	40.8
Zinc	2.0[b]	0.281	0.37	0.11507	99.67	82.42

[a] Metal finishing standards are recalculated every 6 months (40 CFR 433). Therefore, four different standards are applied to each parameter. The limits provided are the average of the four standards applicable to KCP during 1993 and 1994.

[b] Limits referenced in the ordinance as generally acceptable as provided in *Missouri Effluent Guidelines for Municipal Control of Industrial Wastes*.

[c] Standard has not been established.

Note: ND - no data; NA - not applicable; (G) - grab sample; (T) - total; (H) - hexavalent.

Source: KCP 1995a:1.

of the average concentrations discharged between 1993 and 1994 with regulatory standards, and the estimated total quantity of each parameter discharged from KCP to the Municipal Wastewater Treatment Plant, during both 1993 and 1994. As indicated in the table, the estimated quantity of constituents discharged from the plant has remained essentially unchanged or has decreased between 1993 and 1994.

As part of KCP's Waste Minimization and Pollution Prevention Program, a design was prepared for an Organics Treatment System. Implementation of this system began in September 1995 and will consist of new piping to route all chlorinated solvent and total toxic organics-contaminated groundwater at KCP to a new organics treatment facility, which will treat the organics prior to discharge to the Kansas City, MO, publicly owned treatment works.

KCP lies within the 500-year floodplain of the Blue River and Indian Creek; however, flood control works, providing KCP with protection against a 500-year flood, are now completed.

Surface Water Quality. Water quality in Indian Creek and Blue River is affected by effluent introduced upstream of KCP from the Leawood, KS, Sewage Treatment Plant on Indian Creek, and runoff from the urbanized Blue River watershed. Water quality in Blue River and Indian Creek is monitored at six locations. KCP's four NPDES-permitted outfalls are monitored on a monthly basis. Water quality monitoring results during 1994 for the Blue River and Indian Creek near KCP are presented in tables 4.4.2.4–2 and 4.4.2.4–3. Drinking water standards are provided for comparison purposes.

The maximum concentrations of cyanide downstream of KCP outfalls on Indian Creek and the Blue River exceed Missouri chronic water quality standards. Upstream of KCP discharges, cyanide concentrations on the same date were similarly elevated and are noted as the source of the elevated readings. The maximum concentrations for aluminum, nitrate, total dissolved solids, and iron were above Federal drinking water regulations in both the Blue River and Indian Creek. Chloride was also above Federal drinking water regulations in Indian Creek. Similarly, upstream concentrations were also elevated for each of these parameters on corresponding dates, indicating the source of these elevated levels is upstream of KCP.

NPDES-permitted outfall 001, which discharges to the Blue River, has a flow of approximately 949 MLY (250 MGY). In the past, contaminated groundwater infiltrated this outfall, resulting in the detection of 1,2-dichloroethylene at an average of 4 micrograms (μg)/L during 1992. A groundwater interceptor drain, referred to as the outfall 001 interceptor system, was installed beneath the portion of outfall 001 into which contaminated groundwater migrated. Groundwater collected in this system is pumped to the KCP Groundwater Treatment Unit which treats groundwater flows from other areas of the plant. Since installation of the outfall 001 interceptor system, 1,2-dichloroethylene has not been detected in outfall 001.

All average effluent concentrations were within NPDES limits in 1994. Past exceedances for PCB led to the reconstruction of outfall 002. Approximately 10,703 m^3 (14,000 yd^3) of PCB-contaminated soil were removed from a former outfall location where the present-day outfall pipe traverses. Zinc concentrations exceeded notification levels three times in 1994, although concentrations in the receiving water bodies remained within applicable standards (table 4.4.2.4–1). It is important to note that exceeding a notification level is not considered a permit violation (KC ASAC 1991a:9). A zinc source report was prepared and issued in March 1991. This report associated elevated levels of zinc with rainwater runoff from vehicle parking areas and from galvanized equipment and fencing on roofs and grounds of the facility (KCP 1993a:1).

Surface Water Rights and Permits. KCP facilities do not withdraw surface water for use. The Kansas City, MO, municipal water supply system provides all drinking and process water for KCP. All industrial wastewater is pretreated on site and then discharged in combination with KCP sanitary wastewater to the Kansas City Municipal Wastewater Treatment Plant.

Groundwater. KCP lies on alluvium, consisting of a complex mix of continuous and discontinuous layers/lenses of clayey silt, sand, and gravel. Two permeable water-bearing zones are present within the alluvium: an upper sand-clay-silt zone and a basal gravel zone with a sand-silt-clay matrix. The two

TABLE 4.4.2.4–2.—***Surface Water Quality Monitoring of the Blue River at Kansas City Plant, 1994***

Parameter	Unit of Measure	Water Quality Criteria[a]	Average[b]	Maximum[b]
Aluminum	mg/L	0.05-0.2[c]	1.01	2.43
Ammonia	mg/L	0.9[d]	0.078	0.28
Arsenic	mg/L	0.02[d]	<0.001	<0.001
Barium	mg/L	2[e]	<0.001	0.677
Beryllium	mg/L	0.004[d]	< 0.001	<0.001
Biochemical oxygen demand	mg/L	NA	10	27
Boron	mg/L	NA	0.0642	0.147
Cadmium	mg/L	0.005[e]	<0.001	<0.001
Chemical oxygen demand	mg/L	NA	28	39
Chloride	mg/L	250[c]	69	99
Chromium, total	mg/L	0.042[d]	<0.001	<0.001
Copper	mg/L	0.029[d]	<0.001	<0.001
Cyanide	mg/L	0.005[d]	0.003	0.01
Iron[b]	mg/L	0.3[c]	1.4	3.23
Lead	mg/L	0.015[e]	<0.001	<0.001
Nickel	mg/L	0.1[d]	<0.001	<0.001
Nitrate	mg/L	10[e]	4.48	10.4
Oil and grease	mg/L	NA	0.0367	2.2
pH	mg/L	6.5–8.5[c]	8	
Phenol	mg/L	0.1[d]	<0.001	<0.001
Phosphorus	mg/L	NA	0.86	1.73
Mercury	mg/L	monitor only	0.0005	0.031
Chromium^{+6}	mg/L	monitor only	0.0083	0.03
Silver	mg/L	0.00012[d]	<0.001	<0.001
Sulfate	mg/L	250[c]	93.67	136
Strontium	mg/L	NA	0.359	0.405
Tantalum	mg/L	NA	<0.001	<0.001
Temperature	F°	NA	57.6	
Thallium	mg/L	0.002[e]	<0.001	<0.001
Titanium	mg/L	NA	0.0123	0.4
Total dissolved solids	mg/L	500[c]	438	527
Total suspended solids	mg/L	NA	39.5	88
Tungsten	mg/L	NA	<0.001	<0.001
Zinc	mg/L	0.345[d]	0.0367	0.07

[a] For comparison only.
[b] Average values are taken from the monitoring station on the Blue River, downstream of all KCP outfalls. Maximum value used is the highest value from all monitoring stations downstream of the confluence of the Blue River and Indian Creek. More parameters than are listed were sampled for. The less than symbol (<) indicates concentration below the analysis detection limit. However, only those parameters having average or maximum concentrations greater than the instrument detection level are presented.
[c] National Secondary Drinking Water Regulations (40 CFR 143).
[d] Specific State of Missouri standards for Indian Creek and Blue River. If both chronic and acute standards apply, chronic is listed.
[e] National Primary Drinking Water Regulations (40 CFR 141).

Note: NA - not applicable.

Source: KCP 1995a:1.

TABLE 4.4.2.4–3.—*Surface Water Quality Monitoring of Indian Creek at Kansas City Plant, 1994*

Parameter	Unit of Measure	Water Quality Criteria[a]	Average[b]	Maximum[b]
Aluminum	mg/L	0.05-0.2[c]	1.63	3.34
Ammonia	mg/L	0.9[d]	0.218	0.55
Arsenic	mg/L	0.02[d]	< 0.001	<0.001
Barium	mg/L	2[e]	0.0925	0.123
Beryllium	mg/L	0.004[d]	< 0.001	<0.001
Biochemical oxygen demand	mg/L	NA	12.17	35
Boron	mg/L	NA	0.131	0.224
Cadmium	mg/L	0.005[e]	0.0015	0.005
Chemical oxygen demand	mg/L	NA	25.92	33.5
Chloride[b]	mg/L	250[c]	302.17	1,380
Chromium, total	mg/L	0.042[d]	<0.001	<0.001
Copper	mg/L	0.029[d]	<0.001	<0.001
Cyanide	mg/L	0.005[d]	0.0133	0.03
Iron[b]	mg/L	0.3[c]	1.89	3.8
Lead	mg/L	0.015[e]	0.0032	0.01
Nickel	mg/L	0.1[d]	<0.001	<0.001
Nitrate	mg/L	10[e]	8.49	17.9
Oil and grease	mg/L	NA	0.733	2
pH	pH units	6.5–8.5[c]	8.03	-
Phenol	mg/L	0.1[d]	<0.001	<0.001
Phosphorus	mg/L	NA	1.33	2.59
Mercury	mg/L	monitor only	<0.001	<0.001
Chromium^{+6}	mg/L	monitor only	0.0083	0.02
Silver	mg/L	0.00012[d]	<0.001	<0.001
Sulfate	mg/L	250[c]	105.1	146
Strontium	mg/L	NA	0.413	0.6
Tantalum	mg/L	NA	<0.001	<0.001
Temperature	F°	NA	58	84.2
Thallium	mg/L	0.002[e]	<0.001	<0.001
Titanium	mg/L	NA	0.02	0.045
Total dissolved solids	mg/L	500[c]	664	1,480
Total suspended solids	mg/L	NA	57	130
Tungsten	mg/L	NA	<0.001	<0.001
Zinc	mg/L	0.345[d]	0.0425	0.048

[a] For comparison only.

[b] Average values are taken from the monitoring station on Indian Creek, downstream of all KCP outfalls. More parameters than are listed were sampled for. The less than symbol (<) indicates concentration below the analysis detection limit.

[c] National Secondary Drinking Water Regulations (40 CFR 143).

[d] Specific State of Missouri standards for Indian Creek and Blue River. If both chronic and acute standards apply, chronic is listed.

[e] National Primary Drinking Water Regulations (40 CFR 141).

Note: NA - not applicable.

Source: KCP 1995a:1.

zones are separated in certain areas by a layer of olive to blue-green clayey silt. The two permeable water-bearing zones and the intervening clayey silt all transmit water and constitute the alluvium aquifer. The alluvial aquifer is considered a Class II aquifer having current and potential sources of drinking water and water having other beneficial uses. There are, however, no current uses of groundwater associated with the aquifer underlying KCP.

Groundwater Quality. Background groundwater quality in the alluvial aquifer is considered poor due to high iron and manganese concentrations. Additionally, three separate groundwater contaminant plumes have been identified within the KCP boundaries (figure 4.4.2.4–1). These contaminant plumes are due to past activities at several sites including the Trichloroethylene Still Area, the Underground Tank Farm, and the Northeast Area. In addition, an abandoned landfill south of the Internal Revenue Service parking lot is a contributing source of contamination to the groundwater. This landfill is not under the authority or control of DOE.

The primary contaminants present in the groundwater are trichloroethylene and its degradation products: 1,2-dichloroethylene and vinyl chloride. The contamination exists solely in the alluvial aquifer. The 1994 monitoring test results for the two plumes, referred to as the Blue River and Indian Creek groundwater flow system plumes, are summarized in table 4.4.2.4–4. Remediation activities include treating an average of approximately 151,000 L (39,900 gal) of solvent-contaminated groundwater per day (KCP 1993a:1).

Groundwater Availability, Use, and Rights. No groundwater is withdrawn for water supply use at KCP. Water is supplied to KCP from the city of Kansas City, MO, potable water distribution system, which currently supplies its users with approximately 158,775 MLY (41,948 MGY). This water is obtained from the Missouri River and from a field of wells in the Missouri River alluvium 24 km (15 mi) north of the plant (KCP 1991a:2). Water use at KCP averages about 1,934.5 MLY (511 MGY). The capacity of the KCP system is approximately 44,165 MLY (11,668 MGY). KCP is able to purchase unlimited amounts of water from Kansas City, MO. Missouri operates under the Riparian Doctrine where landowners have unrestricted rights to use water contained on their land.

4.4.2.5 *Geology and Soils*

Geology. KCP is located on the Central Stable Interior Platform of the Great Plains Province and rests on the southeastern flank of the Forest City Basin as it rises toward the Ozark Uplift. The plant lies on approximately 14 m (46 ft) of alluvium of the Blue River floodplain, which is bordered by outcrops of Pennsylvanian limestones and shales (DOE 1993j:4-29).

TABLE 4.4.2.4–4.—*Groundwater Contaminant Monitoring at Kansas City Plant, 1994*

			Blue River Flow System			Indian Creek Flow System
Parameter	Unit of Measure	Water Quality Criteria and Standards[a]	TCE Still Area[b]	Northeast Area[c]	Tank Farm Area[d]	TCE Still RCRA Facility Investigation Area[e]
1,1-Dichloroethane	mg/L	NA	84	h	h	15
1,1-Dichloroethylene	mg/L	0.007[f,g]	15	h	h	73
1,2-Dichloroethylene (total)	mg/L	0.007	11,000	1,100	3,700	42,000
Trichloroethylene	mg/L	0.005[g]	h	1,900	95	37,000
Tetrachloroethylene	mg/L	0.005[g]	h	h	h	h
Vinyl chloride	mg/L	0.002[g]	1,200[f]	h	150[e]	1,700

[a] For comparison purposes only, except for those parameters with State of Missouri Water Quality Standards.
[b] Well KC-87-69L.
[c] Well KC-84-18L.
[d] Well KC-89-182L.
[e] Well KC-89-168L, located in the RCRA Facility Investigation (RFI) Area.
[f] Missouri Division 60-Public Drinking Water Program.
[g] National Primary Drinking Water Regulations (40 CFR 141).
[h] Below detection level.
Note: NA - not applicable.
Source: KCP 1995a:1.

The Kansas City area is seismically stable and located in seismic Zone 2 (figure A.1-1). Since 1811, Kansas has experienced 13 earthquakes of intensity V or above on the modified Mercalli scale (approximately 4.5 on the Richter scale). Missouri has experienced 45 earthquakes with intensity V or above during the same period (DOC 1982a:191,195,198, 47a, 48a).

Several large earthquakes greater than magnitude 8 occurred in 1811 and 1812 along the New Madrid Fault Zone, 563 km (350 mi) southeast of Kansas City. The Kansas City area was affected by modified Mercalli intensity values estimated at VII or less during these events (Nuttli 1990a:2,3). No geological hazards are known in the immediate area of KCP. The plant does not lie within areas of subsidence, landsliding, active volcanism, rapid erosion, or sedimentation (DOE 1993j:4-29).

Soils. KCP is underlain by urban bottomland and udifluvents. Urban bottomland consists of areas where more than 85 percent of the surface is covered by concrete, asphalt, buildings, or other impervious material. Udifluvents consist of nearly level fill areas located adjacent to the Blue River. These soils present no erosion hazard or shrink-swell problems. No agricultural or prime farmland soils are present (DOE 1993j:4-29).

4.4.2.6 *Biotic Resources*

The following section describes biotic resources at KCP including terrestrial resources, wetlands, aquatic resources, and threatened and endangered species.

Terrestrial Resources. KCP is located in an area of mixed residential and industrial development in a region of former oak-hickory forest. The plant itself occupies 57 ha (141 acres) of the 121-ha (299-acre) Bannister Federal Complex site. The site is almost exclusively occupied by buildings, parking lots, lawns, and lawns with ornamental trees. The Bannister Federal Complex is bordered on the north by a bluff supporting a relatively undisturbed oak-hickory woodland designated as Legacy Park. Riparian forests, dominated by cottonwoods (*Populus spp.*) and willow (*Salix spp.*), and disturbed by human activities, border the Blue River and Indian Creek east and south of the complex (KC DOE 1989a:3-21).

Wildlife in the KCP area is dominated by human-tolerant species (KC DOE 1989a:3-21). Animal species found on the site would be limited to species such as American robins (*Turdus migratorius*), house sparrows (*Passer domesticus*), and squirrels (*Sciuridae*). A more diversified fauna would be expected within Legacy Park and the riparian forests bordering the Blue River and Indian Creek. With the exception of squirrels, no game species would be expected within the Bannister Federal Complex. While raptors could occasionally fly over the site, none would be expected to nest or forage there. Due to the developed nature of the site, carnivores would not be expected.

Wetlands. No wetlands exist within DOE-controlled areas in the Bannister Federal Complex. An area of potential wetlands supporting a cover of narrow-leafed cattail (*Typha augustifolia*) and a mixture of bulrushes (*Scirpus spp.*) and sedges (*Carex spp.*) is located in a low area north of the Internal Revenue Service building near the northeastern corner of the Bannister Federal Complex (KC DOE 1990a:13).

Aquatic Resources. No aquatic habitats exist within the Bannister Federal Complex. Beyond the KCP boundary, aquatic habitats associated with the Blue River and Indian Creek receive discharges of stormwater and one-pass cooling water generated on the Bannister Federal Complex. Four fish kills have occurred in the Blue River in the 5 years preceding 1992; however, the Missouri Department of Conservation has not attributed any of those kills to activities conducted at KCP (KCP 1991a:3). A 1980 census of fish in the Blue River indicated 29 species were present including gar (*Lepisosteus spp.*), shad (*Clupeidae*), common carp (*Cyprinus carpio*), minnows (*Cyprinidae*), suckers (*Catostomidae*), catfish (*Ictaluridae*), bass (*Centrarchidae*), sunfish (*Lepomis spp.*), and perch (*Percidae*) (KC DOE 1989a:3-19,3-21).

Threatened and Endangered Species. The USFWS has indicated that the bald eagle (*Haliaeetus leucocephalus*) is the only Federal-protected, threatened, or endangered species present in the vicinity of the Bannister Federal Complex (KC DOE 1990a:13).

Because of the nearly complete development of the Bannister Federal Complex, suitable habitat for the bald eagle does not exist. The Missouri Department of Conservation's records do not indicate that any sensitive species or communities exist within the Bannister Federal Complex or the surrounding area (KC DOE 1989a:3-22). No critical habitat for threatened or endangered species, as defined in the *Endangered Species Act* (50 CFR 17.11; 50 CFR 17.12), exists on KCP.

4.4.2.7 *Cultural and Paleontological Resources*

Prehistoric Resources. The prehistoric chronology of the KCP area consists of five broad time periods: Paleo-Indian (12,000 to 8,000 B.C.), Dalton (8,000 to 7,000 B.C.), Archaic (7,000 to 1,000 B.C.), Woodland (1,000 B.C. to A.D. 900), and Mississippian (A.D. 900 to 1700). Site types that may exist in the area include villages, campsites, limited-activity sites, and burial mounds. Two prehistoric sites and a multicomponent site have been previously recorded along the terraces of the Blue River. All of the KCP area has been either developed or disturbed, mainly as a result of flood protection construction. No surveys have been conducted at KCP. However, one cultural resources survey was conducted on areas adjacent to KCP and no prehistoric resources were identified.

Historic Resources. The history of the KCP region has been previously documented. The main building was built in 1942 for the manufacture of Pratt & Whitney aircraft engines for the U.S. Navy. After World War II, production ceased, and the plant was declared excess. The Atomic Energy Commission began production at the plant in 1949. Some of the facilities at KCP lack architectural integrity, are not representative of a particular style, and are not considered contributing features to the broad themes of World War II defense production, the Manhattan Project, or initial nuclear production. Consequently, these facilities are not likely to be considered eligible for the NRHP. However, some of the facilities at KCP may be NRHP eligible based on their association with the Cold War.

Native American Resources. Three Native American groups occupied or traversed the KCP area: the Osage, the Missouri, and the Kansas. The Great and Little Osage Indians occupied the region when French explorers and trappers arrived in the early 1700s. The Missouri Indians occupied the area along the Missouri River between the Grand and Chariton Rivers in central Missouri. The Kansas moved along the Missouri River from St. Louis toward St. Joseph, MO, from the late 1600s to around 1800. By 1827, they were living along the Kansas River in northern Kansas. Native American resources in the KCP area may include remains of villages, trails, springs, vision quest sites, and burial sites. However, most of the historic Indian villages were not located in the KCP area, but south on the Osage River or north and east along the Missouri River.

Paleontological Resources. KCP is located on alluvium from the Blue River floodplain, which is bordered by outcrops of Pennsylvanian limestones and shale. Some fossils may exist in the limestones and shale.

4.4.2.8 *Socioeconomics*

Socioeconomic characteristics addressed at KCP include employment, regional economy, population, housing, and public finance. Statistics for employment and regional economy are presented for the regional economic area that encompasses 49 counties surrounding KCP in Kansas and Missouri. Population, housing, and public finance statistics are presented for the ROI, a four-county area where 93 percent of the KCP employees lived in 1991. The ROI includes Cass (14 percent) and Jackson (60 percent) Counties in Missouri and Wyandotte (2 percent) and Johnson (17 percent) Counties in Kansas. Figure 4.4.2.8–1 presents a map of the counties and selected cities composing the KCP regional economic area and ROI. Supporting data are presented in appendix D.

Regional Economy Characteristics. Selected employment and regional economy statistics for the KCP regional economic area are summarized in figure 4.4.2.8–2. The civilian labor force in the regional economic area grew 13 percent between 1980 and 1990 (1.3 percent annual growth). Total regional employment numbered 1,160,522 persons in 1994. The unemployment rate in the region was 4.9 percent, comparable to the 5.3 and 4.9 percent unemployment rates in Kansas and Missouri, respectively. Per capita income in the region was $19,629 in

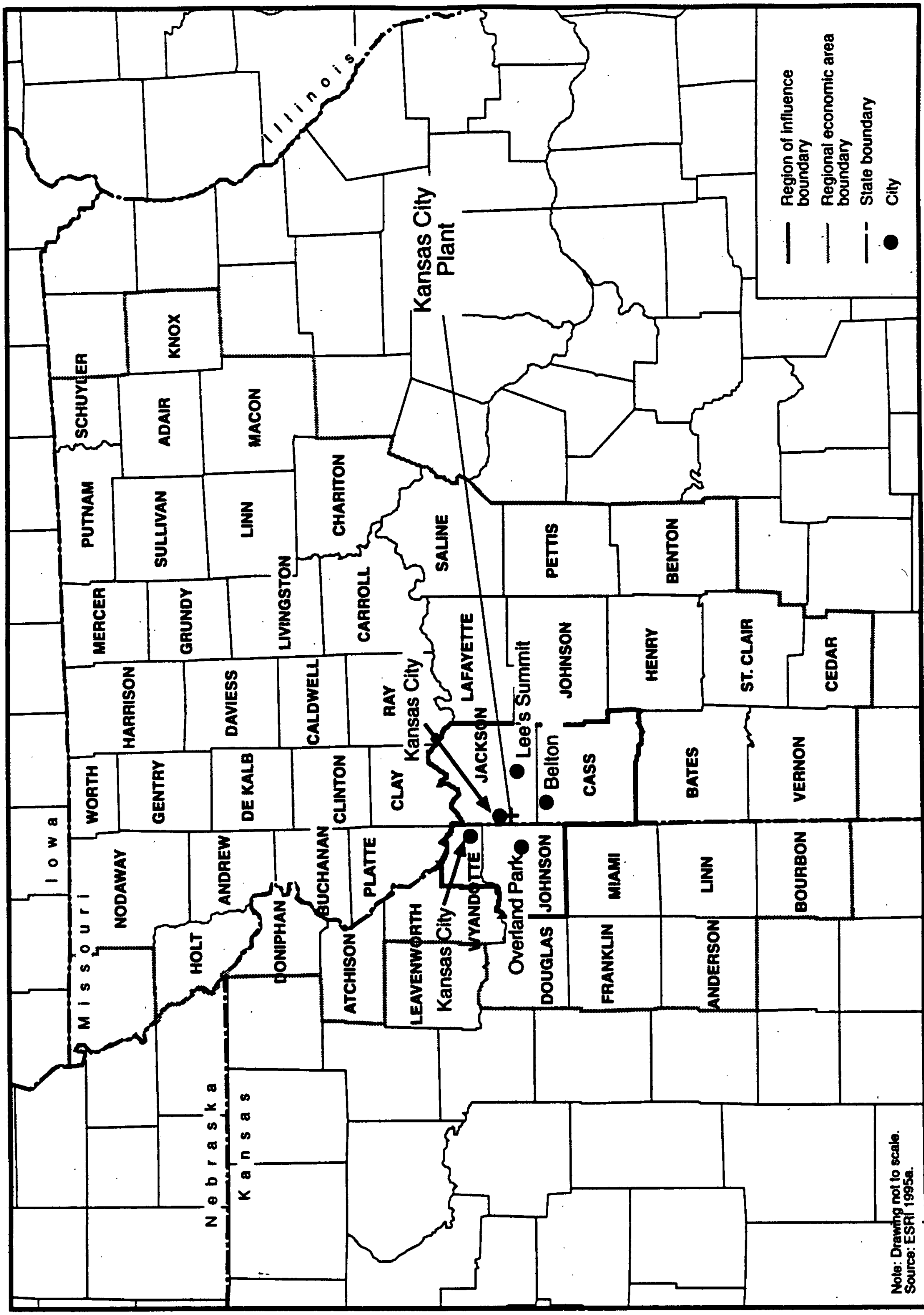
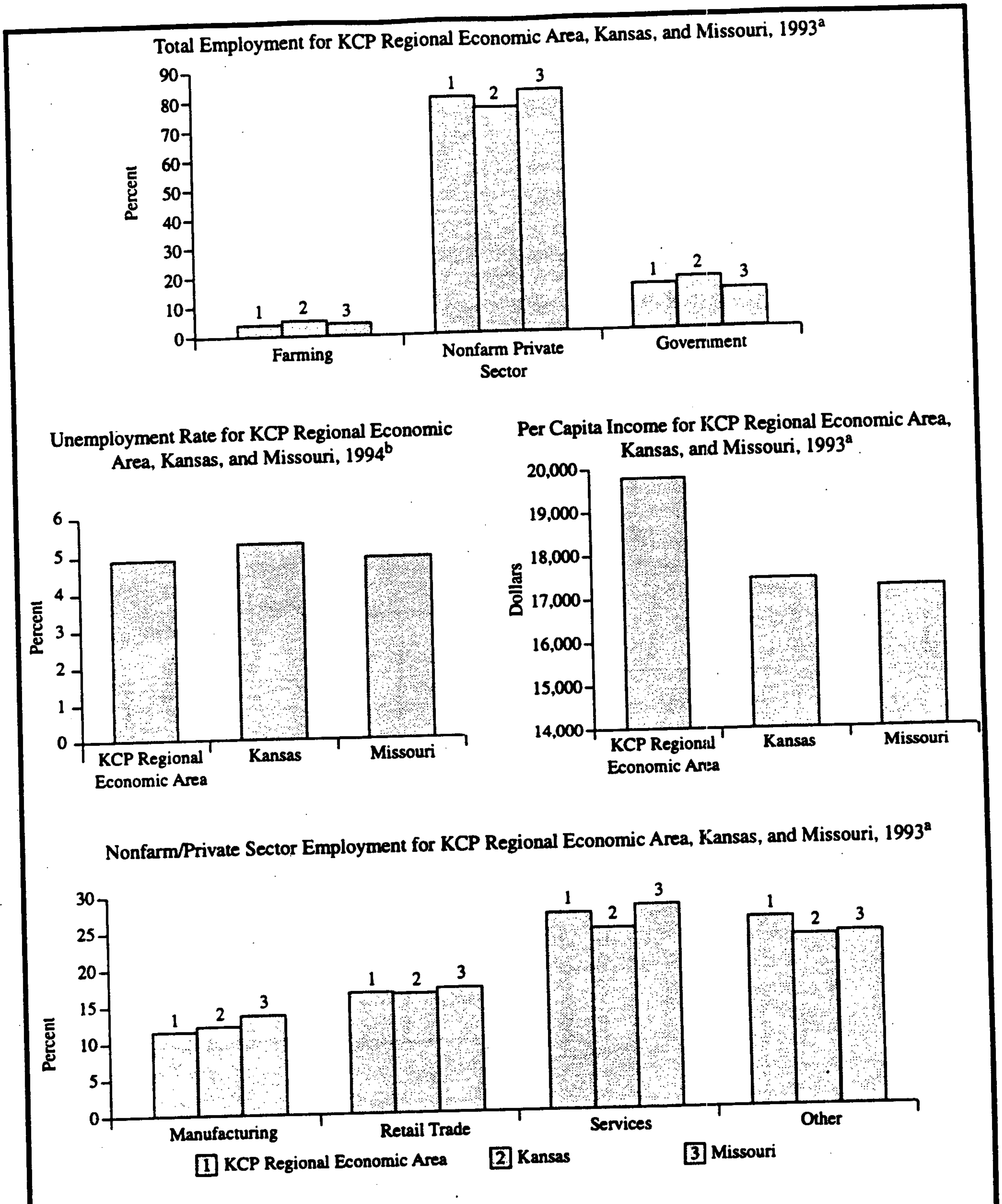


FIGURE 4.4.2.8–1.—*Regional Economic Area and Region of Influence for Kansas City Plant.*



[a] DOC 1995a.
[b] DOL 1995a.

FIGURE 4.4.2.8–2.—*Economy for the Kansas City Plant Regional Economic Area, Kansas, and Missouri.*

1993. The 1993 state per capita income was $17,213 in Missouri and $17,440 in Kansas.

As shown in figure 4.4.2.8–2, Kansas, Missouri, and the regional economic area have similar employment patterns. The service sector accounts for the largest share of total employment in both Kansas and Missouri (25 percent and 28 percent, respectively) and in the KCP region (27 percent).

Population and Housing. The ROI population, which totalled 1,235,369 in 1992, increased by about 10 percent (0.8 percent annually) between 1980 and 1992. This increase significantly exceeded the population growth rate for Kansas and Missouri (approximately 0.5 percent annually) during the same period. Within the ROI, the Cass County population increased by a total of 39 percent (3 percent annually), while the population in Wyandotte County fell by approximately 8 percent during the same period.

The increases in the number of housing units averaged approximately 1 percent annually in the ROI between 1980 and 1990, when the total reached 504,197. During this period however, the housing stock in Johnson County expanded by about 40 percent, an increase of almost 4 percent annually. In 1990, the homeowner vacancy rates averaged 3 percent in the ROI and rental vacancies averaged 12 percent. Population and housing statistics for the ROI are summarized in figure 4.4.2.8–3.

Public Finance. Financial characteristics of the local jurisdictions in the KCP ROI that are most likely to be affected by the proposed action are presented in this section. The data reflect total revenues and expenditures of each jurisdiction's general fund, special revenue funds, and, as applicable, debt service, capital project, and expendable trust funds. School district boundaries may or may not coincide with county or city boundaries, but the districts are presented under the county where they primarily provide services. Major revenue and expenditure fund categories for counties, cities, and school districts are presented in appendix tables D.2.3–4 and D.2.3–5. Figure 4.4.2.8–4 summarizes local governments' revenues and expenditures. Fund balances, which are dollars carried over from previous years, are not included in figure 4.4.2.8–4. All jurisdictions assessed had positive fund balances.

4.4.2.9 *Radiation and Hazardous Chemical Environment*

The following section provides a description of the radiation and hazardous chemical environment at KCP. Also included are discussions of health effects studies, a brief accident history, and emergency preparedness considerations.

Radiation Environment. Major sources of background radiation exposure to individuals (public and workers) in the vicinity of KCP are shown in table 4.4.2.9–1. All annual doses to individuals from background radiation are expected to remain constant over time. The total dose to the population changes as population size changes. There are no releases of radioactive material at KCP (KC ASAC 1991a:33); therefore, background radiation doses are unrelated to KCP operations.

TABLE 4.4.2.9–1.—*Sources of Radiation Exposure to Individuals in the Vicinity, Unrelated to Kansas City Plant Operations*

Source	Committed Effective Dose Equivalent (mrem/yr)
Natural Background Radiation	
Cosmic and external terrestrial radiation[a]	57
Internal terrestrial radiation[b]	39
Radon in homes[b] (inhaled)	200
Other Background Radiation[b]	
Diagnostic x rays and nuclear medicine	53
Weapons test fallout	<1
Air travel	1
Consumer and industrial products	10
Total	361

[a] Derived from information given in EPA 1981b.
[b] NCRP 1987a. Value for radon is an average for the United States.

Chemical Environment. The background chemical environment important to human health consists of the atmosphere, which may contain hazardous chemicals that can be inhaled; drinking water, which

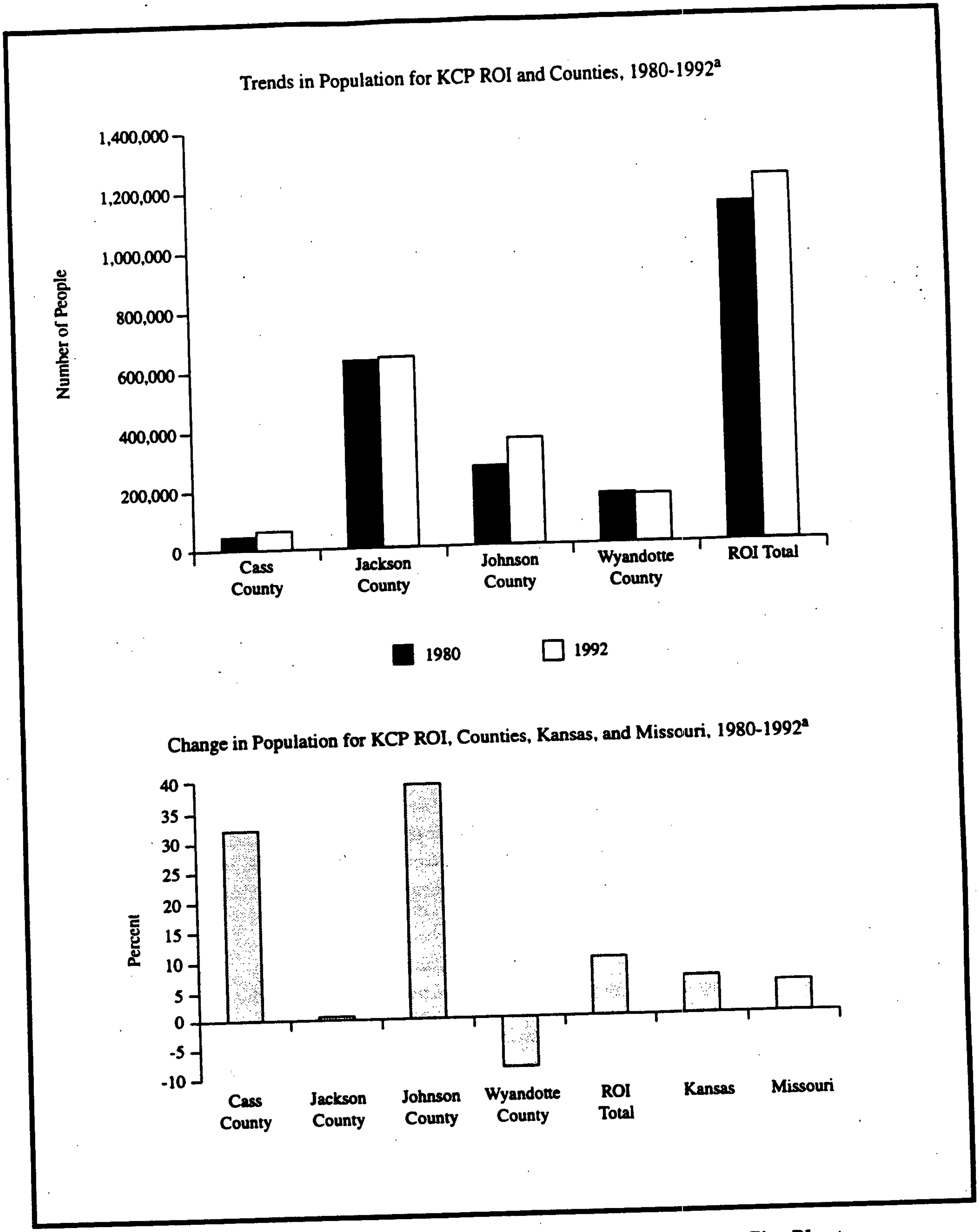
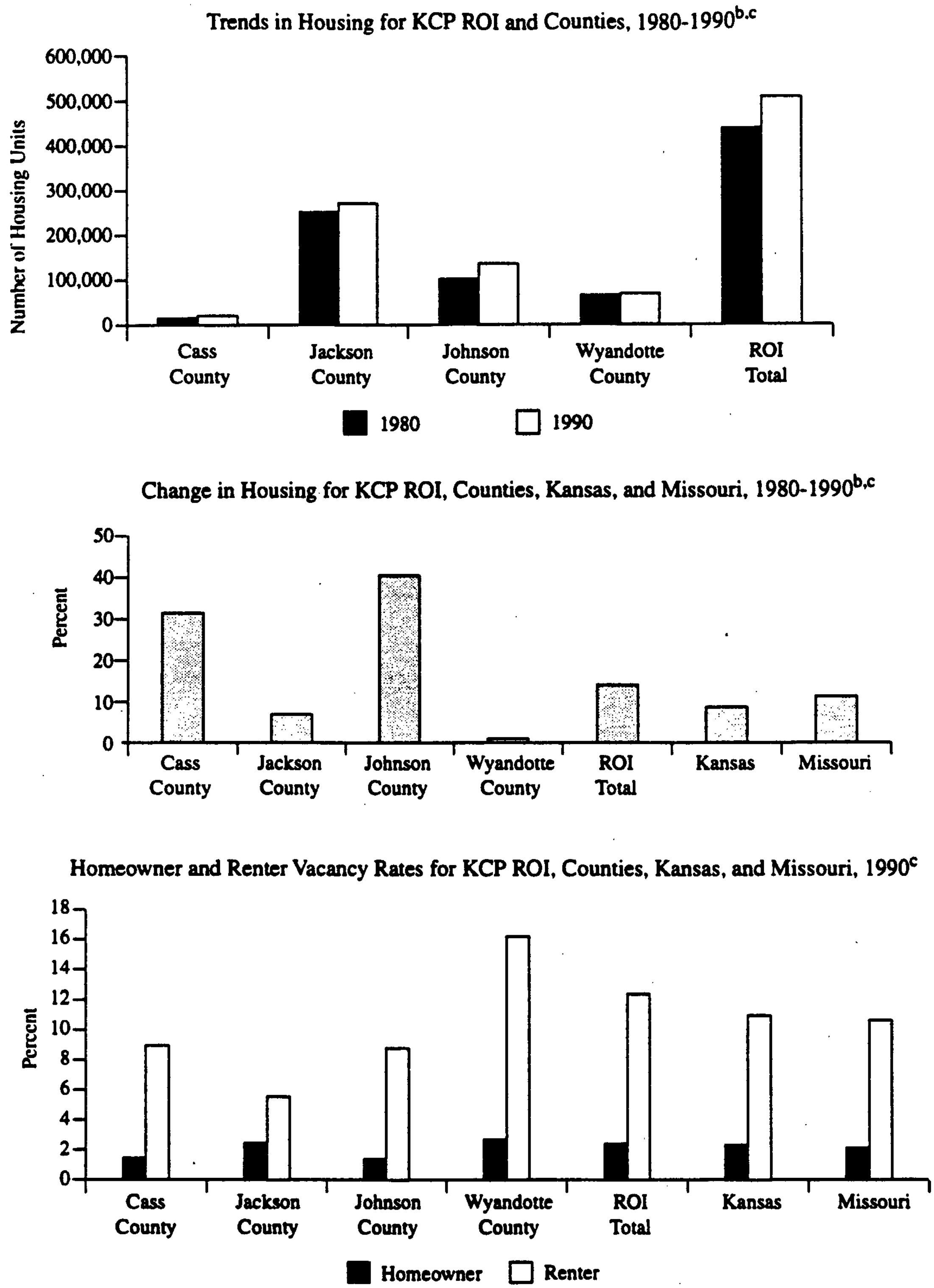


FIGURE 4.4.2.8–3.—***Population and Housing for the Kansas City Plant Region of Influence*** **[Page 1 of 2].**



[a]Census 1994o.
[b]Census 1982f, Census 1982u.
[c]Census 1991f, Census 1991ff.

FIGURE 4.4.2.8–3.—*Population and Housing for the Kansas City Plant Region of Influence* **[Page 2 of 2].**

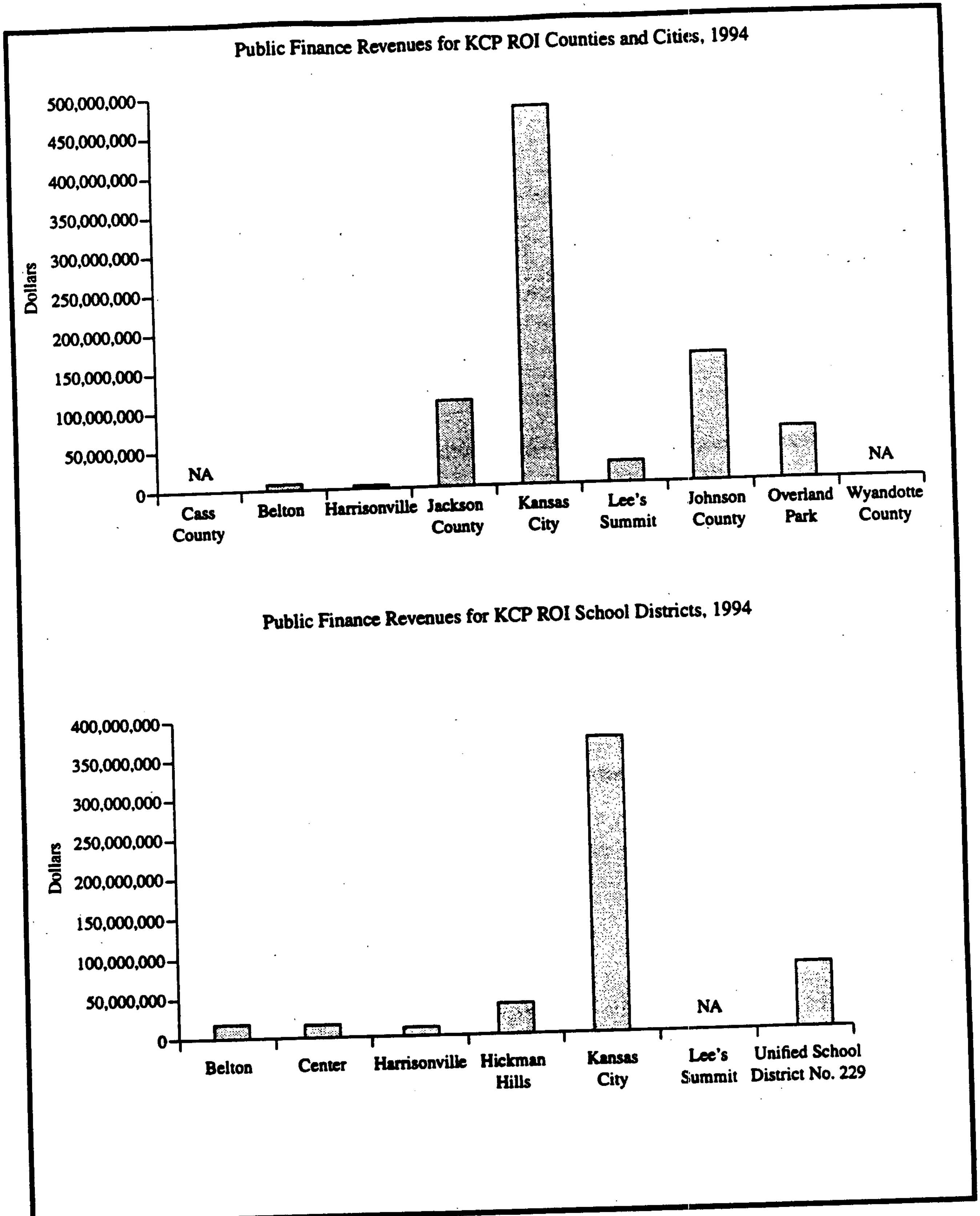
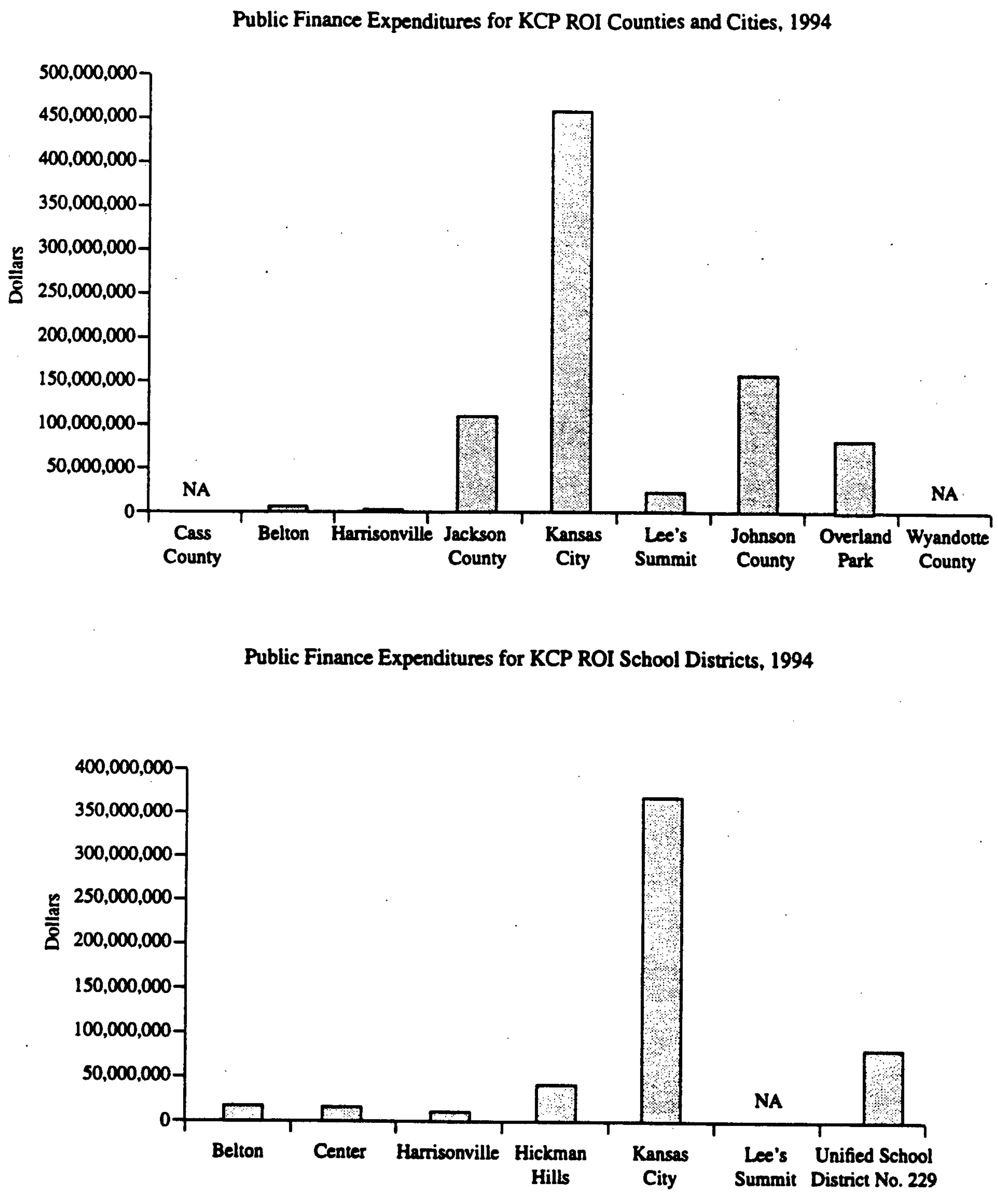


FIGURE 4.4.2.8–4.—*Local Government Public Finance for the Kansas City Plant Region of Influence* [Page 1 of 2].



Note: NA - not available.
Source: KC City 1995a; KC County 1995a; KC School 1995a.

FIGURE 4.4.2.8–4.—*Local Government Public Finance for the Kansas City Plant Region of Influence* **[Page 2 of 2].**

may contain hazardous chemicals that can be ingested; and other environmental media with which people may come in contact (e.g., soil through direct contact or via the food pathway). The baseline data for assessing potential health impacts from the chemical environment are those presented in sections 4.4.2.3 and 4.4.2.4.

Adverse health impacts to the public can be minimized through administrative and design controls to decrease hazardous chemical releases to the environment and to achieve compliance with permit requirements. The effectiveness of these controls is verified through the use of monitoring information and inspection of mitigation measures. Health impacts to the public may occur during normal operation at KCP via inhalation of air containing hazardous chemicals released to the atmosphere by KCP operations. Risks to public health from other possible pathways such as ingestion of contaminated drinking water or direct exposure are low relative to the inhalation pathway.

Baseline air emission concentrations for hazardous air pollutants and their applicable standards are presented in section 4.4.2.3. These concentrations are estimates of the highest existing offsite concentrations and represent the highest concentrations to which members of the public could be exposed. These concentrations are in compliance with applicable guidelines and regulations. Information about estimating health impacts from hazardous chemicals is presented in appendix E.

Exposure pathways to KCP workers during normal operation may include inhaling the workplace atmosphere, drinking KCP potable water, and possible other contact with hazardous materials associated with work assignments. The potential for health impacts varies from facility to facility and from worker to worker, and available information is not sufficient to allow a meaningful estimation and summation of these impacts. However, workers are protected from hazards specific to the workplace through appropriate training, protective equipment, monitoring, and management controls. KCP workers are also protected by adherence to OSHA and EPA occupational standards that limit atmospheric and drinking water concentrations of potentially hazardous chemicals. Appropriate monitoring, which reflects the frequency and amounts of chemicals utilized in the operation processes, ensures that these standards are not exceeded. Additionally, DOE requirements ensure that conditions in the workplace are as free as possible from recognized hazards that cause or are likely to cause illness or physical harm. Therefore, worker health conditions at KCP are expected to be substantially better than required by standards.

Health Effects Studies. No known epidemiological studies have been conducted in the surrounding communities to date. Karches et al., conducted a health hazard evaluation of the plant that manufactured nonnuclear hardware for weapons systems (NIOSH 1972a). The survey revealed concentrations of toluene-diisocyanate that exceeded the ceiling standard in mixing and molding operations and levels of methyl-ethyl-ketone used in cleaning operations that exceeded the excursion limits. Employee complaints include respiratory symptoms and recurrent dermatitis from epoxy resins. For information on DOE's Epidemiological Surveillance Program at KCP, refer to appendix section E.4.4.

Accident History. A review of recent KCP annual environmental and accident reports indicates that there have been no significant adverse impacts to workers, the public, or the environment. This review was performed to provide an indication of the site's accident history.

Emergency Preparedness. Each DOE site has established an emergency management program that would be activated in the event of an accident. This program has been developed and maintained to ensure adequate response for most accident conditions and to provide response efforts for accidents not specifically considered. The emergency management program incorporates activities associated with emergency planning, preparedness, and response. The KCP Emergency Preparedness Plan is designed to minimize or mitigate the impact of any emergency upon the health and safety of employees and the public.

4.4.2.10 *Waste Management*

This section outlines the major environmental regulatory structure and ongoing waste management activities at KCP. A more detailed discussion of the ongoing waste management activities is provided in appendix section H.2.3.

DOE is working with Federal and state regulatory authorities to address compliance and cleanup obligations arising from its past operations at KCP. DOE is engaged in several activities to bring its operations into full regulatory compliance. These activities are set forth in negotiated agreements that contain schedules for achieving compliance with applicable requirements, and financial penalties for nonachievement of agreed upon milestones. These agreements have been reviewed to assure the proposed actions are allowable under the terms of these agreements.

KCP does not dispose of waste onsite, although onsite disposal, and leaks and discharges have occurred in the past. On March 6, 1989, EPA requested that DOE enter into a RCRA Section 3008(h) Administrative Order of Consent. On June 23, 1989, DOE and EPA Region VII signed the order. The provisions of the order require that DOE conduct all assessment and remediation activities regulated under the order in accordance with approved environmental restoration remediation schedules.

KCP manages four broad waste categories: low-level, mixed, hazardous, and nonhazardous. A discussion of the waste management activities associated with each of these categories follows.

Low-Level Waste. KCP generates small quantities of LLW (<1 m^3) (KCP 1995a:1). Activities that generate LLW are the assembly, disassembly, and testing of irradiated components, scheduled replacement of tritium exit signs, disposal of x-ray sources, and small amounts of contaminated cleanup towels, disposable gloves, and packing materials. Periodically, the liquid LLW (≤1 gal) is solidified and mixed into concrete or plaster of Paris for final handling and disposal.

The solid LLW (≤1 m^3) is accumulated and stored in one controlled access facility used to store both LLW and mixed waste. LLW is stored onsite temporarily using DOT-approved containers until sufficient quantities accumulate to warrant shipment to a DOE disposal facility.

Mixed Low-Level Waste. Through process changes that have been made, KCP no longer routinely generates mixed waste. However, the potential exists for the generation of mixed waste from shielded equipment sources and future clean-up debris. Any KCP mixed waste generated in the future would be stored with LLW in a controlled access, RCRA-permitted storage facility pending the contract award to an offsite commercial RCRA-permitted mixed waste treatment and disposal facility. Once a contract is awarded, the mixed LLW would be transported to the commercial facility for treatment and disposal.

Hazardous Waste. In 1994, KCP generated 130 m^3 (34,340 gal) of RCRA-regulated and 80 m^3 (21,130 gal) of TSCA-regulated liquid wastes. In addition, 175 m^3 (229 yd^3) of RCRA-regulated and 500 m^3 (654 yd^3) of TSCA-regulated solid wastes were also generated (KCP 1995a:1). Hazardous waste is generated by a number of activities at KCP and consists of wastes such as acidic and alkaline liquids, solvents, oils, and coolants. Processes such as plating, etching, electronic assembly, metals and plastics machining and forming, and wastewater treatment are the principal generators. Waste stream residues generated at KCP that are not reclaimed, treated onsite at the Industrial Wastewater Pretreatment Facility, or recycled, are manifested and shipped under contract with DOT-certified transporters to RCRA-permitted offsite treatment and disposal facilities.

Hazardous wastes are managed in compliance with RCRA requirements as delineated in the Operating Permit issued by the Missouri Department of Natural Resources under the provisions of 40 CFR 270-272. KCP currently operates 10 RCRA interim status waste storage areas for containerized nonradioactive hazardous wastes, and 6 bulk storage tanks for nonradioactive hazardous wastes. These facilities are for temporary storage of wastes prior to disposal using offsite RCRA-permitted commercial facilities. The container storage and tank storage facilities have total design capacities of 167 m^3 (44,000 gal) for liquid and 2,350 m^3 (3,070 yd^3) for solid hazardous/toxic wastes (KCP 1993a:1).

The KCP Environmental Restoration Program serves to identify the nature and extent of environmental contamination at inactive waste sites. The site investigations conducted to date have indicated that hazardous waste constituents found in soil and groundwater at KCP are associated with past operations and are found at or near units now considered regulated hazardous waste management and solid waste management units.

Hazardous waste generated at KCP is manifested and shipped under contracts with DOT-registered transporters to RCRA- or TSCA-permitted incineration, reclamation, or disposal facilities. In addition, procedures have been developed by KCP to evaluate all prospective treatment, storage, and disposal sites to ensure that the facilities are operating in accordance with all applicable regulations. An annual reevaluation site visit is conducted by KCP environmental and waste management personnel for all treatment, storage, or disposal facilities utilized by KCP.

Waste that requires disposal under TSCA continues to decrease. The primary generation source of PCB wastes over the past 15 years has been equipment upgrades and electrical substation replacement (i.e., replacement of transformers). These projects are now complete and this category of waste is now primarily generated from restoration and remediation projects.

Nonhazardous Waste. Nonhazardous wastes are generated routinely and include general plant refuse such as paper, cardboard, glass, wood, plastics, scrap, and metal containers. Nonhazardous wastes are segregated and recycled whenever possible. The wastes are transported to a sanitary landfill. Approximately 8,300 t (9,150 tons) of solid sanitary waste were generated in 1994 (KC DOE 1995a:7). Sanitary wastewaters are discharged to the sanitary sewer in compliance with Kansas City, MO, sewer-use ordinance provisions and permit discharge limits. In 1994, about 249,000 m^3 (65,778,800 gal) of sanitary wastewater were generated (KC DOE 1995a:10). Biomedical waste is incinerated offsite at an incinerator permitted and approved by the Kansas Department of Health and Environment.

4.4.3 Environmental Impacts

4.4.3.1 *Land Use*

No Action. Under No Action, DOE would continue current and planned activities at KCP as described in section 3.2.4. No additional land use impacts are anticipated at KCP beyond the effects of existing and future activities that are independent of the proposed action.

Management Alternatives

Downsize Nonnuclear Fabrication. Since 1990, KCP has been undergoing a restructuring of the physical plant to reduce its size under nonnuclear manufacturing consolidation of the Complex. Modification of existing facilities as a result of the downsizing effort would continue and appropriate measures would be taken to further consolidate nonnuclear fabrication at KCP. No additional land would be used to downsize the nonnuclear fabrication mission. Impacts to land use or land use plans are not expected.

Phaseout of Nonnuclear Fabrication. The phaseout of nonnuclear fabrication at KCP would not affect land resources. The proposed alternative would not affect land use in the short term. Facilities and infrastructure would transition to EM for D&D before disposition. A future scenario may be the potential for the site to accommodate industrial type activities. The subsequent use of KCP would be addressed in the transition plan prepared by EM.

Sensitivity Analysis. All operations and support functions for nonnuclear fabrication can be accomplished within the restructured KCP. The downsized facility (167,000 m^2 [1.8 million ft^2]) would be sufficient to maintain capacity for the low case production scenario. Approximately 5,760 m^2 (62,000 ft^2) of unallocated floor space would be rearranged in order to support the high case production scenario.

Potential Mitigation Measures. No mitigation measures are anticipated.

4.4.3.2 *Site Infrastructure*

A comparison of site infrastructure and facilities resource needs for the nonnuclear fabrication alternatives at KCP is shown in table 4.4.3.2–1.

No Action. This alternative continues the nonnuclear fabrication mission in current facilities as described in section 3.4.2. Reductions in site infrastructure

TABLE 4.4.3.2–1.—***Site Infrastructure Requirements and Changes for Stockpile Management Alternatives at Kansas City Plant***

	Electrical		Fuel		
Alternative	**Energy (MWh/yr)**	**Peak Load (MWe)**	**Liquid (L/yr)**	**Gas (m^3/yr)**	**Coal (t/yr)**
Current Resources	129,886	24.2	9,058	15,151,078	NA
No Action (2005)					
Total site requirement	119,150	24.2	9,058	13,449,774	NA
Change from current resources	-10,736	0	0	-1,701,304	NA
Downsize Nonnuclear Fabrication					
Total site requirement	225,000	30	0[a]	18,900,000	NA
Change from No Action	105,850	5.8	-9,058	5,450,226	NA
Phaseout Nonnuclear Fabrication					
Total site requirement	0	0	0	0	NA
Change from No Action	-119,150	-24.2	-9,058	-13,449,774	NA

[a] Oil consumption is reduced to 0 L/yr after facility downsize.
Note: NA - not applicable.
Source: KC ASI 1995a; KCP 1995a:1.

would be minimal, consistent with reduced output requirements.

Management Alternatives

Downsize Nonnuclear Fabrication. The nonnuclear fabrication alternative for KCP would downsize and consolidate facilities at KCP to more efficiently support the reduced mission. The KCP infrastructure would be capable of supporting the reduced nonnuclear fabrication mission without major modifications to the existing infrastructure. For normal operation, the modified production facilities would require fewer resources compared to the current site-wide requirements, except for peak electrical load, which would increase slightly. Construction impacts would be minimal since downsizing consists of minor modifications to existing facilities. As indicated in table 4.4.3.2–1, electrical energy requirements for three-shift surge operation in the base case facility would be almost double compared to No Action.

Phaseout of Nonnuclear Fabrication. Phaseout of the nonnuclear fabrication mission at KCP would result in a substantial reduction in site infrastructure resource requirements. During facility transition activities to prepare for turnover to EM, site resource requirements would remain approximately the same as No Action. After transfer to EM and after D&D, facilities would remain in a caretaker status until final disposition.

Sensitivity Analysis. To support high case production levels, a modest increase in factory floor space size to 172,985 m^3 (1,862,000 ft^2) would be necessary. The majority of additional space would be in the electronics factory along with a smaller increase in the utility reservoir area. Utility requirements would change moderately to accommodate the additional production and floor space. There would be little difference in the site infrastructure impacts associated with high case production compared to base case surge operation. The low case scenario could easily be handled in the base case facility without modification.

Potential Mitigation Measures. No additional mitigation measures are anticipated.

4.4.3.3 Air Quality

No Action. Impacts to air quality under No Action are estimated using air emissions data from operations at KCP in 2005, assuming continuation of current site missions, to calculate pollutant concentrations at or beyond the KCP site boundary. The emission rates for criteria and toxic/hazardous pollutants for No Action are presented in table B.3.4–1. Table 4.4.3.3–1 presents the No Action pollutant concentrations calculated from the 2005 emission rates. In this table, pollutant concentrations are compared with applicable Federal and state regulations and guidelines. Pollutant concentrations in the vincinity of KCP are expected to remain within applicable Federal and state regulations and guidelines except for the 1-hour concentration for ozone and the annual concentration for particulate matter, which may be the result of offsite contributions.

Management Alternatives

Downsize Nonnuclear Fabrication. The primary impact of downsizing and/or consolidating the nonnuclear fabrication function at KCP would be to reduce the fugitive emissions of numerous small amounts of solvents in the nonnuclear component fabrication processes. These solvents include acetone, isopropyl alcohol, methyl ethyl ketone, toluene, and trichloroethylene. Table 4.4.3.3–1 presents the concentrations of criteria and toxic/hazardous pollutants resulting from downsizing and/or consolidating the nonnuclear fabrication mission. Emission rates of criteria and toxic/hazardous pollutants for this option are presented in table B.3.4–1. Concentrations of pollutants resulting from downsizing and/or consolidating nonnuclear fabrication are expected to be within Federal and state regulations except for the 1-hour concentration of ozone and the annual concentration of particulate matter, which are above their applicable standards.

Phaseout of Nonnuclear Fabrication. Phaseout of nonnuclear fabrication at KCP would result in cessation of air pollutant emissions from the facility. The air quality in and around KCP is expected to improve as a result of the phaseout of the nonnuclear fabrication mission.

Sensitivity Analysis. Impacts to air quality from either the low or high case scenario of the downsize nonnuclear fabrication alternative would result in higher and lower concentrations of criteria and toxic-hazardous pollutants for the high and low cases, respectively. The concentrations of pollutants for both cases are expected to be within applicable

TABLE 4.4.3.3–1.—*Estimated Concentrations of Pollutants from No Action and Stockpile Management Alternatives at Kansas City Plant*

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines (μg/m³)	2005 No Action (μg/m³)	Downsize Nonnuclear Fabrication (μg/m³)	Phaseout Nonnuclear Fabrication (μg/m³)
Criteria Pollutant					
Carbon monoxide	8-hour	10,000[a]	4,872	4,872	[b]
	1-hour	40,000[a]	7,772	7,772	[b]
Lead	Calendar quarter	1.5[a]	[c]	[c]	[b]
Nitrogen dioxide	Annual	100[a]	36.6	36.6	[b]
Ozone	1-hour	235[a]	242.9	242.9	[b]
Particulate matter	Annual	50[a]	84.8	84.8	[b]
	24-hour	150[a]	[d]	[d]	[b]
Sulfur dioxide	Annual	80[a]	14.8	14.8	[b]
	24-hour	365[a]	<59.8	<59.8	[b]
	3-hour	1,300[a]	59.8	59.8	[b]
Mandated by Missouri					
Hydrogen sulfide	30-minute	42[e]	[c]	[c]	[b]
Sulfuric acid	24-hour	10[e]	[c]	[c]	[b]
	1-hour	30[e]	[c]	[c]	[b]
Hazardous and Other Toxic Compounds					
Acetone	24-hour	161[e]	3.78	3.94	[b]
Chromium	24-hour	1.36[e]	0.09	0.09	[b]
Cyanide	8-hour	66.67[e]	0.18	0.05	[b]
Ethyl benzene	24-hour	118[e]	0.43	0.43	[b]
Formaldehyde	24-hour	0.33[e]	0.09	0.09	[b]
Hydrogen chloride	24-hour	2.03[e]	0.26	0.14	[b]
Isopropyl alcohol	8-hour	13,066.7[e]	25.57	44.16	[b]
Methanol	24-hour	7.13[e]	0.09	0.09	[b]
Methyl ethyl ketone	24-hour	32.1[e]	1.37	1.17	[b]
Methyl isobutyl ketone	24-hour	55.7[e]	0.26	0.26	[b]
Perchloroethylene	24-hour	922[e]	2.49	2.49	[b]
Toluene	24-hour	10.2[e]	4.30	4.79	[b]
Toluene-2,4-diissocyanate	24-hour	0.10[e]	0.09	0.09	[b]
Trichloroethylene	24-hour	36.5[e]	22.33	30.31	[b]
Trichloroethane	24-hour	1,040[e]	0.34	0.34	[b]
Xylene	8-hour	5,800[e]	4.10	4.10	[b]

[a] Federal standard.
[b] No air pollutants will be emitted from KCP after phaseout of nonnuclear fabrication.
[c] No monitoring data available, concentration is assumed to be less than applicable standard.
[d] No monitoring data available.
[e] State standard or guideline.
Source: 40 CFR 50; KC ASI 1995a; MO DNR 1995a.

Federal and state regulations and guidelines, except the 1-hour concentration of ozone and the annual concentration of particulate matter.

Potential Mitigation Measures. The reduction of emissions of nitrogen oxides and VOCs from KCP using reasonably available control technology may contribute to the reduction of concentrations of ozone. Installation of additional HEPA filters may contribute to the reduction of annual particulate matter concentrations. In general, however, these concentrations of pollutants are an area-wide phenomenon closely linked to urban concentrations of automobile exhaust which are not linked to the KCP site mission.

4.4.3.4 *Water Resources*

Environmental impacts associated with the modification and operation of the potential nonnuclear fabrication facilities at KCP could affect surface and groundwater resources. All water required for modification and operations would be supplied from the Kansas City Municipal Water Supply System. Process and sanitary wastewater generated from the modification and operation activities would be discharged to the Kansas City Wastewater Treatment Plant. With improved flood control, all KCP operations are protected from flooding events up to and including a 500-year flood. Modification would take place within existing facilities to achieve the downsizing and consolidation of nonnuclear fabrication. A description of the functions to be included in the nonnuclear fabrication process and the facility locations selected to house these activities is presented in section 3.4.2. Table 4.4.3.4–1 presents existing surface and groundwater resources and the potential changes to water resources at KCP resulting from the proposed alternatives. The total site water resource requirements for each alternative including No Action are displayed in this table.

Surface Water

No Action. No construction would occur under No Action; therefore, no additional construction water would be used or discharged. Under No Action, because of reduced operating requirements of existing facilities at KCP, treated wastewater volume is estimated to decrease to 702 MLY (185 MGY) by 2005. No adverse impacts to surface water or surface water quality are expected.

Management Alternatives

Downsize Nonnuclear Fabrication. No surface water would be required to modify the nonnuclear fabrication facilities, nor would modification activities generate wastewater.

Approximately 1,340 MLY (354 MGY) of municipal water would be required for three-shift surge operation of the downsize nonnuclear fabrication facilities. The water usage would represent approximately a 31-percent decrease from the projected No Action use of 1,930 MLY (509 MGY) and would not affect other users of the Kansas City Municipal Water Supply System.

No added or special wastewater handling capability would be required. Existing capabilities would be used to handle the generated wastewater. Most of the process wastewater is acidic and alkaline wastewater requiring pH adjustment, and is readily amenable to treatment at the wastewater pretreatment facility prior to discharge to the Kansas City Municipal Sewer System. The KCP Industrial Wastewater Pretreatment Facility, with a design capacity of approximately 1,788.5 MLY (472.5 MGD), has sufficient available capacity to treat the wastewater from the proposed alternative.

Surface Water Quality. There would be no impact to surface water quality due to sanitary or process wastewater because these discharges go to city treatment facilities. There would be no increase in cooling water discharges from the operations. In addition, significant changes in stormwater runoff from KCP are not anticipated.

Phaseout of Nonnuclear Fabrication. Phaseout activities for KCP would end all current DP operations. The phaseout of DP activities would cease industrial discharges to the wastewater pretreatment facility and cooling water discharges to Blue River and Indian Creek. This would have a minor beneficial impact to water quality in Blue River and Indian Creek.

TABLE 4.4.3.4–1.—*Potential Changes to Water Resources from Stockpile Management Alternatives at Kansas City Plant*

Affected Resource Indicator	No Action Single-Shift Operation 2005	Downsize Nonnuclear Fabrication Three-Shift Operation	Phaseout of Nonnuclear Fabrication
Construction			
Water Availability and Use			
Water source	Municipal supply	Municipal supply	Municipal supply
Total site water operation requirement (MLY)[a]	0[b]	1,930	0
Percent change from No Action water use (1,930 MLY)	NA	0	0
Water Quality			
Wastewater discharge to Kansas City Wastewater Treatment Plant (MLY)	0[b]	702	0
Percent change from No Action wastewater discharge (702 MLY)	NA	0	0
Operation			
Water Availability and Use			
Water source	Municipal water supply	Municipal water supply	Municipal water supply
Total site water operation requirement (MLY)	1,930	1,340	0
Percent change from No Action water use (1,930 MLY)	NA	-31	-100
Percent change from current water use (1,934.5 MLY)	-0.2	-31	-100
Water Quality			
Wastewater discharge to Kansas City Wastewater Treatment Plant (MLY)	702	794	0
Percent change from No Action wastewater discharge (702 MLY)	NA	13	-100
Percent change from current wastewater discharge (884 MLY)	-21	-10	-100
Floodplain			
Actions in 100-year floodplain	None	None	None
Actions in 500-year floodplain	None	None	None

[a] Total water requirements for construction at KCP are based on a 4-year time period for nonnuclear fabrication.
[b] No construction water would be used or construction wastewater generated. Total site water use and wastewater discharged would be the same as No Action operation.
Note: NA - not applicable; MLY - million liters per year.
Source: KC ASI 1995a; KCP 1995a:1.

Groundwater

No Action. Under No Action, no additional impacts to groundwater resources are anticipated beyond the effects of existing and future activities that are independent of and unaffected by the proposed action. Under No Action, current restoration programs described in section 4.4.2.4 would continue. Process and sanitary wastewater would continue to be treated prior to release.

Management Alternatives

Downsize Nonnuclear Fabrication. No groundwater would be used for modification of buildings and operating the downsize and consolidation of nonnuclear fabrication mission at KCP.

Groundwater Quality. Plumes of organic solvents and VOCs are present beneath the buildings proposed to contain downsized and consolidated nonnuclear fabrication functions (section 4.4.2.4). Groundwater corrective actions are in progress and should not affect future nonnuclear fabrication activities. Because no groundwater beneath KCP would be used and no discharge of waste materials to groundwater is planned, no additional impacts to groundwater quality are expected to result from this alternative.

Phaseout of Nonnuclear Fabrication. By phasing out the nonnuclear fabrication mission at KCP, water demand on the Kansas City Municipal Water Supply System would decrease. No adverse impacts on water supplies are expected.

Spill protection systems and plans exist to contain and minimize effects of releases of hazardous substances. Given normal safeguards and precautions, no adverse impacts to groundwater quality are expected to result from phaseout activities. Current environmental restoration programs would not be adversely impacted.

Sensitivity Analysis. Surface water, surface water quality, groundwater, and groundwater quality would not be affected by the high or low case stockpile requirement at KCP.

Potential Mitigation Measures. No mitigation measures are anticipated.

4.4.3.5 *Geology and Soils*

The proposed alternatives for KCP would have no impact on geological resources as described in section 4.4.2.5. Due to low seismic and volcanic risk, the proposed action would not be affected by geological conditions. Potential changes to geology and soils associated with alternatives at KCP are discussed below.

No Action. Under No Action, DOE would continue current and planned activities at KCP. Any impacts to geology and soils would be independent of and unaffected by the proposed action.

Management Alternatives

Downsize Nonnuclear Fabrication. Downsizing and/or consolidating the nonnuclear fabrication mission at KCP would not affect geological conditions. Designs of the project facilities would ensure that they would not be adversely affected by geological conditions.

Building modification activities at KCP would be limited to rearrangements and modifications within the confines of existing plant floor space. Existing parking areas are sufficient to accommodate construction workers. Building material laydown areas would be within the space being modified.

The properties and conditions of the soils underlying the proposed site place no limitations on modification and renovation activities. Soil conditions would not adversely affect the safe operation of downsized and/or consolidated project facilities. The proposed action would have no adverse impacts on KCP soils because the entire area has been disturbed to accommodate existing facilities and operations.

Renovation and facility modifications would be performed in accordance with DOE O 420.1 and accompanying safety guides. Seismic hazards would not increase. Landslides, sinkhole development, rapid erosion, sedimentation, or other nontectonic events are unlikely.

Phaseout of Nonnuclear Fabrication. The phaseout of the nonnuclear fabrication mission at KCP would not affect geology and soils. The D&D of vacated facilities would take place within the buildings.

Sensitivity Analysis. The high or low case operation scenario would not affect geology and soils.

Potential Mitigation Measures. No mitigation measures are anticipated.

4.4.3.6 *Biotic Resources*

The following sections address impacts to terrestrial resources, wetlands, aquatic resources, and threatened and endangered species. In general, impacts to these resources are not expected from the proposed alternatives; however, noise and human presence could temporarily disturb wildlife.

No Action. Under No Action, the nonnuclear fabrication mission described in section 3.2.4 would continue at KCP. This would result in no changes to current biotic resource conditions at the site as described in section 4.4.2.6.

Management Alternatives

Downsize Nonnuclear Fabrication. Downsizing the nonnuclear fabrication mission at KCP would involve consolidating all functions into the main manufacturing building and a number of outlying buildings. Stormwater and some cooling wastewaters would continue to be discharged to the Blue River via NPDES permitted outfalls. This alternative would not be expected to impact biotic resources.

Phaseout of Nonnuclear Fabrication. Phaseout of the nonnuclear fabrication mission at KCP is unlikely to result in adverse impacts to biotic resources. During the phaseout period, additional human activity could temporarily disturb wildlife living nearby; however, disturbance would be minimal since the facility is presently a heavily used industrial area and nearby wildlife populations have already adapted to its presence. Once all phaseout activities are complete, wildlife use of the area would depend on future use of the facilities.

Sensitivity Analysis. Implementation of either a low or high case workload would not affect biological resources.

Potential Mitigation Measures. No mitigation measures are anticipated.

4.4.3.7 *Cultural and Paleontological Resources*

For the discussion of impacts, the term cultural resources includes prehistoric, historic, and Native American resources. Cultural and paleontological resources may be affected directly through ground disturbance, building modifications, visual intrusion of the project to the historic setting or environmental context of historic sites, visual and audio intrusion into Native American resources, reduced access to traditional use areas, and unauthorized artifact collecting and vandalism. To date, no surveys have been conducted at KCP. All of the area has been either developed or disturbed; consequently, the probability for locating NRHP-eligible archaeological resources at KCP is low. Because the facility was designed and organized around the mission of the Cold War era, some of the existing buildings may be eligible for the NRHP. Site-specific surveys and evaluations would be conducted in conjunction with tiered NEPA documentation. No Native American resources have been identified at KCP. Geological strata at KCP may be fossil bearing.

No Action. Under No Action, DOE would continue the existing and planned missions of KCP described in section 3.2.4. Any impacts to cultural or paleontological resources from these missions would be independent of and unaffected by the proposed action.

Management Alternatives

Downsize Nonnuclear Fabrication. This alternative would involve reducing the operating size of the facility and its support infrastructure. Because KCP is developed and disturbed, it is unlikely to contain NRHP-eligible archaeological resources. This alternative is not expected to affect prehistoric, Native American, or paleontological resources. KCP was designed and organized around the mission of the Cold War and, as such, some of the buildings may be NRHP eligible. NRHP-eligible resources would be identified through project-specific inventories and evaluations, and any project-related effects would be addressed in tiered NEPA documentation.

Phaseout of Nonnuclear Fabrication. The phaseout of nonnuclear fabrication at KCP may affect some cultural resources. The subsequent use of KCP would determine potential future impacts to these resources. NRHP-eligible resources would be identified through project-specific surveys and evaluations. Specific concerns about Native American resources would be addressed through consultation with the potentially affected tribes. Any project-related effects would be addressed in tiered NEPA documentation. No impacts to paleontological resources are expected.

Sensitivity Analysis. The high and low case scenarios have the same impacts to cultural and paleontological resources. The base case production facility for downsize nonnuclear fabrication would accommodate both the high and low case production scenarios.

Potential Mitigation Measures. If NRHP-eligible sites cannot be avoided through project design or siting, and would be adversely affected, then a Memorandum of Agreement would need to be negotiated among DOE, the Missouri SHPO, and the Advisory Council on Historic Preservation. The Memorandum of Agreement would formalize mitigation measures agreed to by these consulting parties. Mitigation measures could include describing and implementing intensive inventory and evaluation studies, data recovery plans, site treatments, and monitoring programs. The appropriate level of data recovery for mitigation would be determined through consultation with the Missouri SHPO and the Advisory Council on Historic Preservation in accordance with Section 106 of the *National Historic Preservation Act*. Mitigation measures for specific NRHP-eligible sites would be identified during tiered NEPA documentation.

If Native American resources cannot be avoided through project design or siting, then acceptable mitigation measures to reduce project effects on them would be determined in consultation with the affected Native American groups. In accordance with the *Native American Graves Protection and Repatriation Act* and the *American Indian Religious Freedom Act*, such mitigations may include, but would not be limited to, appropriately relocating human remains, planting vegetation screens to reduce visual or noise intrusion, increasing access to traditional use areas, or transplanting or harvesting important Native American plant resources.

4.4.3.8 *Socioeconomics*

No Action. Under No Action, the existing Nonnuclear Fabrication Facility at KCP would remain operational with its current staffing requirements. The facility would continue to employ a total of 3,179 workers. Of these workers, 2,508 would be core stockpile management workers involved in the process of nonnuclear fabrication, while the remaining 671 workers would be support staff or other employees not involved in the mission. Projected regional economy and employment levels, population, housing, and public finance characteristics are presented in appendix D.

Regional Economy and Employment. Total employment in the regional economic area is projected to increase by less than 1 percent annually between 1995 and 2030, reaching approximately 1,194,400 in 2000 and 1,373,300 in 2030. Unemployment in the regional economic area was 4.9 percent in 1994 and is expected to remain near that level into the near future. Per capita income is projected to increase from approximately $20,004 in 1995 to $23,759 in 2030.

Population and Housing. Annual ROI county and city population and housing growth is projected to average less than 1 percent between 1995 and 2030. The ROI population is projected to grow from 1,257,600 in 1995 to 1,493,700 in 2030. The total number of housing units is projected to increase from 525,200 in 1996 to 619,700 in 2030.

Public Finance. Between 2000 and 2005, all ROI county, city, and school district total revenues and expenditures are projected to increase at an annual average of less than 1 percent. This rate of increase should continue until 2030.

Management Alternatives

Downsize Nonnuclear Fabrication. Downsizing and consolidating the nonnuclear fabrication mission at KCP would initially require some construction workers to reconfigure the facility, but would result in a reduced operations workforce. Under this alternative, nonnuclear fabrication would be organized into three modules: mechanical, electronics, and engineered materials. The size of the operational workforce would depend on whether DOE implements a single-shift or three-shift operation.

Base Case Single Shift. Under the base case single shift, the total KCP workforce would decrease from the No Action level of 3,179 to 2,340. The composition of the workforce would also change. The number of support and other workers would remain at the same level as for No Action; however, the number of workers associated with the nonnuclear fabrication mission would decrease from 2,508 to 1,669.

Base Case Surge (Three Shift). Under the base case surge scenario the total KCP workforce would decrease from the No Action level of 3,179 to 2,928. As with the base case single-shift operation, the number of support and other workers would remain at the same level as for No Action. The number of workers associated with the nonnuclear fabrication mission would decrease from 2,508 to 2,257. It should be noted that the number of workers employed for high case production would be the same as for base case surge. Therefore, the socioeconomic impacts would be identical for both cases.

Regional Economy and Employment. Modification of the existing facility for downsized operation would employ 187 workers during peak construction in 2000 and generate an additional 262 indirect jobs in related industries. Changes in the regional economic area's employment would be less than 1 percent, and there would be no perceptible change in the unemployment rate.

Base Case Single Shift. Base case single-shift operation would employ fewer workers than the No Action alternative, and would result in employment and income losses to the region. A total of 2,319 jobs (839 direct and 1,480 indirect), would be lost, and regional unemployment would increase from 4.9 to 5.1 percent. Per capita income would decrease by less than 1 percent. These employment and income effects are shown in figure 4.4.3.8–1.

Base Case Surge (Three Shift). The base case surge operation would employ fewer workers than under No Action and would result in employment and income losses to the region. A total of 694 jobs (251 direct and 443 indirect) would be lost, although there would be no perceptible change to the region's unemployment rate. Per capita income would decrease by less than 1 percent. These changes are shown in figure 4.4.3.8–1.

Population and Housing. Modifying the facility for base case single-shift operation would cause no change in the region's population from the No Action projections because available labor in the region would fill any jobs generated during construction.

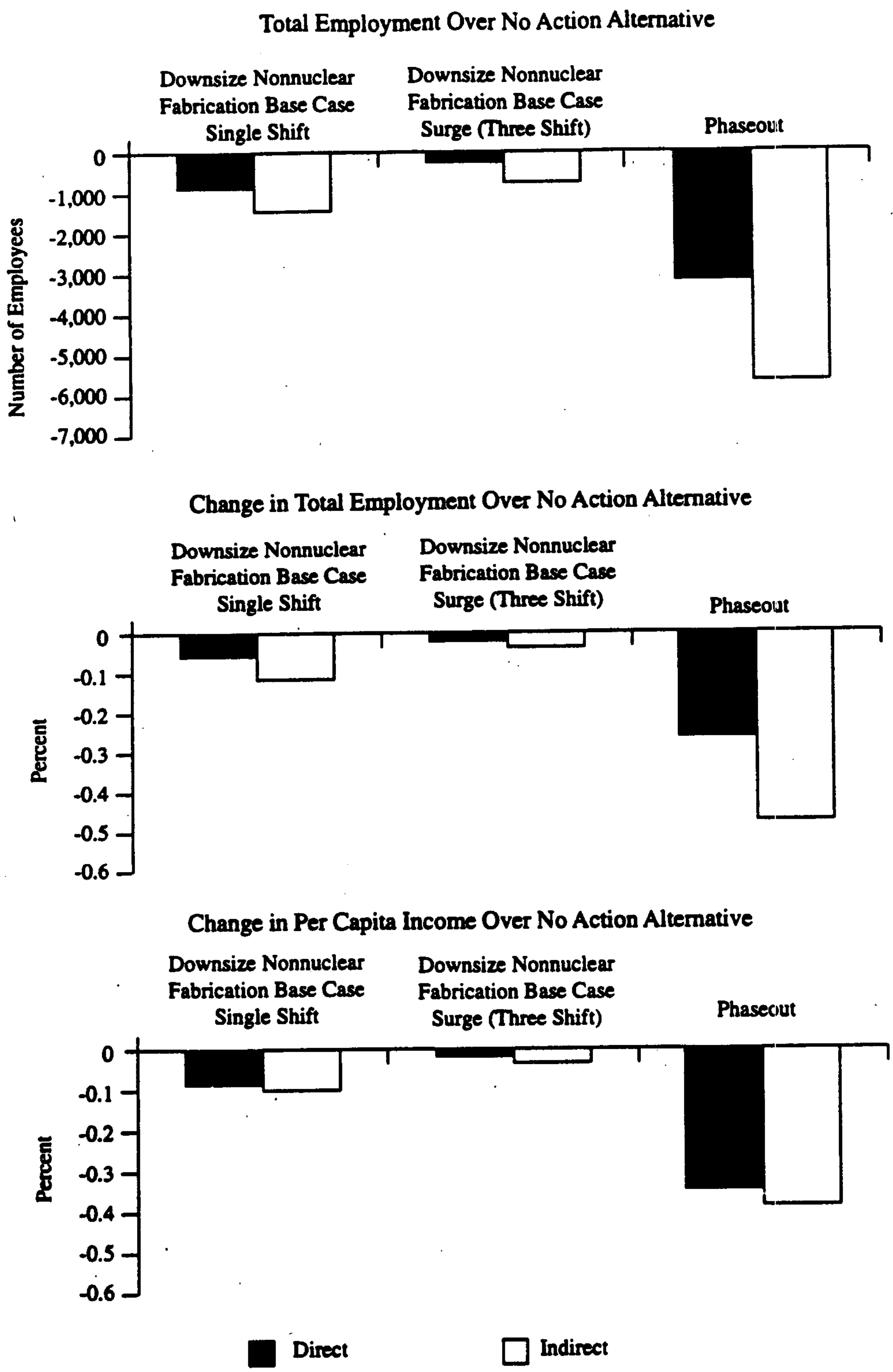
Base Case Single Shift. Operation of the downsized facility for base case single-shift production could lead to out-migration of the displaced workers seeking employment outside the region. Although this scenario is less probable for KCP than for other, more rural DOE installations, out-migration of displaced workers would lead to a decrease in population and an increase in housing vacancies. If all displaced direct and indirect workers were to out-migrate with their families, the regional population would decrease by about 5,937 or 0.2 percent of the projected population under the No Action alternative. These changes are shown in figure 4.4.3.8–2. The largest loss in population would occur in Jackson County and Kansas City, MO, where the majority of the current workforce resides. Housing vacancies would increase, but the change would be too small to significantly affect the market for either rental or nonrental housing.

Base Case Surge (Three Shift). Operation of the facility for base case surge production could lead to out-migration of the displaced workers seeking employment outside of the region. If all of the displaced direct and indirect workers and their families were to out-migrate, the regional population would decrease by about 1,811, a decrease of less than 0.1 percent of the projected population under the No Action alternative. As with the base case single shift operation, the largest population losses would occur in Jackson County and Kansas City, MO, where the majority of current KCP workers reside. Housing vacancies would increase, but the change would be too small to significantly affect the market for either rental or nonrental housing. These changes are shown in figure 4.4.3.8–2.

Public Finance. Modification of the Nonnuclear Fabrication Facility for base case single-shift operation would not require in-migrating workers. Therefore, changes to local finances compared to No Action projections would be due to income increases and would be negligible.

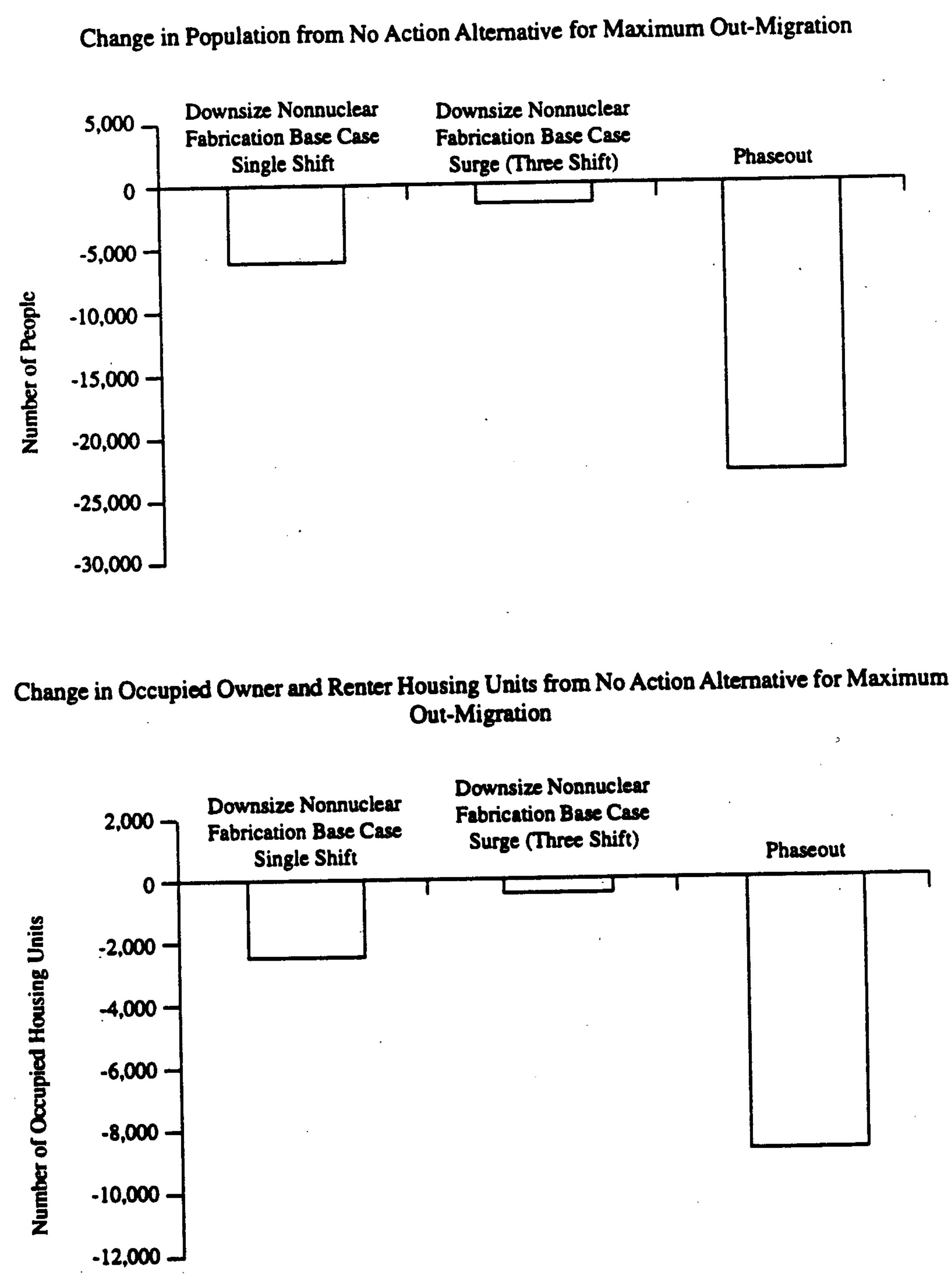
Base Case Single Shift. Downsizing the facility for base case single-shift operation could result in the out-migration of workers from the ROI, causing a loss of income that would affect ROI revenues and expenditures. Changes in revenues and expenditures compared to No Action projections due to downsizing the Nonnuclear Fabrication Facility at KCP are shown in figure 4.4.3.8–3. In 2005, the total ROI revenues and expenditures would be reduced below No Action projections by approximately 0.5 and 2.0 percent, respectively. The Center School District would experience the greatest decreases in revenues (nearly 0.6 percent) and expenditures (approximately 0.4 percent).

Base Case Surge. Downsizing the facility could result in the out-migration of workers from the ROI, which would cause a loss of income that would affect



Source: Socio 1996b.

FIGURE 4.4.3.8–1.—*Employment and Income Changes Resulting from Management Alternatives in the Kansas City Plant Regional Economic Area, 2005.*



Note: No Action projections are baseline for comparing proposed alternatives.
Source: Socio 1996b.

FIGURE 4.4.3.8–2.—*Population and Housing Changes Resulting from Management Alternatives in the Kansas City Plant Region of Influence, 2005.*

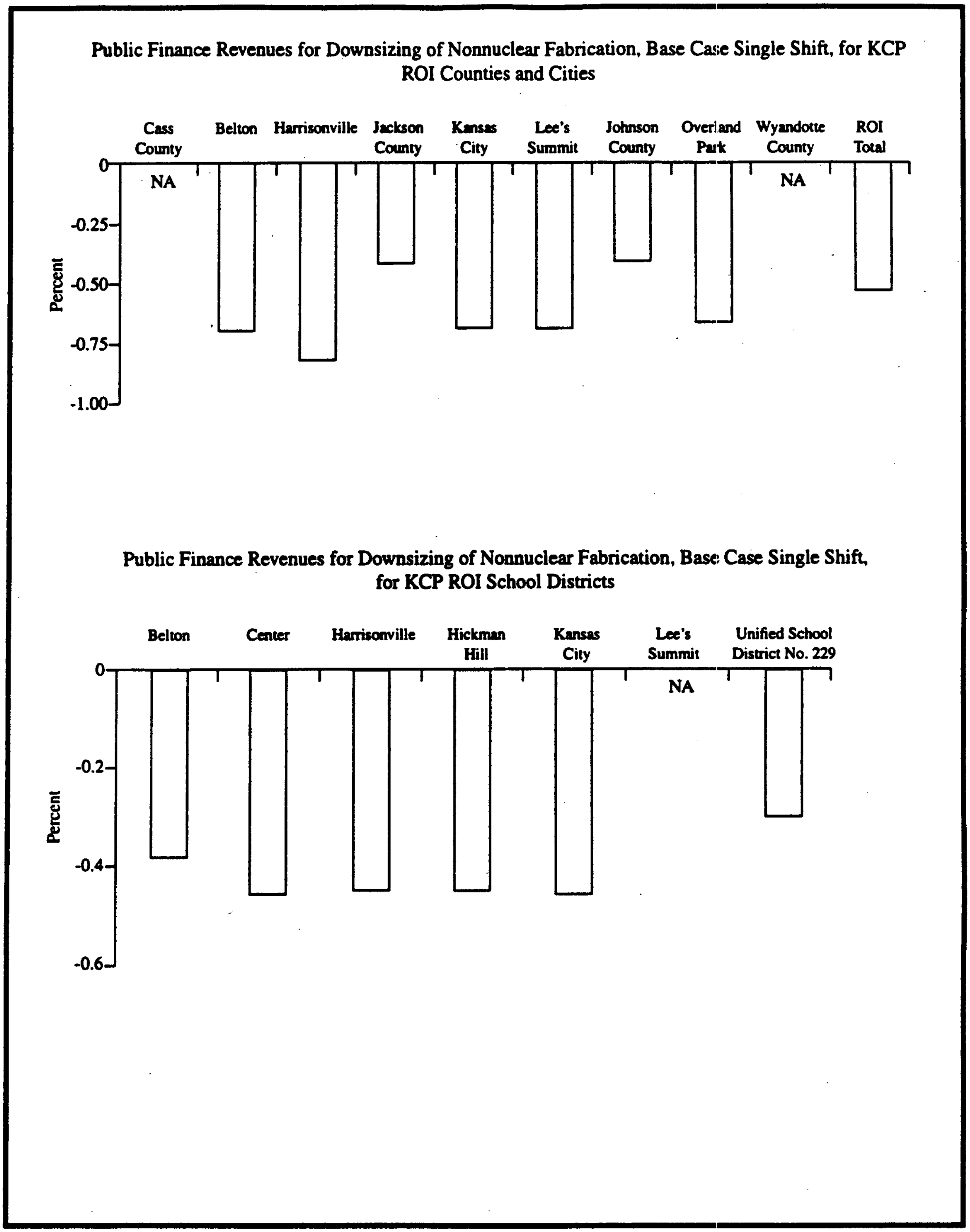


FIGURE 4.4.3.8–3.—*Percent Change from No Action Alternative in County, City, and School District Total Revenues and Expenditures in the Kansas City Plant Region of Influence with Downsizing of Nonnuclear Fabrication, Base Case Single Shift, 2005* [Page 1 of 2].

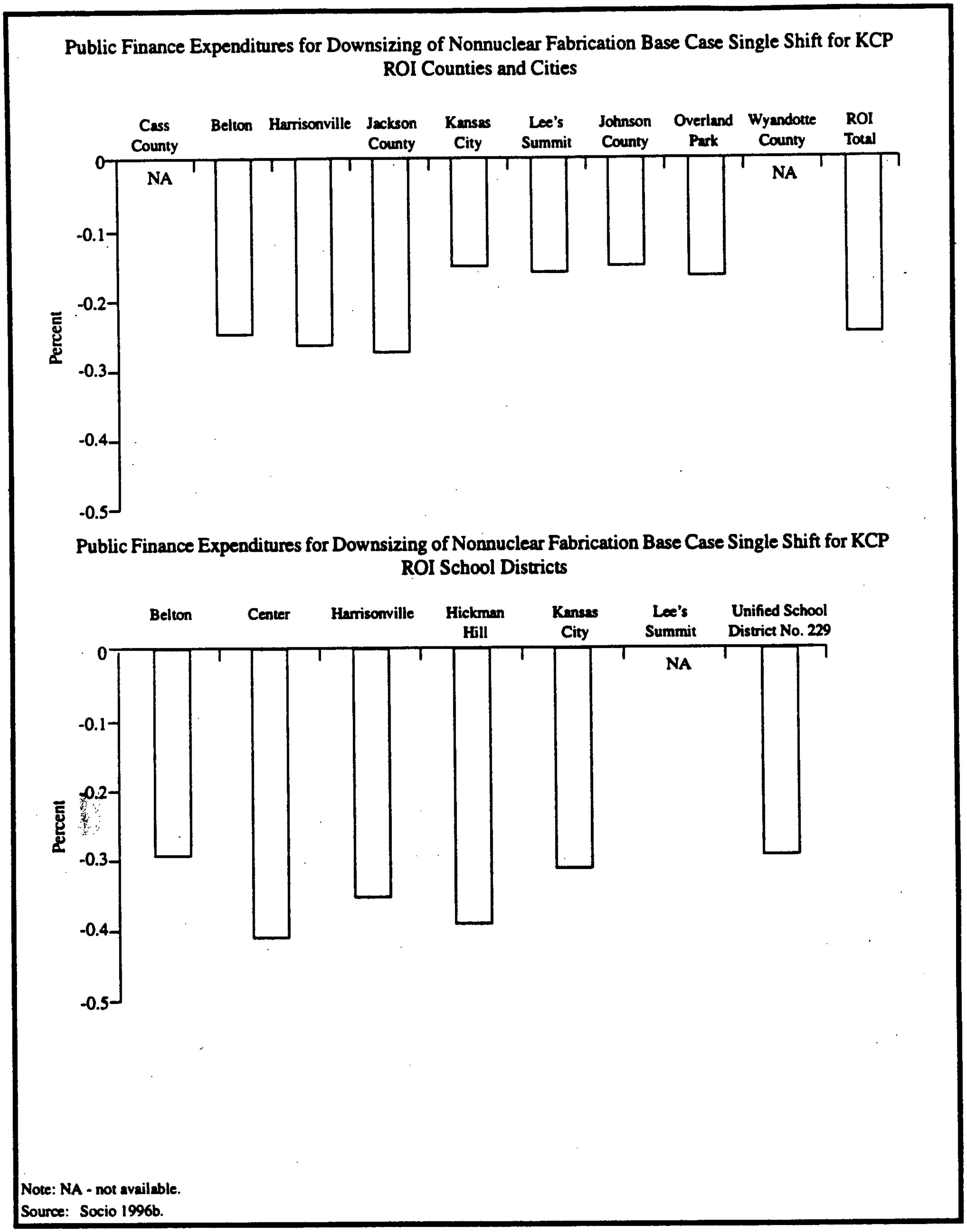


FIGURE 4.4.3.8–3.—*Percent Change from No Action Alternative in County, City, and School District Total Revenues and Expenditures in the Kansas City Plant Region of Influence with Downsizing of Nonnuclear Fabrication, Base Case Single Shift, 2005* [Page 2 of 2].

ROI revenues and expenditures. Changes in revenues and expenditures compared to No Action projections due to downsizing the nonnuclear facility for surge operation at KCP are shown in figure 4.4.3.8–4. In 2005, the total ROI revenues and expenditures would be reduced below No Action projections by approximately 0.16 and 0.07 percent, respectively.

Phaseout of Nonnuclear Fabrication. Under this alternative, the nonnuclear fabrication mission at KCP would be transferred to other existing DOE installations, and the KCP workforce would decrease from 3,179 under the No Action alternative to zero in 2005, when the phaseout would be completed. Termination of the KCP mission would generate additional losses in related industries in the region.

Regional Economy and Employment. Termination of the KCP nonnuclear fabrication mission would lead to both direct and indirect employment and income losses to the regional economy, which are shown in figure 4.4.3.8–1. Total job loss in 2005 is estimated at 8,788 (3,179 direct and 5,609 indirect), about 0.7 percent of projected employment for the regional economic area. Unemployment in the region would increase from 4.9 percent to 5.6 percent and per capita income would decrease from approximately $21,330 to $21,174.

Population and Housing. Phaseout of KCP could result in displaced workers leaving the region to seek employment elsewhere. However, this scenario is less probable for KCP than for other DOE installations, because of its location in a large urban economy where a diverse industrial base provides a greater abundance of alternative employment opportunities than at more rural sites.

If all of the displaced direct and indirect workers leave the area with their families, total out-migration would number 22,497, a 0.9-percent reduction from the projected No Action population. These changes are shown in figure 4.4.3.8–2. The largest population loss would occur in Jackson County and Kansas City, MO, where the majority of KCP employees currently reside. Housing vacancies would also increase as a result of out-migration. However, the change would be too small to significantly affect either the rental or nonrental housing market.

Public Finance. Phaseout of the Nonnuclear Fabrication Facility could result in the out-migration of workers from the ROI that would affect ROI revenues and expenditures. Changes in revenues and expenditures compared to No Action projections due to phaseout of the nonnuclear fabrication mission are shown in figure 4.4.3.8–5. In 2005, the percent decrease in total ROI revenues and expenditures below No Action would be approximately 2.0 and 0.9 percent, respectively. The city of Harrisonville would experience the greatest decrease in revenues (nearly 31 percent) and the Center School District would experience the greatest decrease in expenditures (1.6 percent).

Sensitivity Analysis. Construction employment requirements for the low-case nonnuclear fabrication mission at KCP are the same as discussed above. Therefore, the socioeconomic impacts on the region from construction for low case production would also be the same. Construction for high-case production, however, would require additional workers above base case requirements. There would be slightly greater benefits to the regional area as a result, but the change in the regional economy would still be extremely small.

Employment requirements for low case production would be slightly smaller than for base case single shift. This option would result in greater employment losses to the regional economy than would the base case single-shift option, when compared to No Action. The high case option or the base case surge (three-shift) operation would require 2,257 core stockpile management workers and the same 671 support workers required under No Action or base case single-shift operation, for a total of 2,928 workers. There would be fewer jobs lost in the region and therefore any negative socioeconomic impacts would be decreased.

Potential Mitigation Measures. In the event of a phaseout of DP activities at KCP, adverse socioeconomic impacts could result in the affected economic region. To mitigate potential socioeconomic impacts, Section 3161 of the *National Defense Authorization Act* (Public Law 102-484) requires DOE to develop a plan for restructuring the workforce for a defense nuclear facility whenever a change in workforce is

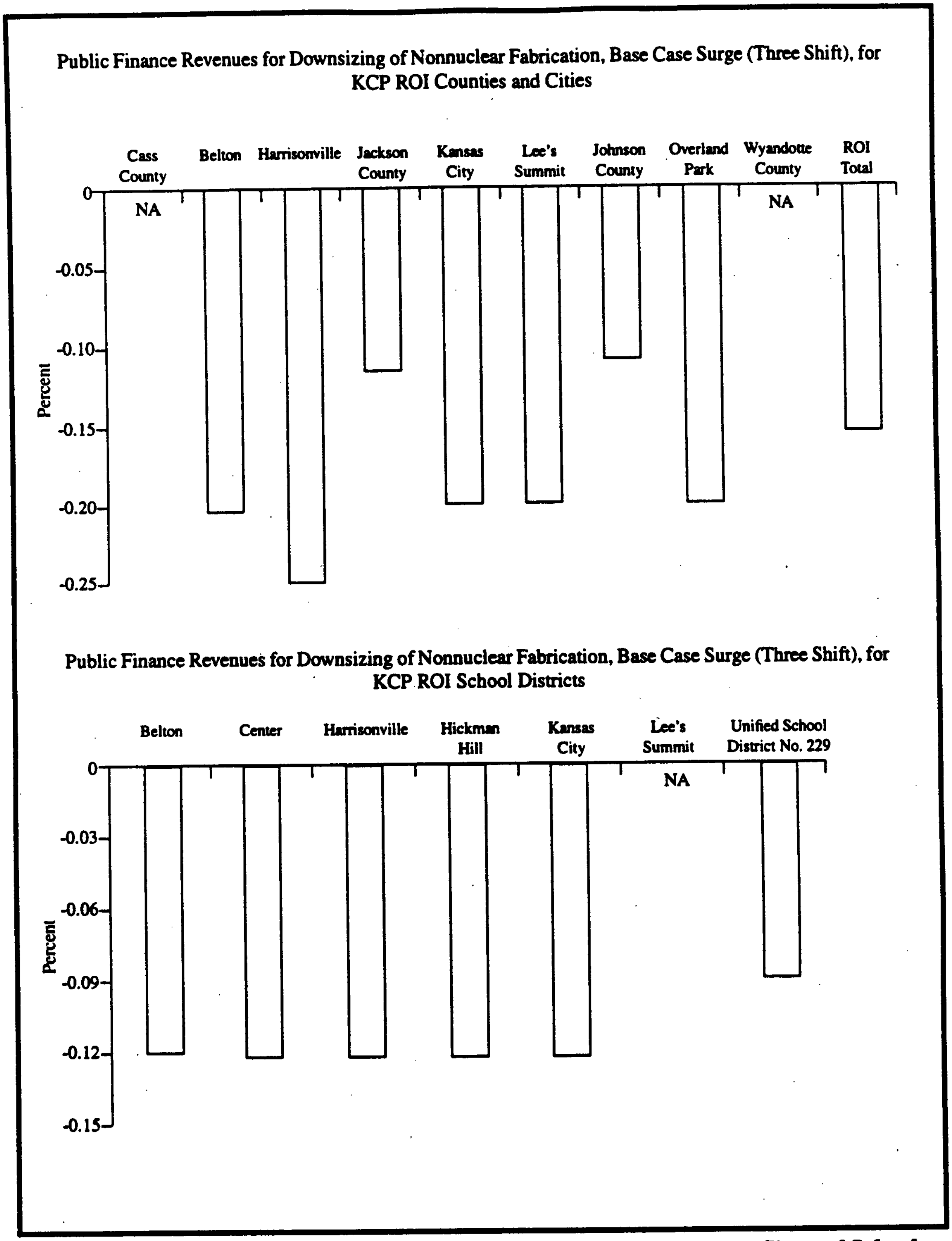
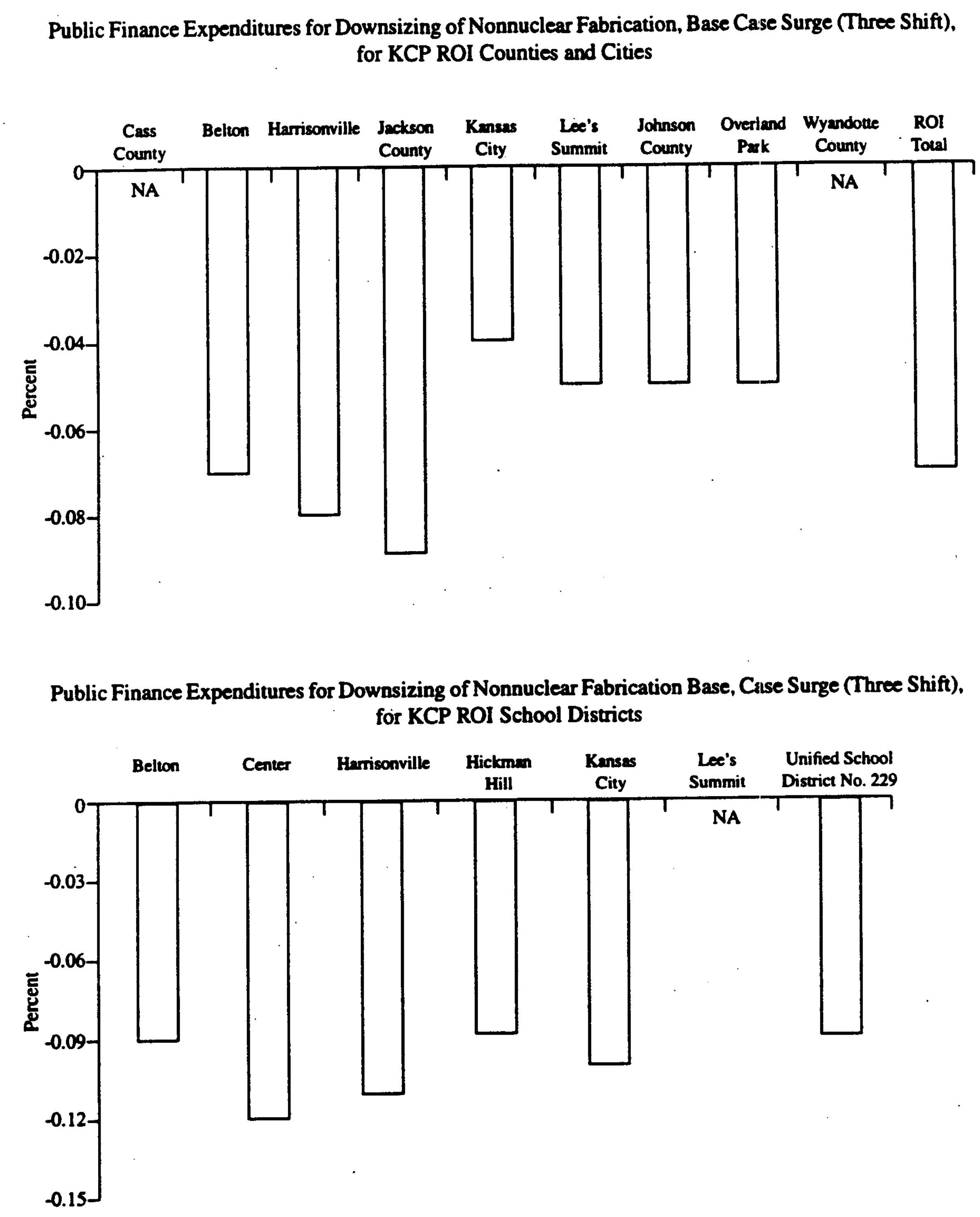


FIGURE 4.4.3.8–4.—*Percent Change from No Action Alternative in County, City, and School District Total Revenues and Expenditures in the Kansas City Plant Region of Influence with Downsizing of Nonnuclear Fabrication, Base Case Surge, 2005* **[Page 1 of 2].**



Note: NA - not available.

Source: Socio 1996b.

FIGURE 4.4.3.8–4.—*Percent Change from No Action Alternative in County, City, and School District Total Revenues and Expenditures in the Kansas City Plant Region of Influence with Downsizing of Nonnuclear Fabrication, Base Case Surge, 2005* [Page 2 of 2].

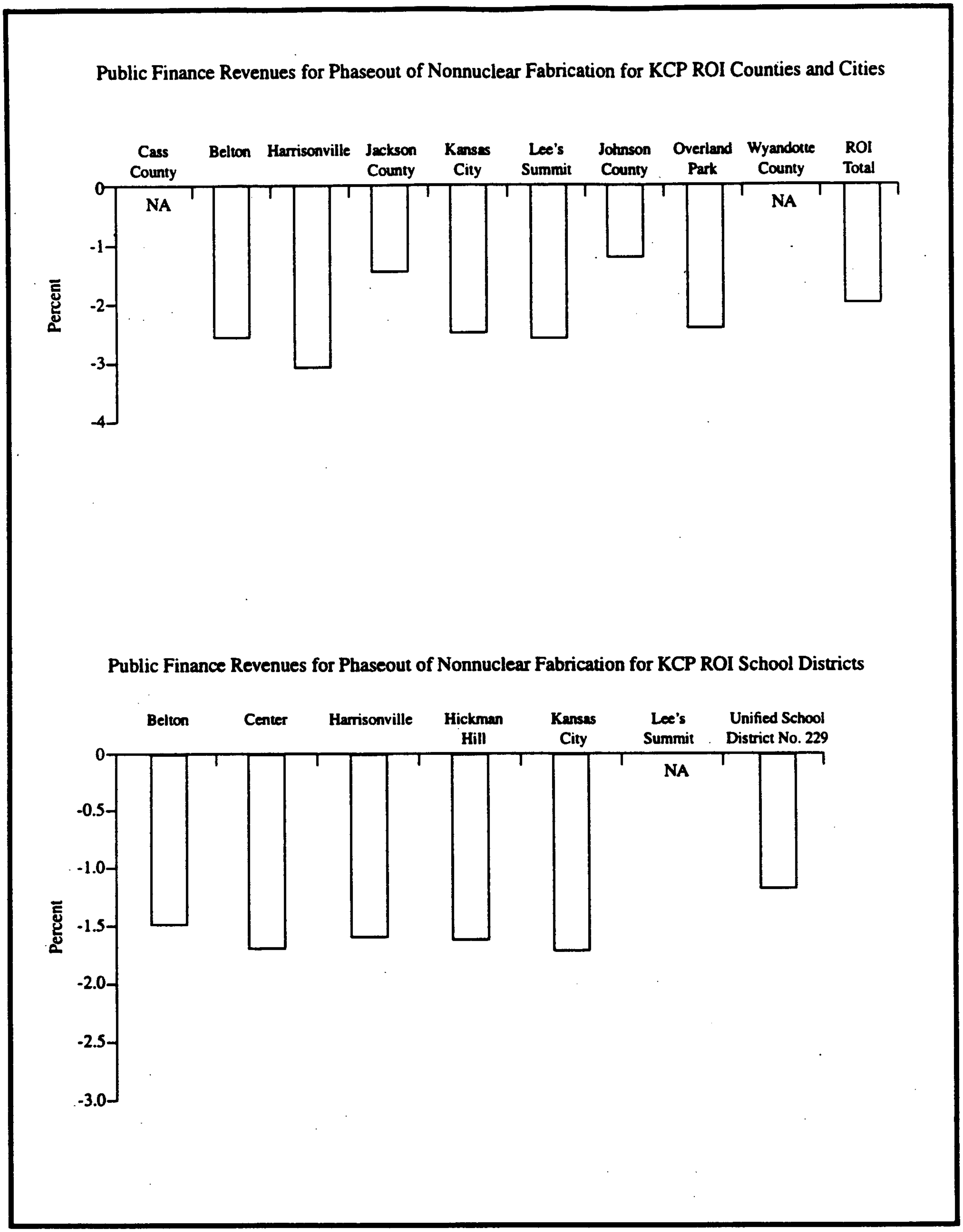
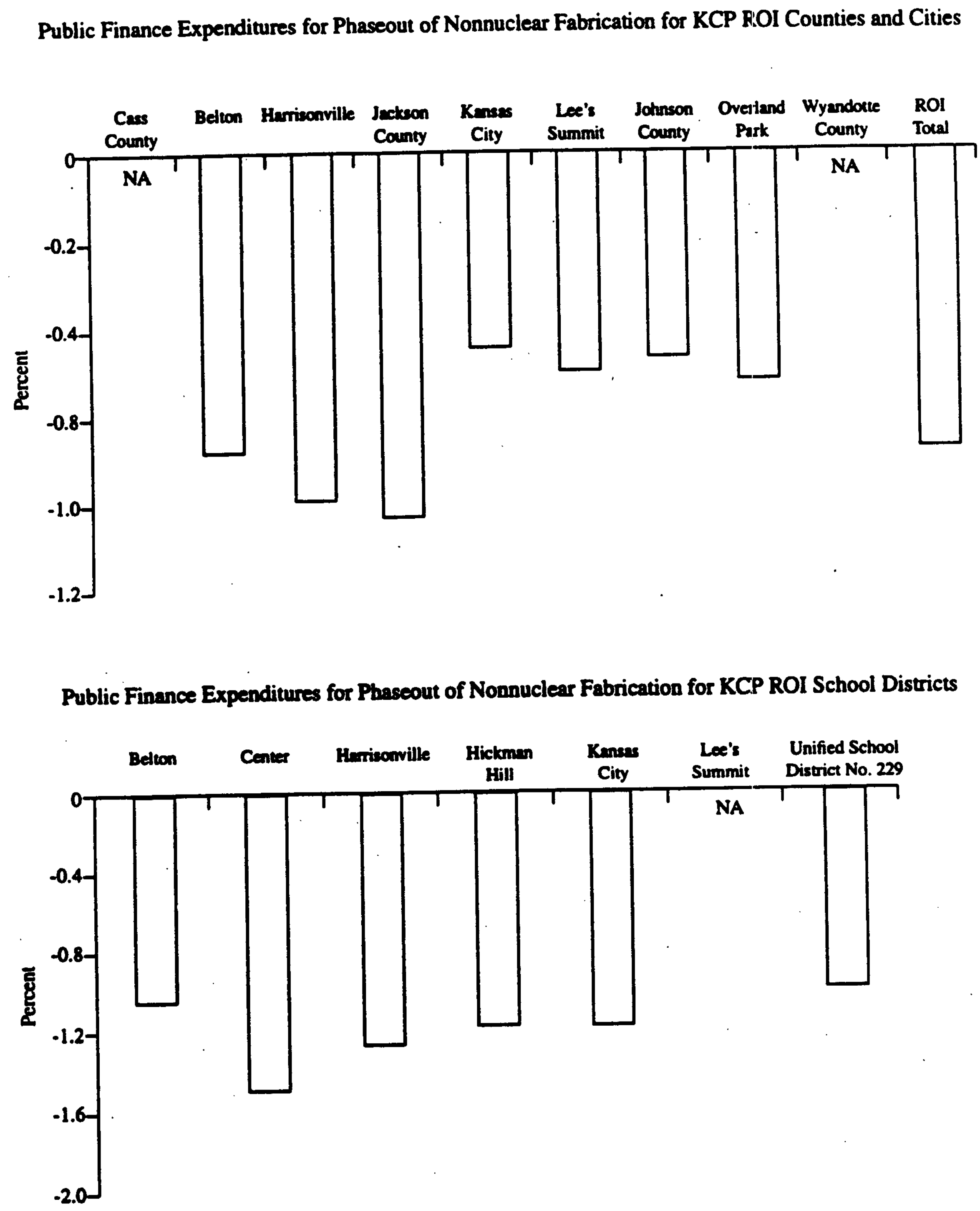


FIGURE 4.4.3.8–5.—*Percent Change from No Action Alternative in County, City, and School District Total Revenues and Expenditures in the Kansas City Plant Region of Influence with Phaseout of Nonnuclear Fabrication, 2005* **[Page 1 of 2].**



Note: NA - not available.
Source: Socio 1996b.

FIGURE 4.4.3.8–5.—*Percent Change from No Action Alternative in County, City, and School District Total Revenues and Expenditures in the Kansas City Plant Region of Influence with Phaseout of Nonnuclear Fabrication, 2005* **[Page 2 of 2].**

necessary. The legislation also directs DOE to develop the plan in consultation with local, state, and national stakeholders.

DOE has initiated a number of actions to respond to the legislative requirements, including the creation of the Office of Worker and Community Transition. In February 1996, the office issued interim planning guidance in developing plans to help mitigate unavoidable impacts from workforce restructuring. Although the guidance is not prescriptive, it sets forth DOE policy on mitigating economic impacts of restructuring. For example, the guidance states that whenever possible, the impacts of workforce reductions should be minimized through the use of early retirement and normal attrition. Where appropriate, employees should be retrained for work in environmental restoration and waste management. The guidance also recommends that terminated employees receive assistance in obtaining reemployment through out-placement services, appropriate retraining, and educational services. To the extent practical, DOE and its contractor should offer a hiring preference to terminated employees. The DOE guidance also suggests that the affected communities should receive assistance to mitigate impacts to the public infrastructure and finances.

4.4.3.9 *Radiation and Hazardous Chemical Environment*

This section describes the hazardous chemical releases and their associated impacts that could result from No Action and proposed alternatives at KCP. There would be no radiological health impacts to the public or to workers from KCP operations resulting from potential alternatives. Within this section, impacts resulting from the base case scenario are quantitatively discussed and the high and low case scenarios are qualitatively discussed. Further supplementary information is presented in appendixes E and F.

Normal Operation. There would be no radiological releases during the modification of any facilities to support the proposed alternatives. However, limited hazardous chemical releases (e.g., small spills of diesel fuel from equipment refueling) would be anticipated due to building modification activities for the base case and may increase slightly for the high case scenario. The concentration of these releases is expected to be well within the regulated exposure limits and would not result in any adverse health effects.

Water from processes containing hazardous chemicals is not discharged directly into surface water or groundwater that serves as potable water. Process water that may contain hazardous chemicals is treated before discharge to the city sewer system and further treated at the public-owned treatment plant. Furthermore, discharges of water through NPDES-permitted outfalls that can be attributed to the activities associated with the nonnuclear fabrication mission at KCP are expected to be below NPDES limits. Water quality would not be adversely affected. Thus, the primary pathway considered for the public and the onsite worker is the air pathway.

For normal operation at KCP, all possible hazardous chemicals were examined for further analysis based on their toxicity, concentration, and frequency of use. The HI is a summation of the HQ for all chemicals. The HQ is the value used as an assessment of noncancer toxic effects of chemicals (e.g., kidney or liver dysfunction). It is independent of cancer risk, which is calculated only for those chemicals identified as carcinogens. The HI was calculated for the No Action chemicals and all management alternative (nonnuclear fabrication) chemicals emitted at the site. An HI of ≤ 1.0 indicates that all noncancer exposure values meet OSHA standards; if the cancer risk is $\leq 1\text{x}10^{-6}$ (the default value, not a regulatory standard), no further analysis is indicated. A cancer risk of $1\text{x}10^{-6}$ is considered acceptable by EPA (40 CFR 300.430) because this incidence of cancers cannot be distinuiguished from the cancer risk for an individual member of the population. Information pertaining to OSHA-regulated exposure limits and toxicity profiles for all hazardous chemicals described in this PEIS may be found in the *Chemical Health Effects Technical Reference* (TTI 1996b).

No Action

Hazardous Chemical Impacts. Hazardous chemical impacts to the public resulting from normal operation under No Action at KCP are presented below. Analyses to support the values presented in this section are provided in appendix table E.3.4–6. This PEIS does not purport to provide the level of detail needed to go beyond a conservative screening process for hazardous chemicals. As such, the analysis in this PEIS for the No Action alternative should not be relied upon as a basis for judging the sites as having a hazardous health concern. The model used to calculate HI and cancer risk in this PEIS only establishes a baseline for comparison of alternatives among sites. The baseline is then used to determine the extent by which each alternative adds or subtracts from the No Action HI and cancer risk to the public at each site.

The HI for the maximally exposed member of the public at KCP resulting from normal operation under the No Action alternative would be 0.019, and the cancer risk would be 1.13×10^{-6}. The HI to the onsite worker would be 1.08×10^{-2}, and the cancer risk would be 7.99×10^{-6}.

The HIs to the public and onsite worker are within acceptable health levels. The cancer risks to the public (1.13×10^{-6}) and to the onsite worker (7.99×10^{-6}) slightly exceed EPA default value of 1×10^{-6}. Cancer risk exceeds the EPA default value due to the emissions of perchloroethylene and trichloroethylene associated with normal site operation.

Potential mitigation measures such as substituting less toxic solvents or modifying production processes are proposed to reduce or eliminate the emissions of perchloroethylene and trichloroethylene due to normal site operation associated with the No Action alternative at KCP.

Management Alternatives

Downsize Nonnuclear Fabrication

Hazardous Chemical Impacts. Hazardous chemical impacts for the public and for the onsite worker resulting from normal operation due to downsizing and/or consolidating the nonnuclear fabrication mission at KCP are presented below. The HI and cancer risk would remain constant over 25 years of operation provided exposures remain the same. Analyses to support the values presented in this section are provided in appendix table E.3.4–7.

The HI for the maximally exposed member of the public would be 1.02×10^{-3}, and the cancer risk would be 1.65×10^{-6} as a result of downsizing and/or consolidating the nonnuclear fabrication mission at KCP. The HI for the onsite worker would be 1.70×10^{-4} and the cancer risk would be 1.16×10^{-5}.

The HIs to the public and the onsite worker are within acceptable health regulatory levels. The cancer risks to the public (1.65×10^{-6}) and the onsite worker (1.16×10^{-5}) marginally exceed the acceptable threshold of regulatory concern of 1×10^{-6}. Cancer risks exceed the default value due to the emission of trichloroethylene with operation of the downsize nonnuclear fabrication alternative at KCP. Cancer risks for the public and onsite worker would increase slightly from the No Action values as a result of this management alternative.

Phaseout of Nonnuclear Fabrication

Hazardous Chemical Impacts. There are no hazardous chemical emissions associated with the phaseout of nonnuclear fabrication at KCP. The HIs for the public and the onsite worker would be reduced to zero, and the cancer risks for the public and the onsite worker would remain at zero as a result of the phaseout (see appendix table E.3.4–8). Therefore, there are no adverse health effects or cancer risks to the public or onsite workers due to this alternative.

Sensitivity Analysis. Operations under the high case scenario substantially increase emissions of hazardous chemicals. However, since the HIs to the public and the onsite workers are well within acceptable health levels, there are no expected adverse impacts as a result of the high case scenario at KCP. However, any additional emissions of hazardous chemicals, particularly trichloroethylene, may increase cancer risks for the public and the onsite worker.

Operations under the low case scenario are not expected to have any appreciable effect on hazardous chemical emissions. Therefore, no increase in the HI for the public or onsite worker, or cancer risks for the public and onsite worker are expected.

Facility Accidents

No Action. Under the No Action alternative, nonnuclear fabrication would continue to be performed at KCP with no changes to facilities and operations. Potential accidents, under existing conditions, and their consequences have previously been addressed in facility safety documentation according to requirements in DOE orders.

Management Alternatives. Accident information on the two management alternatives under consideration at KCP, nonnuclear fabrication and phaseout of the nonnuclear fabrication mission, is provided in this section.

Downsize Nonnuclear Fabrication. The impacts of potential accidents associated with nonnuclear fabrication activities at KCP were previously addressed in the *Nonnuclear Consolidation Environmental Assessment* (DOE/EA-0792, June 1993) where it was determined that the then current accident profile would not change as a result of the relocation of nonnuclear fabrication functions to KCP. The present proposed action to downsize and/or consolidate the nonnuclear fabrication mission at KCP is not expected to change the accident profile that presently exists at the site.

Phaseout of Nonnuclear Fabrication. A phaseout of the nonnuclear fabrication mission at KCP would have the effect of eliminating any potential for accidents over the long term related to nonnuclear fabrication activities. However, there would be a potential for accidents during the phaseout process that could impact workers and the public. These potential accidents and their consequences are generally addressed in each affected facility's safety analysis report and/or safety documentation applicable to the phaseout process.

Potential Mitigation Measures. No mitigation measures are anticipated to be needed with the nonnuclear fabrication phaseout alternative.

4.4.3.10 *Waste Management*

This section summarizes the impacts on waste management at KCP under No Action and for each of the alternatives, including the phaseout of nonnuclear fabrication. There is no spent nuclear fuel, high-level, or TRU waste associated with the fabrication of nonnuclear components. Table 4.4.3.10–1 lists the projected waste generation rates and treatment, storage, and disposal capacities under No Action for KCP. Projections for No Action are based on base case single-shift operation and were derived from 1994 environmental data, with the appropriate adjustments made for those changing operational requirements where the volume of wastes generated is identifiable. The projection does not include wastes from future, yet uncharacterized, environmental restoration activities.

Table 4.4.3.10–2 provides the total estimated operational waste volumes projected to be generated at KCP as a result of the various alternatives. The net increase or decrease over No Action is provided in parentheses. The waste volumes generated and the resultant waste effluent for the nonnuclear fabrication mission can be found in table 3.4.2.2–3 and are based on surge operations (three shifts). KCP facilities that would support nonnuclear fabrication would treat and package all waste generated into forms that would enable long-term storage and/or disposal in accordance with the *Atomic Energy Act*, RCRA, and other applicable statutes as outlined in appendix section H.1.2.

No Action. Under No Action, generation of all waste types at KCP is expected to decrease as production workload operations are reduced from the missions outlined in section 3.2.4. The Pollution Prevention Program would systematically reduce waste generation through specific waste minimization projects and the use of process waste assessments. There are no significant changes expected in waste stream types or handling other than possible reduced quantities due to the smaller workload.

KCP would continue to generate small quantities of LLW, which would be accumulated onsite and stored in DOE-approved containers in a controlled-access facility until sufficient quantities accumulate to warrant shipment to an approved DOE disposal facility. Due to process changes, KCP would no longer expect to generate any mixed waste, but the potential to generate a small quantity of mixed LLW would exist under upset conditions such as a leaking commercial source or contamination of a segregating medium used to recover radioactive gap tubes from weapon components. In the event any mixed waste is generated, it would be stored in a RCRA-permitted facility until shipped to a RCRA-permitted commercial mixed waste treatment and disposal facility.

PCB and asbestos wastes would be managed and stored in compliance with all applicable TSCA requirements. All hazardous waste stream residue generated at KCP that is not reclaimed or recycled on

TABLE 4.4.3.10–1.—*Projected Waste Management Under No Action at Kansas City Plant*

Category	Annual Generation (m^3)	Treatment Method	Treatment Capacity (m^3/yr)	Storage Method	Storage Capacity (m^3)	Disposal Method	Disposal Capacity (m^3)
Low-Level							
Liquid	<1	Solidification	<1	Staged for processing	Included in LLW solid	None	NA
Solid	<1	None	NA	Staged for shipment	20[a]	Ship off site to NTS	NA
Mixed Low-Level[b]							
Liquid	None	Stabilization - commercial vendor	NA	Staged for processing/ shipment	Included in LLW solid	None	NA
Solid	None	Encapsulation - commercial vendor	NA	Staged for shipment/ processing	Included in LLW solid	Ship off site to NTS	NA
Hazardous							
Liquid	98[c]	Evaporation/ filtration[d]	Included in nonhazardous (other) liquid	Staged for shipment	186[e]	Ship off site	NA
Solid	255[f]	None	NA	Staged for shipment	2,550[g]	Ship off site	NA
Nonhazardous (Sanitary)							
Liquid	429,000	None	NA	None	NA	Offsite-sewer system outfall	NA
Solid	170	None	None	None	NA	Landfill (off site)	NA
Nonhazardous (Other)							
Liquid	273,000	Evaporation/ filtration[d]	1,800,000	None	NA	Offsite-sewer system outfall	NA
Solid	13,400	None	NA	None	NA	Landfill (off site)	NA

[a] KCP has a 20 m^3 storage area that can store LLW and/or mixed waste.
[b] Although no mixed waste was generated, the potential exists for generation of mixed waste.
[c] Includes 20 m^3 of TSCA liquids.
[d] Pretreatment at Industrial Wastewater Pretreatment Facility.
[e] Includes 20 m^3 of TSCA storage.
[f] Includes 150 m^3 of TSCA solids.
[g] Includes 200 m^3 for TSCA storage.
Note: NA - not applicable.
Source: KCP 1995a:1.

TABLE 4.4.3.10–2.—*Estimated Annual Generated Waste for Stockpile Management Alternatives at Kansas City Plant*

Category	No Action[a] (m^3)	Downsize Nonnuclear Fabrication[b] (m^3)	Phaseout of Nonnuclear Fabrication (m^3)
Low-Level			
Liquid	<1	None (-<1)	None (-<1)
Solid	<1	None (-<1)	None (-<1)
Mixed Low-Level			
Liquid	None	None (-0)	None (-0)
Solid	None	None (-0)	None (-0)
Hazardous			
Liquid	98	60 (-38)	None (-98)
Solid	255	61 (-194)	None (-255)
Nonhazardous (Sanitary)			
Liquid	429,000	570,000 (+141,000)	None (-429,000)
Solid	170	310 (+140)	None (-170)
Nonhazardous (Other)			
Liquid	273,000	224,000 (-49,100)	None (-273,000)
Solid	13,400	11,500 (-1,930)	None (-13,400)

[a] The No Action volumes are from table 4.4.3.10–1 and are based on single-shift operations.
[b] Generated waste volumes from table 3.4.2.2–3 and are based on surge operations (three shifts).
Note: Waste generation volumes were rounded to three significant figures. Waste effluent volumes (i.e., after treatment and volume reduction) which are used in the narrative description of the impacts can also be found in table 3.4.2.2–3.

site would be manifested and shipped under contract with RCRA-permitted transporters to RCRA-permitted offsite treatment and disposal facilities. KCP industrial wastewater would be treated onsite to meet effluent standards prior to discharge to the Kansas City, MO, wastewater treatment plant.

Solid refuse waste streams would be segregated and recycled whenever possible. Solid refuse not recycled would be disposed of in the local sanitary landfill by a commercial contractor. Sanitary wastewaters would be discharged to the industrial wastewater processing facility or to the sanitary sewer system.

Management Alternatives

Downsize Nonnuclear Fabrication. Downsizing and consolidating nonnuclear fabrication would result in a decrease in the generation of low-level and hazardous wastes. The generation of nonhazardous waste would increase due to the use of multiple worker shifts as compared to No Action operations.

Waste generated during construction would consist of wastewater, nonhazardous solids, and hazardous wastes. The nonhazardous wastes would be disposed of by the construction contractor, and the hazardous wastes would be shipped to a commercial RCRA-permitted treatment and disposal facility.

The downsized and consolidated nonnuclear fabrication facilities would not expect to generate LLW or mixed LLW. The approximately 60 m^3 (15,960 gal) of liquid hazardous wastes and 61 m^3 (80 yd^3) of solid hazardous wastes would not impact waste management activities at KCP.

Approximately 793,900 m^3 (209,700,000 gal) of liquid nonhazardous wastes, to include sanitary and utility/process wastewaters, would be treated to meet the discharge permit requirement for the Kansas City publicly owned treatment facilities. Existing facilities and the available technologies are adequate to accommodate the volume from a multiple-shift operation. The 11,900 m^3 (15,500 yd^3) of solid nonhazardous wastes would be shipped to the currently utilized offsite landfill. The reduced nonhazardous waste volumes would not impact onsite or offsite waste treatment and disposal facilities.

Phaseout of Nonnuclear Fabrication. With the phaseout of nonnuclear fabrication, 210 m^3 (55,500 gal) of liquid and 675 m^3 (883 yd^3) of solid hazardous wastes would no longer be generated from operations. Liquid and solid nonhazardous wastes would decrease over time as the facilities were deactivated and employment decreased to a caretaker level. D&D activities associated with the closure of KCP would generate 71,112 m^3 (93,000 yd^3) of liquid and 3,397 m^3 (4,440 yd^3) of solid hazardous waste, as well as 837 m^3 (1,090 yd^3) of solid sanitary waste over the 5-year period of D&D activities.

Sensitivity Analysis. The waste volumes generated from the Nonnuclear Fabrication Facility required to support a large stockpile level (high case) operating on a single-shift basis are bounded by the base case under surge operations. Thus, there are no additional waste management impacts associated with the Nonnuclear Fabrication Facility that would support a high case stockpile. The volumes generated from the Nonnuclear Fabrication Facility required to support a low case stockpile would be reduced by a factor of at least three.

Potential Mitigation Measures. Waste quantities or waste forms could undergo additional reductions by utilizing emerging technologies. Pollution prevention and waste minimization would be incorporated in determining the final proposed actions of the Stockpile Stewardship and Management Program at KCP.

4.4.3.11 *Environmental Justice*

As discussed in section 4.14, any impacts to surrounding communities would most likely result from toxic or hazardous air pollutants and radiological emissions. Section 4.4.3.9, which describes public and occupational health impacts from normal operation, shows that potential chemical air emissions and releases are marginally not within the generally acceptable threshold of regulatory concern. This information is based on the conservative programmatic assumptions and modeling detailed in appendix E. Any adverse human health or environmental impacts that may occur would affect people living within communities located near KCP. The analysis of the demographic data presented in appendix D for the communities surrounding KCP indicates that if there were any adverse health impacts to these communities, they would not appear to disproportionately affect minority or low-income populations.

4.5 PANTEX PLANT

Pantex was established in 1951 and currently occupies approximately 4,119 ha (10,177 acres) of DOE-owned land near Amarillo, TX. The current DP mission at Pantex is to assemble and disassemble nuclear weapons; perform HE manufacturing; perform weapons repair, modification, and disposal; conduct stockpile evaluation and testing; and provide interim storage for plutonium. Section 3.2.5 provides a description of all the DOE missions and support facilities at Pantex. The location of Pantex is illustrated in figure 4.5–1, and the principal facilities and zones at Pantex are shown in figure 4.5–2.

4.5.1 Description of Alternatives

No Action. Pantex would continue to perform the missions described in section 3.2.5.

Stockpile Management Alternatives. The A/D and the high explosives (HE) fabrication missions could be downsized and consolidated and remain at Pantex. If the A/D mission remains at Pantex, the nonintrusive modification pit reuse mission and the option of storing the strategic reserve of pits could be located there. In addition, if Y-12 does not retain the secondary and case fabrication mission, the storage of the strategic reserve of secondaries could be located at Pantex.

The HE fabrication mission could be phased out at Pantex and transferred to either LANL, LLNL, or both. In the event that the HE fabrication mission was transferred, those facilities associated with this mission would be phased out and Pantex downsized to accommodate just the A/D mission. The nonintrusive modification pit reuse and strategic storage options would also be located at Pantex.

The A/D mission could either stay at Pantex without the HE fabrication mission or it could be phased out at Pantex and transferred to NTS. If the A/D mission was also transferred, then all of the DP missions at Pantex would be phased out and the entire plant could be turned over to EM for disposition.

Stockpile Stewardship Alternatives. There are no tockpile stewardship alternatives that include antex.

4.5.2 Affected Environment

4.5.2.1 *Land Resources*

Pantex is located within Carson County in the Panhandle region of Texas, 27 km (17 mi) east-northeast of downtown Amarillo. Pantex covers 6,466 ha (15,978 acres) of land, of which 4,119 ha (10,177 acres) are owned by the Federal Government, and 2,347 ha (5,800 acres) immediately south of the main plant area are leased from Texas Tech for use as a safety and security buffer zone. DOE-owned land at the plant facility includes 3,683 ha (9,100 acres) in the main plant area and 436 ha (1,077 acres) around Pantex Lake, 4 km (2.5 mi) northeast of the main plant area. The undeveloped land at Pantex Lake is held by DOE to retain water rights. All owned and leased buildings on the Pantex site are administered, managed, and controlled by DOE. Generalized land uses at Pantex and in the vicinity are shown in figure 4.5.2.1–1.

Industrial operations at Pantex are currently located on approximately 809 ha (2,000 acres) of DOE-owned property, excluding the Burning Ground, firing sites, and other outlying areas. The Burning Ground and firing sites occupy approximately 198 ha (489 acres).

Texas Tech Agriculture Research operations use DOE-leased land that is not actively used by Pantex operations for agricultural use. Agricultural activities generally consist of dry farming and livestock grazing. A limited amount of crop irrigation occurs. Except for the playas, the Natural Resources Conservation Service (formerly the Soil Conservation Service) considers these lands prime farmland when irrigated. Texas Tech land also contains four dwelling units located approximately 5 km (3 mi) southwest of the weapons A/D and HE production core.

The land surrounding Pantex is rural private property. The closest offsite residences are approximately 31 m (102 ft) west of the plant boundary along Farm-to-Market Road 683. Most of the surrounding land is prime farmland when irrigated, with the exception of the area northwest of the plant site, which is rangeland. The majority of the surrounding land is cultivated. The packing plant of Iowa Beef Packers, Inc., is the only industrial facility within 3 km (2 mi) of the plant.

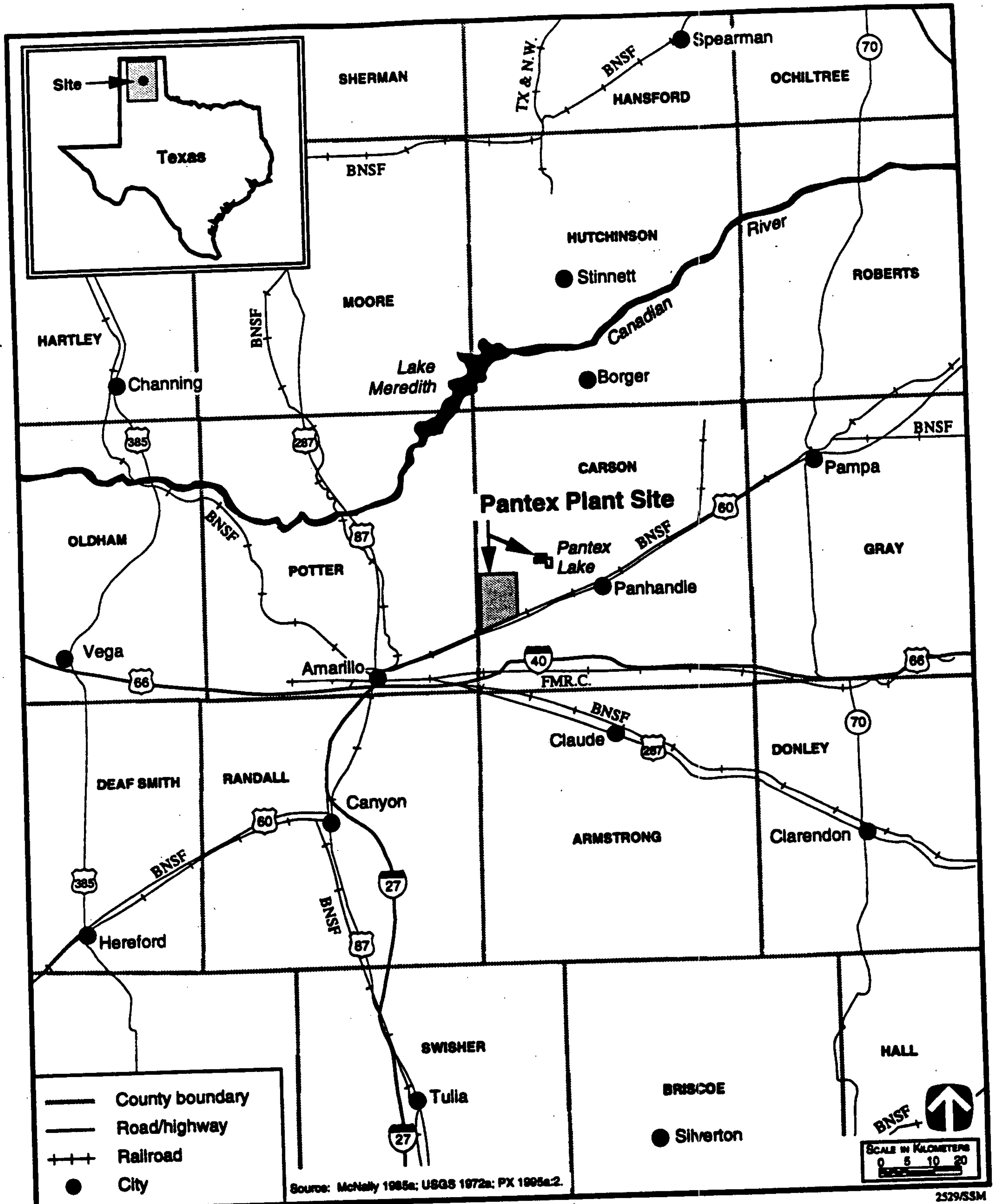


FIGURE 4.5–1.—*Pantex Plant Site, Texas, and Region.*

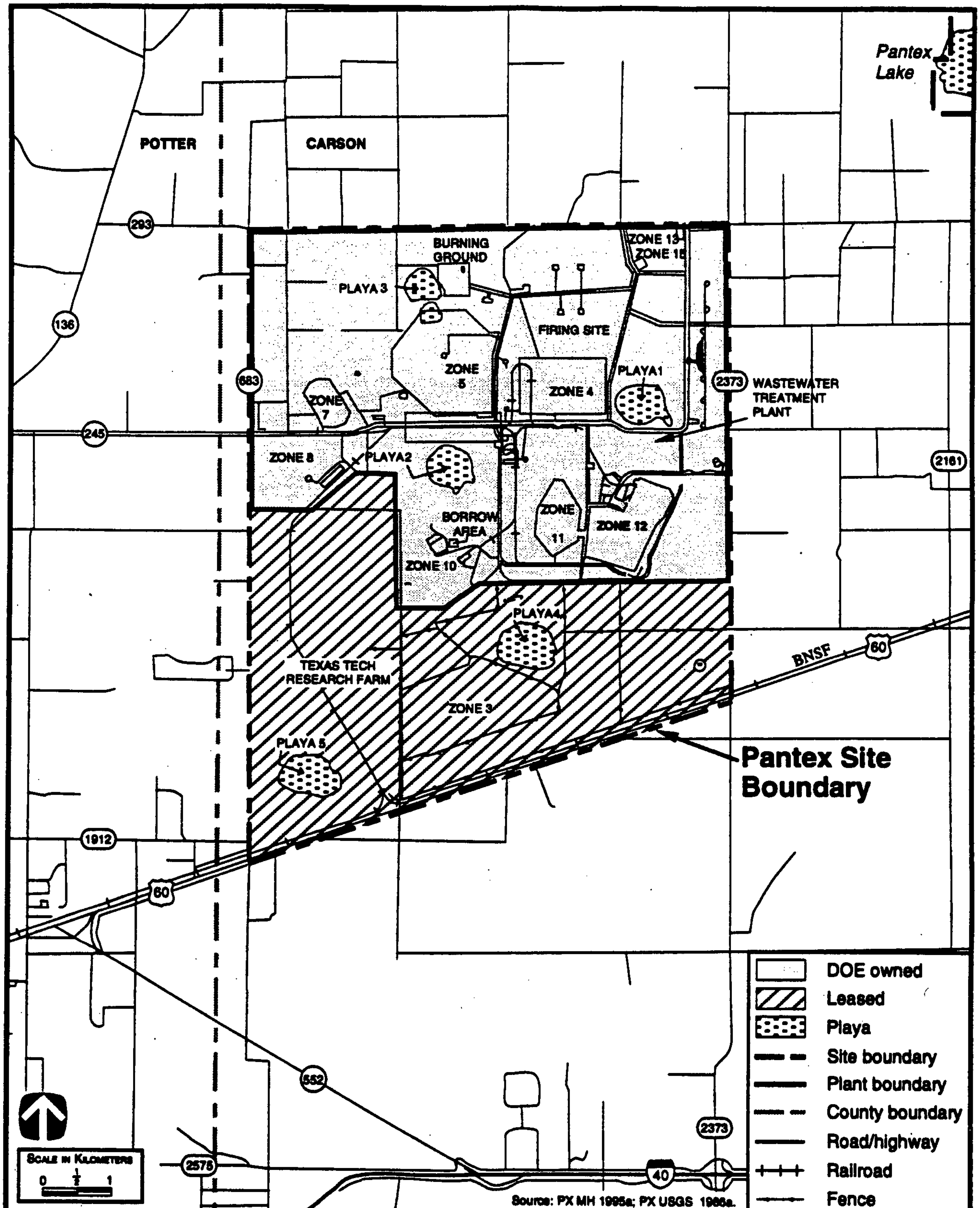


FIGURE 4.5–2.—*Principal Facilities and Zones at Pantex Plant.*

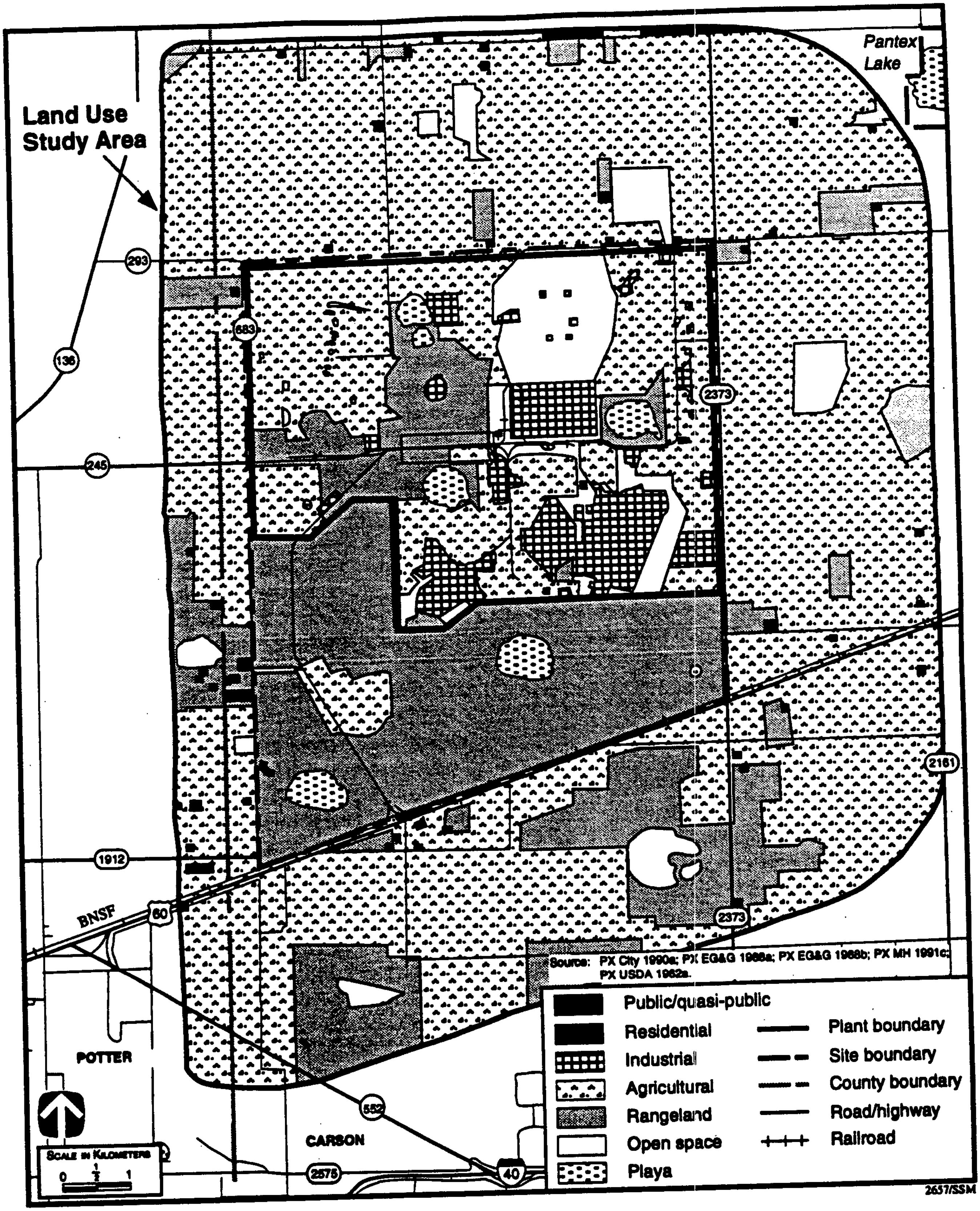


FIGURE 4.5.2.1–1.—*Generalized Land Use at Pantex Plant and Vicinity.*

Four low-altitude Federal airways used by the Amarillo International Airport for aircraft landings and takeoffs cross or come near Pantex. The runway is located approximately 11 km (7 mi) southwest of the site boundary.

It is anticipated that future residential development in the area will occur toward the southwest, away from the plant. The East Planning Area of the city, which extends to within 3.2 km (2 mi) of the plant site, has historically been one of the slower growing residential areas. Because of the presence of the airport, an important industrial use in this area, the Amarillo Comprehensive Plan encourages compatible use rather than residential use. The largest residential area, located approximately 8 km (5 mi) southwest of the plant boundary, is the site of the former Amarillo Air Force Base housing, which has been converted to rental housing.

4.5.2.2 *Site Infrastructure*

Section 3.2.5 describes the current missions at Pantex. To support these missions, infrastructure exists as shown in table 4.5.2.2–1.

TABLE 4.5.2.2–1.—***Baseline Characteristics for Pantex Plant***

Characteristics	Current Value
Land	
Area (ha)	4,119
Roads (km)	76
Railroads (km)	27
Electrical	
Energy consumption[a] (MWh/yr)	84,420
Peak load (MWe)[b]	13.6
Fuel	
Natural gas[c] (m^3/yr)	14,600,000
Liquid (L/yr)	1,775,720
Coal (t/yr)	0
Steam[d]	
Generation (kg/hr)	59,524

[a] System capacity is 201,480 MWh/yr.
[b] System capacity is 22.5 MWe.
[c] System capacity is 289,000,000 m^3/yr.
[d] System capacity is 68,040 kg/hr.
Source: PX 1996e:1; PX DOE 1995g; PX DOE 1996b.

4.5.2.3 *Air Quality*

This section describes existing air quality including a review of the meteorology and climatology in the vicinity of Pantex. More detailed discussions of the air quality methodologies, input data, and atmospheric dispersion characteristics are presented in appendix section B.3.5.

Meteorology and Climatology. The climate at Pantex and in the surrounding region is characterized as semi-arid with hot summers and relatively cold winters. The average annual temperature in the Amarillo region is 13.8 °C (56.9 °F); average daily temperatures vary from a mean daily minimum of -5.7 °C (21.8 °F) in January to a mean daily maximum of 32.8 °C (91.1 °F) in July. The annual average precipitation is approximately 49.7 cm (19.6 in). Prevailing wind directions at Pantex are from the south to southwest. The annual average wind speed is 6.0 m/s (13.5 mph) (NOAA 1994c:3).

Ambient Air Quality. Pantex is located within the Amarillo-Lubbock Intrastate AQCR 211, which is currently designated as "attainment" or "unclassified" by EPA (40 CFR 81.344) with respect to the NAAQS for criteria pollutants (40 CFR 50). Appendix table B.3.1–1 lists the NAAQS for these criteria pollutants. These standards have been adopted by the State of Texas (TX ACB 1993a). There are no Prevention of Significant Deterioration (40 CFR 52.21) Class I areas within 100 km (62.1 mi) of Pantex.

The primary emission sources of criteria pollutants at Pantex are the steam plant boilers, the explosives burning operation, and diesel and gasoline engines. Potential emission sources of hazardous/toxic air pollutants include the HE Synthesis Facility, the explosives burning operation, miscellaneous laboratories, and other small operations. With the exception of open burning of HE at the Burning Ground, most stationary points of nonradioactive atmospheric releases are from fume hoods and building exhaust systems with HEPA filters.

Table 4.5.2.3–1 presents the baseline ambient air concentrations for criteria pollutants and other pollutants of concern at Pantex. As shown in the table, baseline concentrations are in compliance with applicable guidelines and regulations.

TABLE 4.5.2.3–1.—***Comparison of Baseline Ambient Air Concentrations with Most Stringent Applicable Regulations and Guidelines at Pantex Plant, 1993*** **[Page 1 of 3]**

Pollutant	Averaging Time	Most Stringent Regulation or Guideline (μg/m³)	Baseline Concentration (μg/m³)
Criteria Pollutant			
Carbon monoxide	8-hour	10,000[a]	161
	1-hour	40,000[a]	924
Lead	Calendar quarter	1.5[a]	0.01
Nitrogen dioxide	Annual	100[a]	0.90
Ozone	1-hour	235[a]	[b]
Particulate matter	Annual	50[a]	8.73
	24-hour	150[a]	88.5
Sulfur dioxide	Annual	80[a]	<0.01
	24-hour	365[a]	<0.01
	3-hour	1,300[a]	<0.01
	30-minute	1,045[c]	<0.01
Mandated by Texas			
Hydrogen fluoride	30-day	0.8[c]	<0.27
	7-day	1.6[c]	<0.27
	24-hour	2.9[c]	0.27
	12-hour	3.7[c]	0.38
	3-hour	4.9[c]	1.52
Hydrogen sulfide	30-minute	111c	[b]
Sulfuric acid	24-hour	15[c]	[b]
	1-hour	50[c]	[b]
Total suspended particulates	3-hour	200[c]	[b]
	1-hour	400[c]	[b]
Hazardous and Other Toxic Compounds			
Alcohols	30-minute[d]	100	195
	Annual	[e]	0.70
Benzene	30-minute[d]	30[c]	19.40
	Annual	3[c]	0.05
Carbon disulfide	30-minute[d]	30[c]	22.60
	Annual	3[c]	0.09
Carbon tetrachloride	30-minute[d]	126[c]	19.7
	Annual	13[c]	0.08
Chlorobenzene	30-minute[d]	460[c]	19.5
	Annual	46[c]	0.08
1,1,1-Chloroethane	30-minute[d]	500[c]	127
	Annual	50[c]	0.53
Chromium	30-minute[d]	1[c]	0.10
	Annual	0.1[c]	0.002
Cresol	30-minute[d]	5[c]	0.41
	Annual	[e]	0.002
Cresylic acid	30-minute[d]	5[c]	0.51
	Annual	[e]	0.002

TABLE 4.5.2.3–1.—***Comparison of Baseline Ambient Air Concentrations with Most Stringent Applicable Regulations and Guidelines at Pantex Plant, 1993*** **[Page 2 of 3]**

Pollutant	Averaging Time	Most Stringent Regulation or Guideline (μg/m³)	Baseline Concentration (μg/m³)
Hazardous and Other Toxic Compounds (Continued)			
Dibenzofuran	30-minute[d]	e	0.001
	Annual	e	0.00002
Ester glycol ethers	30-minute[d]	e	35.9
	Annual	e	0.15
Ethyl benzene	30-minute[d]	2,000[c]	31.1
	Annual	434[c]	0.13
Ethylene dichloride	30-minute[d]	40[c]	9.58
	Annual	4[c]	0.04
Formaldehyde	30-minute[d]	15[c]	0.37
	Annual	1.5[c]	0.004
Hydrogen chloride	30-minute[d]	75[c]	5.98
	Annual	0.1[c]	0.09
Ketones	30-minute[d]	e	33.4
	Annual	e	0.14
Mercury	30-minute[d]	0.5[c]	0
	Annual	0.05[c]	0
Methanol	30-minute[d]	e	245
	Annual	e	0.58
Methyl cyanide	30-minute[d]	e	0
	Annual	e	0
Methyl ethyl ketone	30-minute[d]	3,900[c]	1,400
	Annual	590[c]	5.10
Methyl isobutyl ketone	30-minute[d]	2,050[c]	4.45
	Annual	205[c]	0.02
Methylene chloride	30-minute[d]	260[c]	180
	Annual	26[c]	0.74
Naphthalene	30-minute[d]	440[c]	0.005
	Annual	50[c]	0.0001
2-Nitropropane	30-minute[d]	50[c]	8.55
	Annual	5[c]	0.04
Nitrobenzene	30-minute[d]	24[c]	0.51
	Annual	5[c]	0.002
Phenol	30-minute[d]	154[c]	0.03
	Annual	19[c]	0.0006
Tetrachloroethylene	30-minute[d]	340[c]	17.6
	Annual	34[c]	0.07
Toluene	30-minute[d]	1880[c]	568
	Annual	188[c]	1.73
1,1,2-Trichloroethane	30-minute[d]	550[c]	17.3
	Annual	55[c]	0.08
Trichloroethylene	30-minute[d]	1350[c]	51.1
	Annual	135[c]	0.21

TABLE 4.5.2.3–1.—*Comparison of Baseline Ambient Air Concentrations with Most Stringent Applicable Regulations and Guidelines at Pantex Plant, 1993* [Page 3 of 3]

Pollutant	Averaging Time	Most Stringent Regulation or Guideline (μg/m³)	Baseline Concentration (μg/m³)
Hazardous and Other Toxic Compounds (Continued)			
Triethylamine	30-minute[d]	40[c]	1.08
	Annual	4[c]	0.002
Xylene	30-minute[d]	3700[c]	145
	Annual	434[c]	0.47

[a] Federal standard.
[b] No monitoring data available; baseline concentration assumed less than applicable standard.
[c] State standard. The effects screening levels are used in evaluation of hazardous and other toxic compounds.
[d] 1-hour predicted concentrations were used for 30-minute standard.
[e] No standard.
Source: 40 CFR 50; PX DOE 1996b; TX ACB 1987a; TX NRCC 1992a; TX NRCC 1995a.

4.5.2.4 *Water Resources*

This section describes the surface and groundwater resources at Pantex.

Surface Water. There are no streams or rivers at Pantex, and all site water requirements are currently met by groundwater. All surface water drains to playas, natural closed depressions that collect runoff to form ephemeral lakes. There are six playas associated with Pantex. Playas 1 through 3 are located on the main site, Playas 4 and 5 are located south and southwest, respectively, of the main site, and Pantex Lake (the sixth playa) is located approximately 4 km (2.5 mi) northeast of the main site (figure 4.5.2.4–1).

Playa 1 receives continuous wastewater discharges from the Pantex Wastewater Treatment Facility. Treated industrial wastewater discharges from buildings, and stormwater runoff are directed to Playas 1, 2, and 4. Playa 3 receives stormwater runoff from the Pantex Burning Ground. Playa 5 has received wastewater from numerous sources other than Pantex. Past Pantex activities included discharge of treated effluents to Pantex Lake. There are also a number of playas adjacent to Pantex that receive drainage from perimeter portions of the site. Playas provide a source of groundwater recharge through infiltration, although the rate of recharge is unknown. A study to determine this infiltration rate is currently being conducted (PX DOE 1996b:4-55).

Because there are no onsite or nearby flowing streams, floodplains exist only in association with the playas. The U.S. Army Corps of Engineers delineated 100- and 500-year floodplains and concluded that the only incidence of flooding would occur at Playa 3. The 500-year flood runoff at Playa 3 would overflow out of the drainage basin creating shallow (less than 30 cm [1 ft]) flooding of the drainage basins for Playas 1 and 2. This limited flooding would not affect the operations of Pantex (PX DOE 1996b:4-57).

Surface Water Quality. Surface water monitoring is conducted at all five playas at the main plant and Pantex Lake as well as at Bushland Playa, an offsite control playa (50 km [30 mi] west of Pantex) used for comparative purposes. Bushland Playa was dry during 1994. With the exception of a June 1994 high water level in Playa 1, due to a rainfall event, the Texas Natural Resources Conservation Commission's annual wastewater inspection in 1993 and 1994 did not note any deficiencies with permit requirements; however, the plant reported 16 excursions of the pH limitation during 1993. A treatment to adjust the effluent pH was installed in September 1993.

Surface Water Rights and Permits. Pantex submitted an NPDES permit application for industrial discharge on November 5, 1990, and a stormwater discharge permit application in October 1991. EPA

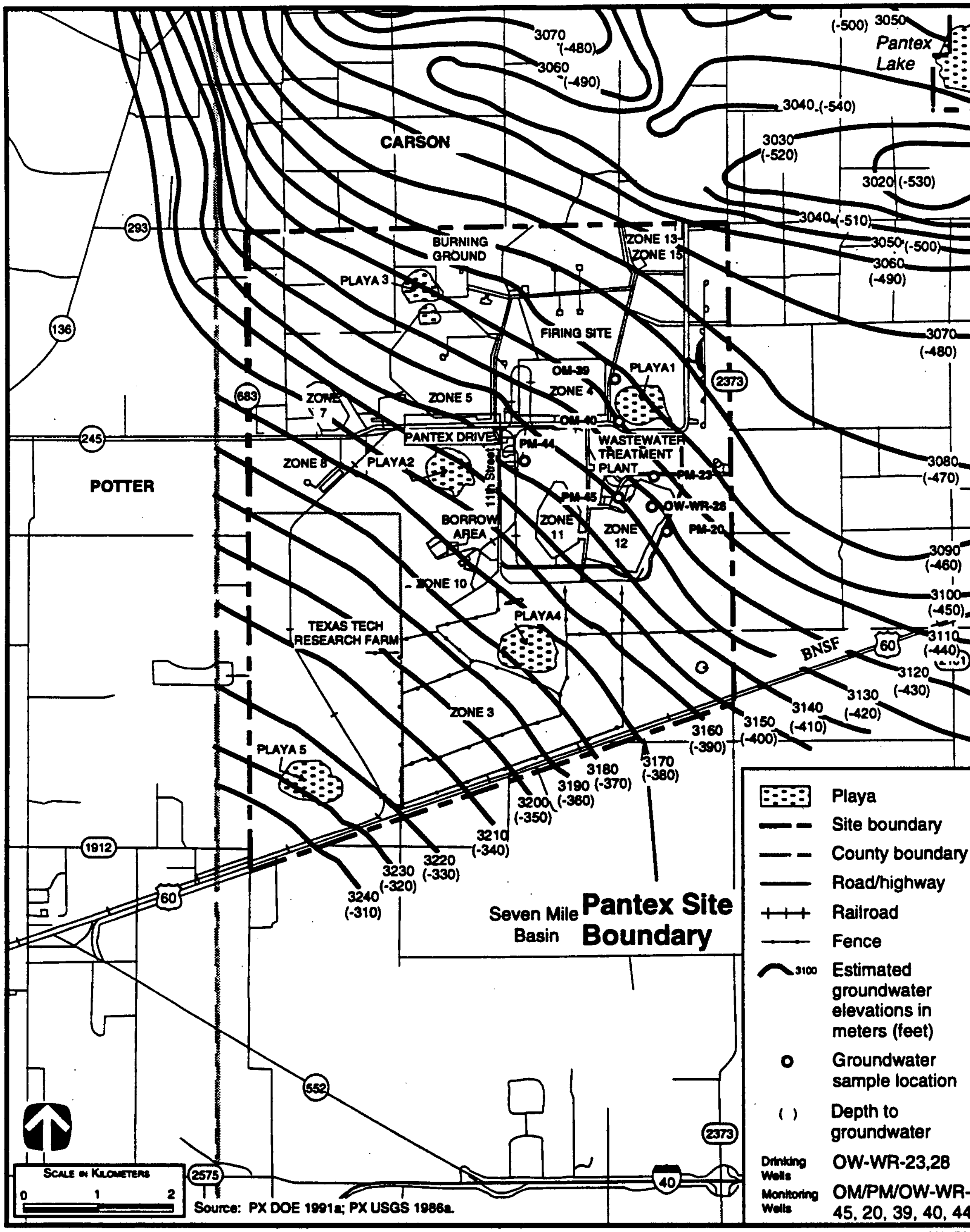


Figure 4.5.2.4–1.—*Potentiometric Surface of the Ogallala Aquifer at Pantex Plant.*

classified the playa lakes as jurisdictional wetlands and not "waters of the U.S." and therefore did not issue either permit. EPA requested on February 16, 1994, that Pantex resubmit modified NPDES permit applications for industrial discharge to Playas 1, 2, and 4. The application was submitted to EPA on August 26, 1994. A Notice of Intent to discharge stormwaters associated with nonconstruction industrial activities into Playas 1, 2, 3, and 4 via outfalls 007 through 030 was submitted to EPA on September 30, 1994. A stormwater permit was issued by EPA in February 1995. A draft NPDES industrial discharge permit was issued on December 31, 1994. Comments followed the issuance of the permit, and additional information was requested. A revised draft NPDES permit was issued on August 12, 1995; issuance of a final permit is still pending (PX DOE 1996b:4-61).

Treated domestic and industrial wastewater from Pantex is discharged into Playas 1 and 2 under the Texas Natural Resource Conservation Commission Wastewater No-Discharge Permit No. 02296. This permit was issued on May 19, 1980, and renewed and modified on May 3, 1988. This permit allows wastewater disposal by evaporation and onsite irrigation on Texas Tech University farmland. A modified renewal application was submitted on December 26, 1990. This application was protested, and the existing permit expired on May 6, 1993, without renewal. A settlement was reached on November 6, 1995, between Pantex and the local citizens. Issuance of the final permit is still pending. Until a decision is made by the Texas Natural Resource Conservation Commission, the plant continues to operate under the terms and conditions of the expired permit (PX DOE 1996b:4-61).

Water rights in Texas fall under the Doctrine of Prior Appropriations. Under this doctrine, the user who first appropriated water for a beneficial use has priority to use available water supply over a user claiming rights at a later time. Courts also recognize riparian rights legally granted from Spanish-American Agreements. The Texas Natural Resources Conservation Commission is the administrator for water rights and is the permit-issuing authority.

Groundwater. Pantex is located on the Texas High Plains aquifer system, which is the southernmost extension of a regional aquifer that extends from Texas to South Dakota (PX WDB 1993a:1). The two principal water-bearing units beneath Pantex and adjacent areas are the Ogallala aquifer and the underlying Dockum Group aquifer (PX DOE 1983a). Deep wells in the northeast corner of Pantex, completed at depths of 183 to 259 m (600 to 850 ft) into the Ogallala Formation, have provided the water supply at Pantex for over 40 years. A discontinuous perched aquifer is present at 66 to 88 m (217 to 290 ft) below ground surface; it is best defined under the eastern portion of Pantex, particularly under Zones 11 and 12. The perched groundwater is capable of yielding 2 to 5 gallons per minute, but is not used as a source for drinking water for any plant operations (PX DOE 1996b:4-65).

The Ogallala aquifer beneath Pantex has not been classified by EPA; however, it is the only source of drinking water at Pantex. Depth to water in the Ogallala aquifer ranges from 104 m (341 ft) at the southern boundary of Pantex to 140 m (459 ft) at the northern boundary. The saturated thickness of the Ogallala Formation ranges from 15 m (49.2 ft) to more than 120 m (394 ft) and in some areas is capable of producing yields in excess of 4,000 L per minute (1,050 gal per minute). Estimates of annual recharge rates to the Ogallala aquifer vary from 0.02 to 4.1 cm/yr (0.0079 to 1.6 in/yr) (PX DOE 1996b:4-69) based on earlier studies that investigated slow regional infiltration of precipitation and recent studies that explored percolation of water through playa lakes and leakage from the Dockum Group aquifer into the Ogallala aquifer (PX WDB 1993a:2).

The withdrawal of water from the Ogallala aquifer continues to exceed recharge, causing water levels to decline in the Pantex area at a rate of approximately 0.6 to 2 m/yr (1.97 to 6.56 ft/yr). From 1980 to 1990, the city of Amarillo well field north of Pantex experienced up to 20 m (60 ft) of water-level decline, causing a depression in the groundwater surface northeast of Pantex (PX WDB 1993a:11). In 1990, the recoverable volume of water in storage and available for use in the Ogallala aquifer was estimated at 5.15×10^{14} L (1.36×10^{14} gal) (PX DOE 1996b:4-71). Figure 4.5.2.4–1 shows the groundwater surface of the Ogallala aquifer beneath Pantex.

Groundwater Quality. Pantex's groundwater monitoring program includes monitoring wells and onsite Ogallala production wells distributed throughout the facility. Wells located in the vicinity of the plant are shown in figure 4.5.2.4–1. Groundwater samples collected from the wells are analyzed for a standard suite of parameters and constituents, including volatile organics, semi-volatile organics, pesticides, herbicides, trace metals, radionuclides (gross alpha and gross beta), and field parameters (total dissolved solids and pH). Limited metal concentrations have been found in some of the groundwater samples from the wells monitoring the Ogallala aquifer, including iron which was above the drinking water regulation.

Table 4.5.2.4–1 shows the most recent groundwater analytical data from the Ogallala aquifer. Past groundwater samples from the perched zone have been found to contain a variety of constituents that are either above background levels or drinking water standards or are not naturally occurring. These include 1,2-dichloroethane; chromium; iron; total dissolved solids; and trichloroethane. Table 4.5.2.4–2 shows the groundwater quality from three wells completed in the perched zone.

Groundwater Availability, Use, and Rights. Five production wells in the northeast corner of Pantex serve the plant's industrial and potable water needs. During the 1994 water year, the plant pumped 836 million L (221 million gal) of water from the Ogallala aquifer, while the city of Amarillo pumped 23,900 million L (6,320 million gal) from its Carson County well field located immediately north and northeast of the plant (PX DOE 1996b:4-77). The capacity of Pantex well field is approximately 1,990 MLY (526 MGY). Pantex Lake, located adjacent to the Amarillo water-well field, is available for drilling additional water wells if needed for future Pantex operations.

Groundwater is controlled by the individual landowner in Texas. The Texas Department of Health and the Texas Water Development Board are the two state agencies with major involvement in groundwater fact finding, data gathering, and analysis. Local groundwater management is the responsibility of local jurisdictions through Groundwater Management Districts. The Pantex facility is located in Panhandle Groundwater District 3, which has the authority to require permits and limit the quantity of water pumped. Presently, the Panhandle Groundwater District does not limit the quantity of water pumped.

4.5.2.5 *Geology and Soils*

Geology. Pantex is located on the southern High Plains of the Texas panhandle. The topography at Pantex consists of flat to gently rolling plains. There are no unique landforms, and the only distinctive features are playas that are spaced more or less uniformly over the site. The playas are about 500 to 1,000 m (1,640 to 3,280 ft) across with clay bottoms and depths to 9 m (30 ft).

The site itself is underlain by the Blackwater Draw Formation. At Pantex this geologic formation consists of a sequence of buried soils with an upper unit of mostly silt, clay, and caliche and a 12- to 23-m (40- to 75-ft) thick lower unit of silty sand with caliche. The Ogallala Formation, one of two principal water-bearing units beneath Pantex and adjacent areas, underlies the Blackwater Draw Formation.

The plant is located at the edge of a large Permian fault block, but there is no indication of faulting in the immediate area in the last 250 million years. Pantex lies on the boundary between seismic Zones 0 and 1 (figure A.1–1). Since 1906, only nine earthquakes of Richter magnitude 3.0 or greater have been recorded in the more seismically active Amarillo Uplift region 20 km (12 mi) northeast of Pantex. Seismicity in the Palo Duro Basin and at Pantex is low. There is no volcanic hazard at Pantex (DOE 1995i:4-298).

In the High Plains area, salt dissolution in Permian formations is an active process which can lead to sinkholes and fractures. Such surficial expressions have not been identified in Carson County, where Pantex is located. Sinkholes and fractures have been identified, however, in adjacent Armstrong County to the south and Hutchinson County to the north (PX DOE 1996b:4-29, 4-31).

Soils. Pantex is underlain by soils of the Pullman-Randall association. These soils are typically deep, very low permeability clay loams and clays. Pullman soils underlie most of the plant area, but Randall soils occur in the vicinity of the playas and depressions. Areas of Estacado, Lofton, and Pep clay loams are found in sloping areas surrounding playa bottoms (PX DOE 1995d:5-3). Water and wind erosion and shrink-swell potential are moderate to severe for most of the soil units (PX USDA 1962a:1,2; PX USDA 1980a:31,32). However, the soils are acceptable for standard construction techniques. DOE-leased land at Pantex that is used for agricultural purposes by

TABLE 4.5.2.4–1.—*Groundwater Quality Monitoring of the Ogallala Aquifer Wells at Pantex Plant, 1994*

Parameter	Unit of Measure	Water Quality Criteria and Standards[a]	Well Number OM-39	Well Number OM-40
Radiological				
Alpha (gross)	pCi/L	15[b]	<MDA-1.0	<MDA-1.0
Beta (gross)	pCi/L	50[c]	<MDA-1.0 (0.8)	<MDA-1.0
Tritium	pCi/L	80,000[d]	<MDA-50	<MDA-100 (70)
Uranium -234	pCi/L	20[d]	0.8-5.5 (1.1)	3.5-5.3 (0.5)
Uranium -238	pCi/L	24[d]	0.9-2.7 (0.4)	2-2.7 (0.2)
Nonradiological				
Barium	mg/L	2.0[b]	0.12-0.19	0.14-0.17
Chromium	mg/L	0.1[b]	≤0.005	<0.005-0.007
Copper	mg/L	1.0[e]	<0.005	<0.005-0.01
1,2-Dichloroethane	mg/L	0.005[b]	<0.005	<0.005
HMX	mg/L	NA	<0.020	<0.020
Iron	mg/L	0.3[e]	0.06-1.49	0.15-0.28
Lead	mg/L	0.015[b]	<0.005	<0.005
Nitrate	mg/L	10[b]	0.77-2.19	1.24-1.77
pH	pH units	6.5-8.5[e]	7.2-7.6	6.7-7.5
RDX	mg/L	NA	<0.020	<0.020
Sulfate	mg/L	250[e]	16-26	18-22
Total dissolved solids	mg/L	500[e]	210-310	220-360
Total organic carbons	mg/L	NA	<1.0-1	<1-2
Total organic halogens	mg/L	NA	<3-23	<3-6
Trichloroethylene	mg/L	0.005[b]	<0.005	<0.005
Zinc	mg/L	5[e]	0.221-1.9	0.033-0.048

[a] For comparison only.
[b] National Primary Drinking Water Regulations (40 CFR 141).
[c] Proposed National Primary Drinking Water Regulation; Radionuclides (56 FR 33050).
[d] DOE Derived Concentration Guides for water (DOE Order 5400.5). Number used is 4 percent of Derived Concentration Guides.
[e] National Secondary Drinking Water Regulations (40 CFR 143).

Note: NA - not applicable; <MDA indicates the results were less than the minimum detectable activity of the radionuclide counting system; parentheses () indicate standard deviation from the mean. If no parentheses are given for the radionuclide, then a mean could not be be calculated.

Source: PX DOE 1995d.

TABLE 4.5.2.4–2.—*Groundwater Quality Monitoring of the Perched Zone Wells at Pantex Plant, 1994*

Parameter	Unit of Measure	Water Quality Criteria and Standards[a]	Well Number PM-44	Well Number PM-45	Well Number PM-20
Radiological					
Alpha (gross)	pCi/L	15[b]	<MDA	<MDA-1	<MDA-1
Beta (gross)	pCi/L	50[c]	<MDA-3	<MDA-2	<MDA-1 (0.8)
Tritium	pCi/L	80,000[d]	<MDA-100	<MDA-40 (350)	<MDA-160 (900)
Uranium-234	pCi/L	20[d]	1.8-2.8 (0.3)	4.3-5.5 (0.4)	2.6-3.8 (0.3)
Uranium-238	pCi/L	24[d]	0.81-1.7 (0.2)	2.2-3 (0.3)	1.5-2.3 (0.2)
Nonradiological					
Barium	mg/L	2[b]	0.13-0.15	0.22-0.25	0.16-0.23
Chromium	mg/L	0.1[b]	<0.005-0.007	<0.005-0.01	0.53-1.95
Copper	mg/L	1.0[e]	<0.005-0.006	<0.005-0.005	<0.005-0.006
1,2-Dichloroethane	mg/L	0.005[b]	<0.005	<0.005	<0.005
HMX	mg/L	NA	<0.020	<0.020	<0.020-0.07
Iron	mg/L	0.3[e]	0.01-0.09	0.02-0.08	0.2-3.55
Lead	mg/L	0.015[b]	<0.005	<0.005	<0.005
Nitrate	mg/L	10[b]	<0.01-4.12	1.02-3.19	1.5-4.8
pH	pH units	6.5-8.5[e]	7.3-7.6	6.9-7.3	7.2-7.9
RDX	mg/L	NA	<0.020	<0.020	<0.020-1.1
Sulfate	mg/L	250[e]	12	25-28	24-40
Total dissolved solids	mg/L	500[e]	180-230	370-460	280-500
Total organic carbons	mg/L	NA	<1-2	<1-3	<1-1
Total organic halogens	mg/L	NA	<5-8	6-13	69-95
Trichloroethane	mg/L	0.2[b]	<0.005	<0.005-0.01	<0.005-0.15
Zinc	mg/L	5[e]	0.011-0.038	0.006-0.032	<0.005-0.017

[a] For comparison only, except for those parameters with the Texas State water quality criteria.
[b] National Primary Drinking Water Regulations (40 CFR 141).
[c] Proposed National Primary Drinking Water Regulation; Radionuclides (56 FR 33050).
[d] DOE Derived Concentration Guides for water (DOE Order 5400.5). Number used is 4 percent of Derived Concentration Guides.
[e] National Secondary Drinking Water Regulations (40 CFR 143).

Note: NA - not applicable; <MDA indicates the results were been that the minimum detectable activity of the radionuclide counting system; parentheses ( ) indicate standard deviation from the mean, if no parentheses are given for the radionuclide, then a mean could not be be calculated.

Source: PX DOE 1995d.

Texas Tech is considered prime farmland when irrigated (DOE 1995i:4-282).

4.5.2.6 *Biotic Resources*

The following section describes biotic resources at Pantex including terrestrial resources, wetlands, aquatic resources, and threatened and endangered species. A list of threatened and endangered species that may be found on or in the vicinity of Pantex is presented in appendix C.

Terrestrial Resources. Pantex is located within a treeless portion of the High Plains that is classified as mixed prairie. The primary vegetation of the High Plains includes short-grasses (buffalo-grass [*Buchloe dactyloides*] and blue grama [*Bouteloua gracilis*]) and mid-grasses (little bluestem [*Schizachyrium scoparium*], sideoats grama [*Bouteloua curtipendula*], and western wheatgrass [*Agropyron smithii*]) (PX DOE 1991a:2). Approximately 23 percent of the site, including land leased from Texas Tech University, has been developed. Much of the remainder of the site has been disturbed by past agricultural practices and is being managed as native and improved pasture, or is being cultivated by the university or its tenant farmers (PX DOE 1983a:3-20,3-23). Small areas of relatively undisturbed vegetation exist around playas. Some protection for native habitat is also provided at Pantex where plant operations preclude agricultural activities. Vegetation within these areas consists primarily of grasses and herbs, although barrel cactus (*Ferocactus sp.*) is also present (PX DOE 1995d;5-3, 5-4). Plant communities on the site have not been mapped. A total of 229 plant species has been identified at Pantex (PX DOE 1993c:2).

Terrestrial wildlife species identified on Pantex include 7 amphibians, 8 reptiles, 43 birds, and 19 mammals (PX DOE 1994c:4-5; PX DOE 1994d:7-11). Common animal species known to exist in the vicinity of Pantex include the upland chorus frog (*Pseudacris triseriata*), common bullsnake (*Pituophis melanoleucus*), western meadowlark (*Sturnella neglecta*), mourning dove (*Zenaida macroura*), black-tailed jackrabbit (*Lepus californicus*), and black-tailed prairie dog (*Cynomys ludovicianus*). Among the game animals existing onsite are cottontails (*Sylvilagus spp.*), scaled quail (*Callipepla squamata*), northern bobwhite (*Colinus virginianus*), mourning dove, and numerous waterfowl species (PX DOE 1994b:2,3; PX DOE 1994d:8,11). Hunting is not permitted at Pantex. Common raptors on Pantex include the Swainson's hawk (*Buteo swainsoni*) and burrowing owl (*Athene cunicularia*). Carnivores present include the American badger (*Taxidea taxus*) and coyote (*Canis latrans*). A variety of migratory birds has been found at Pantex. Migratory birds and their nests and eggs, are protected by the *Migratory Bird Treaty Act*. Eagles are similarly protected by the *Bald and Golden Eagle Protection Act*.

Wetlands. Wetlands at Pantex are associated with the five playa basins existing on the site and Pantex Lake (also a playa), located approximately 4 km (2.5 mi) northeast of the site. The National Wetland Inventory map identifies Playas 1 through 5 and part of Pantex Lake as wetlands. Playas 1, 2, and 3 are classified by the USFWS as palustrine (nontidal wetlands dominated by trees, shrubs, and emergent vegetation) systems. The larger Playas, 4 and 5, and Pantex Lake are classified as lacustrine (lakes, ponds, and other enclosed open waters at least 8 ha [20 acres] in extent and not dominated by trees, shrubs, or emergent vegetation) systems. Playas 1, 2, and 4 currently receive treated industrial discharges and stormwater runoff, while Playa 3 receives only stormwater runoff. Playa 5 and the Pantex Lake do not receive site discharges. National Wetland Inventory maps identify a number of smaller palustrine wetlands, approximately 4 ha (10 acres) or less, located on the western and southwestern parts of Pantex in areas that are largely grazed or farmed. Situated along the Central Flyway Migratory Route, the Pantex playas are important to migratory birds and provide valuable habitat for nesting and wintering birds, as well.

Aquatic Resources. Aquatic habitat at Pantex is limited to four ephemeral playas, one permanent playa, and several ditches. Although the playas and ditches located on the Pantex site proper may provide habitat for amphibians and macroinvertebrates, they do not support any fish populations. However, a small pond associated with Pantex Lake does support a small population of minnows (*Cyprinidae*) (PX DOE 1996b:4-139).

Threatened and Endangered Species. Ten Federal- or state-listed threatened, endangered, and other special status species may be found on and in the vicinity of Pantex (appendix table C–3). Five of these species have records of occurrence on the site, four of which are Federal- and/or state-listed as threatened or endangered. The Federal-listed bald eagle (*Haliaeetus leucocephalus*) is a winter resident that has been observed foraging at playas on the site each year, while the whooping crane (*Grus americana*) is considered a very infrequent migrant, last observed in 1990. The state-listed Texas horned-lizard (*Phrynosoma cornutum*) resides on site, while the white-faced ibis (*Plegadis chihi*) may forage at site playas. The Federal candidate swift fox (*Vulpes velox*) has also been observed onsite. No critical habitat for threatened and endangered species, as defined in the *Endangered Species Act* (50 CFR 17.11; 50 CFR 17.12), exists on Pantex.

4.5.2.7 *Cultural and Paleontological Resources*

Prehistoric Resources. Archaeological surveys at Pantex have systematically covered approximately one-half of the facility. To date, 63 prehistoric sites have been recorded on DOE and Texas Tech University property. Prehistoric site types identified at Pantex include small temporary campsites and limited activity locations characterized by surface scatters of artifacts. Some of the sites contain heat-altered rock that suggests food processing. Consistent with a Pantex prehistoric site location model, these prehistoric campsites tend to be clustered near the Pantex playa drainages. In this model, prehistoric sites would be located only within 0.4 km (0.25 mi) of playas or their drainages. Of 22 prehistoric sites tested, only one, a late prehistoric bison kill site north of Pantex Lake, has been determined potentially eligible for the NRHP. To date, no activity is planned that would affect this potentially significant site. Other identified sites are thought to be ineligible based on their lack of contextual integrity. A cultural resources management plan is being developed for Pantex. Implementation of this plan is scheduled for 1997. An interim programmatic agreement is in place to ensure regulatory compliance, and potential adverse impacts are evaluated on a case-by-case basis.

Historic Resources. The Pantex facility was originally constructed in 1942 as a World War II bomb-loading plant on land claimed from local farmers. Remains of eight of these farmsteads have been recorded as historic archaeological sites; these sites have minimal integrity and are highly unlikely to be eligible for the NRHP.

The entire Pantex site has been surveyed for World War II-era structures and foundations, and all such properties have been systematically recorded. The Texas SHPO has listed 45 of these structures as potentially eligible for the NRHP. The Cold War historic context has not yet been fully defined for Pantex. When completed, it is probable that a number of plant structures will be determined NRHP eligible.

Native American Resources. Native Americans known to have traditional interests in Pantex include the Comanche Tribe of Oklahoma, the Kiowa Tribe of Oklahoma, the Apache Tribe of Oklahoma, the Mescalero Apache Tribe, the Jicarilla Apache Tribe, the Cheyenne-Arapaho Tribe of Oklahoma, the Wichita and Affiliated Tribes, the Caddo Tribe of Oklahoma, the Delaware Tribe of Western Oklahoma, and the Fort Sill Apache Tribe. DOE is performing a historic treaties search and a public outreach program to involve Native American stakeholders in decisionmaking related to the use of plant land and the protection of cultural resources. Traditional cultural properties have not been identified at Pantex, but the remains of temporary historic campsites and hunting locations are possible.

Paleontological Resources. The surficial geology of the Pantex area consists of silts, clays, and sands of the Blackwater Draw Formation. In other areas of the High Plains, this formation contains Late Pleistocene vertebrate remains, including bison, camel, horse, mammoth, and mastodon, with occasional and significant evidence of their use by early humans. Evidence of woolly mammoths has been found north of Pantex near the Canadian River.

4.5.2.8 *Socioeconomics*

Socioeconomic characteristics addressed at Pantex include employment, regional economy, population, housing, and public finance. Statistics for employment and regional economy are presented for the regional economic area that encompasses 32 counties surrounding Pantex in Texas and New Mexico. Statistics for population, housing, and public finance are presented for the ROI, a four-county area in which approximately 96 percent of all Pantex employees reside: Armstrong County (1 percent), Carson County (11 percent), Potter County (34 percent), and Randall County (50 percent). Site employment at Pantex totalled 3,555 in 1994 and is projected to decrease to 1,644 by 2005. Figure 4.5.2.8–1 presents a map of the counties and selected cities composing the Pantex regional economic area and ROI. Supporting data are shown in appendix D.

Regional Economy Characteristics. Selected employment and regional economy statistics for the Pantex regional economic area are summarized in figure 4.5.2.8–2. The civilian labor force in the regional economic area grew approximately 9 percent between 1980 and 1990 (about 1 percent annually). Total employment in the region was 219,504 in 1994. In 1994, unemployment in the regional economic area was 4.8 percent, significantly lower than 6.4 and 6.3 percent unemployment in Texas and New Mexico, respectively. The 1993 per capita income in the regional economic area was $19,310, approximately 1.5 percent higher than the per capita income in Texas ($19,023) and 19 percent higher than New Mexico's per capita income of $16,346.

As shown in figure 4.5.2.8–2, the Pantex regional economic area, Texas, and New Mexico have similar employment patterns. The service sector accounts for the largest share of total employment in both Texas and New Mexico (28 percent in both states), as well as in the region (22 percent). Manufacturing, however, accounts for a greater share of employment in Texas (11 percent) than in the region (9 percent) or New Mexico (6 percent).

Population and Housing. The ROI population, which totalled 200,052 in 1992, increased by approximately 10 percent (less than 1 percent annually) between 1980 and 1992, less than half the growth rate of Texas during the same period. Furthermore, population growth was uneven among the ROI counties; Randall County grew about 22 percent (an annual rate of almost 2 percent) while the populations of Carson and Armstrong Counties decreased slightly.

Increases in the number of housing units averaged approximately 1 percent annually in the ROI from 1980 to 1990, less than the almost 3 percent annual increase for Texas. Within the ROI, the number of housing units increased at a rate of almost 3 percent in Randall County, while the number of units decreased slightly in both Carson and Potter Counties. Homeowner and rental vacancy rates in the Pantex ROI in 1990 were comparable to those in Texas. Population and housing statistics for the ROI are summarized in figure 4.5.2.8-3.

Public Finance. Financial characteristics of the local jurisdictions in the Pantex ROI that are most likely to be affected by the proposed action are presented in this section. The data reflect total revenues and expenditures of each jurisdiction's general fund, special revenue funds, and, as applicable, debt service, capital project, and expendable trust funds. School district boundaries may or may not coincide with county or city boundaries, but the districts are presented under the county where they primarily provide services. Major revenue and expenditure fund categories for counties, cities, and school districts are presented in appendix tables D.2.3–6 and D.2.3–7. Figure 4.5.2.8–4 summarizes local governments' revenues and expenditures. Fund balances, which are dollars carried over from previous years, are not included in figure 4.5.2.8–4. All jurisdictions assessed had positive fund balances.

4.5.2.9 *Radiation and Hazardous Chemical Environment*

The following section provides a description of the radiation and hazardous chemical environment at Pantex. Also included are discussions of health effects studies, emergency preparedness considerations, and a brief accident history.

Radiation Environment. Major sources of background radiation exposure to individuals in the vicinity of Pantex are shown in table 4.5.2.9–1. All annual doses to individuals from background radiation are expected to remain constant over time. The incremental total dose to the population would result only from changes in the size of the population. Background radiation doses are unrelated to Pantex operations.

Releases of radionuclides to the environment from Pantex operations provide another source of radiation exposure to people in the vicinity of Pantex. The radionuclides and quantities released from Pantex

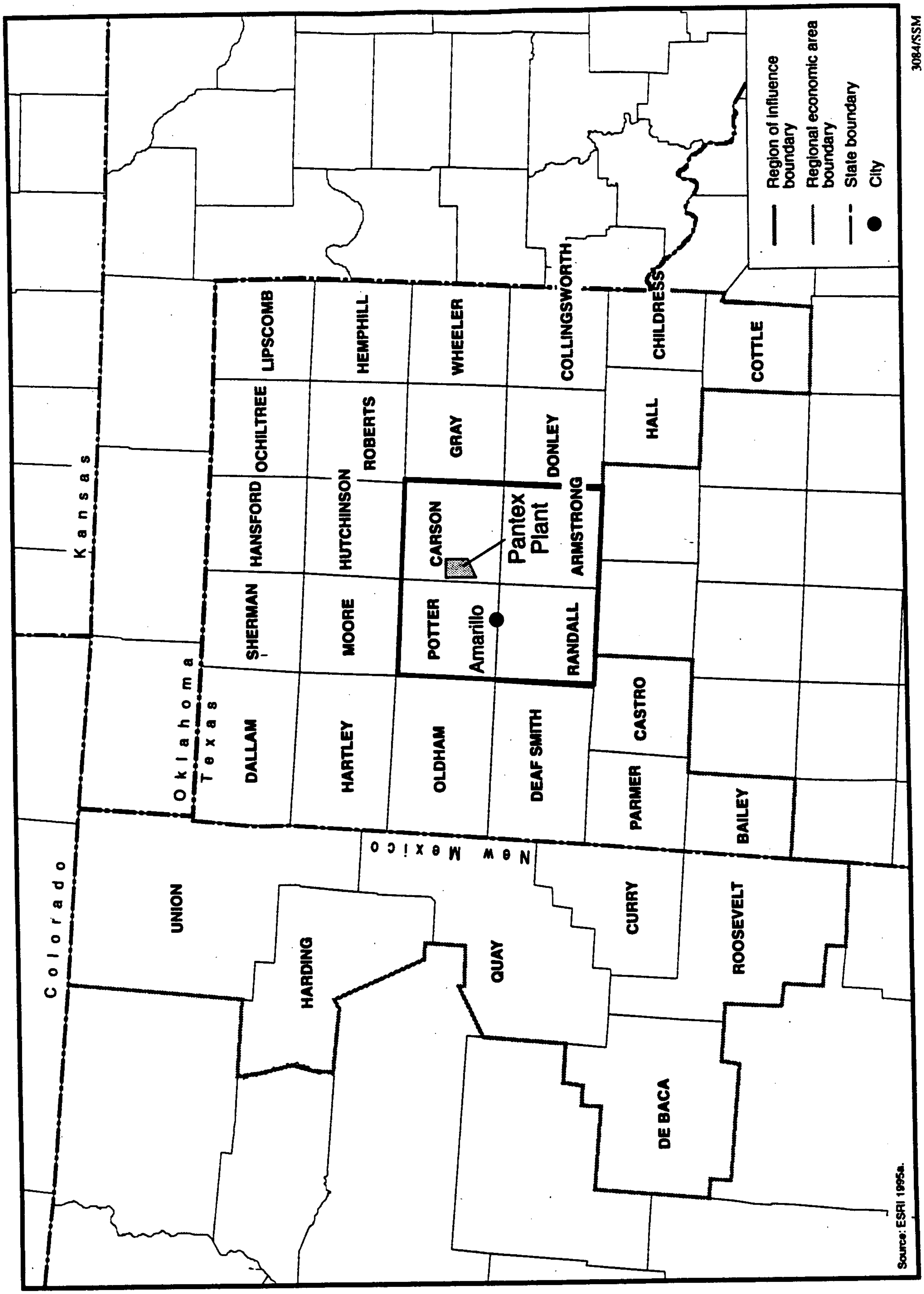
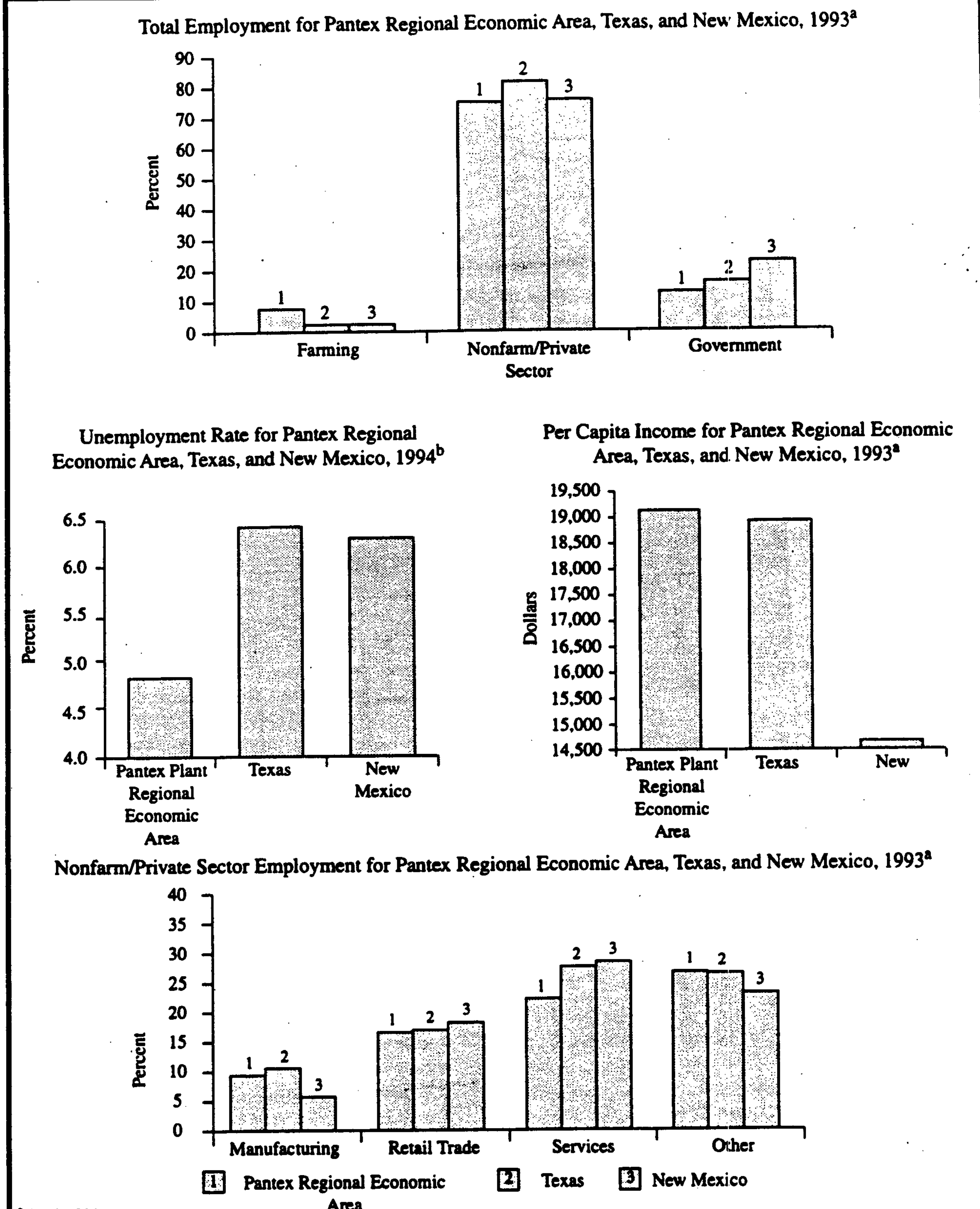


FIGURE 4.5.2.8–1.—*Regional Economic Area and Region of Influence for Pantex Plant.*



[a] DOC 1995a.
[b] DOL 1995a.

FIGURE 4.5.2.8–2.—*Economy for the Pantex Plant Regional Economic Area, Texas, and New Mexico.*

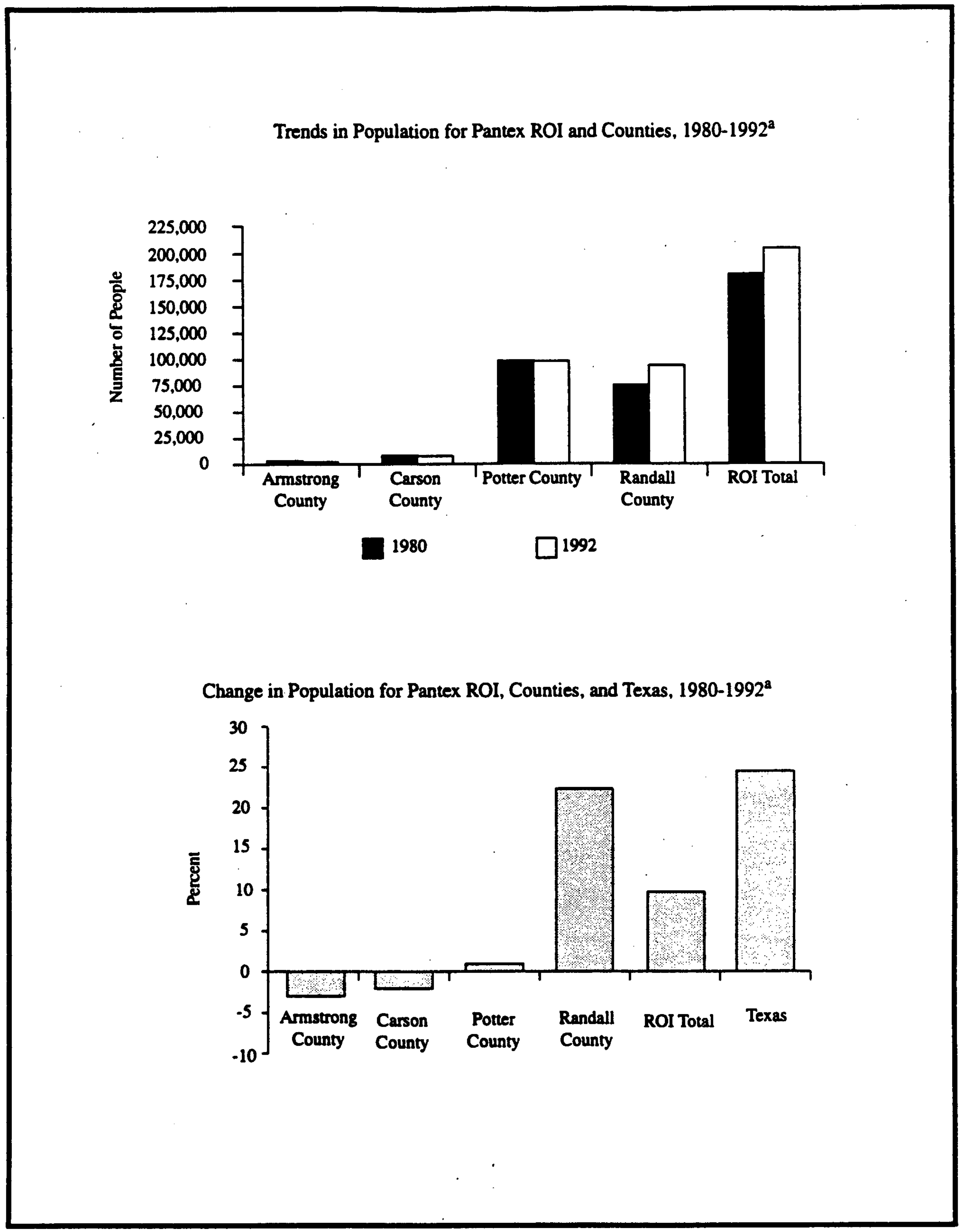
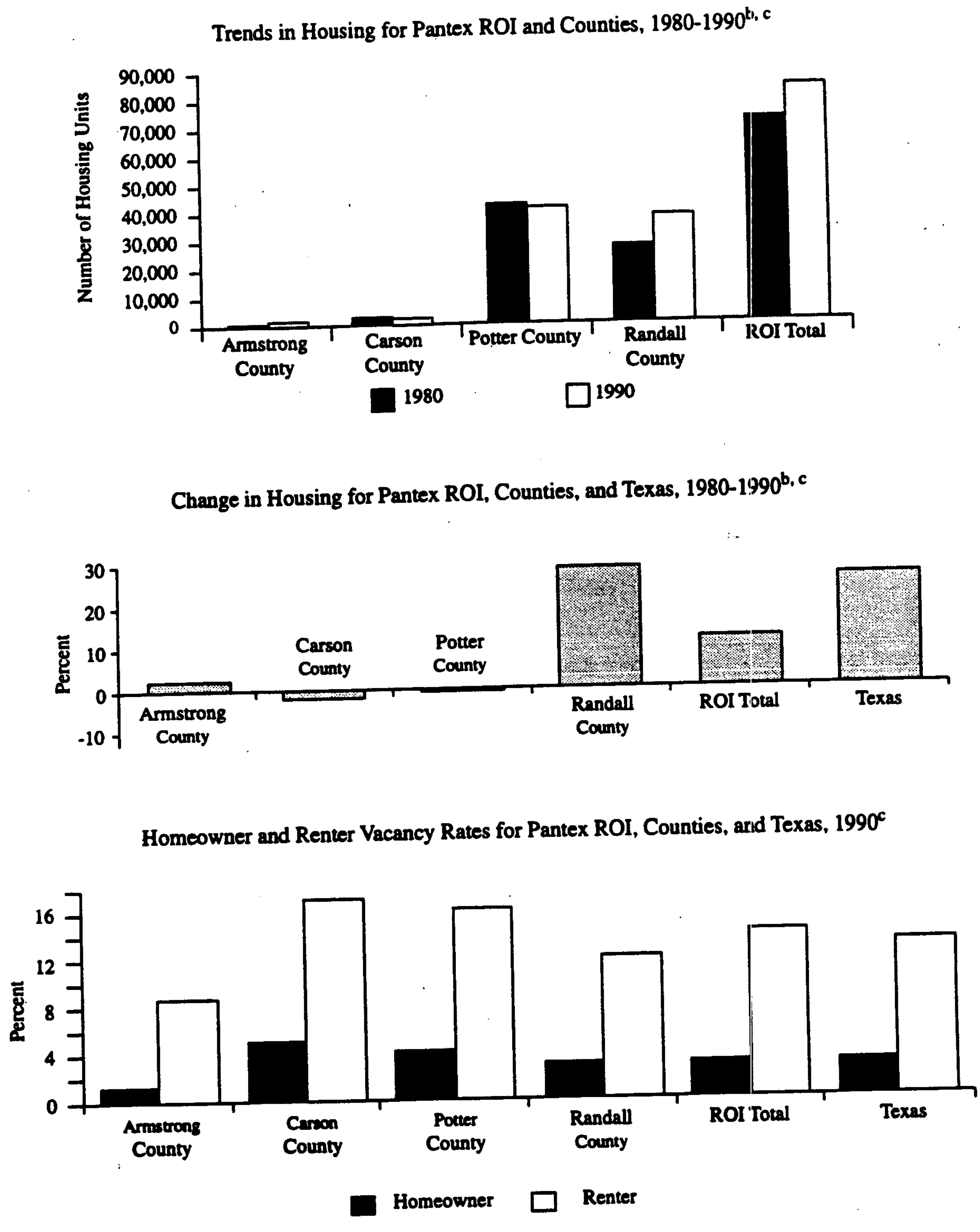


FIGURE 4.5.2.8–3.—*Population and Housing for the Pantex Plant Region of Influence* **[Page 1 of 2].**



[a] Census 1994o.
[b] Census 1982v.
[c] Census 1991m.

FIGURE 4.5.2.8–3.—*Population and Housing for the Pantex Plant Region of Influence* [Page 2 of 2].

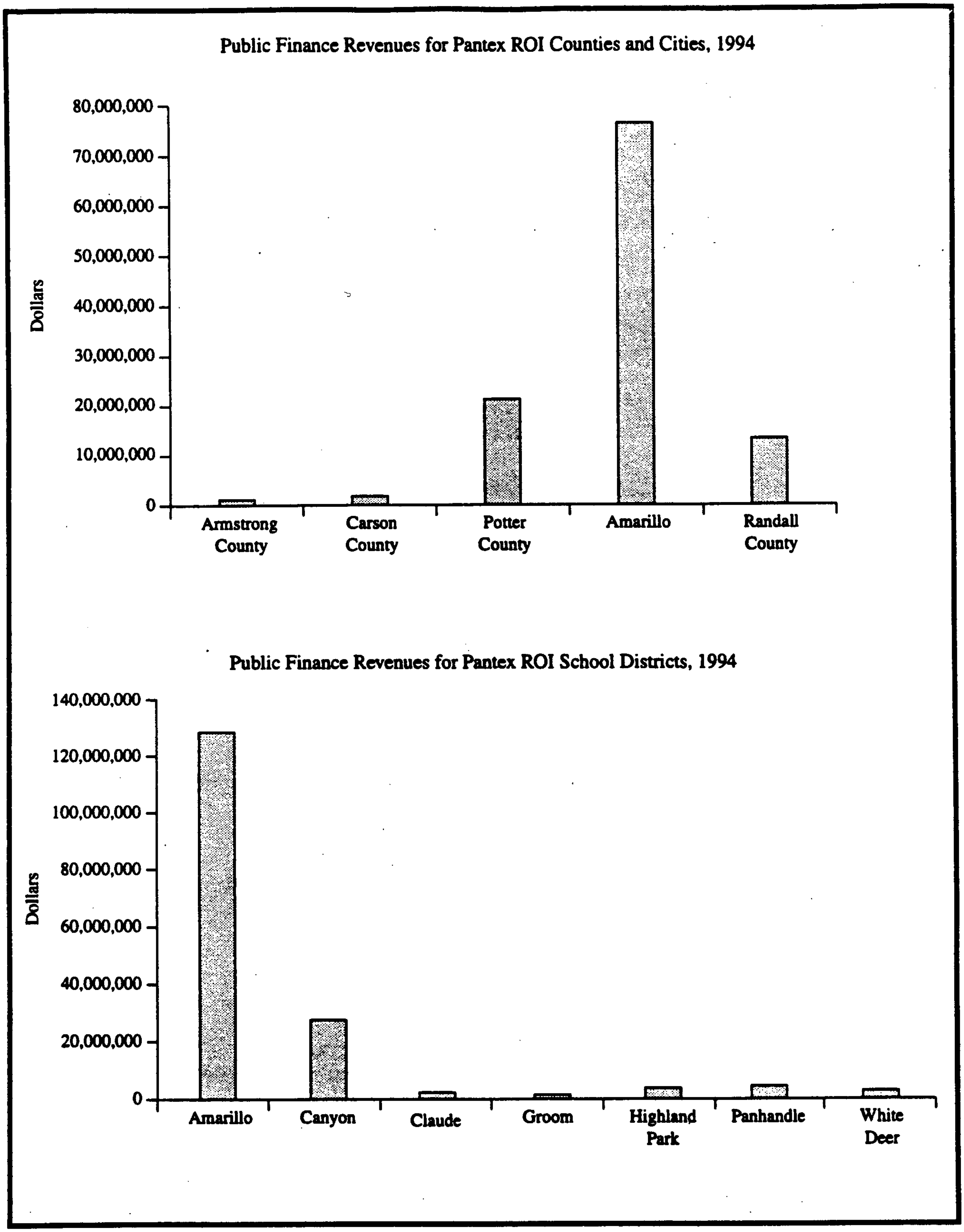
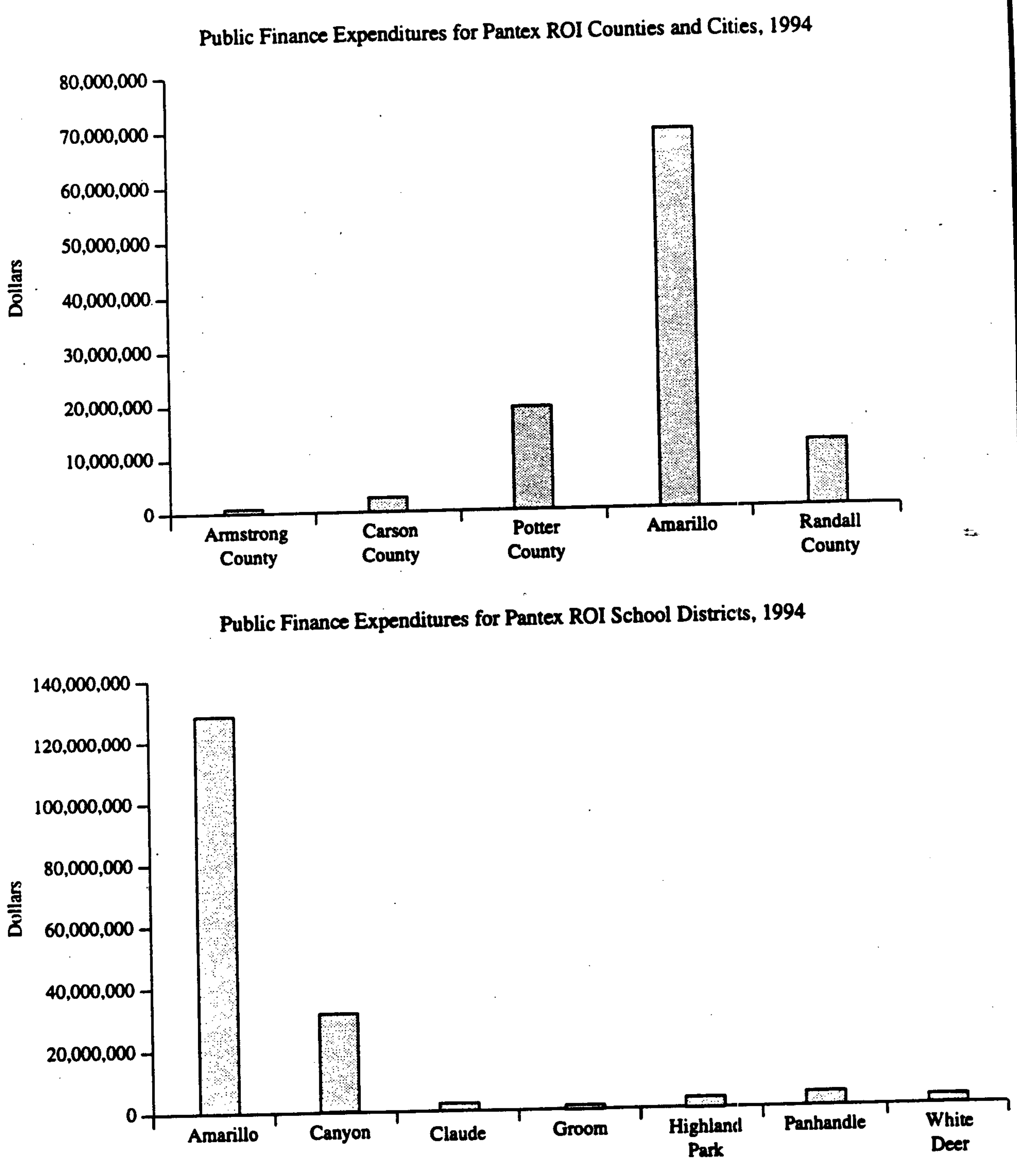


FIGURE 4.5.2.8–4.—*Local Government Public Finance for the Pantex Plant Region of Influence* [Page 1 of 2].



Note: 1993 and 1994 financial audit data for Groom and Highland Park School Districts is not available. Data presented is for 1992.
Source: PX City 1995a; PX County 1995a; PX School 1995b.

FIGURE 4.5.2.8–4.—*Local Government Public Finance for the Pantex Plant Region of Influence* [Page 2 of 2].

TABLE 4.5.2.9–1.—*Sources of Radiation Exposure to Individuals in the Vicinity, Unrelated to Pantex Plant Operations*

Source	Committed Effective Dose Equivalent (mrem/yr)
Natural Background Radiation	
Cosmic and external terrestrial cosmogenic radiation[a]	95
Internal terrestrial radiation[b]	39
Radon in homes (inhaled)[b]	200
Other Background Radiation[b]	
Diagnostic x rays and nuclear medicine	53
Weapons test fallout	<1
Air travel	1
Consumer and Industrial Products	10
Total	399

[a] PX DOE 1995d.

[b] NCRP 1987a. Value for radon is an average for the United States.

operations in 1994 are listed in the *1994 Environmental Report for Pantex Plant* (DOE/AL/65030-9506). The doses to the public resulting from these releases are given in table 4.5.2.9–2. These doses fall within radiological limits (DOE Order 5400.5) and are small in comparison to background radiation. The releases listed in the 1994 report were used in the development of the reference environment (No Action) radiological releases at Pantex in 2005 (section 4.5.3.9).

Based on a dose-to-risk conversion factor of 500 cancer deaths per 1 million person-rem ($5x10^{-4}$ fatal cancer per person-rem) to the public (appendix E), the fatal cancer risk to the maximally exposed member of the public due to radiological releases from Pantex operations in 1994 is estimated to be approximately $2.9x10^{-11}$. That is, the estimated probability of this person dying of cancer at some point in the future from radiation exposure associated with 1 year of Pantex operations is less than 3 chances in 100 billion. (Note that it takes several to many years from the time of exposure to radiation for a cancer to manifest itself.)

Based on the same conversion factor, $7.0x10^{-8}$ excess fatal cancers are projected in the population living within 80 km (50 mi) of Pantex from normal operation in 1994. To place this number into perspective, it can be compared with the number of fatal cancers expected in this population from all causes. The 1990 mortality rate associated with cancer for the U.S. population was 0.2 percent per year (Almanac 1993a:839). Based on this mortality rate, the number of fatal cancers from all causes expected to occur during 1994 in the population living within 80 km (50 mi) of Pantex was 550. This number of expected fatal cancers is much higher than the

TABLE 4.5.2.9–2.—*Doses to the General Public from Normal Operation at Pantex Plant, 1994 (Committed Effective Dose Equivalent)*

Affected Environment	Atmospheric Releases		Liquid Releases		Total	
	Standard[a]	Actual	Standard[a]	Actual	Standard[a]	Actual
Maximally exposed individual (mrem)	10	$5.8x10^{-5}$	4	0.0	100	$5.8x10^{-5}$
Population within 80 kilometers[b] (person-rem)	None	$1.4x10^{-4}$	None	0.0	100	$1.4x10^{-4}$
Average individual within 80 kilometers[c] (mrem)	None	$5.0x10^{-7}$	None	0.0	None	$5.0x10^{-7}$

[a] The standards for individuals are given in DOE Order 5400.5. As discussed in that order, the 10 mrem/yr limit from airborne emissions is required by the CAA, the 4 mrem/yr limit is required by the SDWA, and the total dose of 100 mrem/yr is the limit from all pathways combined. The 100 person-rem value for the population is given in proposed 10 CFR 834 (58 FR 16268).

[b] In 1994, this population was approximately 275,000.

[c] Obtained by dividing the population dose by the number of people living within 80 km (50 mi) of the site.

Source: PX DOE 1995d.

TABLE 4.5.2.9–3.—*Doses to the Onsite Worker from Normal Operation at Pantex Plant, 1994*

Affected Environment	Onsite Releases and Direct Radiation	
	Standard[a]	Actual[b]
Average worker (mrem)	None	10
Maximally exposed worker (mrem)	5,000	660
Total workers (person-rem)	None	30

[a] 10 CFR 835. DOE's goal is to maintain radiological exposure as low as reasonably achievable.

[b] PX DOE 1995d. The number of badged workers in 1994 was approximately 2,980.

estimated 7.0×10^{-8} fatal cancers that could result from Pantex operations in 1994.

Workers at Pantex receive the same dose as the general public from background radiation, but also receive an additional dose from working in the facilities. Table 4.5.2.9–3 includes the average, maximum, and total occupational doses to Pantex workers from operations in 1994. These doses fall within radiological limits (10 CFR 835). Based on a dose-to-risk conversion factor of 400 fatal cancers per 1 million person-rem (4×10^{-4} fatal cancers per person-rem) among workers (appendix E), the number of excess fatal cancers to Pantex workers from operations in 1994 is estimated to be 0.012.

A more detailed presentation of the radiation environment, including background exposures and radiological releases and doses, is presented in the *Pantex Plant Site Report for Calendar Year 1994*. In addition, the concentrations of radioactivity in various environmental media (e.g., air, water, and soil) in the onsite and offsite site regions are presented in the same reference. Pantex operations contribute only small amounts of radioactivity to all these media.

Chemical Environment. The background chemical environment important to human health consists of the atmosphere, which may contain hazardous chemicals that can be inhaled; drinking water, which may contain hazardous chemicals that can be ingested; and other environmental media with which people may come in contact (e.g., soil through direct contact or via the food pathway). The baseline data for assessing potential health impacts from the chemical environment are those presented in sections 4.5.2.3 and 4.5.2.4.

Adverse health impacts to the public can be minimized through administrative and design controls to decrease hazardous chemical releases to the environment and to achieve compliance with permit requirements. The effectiveness of these controls is verified through the use of monitoring information and inspection of mitigation measures. Health impacts to the public may occur during normal operation at Pantex via inhalation of air containing hazardous chemicals released to the atmosphere by Pantex operations. Risks to the public health from ingestion of contaminated drinking water or by direct exposure are also potential pathways.

Baseline air emission concentrations for hazardous air pollutants and their applicable standards are presented in section 4.5.2.3. These concentrations are estimates of the highest existing offsite concentrations and represent the highest concentrations to which members of the public could be exposed. All annual concentrations are compared with applicable guidelines and regulations. Information about estimating health impacts from hazardous/toxic chemicals is presented in appendix E.

Exposure pathways to Pantex workers during normal operation may include inhaling the workplace atmosphere, drinking Pantex potable water, and possible other contact with hazardous materials associated with particular work assignments. The potential for health impacts varies from facility to facility and from worker to worker, and available information is not sufficient to allow a meaningful estimation and summation of these impacts. However, workers are protected from hazards specific to the workplace through appropriate training, protective equipment, monitoring, and management controls. Pantex workers are also protected by adherence to OSHA and EPA occupational standards that limit workplace atmospheric and drinking water concentrations of potentially hazardous chemicals. Appropriate monitoring, which reflects the frequency and amounts of chemicals utilized in the operating processes, ensures that these standards are not exceeded. Additionally, DOE requirements ensure that conditions in the workplace are as free as possible from recognized hazards that cause or are likely to cause illness or physical harm. Therefore, worker health conditions at Pantex are expected to be substantially better than required by standards.

Health Effects Studies. Only one mortality study and one cancer incidence epidemiological study of the general population in communities surrounding Pantex has been performed, and only one study of workers has been done. Significant increases in prostate cancer mortalities among males in Potter and Randall Counties and leukemia mortalities among Carson County males were observed between 1981 and 1992. The analysis on excess cancer incidence found no statistically significant excesses in males. Workers were reported to show a nonstatistically significant excess of brain cancer and leukemia in the one study conducted, but the small number of cases could be attributed to chance alone. For a more detailed description of the studies reviewed and the findings, refer to appendix section E.4.5.

Accident History. There have been no plutonium-dispersing detonation accidents during nuclear weapons operations at Pantex. In 1989, during a weapon disassembly and retirement operation, a release of tritium in the assembly cell occurred. As a result, four workers received negligible doses and a fifth worker received a dose of 1.4 mrem.

Emergency Preparedness. Each DOE site has established an emergency management program that would be activated in the event of an accident. This program has been developed and maintained to ensure adequate response to accident conditions and to provide response efforts for accidents not specifically considered. The emergency management program incorporates activities associated with planning, preparedness, and response.

Pantex has an emergency management plan, with guidance on implementation provided by a series of Emergency Preparedness Procedures manuals, to protect life and property within the facility, the health and welfare of surrounding areas, and the defense interests of the Nation during any credible emergency situation. Formal mutual assistance agreements have been made with Federal, State of Texas, and local governments. Federal agreements include Interagency Agreements with the Federal Bureau of Investigation for security-based events requiring its efforts, Veteran's Administration for maintenance of an Emergency Radiation Treatment Facility, LLNL for plume modeling information and data from the Atmospheric Release Advisory Center, and the U.S. Army for Explosives Ordnance Disposal. The DOE/State of Texas Agreement-in-Principle contains both DOE and State activities to mutually improve and integrate both Pantex and State of Texas emergency preparedness programs for potential Pantex-generated emergencies. Memoranda of Understanding among the city of Amarillo, Carson County, and Randall County are in place for mutual assistance and aid in the event of a Pantex-generated emergency. Under accident conditions, an emergency coordinating team of DOE and Pantex contractor management personnel would initiate the Pantex Emergency Plan and coordinate all onsite actions.

If offsite areas could be affected, the Texas Department of Public Safety would be notified immediately, and would make emergency announcements to the public and local governmental agencies in accordance with Annex R of the State of Texas Emergency Management Plan. Pantex has radiological assistance teams with a total of 46 personnel who are equipped and trained to respond to an accident involving radioactive contamination either onsite or offsite.

In addition, the Joint Nuclear Accident Coordination Center in Albuquerque, NM, can be called upon should the need arise. This would mobilize radiation emergency response teams from DOE, DOD, and other participating Federal agencies.

4.5.2.10 *Waste Management*

This section outlines the major environmental regulatory structure and ongoing waste management activities for Pantex. A more detailed discussion of the ongoing waste management operation is provided in appendix section H.2.4.

DOE is working with Federal and state regulatory authorities to address compliance and cleanup obligations arising from its past operations at Pantex. The activities DOE is engaged in to bring its operations into full regulatory compliance are set forth in negotiated agreements that contain schedules for achieving compliance with applicable requirements and financial penalties. These agreements have been reviewed to assure the proposed actions are allowable under the terms of these agreements.

EPA Region 6 on July 29, 1991, proposed Pantex for listing on the NPL of Superfund cleanup sites. Independent evaluations questioned this proposed listing and DOE dissented on the proposal. In September 1991, DOE submitted to EPA its technical comments regarding the proposed listing. EPA placed Pantex on the NPL on May 31, 1994. The DOE Amarillo Area office is currently negotiating a tri-party Federal Facility Agreement with the EPA and the State of Texas. Currently all environmental restoration activities are conducted in compliance with an RCRA permit issued in April 1991. Environmental restoration activities are expected to be completed in 2000.

Pantex's waste management goals are to avoid waste generation or minimize the volume of waste generated to the extent that is technologically and economically practicable, reduce the hazard of waste through substitution or process modification, minimize contamination of existing or proposed real property and facilities, minimize exposure and associated risks to human health and the environment to as low as reasonably achievable levels, and ensure safe, efficient, and compliant long-term management of all wastes. Pantex manages four broad waste categories: low-level, mixed, hazardous, and nonhazardous. Pantex does not generate or manage spent nuclear fuel or HLW. Pantex does not generate TRU waste as a result of normal operation. In the unlikely event that any TRU waste is generated, it would be stabilized and packaged in an appropriate container until shipment to a DOE-approved storage site. A discussion of the waste management operations associated with the remaining categories follows.

Low-Level Waste. LLW generated at Pantex consists of radioactive waste materials associated with weapons A/D, such as protective clothing, cleaning materials, filters, and other similar materials. In 1994, Pantex generated 33 m^3 (8,720 gal) of liquid and 122 m^3 (160 yd^3) of solid LLW (PX 1995a:2). Liquid LLW is being stored onsite awaiting a treatment process. Compactible wastes are processed at Pantex's Solid Waste Compaction Facility and staged along with the noncompactible wastes for shipment to a DOE-approved disposal site and/or a commercial vendor. Pantex's LLW is currently shipped to NTS for disposal.

Mixed Low-Level Waste. Mixed LLW is generated during various production, maintenance, modification, and dismantlement functions. For 1994, Pantex generated approximately 1 m^3 (264 gal) of liquid and 15 m^3 (20 yd^3) of solid mixed LLW (PX 1995a:2). These wastes consist primarily of small quantities of material such as radioactively contaminated solvents and wipes contaminated by organic solvents and radioactive scrap metal. Mixed LLW is currently stored onsite in RCRA-permitted facilities. Pantex has received exemptions to DOE Order 5820.2A, *Radioactive Waste Management* for mixed waste shipments to two RCRA-permitted commercial facilities. Pantex developed the *Pantex Plant Compliance Plan* to provide mixed waste treatment capability for all mixed waste streams in accordance with the *Federal Facility Compliance Act* of 1992. This plan was approved by the Texas Natural Resources Conservation Commission and adopted through an Agreed Order on September 27, 1995. The Agreed Order signed by the State of Texas on October 2, 1995, requires implementation of this plan.

Hazardous Waste. Pantex received an RCRA Part B hazardous waste permit from EPA and the Texas Natural Resources Conservation Commission on April 25, 1991. This permit authorizes Pantex to manage hazardous and industrial solid wastes listed in the permit. The permit also requires Pantex to notify the Texas Natural Resources Conservation Commission of the discovery of any release of hazardous waste or hazardous constituents that may have occurred from any solid waste management unit. The hazardous waste permit specifically excluded the 17 RCRA units at the HE Burning Ground that are currently operated under interim status with a written grant of authority for air emissions from the Texas Natural Resources Conservation Commission. Pantex has submitted a request to the Texas Natural Resources Conservation Commission for an RCRA Part B permit modification to add these units at the Burning Ground. A decision on this modification has not been reached.

Most of the hazardous waste generated by Pantex results from HE operations; however, electroplating and photographic and various other operations also generate additional hazardous waste streams. In 1994, Pantex generated 16 m^3 (4,230 gal) of solvent-contaminated wastewater, explosives-contaminated wastewater, and spent organic solvents contaminated with explosives. Solid hazardous wastes included approximately 177 m^3 (232 yd^3) of RCRA-regulated and 8 m^3 (10 yd^3) of TSCA-regulated wastes (PX 1995a:2). HE, HE support material, HE-contaminated materials, and HE-contaminated solid wastes are burned under controlled conditions at Pantex's Burning Ground. Ash, debris, and residue resulting from this burning are transported offsite for approved disposal at a commercial RCRA-permitted facility. All other hazardous waste generated at Pantex, including various chemicals, solvents, heavy metals, and other hazardous constituents, are manifested and shipped offsite by DOT-certified transporters for recycling or disposal at a commercial RCRA-permitted facility.

Nonhazardous Waste. Nonhazardous solid and liquid sanitary wastes are generated at Pantex. An estimated 476,000 m^3 (125,700,000 gal) of sewage wastewater and 4,190 m^3 (1,107,000 gal) of other wastewater was generated in 1994 (PX 1995a:2). Sewage and some pretreated industrial wastewater are treated by the sanitary sewage wastewater treatment system. The liquid effluent from the system is discharged into a playa, where it then either evaporates or filtrates into the ground. Liquid industrial waste is also treated in a tank system that removes metals from plating solutions and then neutralizes this solution. The effluent from this process is discharged to a playa, which is permitted by the Texas Natural Resources Conservation Commission. Stormwater discharges are regulated by a NPDES permit. A proposed upgrade to the sanitary wastewater sewer treatment system would permit all industrial wastewater and sewage to be treated at one location.

Nonhazardous solid waste generated onsite consists primarily of paper, cardboard, construction waste, and cafeteria waste. For 1994, Pantex generated approximately 824,400 kg (1,817,500 lb) of solid sanitary waste (PX 1995a:2). Seventy percent of the solid sanitary waste was disposed of at the City of Amarillo Landfill. The remainder was shipped offsite to other treatment/disposal facilities. In addition, 47,400 m^3 (62,000 yd^3) of construction debris were generated (PX 1995a:2). Only construction wastes are disposed of onsite. Prior to late 1989, sanitary waste was disposed of onsite. Since then, sanitary waste has been transported to the City of Amarillo Landfill for disposal. Waste asbestos is sent to an offsite permitted landfill.

4.5.3 Environmental Impacts

4.5.3.1 *Land Use*

No Action. Under No Action, DOE would continue current and planned activities at Pantex. No additional land use impacts are anticipated at Pantex beyond the effects of existing and future activities which are independent of the proposed action.

Management Alternatives

Downsize Assembly/Disassembly and High Explosives Fabrication. The downsizing and consolidating of the A/D and HE fabrication activities at Pantex would occur within existing buildings. Modification of existing buildings would require the short-term use of approximately 0.4 ha (1 acre) for equipment laydown and parking. These activities would be accommodated within vacant building space or developed areas near the modification sites. No additional land would be used to implement the downsize A/D and HE fabrication mission. The proposed activities would be compatible with existing land use plans. Impacts to land use are not expected.

The movement of the strategic reserve pits at Pantex to another DOE site location (an alternative in the Storage and Disposition Program) would have no adverse impact on Pantex land-use plans and policies. Vacated storage facilities would be transferred to EM for D&D and disposition.

Downsize Assembly/Disassembly. The downsizing and consolidating of A/D activities at Pantex would occur within existing buildings. Modification of existing buildings would require the short-term use of approximately 0.2 ha (0.4 acres) for equipment laydown and parking. These activities would be accommodated within vacant building space or developed areas near the modification sites. No additional land would be used to implement the downsize A/D mission. The phaseout of HE fabrication would make more of the Pantex site available for other use but would not adversely affect land use at Pantex. The proposed activities would be compatible with existing land use plans and activities. Impacts to land use are not expected.

Phaseout of Assembly/Disassembly and High Explosives Fabrication. This alternative would not affect land use in the short term. Facilities and infrastructure would transition to EM for D&D before disposition. A future scenario may be the potential for the site to accommodate industrial-type activities. The subsequent use of Pantex facilities and land would be addressed in the transition plan prepared by EM.

Sensitivity Analysis. All operations and support functions and facilities for the downsize A/D and HE fabrication activities at Pantex would be sufficient to accommodate the high and lower production cases with no change.

Potential Mitigation Measures. No mitigation measures are anticipated.

4.5.3.2 *Site Infrastructure*

The Pantex infrastructure would be capable of supporting the downsizing and consolidation of the A/D and HE fabrication missions or A/D mission alone without major modifications. A comparison of site infrastructure and facility requirements for the proposed alternatives is shown in table 4.5.3.2–1. Site infrastructure construction impacts would be minimal since existing Pantex facilities would be used with only minor modifications.

No Action. This alternative would continue the A/D and HE fabrication missions described in section 3.2.5 in essentially the same facilities. The significant reduction in required site infrastructure resources shown in table 4.5.3.2–1 reflects the reduced workload after current nuclear weapons stockpile dismantlement actions are complete. Because of the reduced production workload, the need for site infrastructure resources would be less than the current requirements for electrical energy, liquid fuel, and natural gas. Peak electrical load would be 74 percent of current demand.

Management Alternatives

Downsize Assembly/Disassembly and High Explosives Fabrication. This alternative would downsize and consolidate the A/D and HE fabrication missions with nonintrusive modification pit reuse and the option of storing the strategic reserve of pits and canned subassemblies at Pantex. The action would result in a 6-percent increase in natural gas consumption compared to the No Action alternative. There

TABLE 4.5.3.2–1.—***Site Infrastructure Requirements and Changes for Stockpile Management Alternatives at Pantex Plant***

Alternative	Electrical		Fuel		
	Energy (MWh/yr)	Peak Load (MWe)	Liquid (L/yr)	Gas (m^3/yr)	Coal (t/yr)
Current Resources (1994)	84,420[a]	13.6[b]	1,775,720	14,600,000[c]	NA
No Action (2005)					
Total site requirement	46,266	10	795,166	7,200,000	NA
Change from current resources	-38,154	-3.6	-980,554	-7,400,000	NA
Downsize Weapons Assembly/Disassembly and High Explosives Fabrication					
Total site requirement	46,250	11	795,600	7,650,000	NA
Change from No Action	-16	1	434	450,000	NA
Downsize Weapons Assembly/Disassembly					
Total site requirement	43,000	10	740,000	7,150,000	NA
Change from No Action	-3,266	0	-55,166	-50,000	NA
Phaseout Weapons Assembly/Disassembly and High Explosives Fabrication					
Total site requirement	0	0	0	0	NA
Change from No Action	-46,266	-10	-795,166	-7,200,000	NA

[a] System capacity is 201,480 MWh/yr.
[b] System capacity is 22.5 MWe.
[c] System capacity is 289,000,000 m^3/yr.
Note: NA - not applicable.
Source: PX 1995a:2; PX 1996e:1; PX DOE 1995g; PX DOE 1996b; PX MH 1995a.

would be only a slight change from No Action requirements in the other site infrastructure resources.

The movement of the strategic reserve pits at Pantex to another DOE site location (an alternative in the Storage and Disposition Program) would cause a negligible change in these requirements because these types of facilities require little infrastructure support and resources. Moving the strategic reserve would make available additional storage facilities for transition to EM for D&D and disposition.

Downsize Assembly/Disassembly. The weapons A/D alternative would downsize and consolidate the A/D mission with nonintrusive modification pit reuse, and the option of storing the strategic reserve of pits and canned subassemblies at Pantex. Under this alternative, HE fabrication at Pantex would also be phased out. This alternative would reduce the requirements for electrical energy by 7 percent, liquid fuel by 7 percent, and natural gas by 1 percent compared to the No Action alternative. Storing strategic reserve pits at another site instead of Pantex would result in a minimal change in site infrastructure requirements.

Phaseout of Assembly/Disassembly and High Explosives Fabrication. This alternative would phase out the A/D and HE fabrication missions. Site infrastructure would continue to operate and resources would continue to be consumed during transition of the buildings to EM for D&D.

Sensitivity Analysis. To support high case production output with single-shift operation, more facilities would be required. Specifically, Pantex would retain 48 operational assembly bays instead of 31, 6 operational assembly cells instead of 4, and a small number of additional cells for strategic reserve storage. Also, several other functions, including weapon staging and pit laser sampling, would be relocated to provide more capability. The only increased facility requirement for HE fabrication would be activating additional operating bays in the HE Machining Building. Very small differences exist between the base and low or high case options in the site infrastructure variables considered in this analysis. There would be little or no difference in the site infrastructure impacts associated with high case operations.

Potential Mitigation Measures. No mitigation measures are anticipated.

4.5.3.3 *Air Quality*

No Action. No Action air quality utilizes estimated air emissions data from operations at Pantex in 2005, assuming continuation of current site missions, to calculate pollutant concentrations at or beyond the Pantex site boundary. The emission rates for criteria and toxic/hazardous pollutants for No Action are presented in appendix table B.3.5–1. Table 4.5.3.3–1 presents the No Action pollutant concentrations calculated from the 2005 emission rate. In this table, pollutant concentrations are compared with applicable Federal and state regulations and guidelines. Concentrations are expected to remain within these standards.

Management Alternatives

Downsize Assembly/Disassembly and High Explosives Fabrication. Gaseous emissions of criteria and toxic/hazardous air pollutants would be generated from the downsized and/or consolidated A/D and HE fabrication mission. These emissions would result from open burn/open detonation of nonradioactive scrap HE and HE-contaminated waste, plant boiler operation, cleaning operations using solvents, and formulation and synthesis operations. Emission rates for the HE fabrication mission for criteria and toxic/hazardous pollutants are presented in table appendix B.3.5–1. Table 4.5.3.3–1 presents the concentrations of criteria and toxic/hazardous pollutants resulting from downsizing and/or consolidating the A/D and HE mission. The resulting concentrations of criteria and toxic/hazardous pollutants are expected to be within Federal and state regulations and guidelines.

The movement of the strategic reserve pits at Pantex to another DOE site location (an alternative in the Storage and Disposition Program) would have no impact on air quality because storage facilities and strategic reserve activities have no measurable air emissions.

Downsize Assembly/Disassembly. Gaseous emissions of criteria and toxic/hazardous air pollutants would be generated from operation of the downsized and/or consolidated A/D mission. These emissions would result from plant boiler operation and cleaning operations using solvents (PX MH 1995a:H-17). Emission rates for criteria and toxic/hazardous pollutants from the downsized and/or consolidated A/D mission are presented in appendix table B.3.5–1. Table 4.5.3.3–1 presents the concentrations of criteria and toxic/hazardous pollutants resulting from operation of the downsized and/or consolidated A/D mission. The resulting concentrations of criteria and toxic/hazardous pollutants are expected to be within Federal and state regulations and guidelines.

Phaseout of Assembly/Disassembly and High Explosives Fabrication. Phaseout of the A/D and HE fabrication mission at Pantex would result in a net reduction of criteria and toxic/hazardous emissions. Table 4.5.3.3–1 presents the concentrations of criteria and toxic/hazardous pollutants resulting from phaseout of the A/D and HE fabrication mission. The resulting concentrations of criteria and toxic/hazardous pollutants are expected to be within Federal and state regulations and guidelines.

Sensitivity Analysis. Impacts to air quality from either the low or high case scenario of the downsize A/D and HE fabrication or downsize A/D alternative would result in higher and lower concentrations of criteria and toxic/hazardous pollutants for the high and low cases, respectively. The concentrations of pollutants for the high case are expected to be within applicable Federal and state regulations and guidelines.

Potential Mitigation Measures. No mitigation measures are anticipated for the downsize A/D and HE fabrication, downsize A/D, or phaseout of A/D and HE fabrication alternatives at Pantex.

4.5.3.4 *Water Resources*

Environmental impacts associated with building modification activities and operation of the proposed A/D and HE facilities at Pantex could affect surface

TABLE 4.5.3.3–1.—*Estimated Concentrations of Pollutants from No Action and Stockpile Management Alternatives at Pantex Plant* [Page 1 of 4]

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines (μg/m³)	2005 No Action (μg/m³)	Downsize Assembly/ Disassembly and High Explosives Fabrication (μg/m³)	Downsize Assembly/Disassembly (μg/m³)	Phaseout of Assembly/ Disassembly and High Explosives Fabrication (μg/m³)
Criteria Pollutant						
Carbon monoxide	8-hour	10,000 [a]	602	9.1	8.4	b
	1-hour	40,000 [a]	2,900	48.1	44.7	b
Lead	Calendar quarter	1.5 [a]	0.09	c	c	b
Nitrogen dioxide	Annual	100 [a]	2.15	0.7	0.7	b
Ozone	1-hour	235	f	f	f	b
Particulate matter	Annual	50 [a]	8.73	0.03	0.03	b
	24-hour	150 [a]	88.5	0.48	0.45	b
Sulfur dioxide	Annual	80 [a]	<0.01	<0.01	<0.01	b
	24-hour	365 [a]	<0.01	<0.01	<0.01	b
	3-hour	1,300 [a]	<0.01	<0.01	<0.01	b
	30-minute	1,045 [d]	<0.01	<0.01	<0.01	b
Mandated by Texas						
Hydrogen fluoride	30-day	0.8 [d]	<0.75	c	c	b
	7-day	1.6 [d]	<0.75	c	c	b
	24-hour	2.9 [d]	0.75	c	c	b
	12-hour	3.7 [d]	1.05	c	c	b
	3-hour	4.9 [d]	4.21	c	c	b
Hydrogen sulfide	30-minute	111 [d]	c	c	c	b
Sulfuric acid	24-hour	15 [d]	c	c	c	b
	1-hour	50 [d]	c	c	c	b
Total suspended particulates	3-hour	200 [d]	c	c	c	b
	1-hour	400 [d]	c	c	c	b

TABLE 4.5.3.3–1.—*Estimated Concentrations of Pollutants from No Action and Stockpile Management Alternatives at Pantex Plant*
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Pollutant	Averaging Time	Most Stringent Regulations or Guidelines (μg/m³)	2005 No Action (μg/m³)	Downsize Assembly/ Disassembly and High Explosives Fabrication (μg/m³)	Downsize Assembly/Disassembly (μg/m³)	Phaseout of Assembly/ Disassembly and High Explosives Fabrication (μg/m³)
Hazardous and Other Toxic Compounds						
Alcohols	30-minute		195	c	c	b
	Annual	e	0.70	c	c	b
Ammonia	30-minute	170 [d]	<0.01	<0.01	<0.01	b
	Annual	17 [d]	<0.01	<0.01	<0.01	b
Benzene	30-minute	30 [d]	19.50	0.02	c	b
	Annual	3 [d]	0.06	<0.01	c	b
Carbon disulfide	30-minute	30 [d]	22.60	c	c	b
	Annual	3 [d]	0.09	c	c	b
Carbon tetrachloride	30-minute	126 [d]	19.7	c	c	b
	Annual	13 [d]	0.08	c	c	b
Chlorobenzene	30-minute	460 [d]	19.5	c	c	b
	Annual	46 [d]	0.08	c	c	b
1,1,1-Chloroethane	30-minute	500 [d]	127	c	c	b
	Annual	50 [d]	0.53	c	c	b
Chromium	30-minute	1 [d]	0.13	c	c	b
	Annual	0.1 [d]	0.001	c	c	b
Cresol	30-minute	5 [d]	0.41	c	c	b
	Annual	e	0.002	c	c	b
Cresylic acid	30-minute	5 [d]	0.51	c	c	b
	Annual	e	0.002	c	c	b
Dibenzofuran	30-minute	e	0.001	c	c	b
	Annual	e	0.00002	c	c	b
Ester glycol ethers	30-minute	e	35.9	c	c	b
	Annual	e	0.15	c	c	b

TABLE 4.5.3.3–1.—*Estimated Concentrations of Pollutants from No Action and Stockpile Management Alternatives at Pantex Plant* [Page 3 of 4]

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines (μg/m³)	2005 No Action (μg/m³)	Downsize Assembly/ Disassembly and High Explosives Fabrication (μg/m³)	Downsize Assembly/Disassembly (μg/m³)	Phaseout of Assembly/ Disassembly and High Explosives Fabrication (μg/m³)
Hazardous and Other Toxic Compounds (Continued)						
Ethyl benzene	30-minute	2,000[d]	31.1	c	c	b
	Annual	434[d]	0.13	c	c	b
Ethylene dichloride	30-minute	40[d]	9.58	c	c	b
	Annual	4[d]	0.04	c	c	b
Formaldehyde	30-minute	15[d]	0.37	c	c	b
	Annual	1.5[d]	0.004	c	c	b
Hydrogen chloride	30-minute	75[d]	6.17	0.23	0.20	b
	Annual	0.1[d]	0.07	<0.01	<0.01	b
Ketones	30-minute	e	33.4	f	c	b
	Annual	e	0.14	f	c	b
Mercury	30-minute	0.5[d]	<0.01	<0.01	<0.01	b
	Annual	0.05[d]	<0.01	<0.01	<0.01	b
Methanol	30-minute	e	245	c	c	b
	Annual	e	0.58	c	c	b
Methyl cyanide	30-minute	e	0	c	c	b
	Annual	e	0	c	c	b
Methyl ethyl ketone	30-minute	3,900[d]	1,400	5.48	2.61	b
	Annual	590[d]	5.10	0.02	0.01	b
Methyl isobutyl ketone	30-minute	2,050[d]	4.45	c	c	b
	Annual	205[d]	0.02	c	c	b
Methylene chloride	30-minute	260[d]	180	c	c	b
	Annual	26[d]	0.74	c	c	b
Naphthalene	30-minute	440[d]	0.005	c	c	b
	Annual	50[d]	0.0001	c	c	b

TABLE 4.5.3.3–1.—*Estimated Concentrations of Pollutants from No Action and Stockpile Management Alternatives at Pantex Plant*
[Page 4 of 4]

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines (μg/m³)	2005 No Action (μg/m³)	Downsize Assembly/ Disassembly and High Explosives Fabrication (μg/m³)	Downsize Assembly/Disassembly (μg/m³)	Phaseout of Assembly/ Disassembly and High Explosives Fabrication (μg/m³)
Hazardous and Other Toxic Compounds (Continued)						
Nickel	30-minute	0.15 [d]	0.02	c	c	b
	Annual	0.015 [d]	0.0002	c	c	b
Nitrobenzene	30-minute	24[d]	0.51	c	c	b
	Annual	5[d]	0.002	c	c	b
2-Nitropropane	30-minute	50[d]	8.55	c	c	b
	Annual	5[d]	0.04	c	c	b
Phenol	30-minute	154[d]	0.03	c	c	b
	Annual	19[d]	0.0006	c	c	b
Tetrachloroethylene	30-minute	340[d]	17.6	c	c	b
	Annual	34[d]	0.07	c	c	b
Toluene	30-minute	1,880[d]	556	c	c	b
	Annual	188[d]	1.73	c	c	b
1,1,2-Trichloroethane	30-minute	550[d]	17.3	c	c	b
	Annual	55[d]	0.08	c	c	b
Trichloroethylene	30-minute	1,350[d]	51.1	c	c	b
	Annual	135[d]	0.21	c	c	b
Triethylamine	30-minute	40[d]	1.08	c	c	b
	Annual	4[d]	0.002	c	c	b
Xylene	30-minute	3,700[d]	145	c	c	b
	Annual	434[d]	0.47	c	c	b

[a] Federal standard.
[b] No air pollutants will be emitted from Pantex after phaseout of A/D and HE fabrication.
[c] No sources indicated.
[d] State standard. The effect screening levels are used in evaluation of hazardous and other toxic compounds.
[e] No Standard.
[f] No data available, concentration assumed less than applicable standard.
Note: 30-minute concentrations are represented by 1-hour predicted concentrations; concentrations for downsized alternatives represent the alternative only.
Source: 40 CFR 50; PX 1996e:1; PX DOE 1996b; PX MH 1995a; PX MH 1995b; TX ACB 1987a; TX ACB1993a; TX NRCC 1992a; TX NRCC 1995a.

and groundwater resources. All water required for modification or operation would be supplied from groundwater. The facilities affected by the alternatives are located outside the 100- and 500-year floodplains. A description of the activities that would continue at Pantex is provided in section 3.2.5. Table 4.5.3.4–1 presents existing surface and groundwater resources and the potential changes to water resources at Pantex resulting from the proposed alternatives. The total site water resource requirements for each alternative including No Action (base case, single-shift operation) are displayed in this table.

Surface Water

No Action. No construction would take place under No Action; therefore, no additional construction water or wastewater would be used or discharged. During operation under No Action, no surface water would be used. However, current wastewater discharges to Playas 1, 2, and possibly 4, would decrease by approximately 339 MLY (89.6 MGY) by 2005. No additional impacts to surface water quality are expected since treated water discharges would be reduced.

Management Alternatives

Downsize Assembly/Disassembly and High Explosives Fabrication. No surface water would be used for any building modification or operation activities associated with downsizing and consolidating A/D and HE fabrication. No additional impacts to surface water availability or surface water quality are expected. Downsizing modifications would take approximately 3 years. The estimated 141.5 MLY (37 MGY) of nonhazardous wastewater, including sanitary wastewater, generated during the modification of the facilities would be discharged to playas. Discharging the wastewater would not result in an exceedance of the Texas Natural Resources Conservation Commission-permitted discharge volume limit.

During operation, approximately 148 MLY (39 MGY) of treated effluent would be discharged from utility processes and facility sanitary wastewater. All treated effluent would be required to meet NPDES permit requirements. No adverse impacts to surface water or surface water quality are expected. The estimated volume of wastewater discharged to the playas would be within the Texas Natural Resources Conservation Commission-permitted discharge volume limit.

Stormwater runoff would be collected in detention ponds. Runoff from site support facilities outside the main plant would be discharged directly to natural drainage channels. Uncontaminated stormwater would be released to natural drainage channels. Contaminated runoff would be retained, treated, and released. All discharges to playas would be monitored and subject to NPDES permit requirements.

The movement of the strategic reserve pits at Pantex to another DOE site location (an alternative in the Storage and Disposition Program) would have no impact on surface or groundwater resources at Pantex.

Downsize Assembly/Disassembly. No surface water would be used for any modification or operation activities associated with downsizing and consolidating A/D facilities. The estimated 141 MLY (37 MGY) of nonhazardous wastewater generated while modifying the facilities would either be recycled or treated and discharged to the playas. Potential impacts to surface waters during the 3-year modification phase for any of the facilities are not expected. During modification activities, wastewater discharged to the playas would not cause an exceedance of the Texas Natural Resources Conservation Commission-permitted discharge volume limit. During operation, no additional wastewater would be discharged.

Stormwater runoff would be collected in detention ponds. Runoff from site support facilities would be discharged directly to natural drainage channels. Uncontaminated stormwater would also be released to natural drainage channels. Contaminated runoff would be retained and treated before being discharged. All discharges to playas would be monitored and subject to NPDES permit requirements.

Phaseout of Assembly/Disassembly and High Explosives Fabrication. The phaseout of DP missions at Pantex would reduce surface water discharges to the playas. The playas would continue to collect precipitation through natural drainage channels. Water

TABLE 4.5.3.4–1.—*Potential Changes to Water Resources from Stockpile Management Alternatives at Pantex Plant*

Affected Resource Indicator	No Action Single-Shift Operation 2005	Downsize Assembly/Disassembly and High Explosives Fabrication Three-Shift Operation	Downsize Assembly/Disassembly Three-Shift Operation	Phaseout Assembly/Disassembly and High Explosives Fabrication
Construction				
Water Availability and Use				
Water source	Ground	Ground	Ground	Ground
Total site water operation requirement[a] (MLY)	0[b]	249.7	249.5	0
Percent change from No Action water use (249 MLY)	NA	0.3	0.2	-100
Water Quality				
Wastewater discharge to playas[c] (MLY)	0[b]	141.5	141.3	0
Percentage change from No Action wastewater discharge (141 MLY)	NA	0.28	0.21	-100
Operation				
Water Availability and Use				
Water source	Ground	Ground	Ground	Ground
Total water requirement (MLY)	249	209	196	0
Percent change from No Action water use (249 MLY)	NA	-16	-21	-100
Percent change from current use (836 MLY)	-70	-75	-77	-100
Water Quality				
Wastewater discharge to playas[c] (MLY)	141	148	141	0
Percentage change from No Action wastewater discharge (141 MLY)	NA	5	0	-100
Percent change from current wastewater discharge (480 MLY)	-71	-69	-71	-100
Floodplain				
Actions in 100-year floodplains	NA	None	None	NA
Actions in 500-year floodplains	NA	None	None	NA

[a] Total water requirements for construction at Pantex are based on a 3-year time period for A/D and HE fabrication.
[b] No construction water would be used or construction wastewater generated. Total site water use and wastewater discharged would be the same as No Action operation.
[c] All discharges to natural drainages require NPDES permits.
Note: NA - not applicable; MLY - million liters per year.
Source: PX MH 1995a.

quality in the playas may improve slightly with the reduction in treated effluent from Pantex.

Groundwater

No Action. No construction would take place under No Action; therefore, no additional construction water would be used. Current groundwater use of 836 MLY (221 MGY) would decrease to 249 MLY (65.8 MGY) by 2005 because current weapons disassembly activities would end. Groundwater would continue to be withdrawn from the Ogallala aquifer through wells located on the Pantex property. No additional impacts to groundwater quality from operation are anticipated since water use and discharges would be reduced, and there are no direct discharges to groundwater.

Management Alternatives

Downsize Assembly/Disassembly and High Explosives Fabrication. Water requirements for the downsized and consolidated A/D and HE fabrication facilities would be small relative to total aquifer storage, but still represent an amount greater than the annual recharge for the aquifer in the area. As shown in table 4.5.3.4–1, water use during modification of the facilities of 249.7 MLY (65.9 MGY) would represent an increase of approximately 0.3 percent over the projected Pantex groundwater usage of 249 MLY (65.8 MGY). Operating the A/D and HE fabrication facilities would require 209 MLY (55.2 MGY) of groundwater, a decrease of 16 percent from the No Action water requirements of 249 MLY (65.8 MGY). The amount of water used for operations would represent approximately 11 percent of the total Pantex well capacity of 1,900 MLY (502 MGY). As mentioned previously, although Pantex water use would decrease, operation water use would still contribute to the overall decline of the Ogallala aquifer because the area groundwater withdrawal rate would exceed the recharge rate.

The movement of the strategic reserve pits at Pantex to another DOE site location (an alternative in the Storage and Disposition Program) would have no impact on surface or groundwater resources at Pantex.

Downsize Assembly/Disassembly. Water requirements for downsizing and consolidating A/D facilities would be small relative to total aquifer storage, but would still represent an amount greater than the annual recharge for the area. As shown in table 4.5.3.4–1, approximately 0.5 MLY (0.13 MGY) would be used to modify the existing facilities at Pantex. This would represent approximately a 0.2-percent increase over the projected groundwater usage of 249 MLY (65.8 MGY) and would increase the total projected amount to be pumped in Carson County by less than 1 percent.

Approximately 196 MLY (51.8 MGY) would be used for operating the facilities. This would represent a 21-percent decrease from No Action water use. The operation water use represents approximately 10 percent of the total Pantex well capacity of 1,900 MLY (502 MGY). Because of the overall negative recharge to withdrawal rate of the Ogallala aquifer, the operation water used by Pantex would still contribute to the overall continued depletion of the Ogallala aquifer.

Groundwater Quality

Downsize Assembly/Disassembly and High Explosives Fabrication. As discussed in the surface water section, modification activities and operation of the facilities would not result in direct discharges to groundwater. However, treated wastewater discharged to playas could percolate into the groundwater. Any contaminants that might enter the aquifer would be expected to move down gradient to the north, away from existing facilities. Water withdrawal from the aquifer would have little effect on plume migration.

Downsize Assembly/Disassembly. As discussed in the surface water section, modification activities and operation of the facilities would not result in direct discharges to groundwater. However, treated wastewater discharged to playas could percolate into the groundwater. Any contaminants that might enter the aquifer would be expected to move down gradient to the north, away from existing facilities. Water withdrawal from the aquifer would have little effect on plume migration.

Phaseout of Assembly/Disassembly and High Explosives Fabrication. The phaseout of DP missions at Pantex would reduce the amount of groundwater withdrawal at the Pantex well field by 249 MLY

(65.8 MGY) and the discharge of treated effluent to the playas by 141 MLY (37.3 MGY). The decrease in groundwater use would benefit the Ogallala aquifer. The reduction in treated plant effluent to the playas would have no effect on groundwater quality.

Sensitivity Analysis. The effluent discharges to playas resulting from the high stockpile case are expected to be similar to the volumes generated by the surge three-shift operation downsize A/D or downsize A/D HE mission. The low case scenario would discharge a slightly smaller volume of treated effluent compared to the No Action volume. Additional impacts to surface water quality from the high and low case production scenarios would be negligible. The groundwater use resulting from the high stockpile case is expected to be similar to low case surge three-shift operation downsize A/D or the downsize A/D HE mission. The low case scenario would require a slightly smaller amount of groundwater compared to the No Action volume. Impacts to groundwater quality from the high and low case production scenarios would be negligible.

Potential Mitigation Measures. Water use could be further reduced by including engineering design measures into the downsized facilities and remaining supporting infrastructure. These design measures could include equipment to enable reuse of process and cooling water to the maximum extent practical.

4.5.3.5 *Geology and Soils*

The proposed alternatives for Pantex would have no impact on geological resources described in section 4.5.2.5. Hazards posed by geological conditions are negligible at Pantex. Potential changes to geology and soils associated with the alternatives at Pantex are discussed below.

No Action. Under No Action, DOE would continue current and planned activities at Pantex. Any impacts to geology and soils would be independent of and unaffected by the proposed action.

Management Alternatives

Downsize Assembly/Disassembly and High Explosives Fabrication. Downsizing and/or consolidating A/D and HE fabrication at Pantex would require approximately 0.4 ha (1 acre) of existing buildings and developed areas for equipment laydown, warehousing, and parking. Soil disturbance would not be expected. No adverse soil impacts are anticipated.

There are no known active faults within the boundaries of Pantex; therefore, there is little chance for ground rupture as a result of an earthquake. All facilities would be designed for earthquake-generated ground acceleration in accordance with DOE O 420.1 and accompanying safety guides.

Volcanic activity has not occurred in the area for millions of years and is extremely unlikely to impact project facilities. It is also unlikely that landslides, sinkhole development, or other nontectonic events would affect project facilities. Slopes and underlying foundation materials are stable. Potential subsidence impacts resulting from salt dissolution are considered negligible at Pantex because salt dissolution is a slow process relative to human activities (PX DOE 1996b: 4-52, 4-53). Potential health impacts from accidents associated with geological hazards are discussed in section 4.5.3.9.

The movement of the strategic reserve pits at Pantex to another DOE site location (an alternative in the Storage and Disposition Program) would have no impacts on geology and soils at Pantex.

Downsize Assembly/Disassembly. Downsizing and/or consolidating A/D would require approximately 0.1 ha (0.3 acre) for equipment laydown and warehousing, and an additional 0.04 ha (0.1 acre) for parking. Soil disturbance would not be expected. Seismic, volcanic, and other nontectonic risks would be the same as described for the downsize A/D and HE fabrication alternative.

Phaseout of Assembly/Disassembly and High Explosives Fabrication. The phaseout of A/D and HE fabrication at Pantex would have no effect on geology and soils. The D&D of vacated facilities would be carried out inside the buildings.

Sensitivity Analysis. The high or low case operation scenario would not affect geology or soils.

Potential Mitigation Measures. No mitigation measures are anticipated.

4.5.3.6 *Biotic Resources*

The following sections address impacts to terrestrial resources, wetlands, aquatic resources, and threatened and endangered species at Pantex. In general, impacts to these resources are not expected from the proposed alternatives; however, noise and human presence could temporarily disturb wildlife. Also, a reduction in discharges due to DP mission phaseout would reduce the area of open water in playas.

No Action. Under No Action, the A/D and HE fabrication missions described in section 3.2.5 would continue at Pantex. This would result in no changes to current biotic resource conditions at the site as described in section 4.5.2.6.

Management Alternatives

Downsize Assembly/Disassembly and High Explosives Fabrication. A downsized and/or consolidated A/D and HE fabrication mission with nonintrusive pit reuse and storage of the strategic reserve of plutonium and uranium at Pantex would utilize existing facilities. Modification of existing buildings would require about 0.4 ha (1 acre) for temporary parking and equipment laydown. Except for some temporary disturbance to wildlife during modification activities, and a slight decrease in wastewater discharge which could reduce open water areas within receiving playas, this alternative is not expected to affect site biotic resources.

The movement of the strategic reserve pits at Pantex to another DOE site location (an alternative in the Storage and Disposition Program) would have no impact on biotic resources at Pantex.

Downsize Assembly/Disassembly. Impacts to biotic resources from downsizing and/or consolidating the A/D mission with nonintrusive pit reuse and storage of the strategic reserve of plutonium and uranium at Pantex would be similar to those described for the downsize A/D and HE fabrication alternative. However, this alternative would require slightly less area (0.2 ha [0.4 acres]) for temporary parking and equipment laydown. As in the case for the A/D alternative, the options of not storing strategic reserves of secondaries (HEU) or strategic reserves of plutonium and HEU would not impact biological resources.

Phaseout of Assembly/Disassembly and High Explosives Fabrication. Phaseout of the A/D and HE fabrication missions at Pantex is unlikely to result in adverse impacts to biotic resources. During the phaseout period, additional human activity could disturb wildlife living nearby; however, disturbance would be minimal since the facility is presently a heavily used industrial area and nearby wildlife populations have already adapted to its presence. Once all phaseout activities are completed, wildlife use of the area would depend upon future use of the facilities. Phaseout would result in a decrease of effluent discharge to site playas which may alter the currently existing habitat.

Sensitivity Analysis. Implementation of either a low or high case workload would not affect biological resources.

Potential Mitigation Measures. No mitigation measures are anticipated.

4.5.3.7 *Cultural and Paleontological Resources*

For the discussion of impacts, the term cultural resources includes prehistoric, historic, and Native American resources. Cultural and paleontological resources may be affected directly through ground disturbance, building modifications, visual intrusion of the project to the historic setting or environmental context of historic sites, visual or audio intrusion to Native American resources, reduced access to traditional use areas, and unauthorized artifact collecting or vandalism. A cultural resources management plan is being developed for Pantex. An interim programmatic agreement is in place to ensure regulatory compliance and potential adverse impacts are evaluated on a case-by-case basis. Zones 11 and 12 at Pantex are the areas to be affected under the alternatives. Because the areas are developed and disturbed and the proposed alternatives involve no new building construction, the potential for impacts to prehistoric, Native American, and paleontological resources is low. There are 12 buildings in Zone 12 that are considered NRHP eligible based on their Cold War era affiliation. None of these structures would be affected by the proposed alternatives. Zone 11 contains a number of historic structures from a World War II era bomb manufacturing line. The Texas SHPO has declared that 34 buildings in Zone 11 are NRHP eligible, as contributing properties to a potential historic district. Some of these structures, or the integrity of their spatial arrangement, may be affected by the alternatives.

No Action. Under No Action, DOE would continue the existing and planned missions at Pantex described in section 3.2.5. Any impacts to cultural and paleontological resources from these missions would be independent of and unaffected by the proposed action.

Management Alternatives

Downsize Assembly/Disassembly and High Explosives Fabrication. A downsized and/or consolidated A/D mission with nonintrusive pit reuse and HE fabrication with or without the storage of the strategic reserve of plutonium and/or uranium would utilize existing Pantex facilities. No modifications or upgrades to NRHP-eligible facilities and infrastructure would be necessary. No new construction or ground disturbance would occur that would affect cultural or paleontological resources.

The movement of the strategic reserve pits at Pantex to another DOE site location (an alternative in the Storage and Disposition Program) would not affect cultural and paleontological resources at Pantex.

Downsize Assembly/Disassembly. A downsized and/or consolidated A/D mission with nonintrusive pit reuse with or without the storage of strategic reserve of plutonium and/or uranium at Pantex would utilize existing facilities. No modifications or upgrades to NRHP-eligible facilities and infrastructure would be necessary. No new construction or ground disturbance would occur that would affect cultural or paleontological resources. The phaseout of HE fabrication may affect some NRHP-eligible structures.

Phaseout of Assembly/Disassembly and High Explosives Fabrication. The phaseout of A/D and HE fabrication may affect some cultural or paleontological resources. The subsequent use of Pantex would determine potential future impacts to these resources. NRHP-eligible prehistoric and historic resources would be identified through project-specific inventories and evaluations. Specific concerns about Native American resources would be addressed through consultation with the potentially affected tribes. Any project-related effects would be addressed in tiered NEPA documentation.

Sensitivity Analysis. The high and low case scenarios have the same impacts to cultural and paleontological resources. The base case facilities to support the downsize A/D or A/D and HE fabrication operations mission would accommodate the high and low case production scenarios.

Potential Mitigation Measures. If NRHP-eligible sites cannot be avoided through project design or siting, and would result in adverse impacts, then a Memorandum of Agreement may need to be negotiated among DOE, the Texas SHPO, and the Advisory Council on Historic Preservation. The Memorandum of Agreement would formalize mitigation measures agreed to by these consulting parties. Mitigation measures could include describing and implementing intensive inventory and evaluation studies, data recovery plans, site treatments, and monitoring programs. The appropriate level of data recovery for mitigation would be determined through consultation with the Texas SHPO and the Advisory Council on Historic Preservation in accordance with Section 106 of the *National Historic Preservation Act*. Mitigation measures for specific NRHP-eligible sites would be identified during tiered NEPA documentation.

If Native American resources cannot be avoided through project design or siting, then acceptable mitigation measures to reduce project effects on them would be determined in consultation with the affected Native American groups. In accordance with the *Native American Graves Protection and Repatriation Act* and the *American Indian Religious Freedom Act*, such mitigations may include, but would not be limited to, appropriately relocating human remains, planting vegetation screens to reduce visual or noise intrusion, increasing access to traditional use areas, or transplanting or harvesting important Native American plant resources.

4.5.3.8 *Socioeconomics*

No Action. Under No Action, the existing A/D and HE fabrication missions at Pantex would remain operational. As Pantex downsizes to fill the post-Cold War mission needs, total plant employment is estimated to decrease from the current level of 3,437 to 1,644 workers in 2005. A/D operations would employ 915 workers and the HE fabrication mission would employ 105 workers. The remaining 624 employees would be support staff or other workers not employed by either of the missions. The size of the Pantex workforce would remain stable from 2005 to 2030. Projected regional economy and employment rates, population and housing changes, and public finance characteristics are presented in appendix D.

Regional Economy and Employment. Total employment in the regional economic area is projected to increase approximately 1.1 percent annually between 1995 and 2000, when total employment reaches approximately 235,800. Long-range projections indicate slower growth after 2000. Total employment is projected to increase by less than 1 percent annually and reach 287,400 in 2030. The unemployment rate was 4.8 percent in 1994 and is expected to remain at that level into the near future. Per capita income is projected to increase from approximately $19,987 in 1995 to $25,719 in 2030.

Population and Housing. Annual ROI county and city population and housing growth is projected to average about 0.8 percent between 1995 and 2030. The ROI population is projected to increase from 210,600 in 1995 to 271,000 in 2030. The total number of housing units is projected to increase from 87,100 to 112,100 during the same period.

Public Finance. Between 2000 and 2005, all ROI county, city, and school district total revenues are projected to increase at an annual average of approximately 1 percent. Total expenditures are projected to increase at an annual average of approximately 1 percent or less during the same period. These rates of increase should continue until 2030.

Management Alternatives

Downsize Assembly/Disassembly and High Explosives Fabrication. Under this alternative, both the A/D and HE missions would remain at Pantex. For all cases, some construction workers would be required to modify the existing facility. Changes to the plant workforce required for each production case are described below.

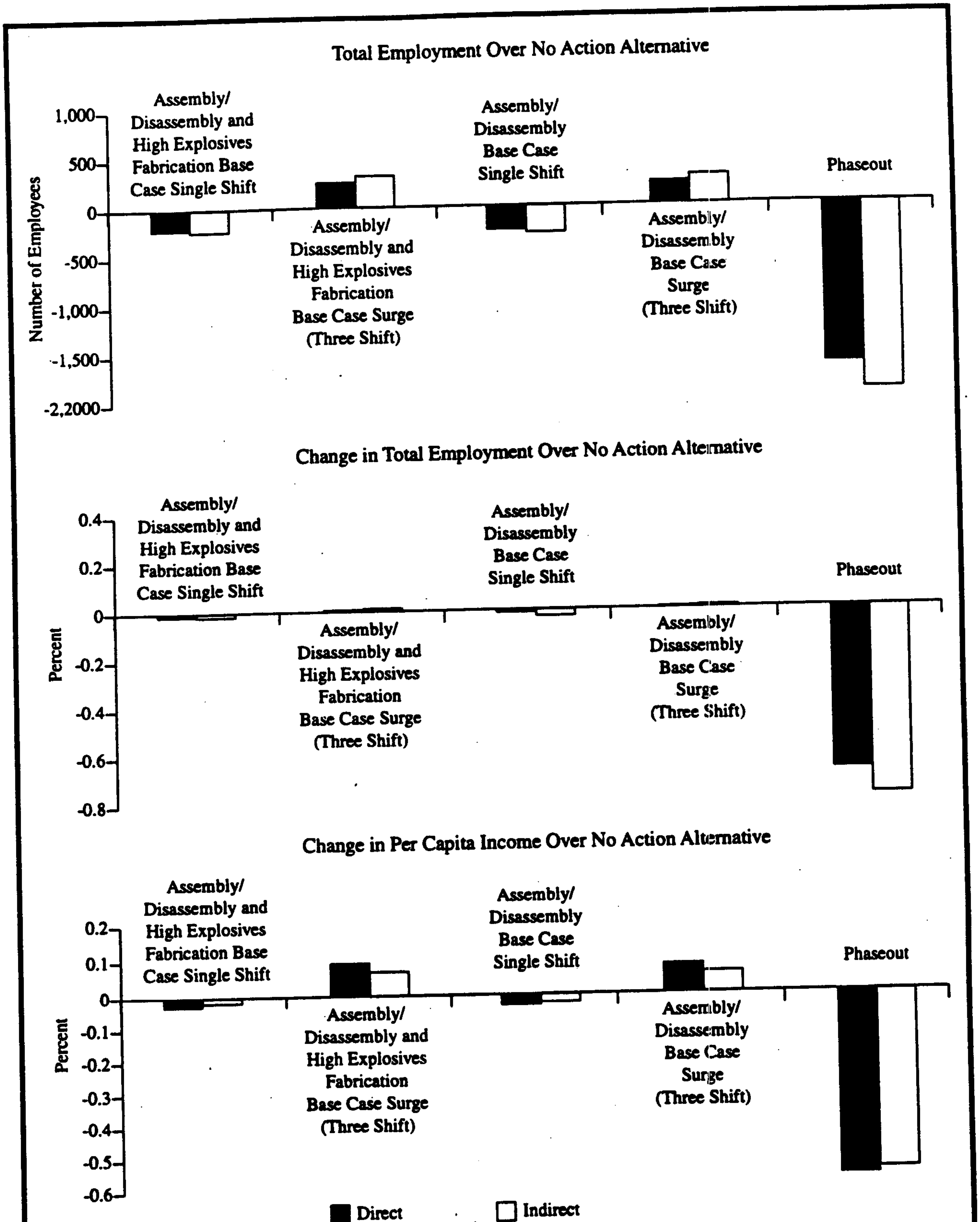
Base Case Single Shift. Under base case single-shift production, the facility would operate at reduced capacity and employ a smaller workforce than under the No Action alternative. The operational workforce would fall from the No Action level of 1,644 to 1,455. The workforce would include the same 624 support and other employees required under the No Action alternative, but a smaller core stockpile management workforce: 780 workers for A/D, 20 workers for pit reuse, and 31 for HE fabrication. The workforce would remain stable from 2005 to 2030.

Base Case Surge. Under base case surge production, the facility would be configured to operate at increased capacity as needed. The operational workforce would increase from the No Action level of 1,644 to 1,927, an increase of 283 workers. The workforce would include the same 624 support and other employees required under the No Action alternative, but a larger core stockpile management workforce: 1,244 workers for A/D, 22 workers for pit reuse, and 37 for HE fabrication.

The movement of the strategic reserve pits at Pantex to another DOE site location (an alternative in the Storage and Disposition Program) would have minimal impact on site employment and the regional economy beyond the downsize A/D and HE fabrication alternative. Strategic reserve pit storage operations are integrated into the A/D mission; therefore, worker numbers would remain essentially unchanged if the pits were moved and the A/D mission remained at Pantex.

Regional Economy and Employment. During peak modification activities, a total of 173 jobs (96 direct and 77 indirect) would be generated. Changes in the regional economic area's employment would be less than 1 percent. There would be no perceptible change in per capita income or in the regional unemployment rate. Impacts to the regional economy during operations for each of the production cases are described below.

Base Case Single Shift. Because fewer workers would be employed than for the No Action alternative, some losses to regional employment and income would result. A total of 408 jobs (189 direct and 219 indirect) would be lost, and regional unemployment would increase from 4.8 to 5.0 percent. Per capita income would decrease by less than 1 percent. These changes are shown in figure 4.5.3.8–1.



Source: Socio 1996b.

FIGURE 4.5.3.8–1.—***Employment and Income Changes Resulting from Management Alternatives in the Pantex Plant Regional Economic Area, 2005.***

Base Case Surge (Three Shift). Under base case surge, a total of 611 jobs (283 direct and 328 indirect) would be generated and unemployment would decrease from 4.8 to 4.5 percent. Per capita income would increase by less than 1 percent. These changes are shown in figure 4.5.3.8–1.

Population and Housing. Because available labor within the regional economic area would be sufficient to fill any direct or indirect jobs created during modification of the facility, the population would remain as projected under the No Action alternative.

Under the base case single-shift scenario, reductions in the workforce could lead to out-migration as displaced workers leave the region to seek employment opportunities. If all of the displaced direct and indirect workers would leave the region with their families, the population would fall by 1,065. Housing vacancies would increase slightly. These changes are shown in figure 4.5.3.8–2. Under base case surge, the additional jobs that would be generated would be filled by workers currently residing in the region. Therefore, there would be no change in the population over the No Action alternative.

Public Finance. Modification of the A/D and HE fabrication facilities or base case surge operation would not require in-migrating workers. Therefore, changes to local finances compared to No Action projections would be due to income increases and would be negligible.

Downsizing the facilities for base case single-shift operation could result in the out-migration of workers from the ROI, which would affect ROI revenues and expenditures. Changes in revenues and expenditures compared to No Action projections due to downsizing the A/D and HE facilities at Pantex are shown in figure 4.5.3.8–3. If all displaced workers and their families left the ROI, total revenues and expenditures would be reduced below No Action projections by approximately 0.5 and 0.3 percent, respectively.

Downsize Assembly/Disassembly. Under this alternative, the A/D mission would remain at Pantex but the HE fabrication operations would be phased out and transferred to another DOE facility. To implement this alternative, modifications would be made to the facility which would generate some construction employment during the modification. Changes to the plant operational workforce for each of the cases is described below.

Base Case Single Shift. The total plant workforce would fall from the No Action level of 1,644 to 1,424. The resulting workforce would include 780 workers involved in A/D, 20 workers for pit reuse, and 624 in support or other non-core stockpile management positions.

Base Case Surge (Three Shift). Under base case surge, the total plant workforce would increase from the No Action level of 1,644 to 1,890. The workforce would include 1,244 workers involved in A/D, 22 workers for pit reuse, and 624 in support or other non-core stockpile management positions.

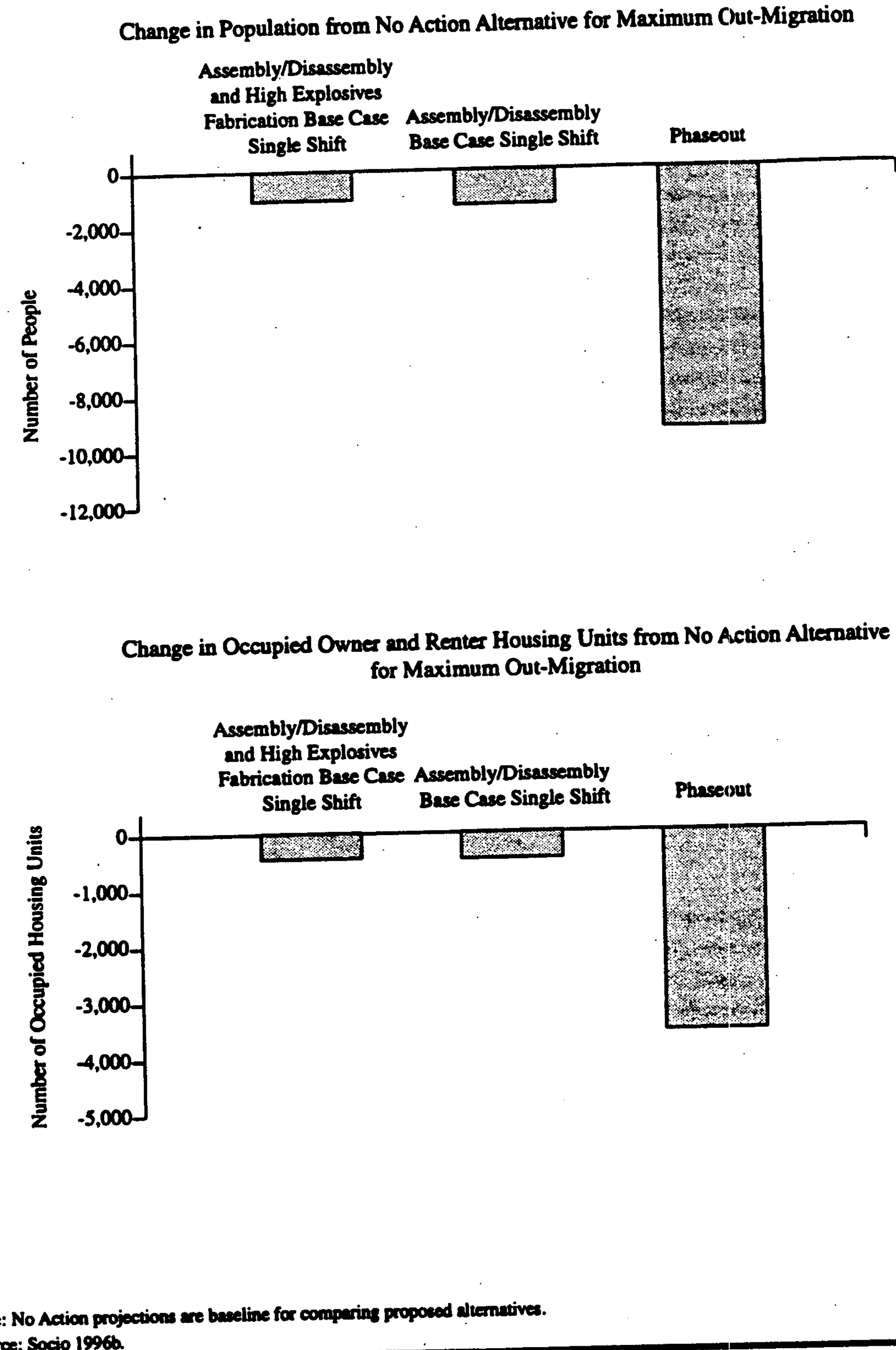
Regional Economy and Employment. For all cases, during peak construction, a total of 121 jobs (67 direct and 54 indirect) would be generated. Employment in the regional economic area would increase by less than 1 percent. There would be no perceptible change in per capita income or in the unemployment rate in the region. Changes to the regional economy during operation is described below for each of the cases.

Base Case Single Shift. Reducing the workforce for the A/D mission would result in a total loss of 475 jobs (220 direct and 255 indirect) in the regional economic area. Unemployment would increase from 4.8 to 5.0 percent. The regional per capita income would fall less than 1 percent. These changes are shown in figure 4.5.3.8–1.

Base Case Surge (Three Shift). Under base case surge, a total of 531 jobs (246 direct and 285 indirect) would be generated and unemployment would decrease from 4.8 to 4.6 percent. Per capita income would increase by less than 1 percent. These changes are shown in figure 4.5.3.8–1.

Population and Housing. There would be no change in the region's population during modification of the facility. Therefore, the housing market would also remain as projected under the No Action alternative.

Under the base case and high case single-shift scenario, the reduction in workforce could lead to out-migration as displaced workers leave the region to seek employment opportunities. If all of the displaced direct and indirect workers would leave the region



Note: No Action projections are baseline for comparing proposed alternatives.
Source: Socio 1996b.

FIGURE 4.5.3.8–2.—*Population and Housing Changes Resulting from Management Alternatives in the Pantex Plant Region of Influence, 2005.*

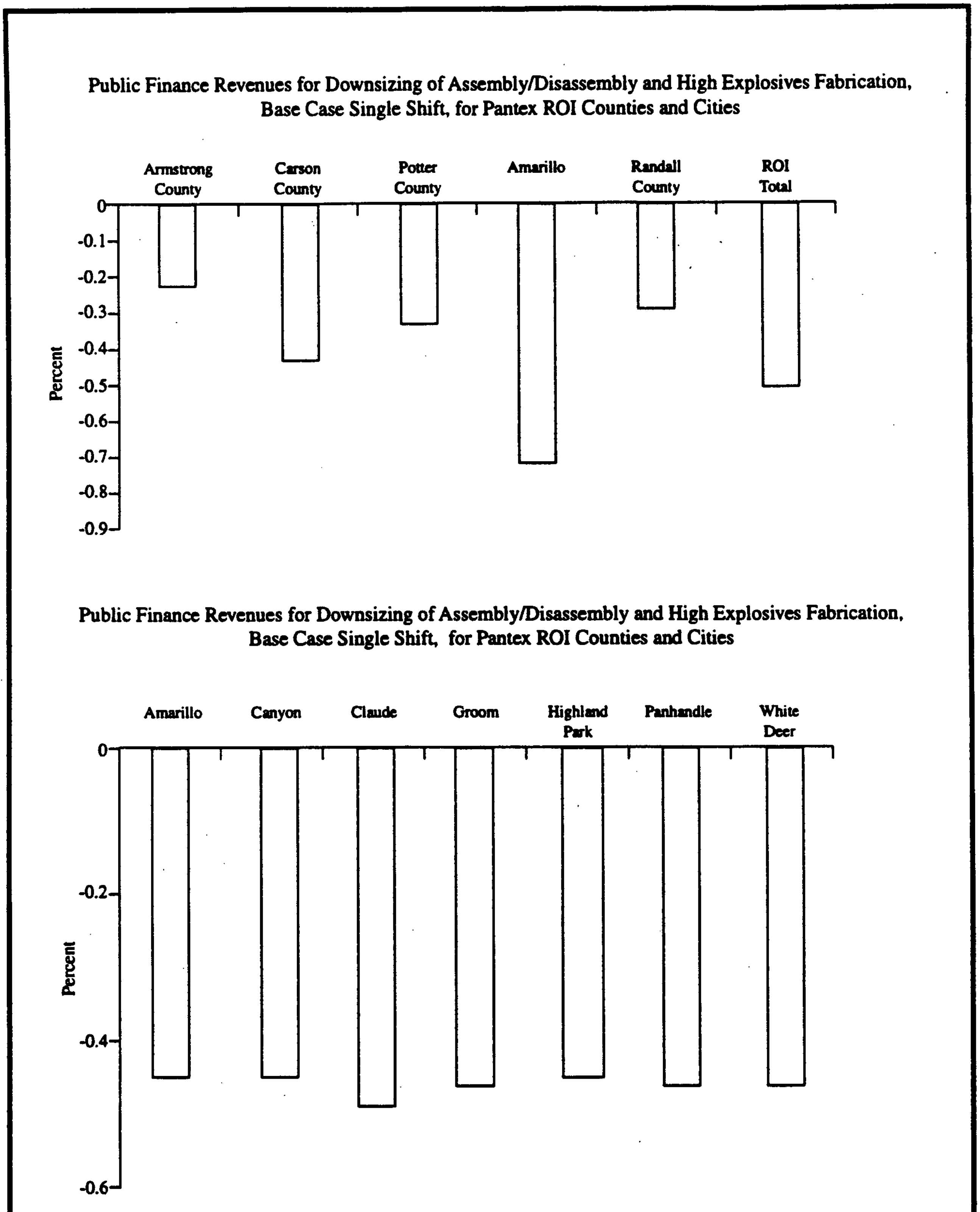
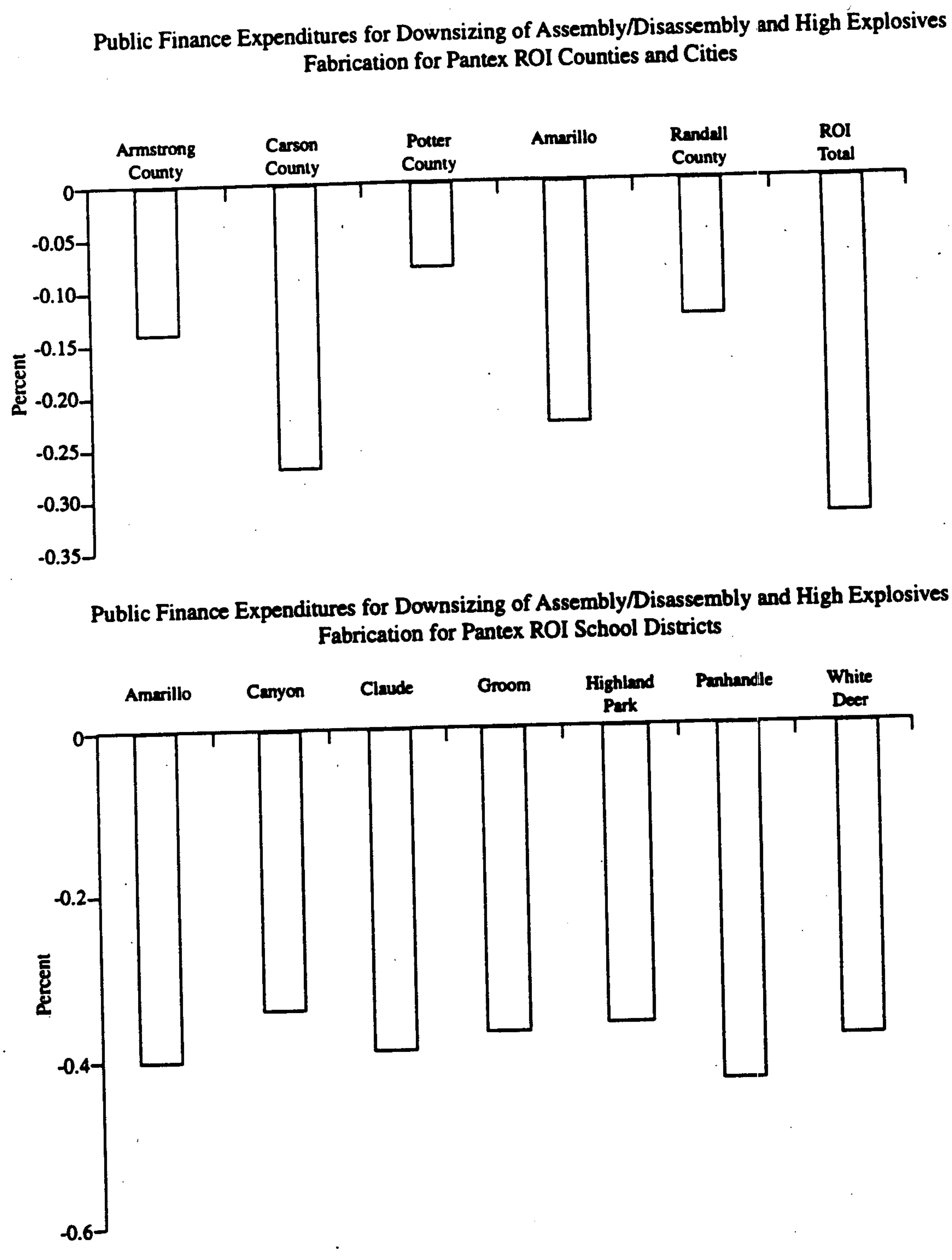


FIGURE 4.5.3.8–3.—*Percent Change from No Action Alternative in County, City, and School District Total Revenues and Expenditures in the Pantex Plant Region of Influence with Downsizing of Assembly/Disassembly and High Explosives Fabrication, Base Case Single Shift, 2005* [Page 1 of 2].



Note: NA - data is not available.
Source: Socio 1996b.

FIGURE 4.5.3.8–3.—*Percent Change from No Action Alternative in County, City, and School District Total Revenues and Expenditures, in the Pantex Plant Region of Influence, with Downsizing of Assembly/Disassembly and High Explosives Fabrication, Base Case Single Shift, 2005* **[Page 2 of 2].**

with their families, the population would fall by 1,240. Housing vacancies would increase slightly. These changes are shown in figure 4.5.3.8–2. Under base case surge, the additional jobs that would be generated would be filled by workers currently residing in the region. Therefore, there would be no change in the population over the No Action alternative.

Public Finance. Neither modification of the A/D Fabrication Facility nor base case surge operation would require in-migrating workers. Therefore, changes to public finances compared to No Action projections would be due to income increases and would be negligible.

Downsizing the facility for base case single-shift operation could result in the out-migration of workers from the ROI, causing a loss of income that would affect ROI revenues and expenditures. Changes in revenues and expenditures compared to No Action projections due to downsizing the A/D Facility for base case single-shift operation at Pantex are shown in figure 4.5.3.8–4. In 2005, revenues and expenditures would fall below No Action projections by approximately 0.6 and 0.4 percent, respectively. There would be less out-migration as a result of high case single-shift production. Therefore, any changes to public finance would be smaller.

Effects of High Explosives Phaseout. The HE fabrication operation requires 105 workers under the No Action alternative (downsizing to lower production levels would involve 31 workers under base case single shift and 37 workers under base case surge) Because HE fabrication generates an additional 122 jobs in related industries, the phaseout of this mission would result in the loss of 227 jobs to the regional economy. These impacts are included in the previous downsize A/D discussion.

Phaseout of Assembly/Disassembly and High Explosives Fabrication. Under this alternative, both the A/D and HE fabrication missions would be transferred to other existing DOE installations. The total workforce at Pantex, projected to be 1,644 under the No Action alternative, would decrease to zero in 2005.

Regional Economy and Employment. Termination of the A/D and HE fabrication missions at Pantex would lead to both direct and indirect job losses in the regional economy. A total of 3,549 jobs (1,644 direct and 1,905 indirect) would be lost. Unemployment rates for the regional economic area would increase from a projected rate of 4.8 percent to 6.2 percent in 2005, the year the phaseout would be implemented. Per capita income would decrease slightly to $22,022 from the projected No Action level of $22,235. Changes in regional employment and income from No Action projections are shown in figure 4.5.3.8–1.

Population and Housing. Population in the ROI could decrease by more than 9,260 if all displaced workers and their families were to leave the ROI to seek employment opportunities elsewhere, a decrease of 3.9 percent from the No Action level projections. This out-migration would create additional housing vacancies in both rental and nonrental housing as shown in figure 4.5.3.8–2. However, the effects to the regional housing market would be minor.

Public Finance. Phaseout of the A/D and HE fabrication missions could lead to the out-migration of workers from the ROI, that would affect ROI revenues and expenditures. Changes in revenues and expenditures compared to No Action projections due to phaseout of operations at Pantex are shown in figure 4.5.3.8–5. In 2005, the percent decrease in total ROI revenues and expenditures below No Action projections would be approximately 4.4 and 2.7 percent, respectively. The greatest decrease would occur in the Claude School District where revenues could decrease by approximately 4.1 percent and in the Panhandle School District where expenditures would be expected to decrease by 3.7 percent.

Sensitivity Analysis. The number of construction workers required to modify the A/D and HE facilities for high case production is the same as for base case single-shift or base case surge production. Therefore, the socioeconomic impacts from construction would be the same.

Operation of the facilities for the high case mode would require more workers than base case single shift, but less than base case surge operation. The size of the site workforce would fall below the No Action levels, but would still be larger than the base case single-shift workforce. Therefore, any negative socioeconomic impacts in the region would be less than would result from base case single-shift operation.

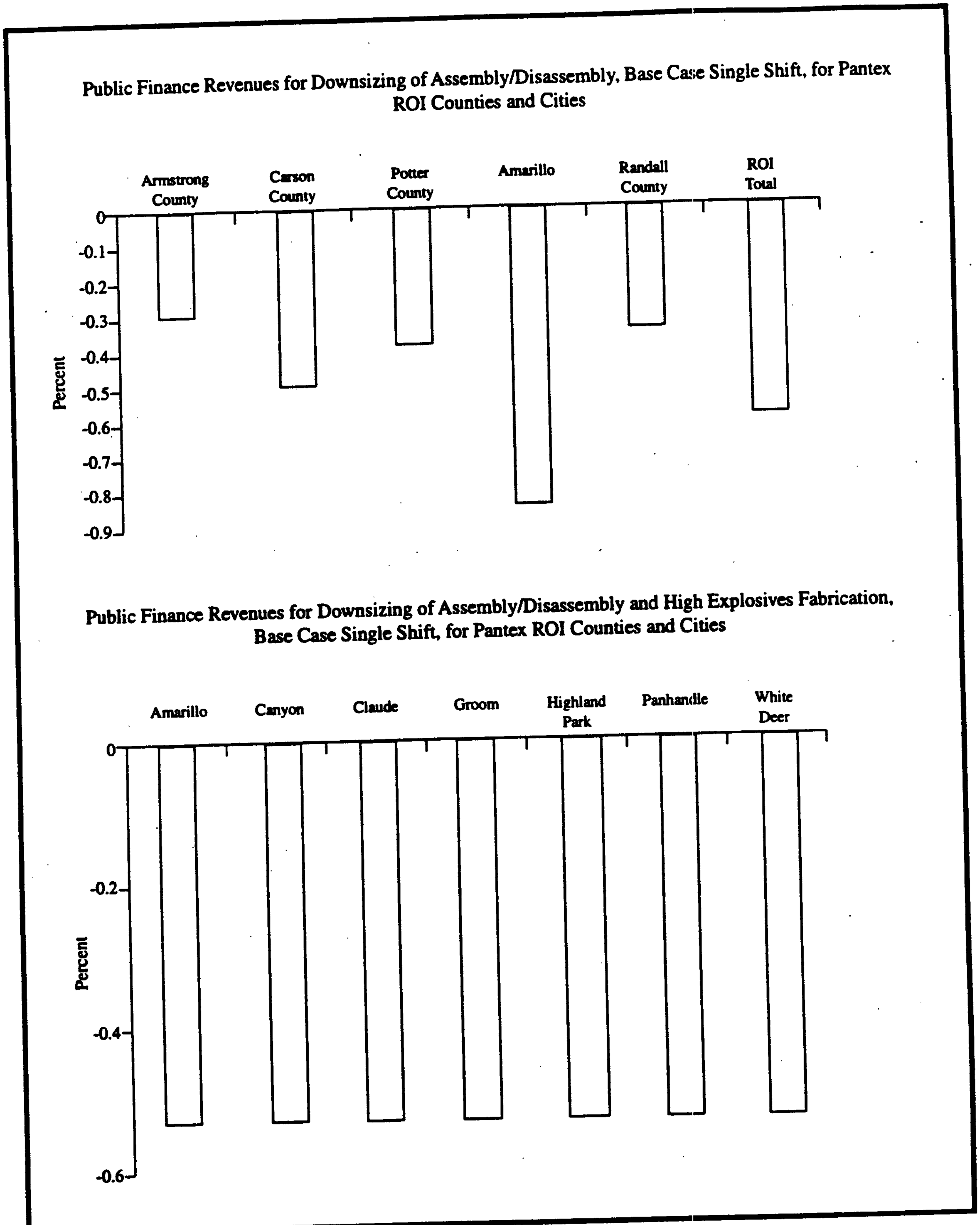
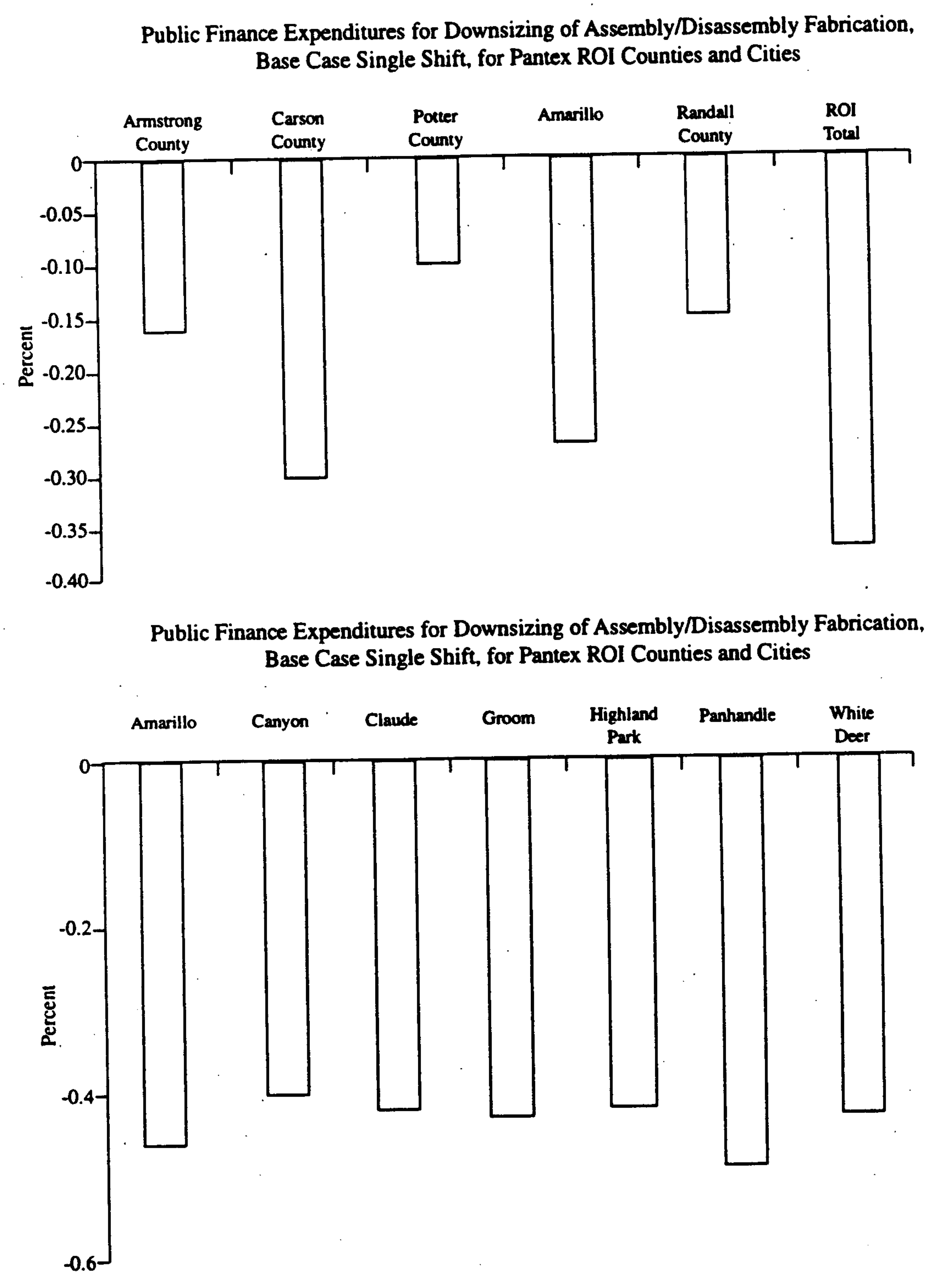


FIGURE 4.5.3.8–4.—*Percent Change from No Action Alternative in County, City, and School District Total Revenues and Expenditures in the Pantex Plant Region of Influence with Downsizing of Assembly/Disassembly, Base Case Single Shift, 2005* [Page 1 of 2].



Source: Socio 1996b.

FIGURE 4.5.3.8–4.—*Percent Change from No Action Alternative in County, City, and School District Total Revenues and Expenditures in the Pantex Plant Region of Influence with Downsizing of Assembly/ Disassembly, Base Case Single Shift, 2005* **[Page 2 of 2].**

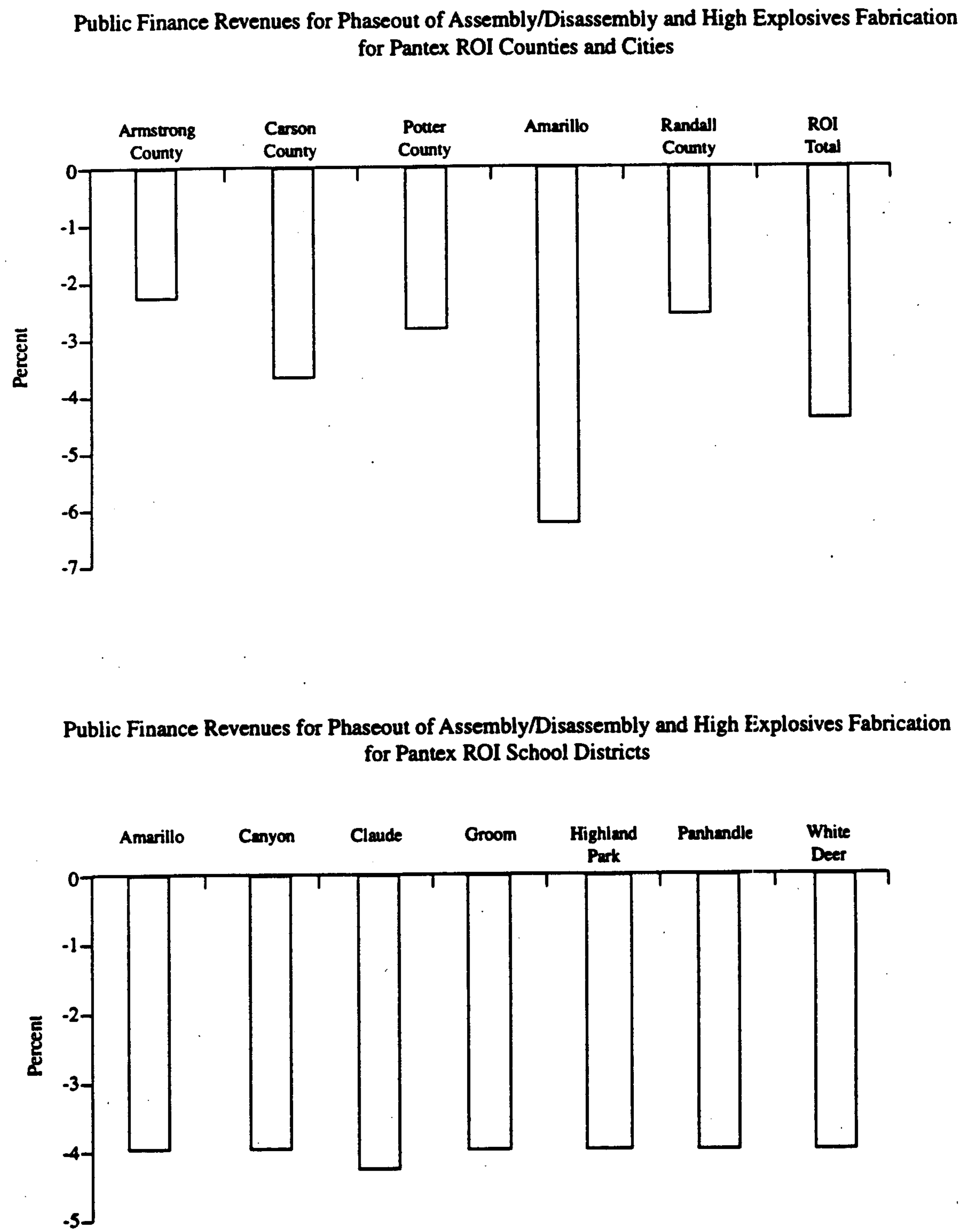


FIGURE 4.5.3.8–5.—*Percent Change from No Action Alternative in County, City, and School District Total Revenues and Expenditures in the Pantex Plant Region of Influence with Phaseout of Assembly/Disassembly and High Explosives Fabrication, 2005* [Page 1 of 2].

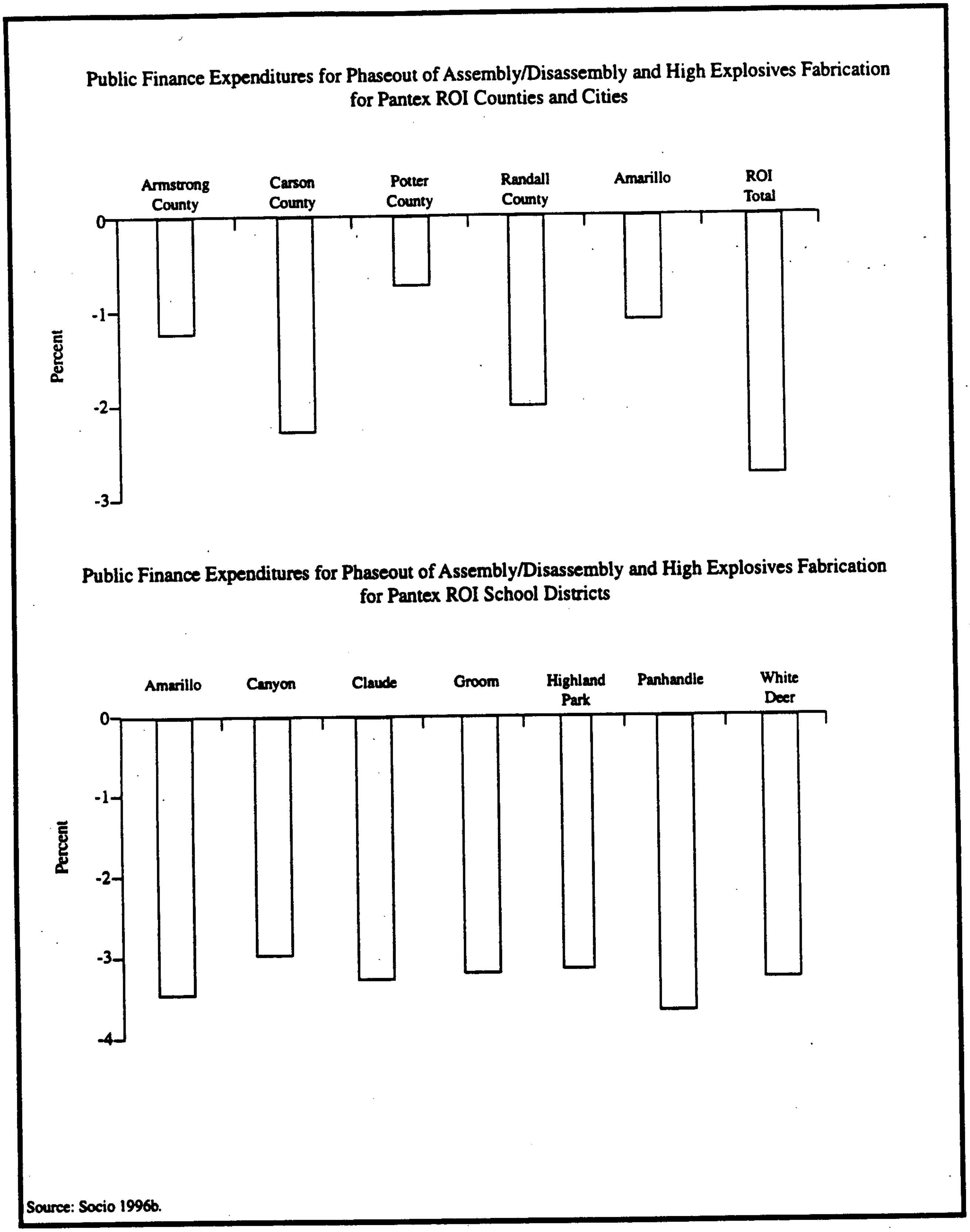


FIGURE 4.5.3.8–5.—*Percent Change from No Action Alternative in County, City, and School District Total Revenues and Expenditures in Pantex Plant Region of Influence with Phaseout of Assembly/Disassembly and High Explosives Fabrication, 2005* **[Page 2 of 2].**

Potential Mitigation Measures. In the event of a phaseout of DP activities at Pantex, adverse socioeconomic impacts could result in the affected economic region. To mitigate potential socioeconomic impacts, Section 3161 of the *National Defense Authorization Act* (Public Law 102-484) requires DOE to develop a plan for restructuring the workforce for a defense nuclear facility whenever a change in workforce is necessary. The legislation also directs DOE to consult with local, state, and national stakeholders in developing the plan.

DOE has initiated a number of actions to respond to the legislative requirements, including the creation of the Office of Worker and Community Transition. In February 1996, the office issued interim planning guidance in developing plans to help mitigate unavoidable impacts from workforce restructuring. Although the guidance is not prescriptive, it sets forth DOE policy on mitigating economic impacts of restructuring. For example, the guidance states that whenever possible, the impacts of workforce reductions should be minimized through the use of early retirement and normal attrition. Where appropriate, employees should be retrained for work in environmental restoration and waste management. The guidance also recommends that terminated employees receive assistance in obtaining reemployment through out-placement services, appropriate retraining, and educational services. To the extent practical, DOE and its contractor should offer a hiring preference to terminated employees. The DOE guidance also suggests that the affected communities should receive assistance to mitigate impacts to the public infrastructure and finances.

4.5.3.9 *Radiation and Hazardous Chemical Environment*

This section describes the radiological and hazardous chemical releases and their associated impacts, which could result from No Action and the proposed alternatives at Pantex. Within this section, impacts resulting from the base case scenario are quantitatively discussed, and a sensitivity analysis of the high and low cases is qualitatively discussed.

Summaries of the prevailing radiological impacts to the public and to workers associated with normal operation at Pantex are presented in tables 4.5.3.9–1 and 4.5.3.9–2, respectively; radiological accident impacts are presented in tables 4.5.3.9–3 and 4.5.3.9–4. The impact assessment methodology is described in section 4.1.9 and further supplementary methodological information is presented in appendixes E and F.

Normal Operation. There would be no radiological releases during the construction/modification of any new facilities; however, limited hazardous chemical releases (e.g., small spills of diesel fuel from equipment refueling) may occur due to building modification activities for the base case scenario and may be somewhat larger if the high case scenario is implemented. The concentration of these releases is expected to be well within the regulated exposure limits and would not result in any adverse health effects.

Water from processes containing hazardous chemicals is not discharged directly into surface water or groundwater that serves as potable water. Process water that may contain hazardous chemicals is treated before discharge. Furthermore, discharges of wastewater through NPDES-permitted outfalls, which can be attributed to the activities associated with normal operation at Pantex, are expected to be below NPDES limits. Water quality would not be adversely affected. Thus, the primary pathway considered for the public and the onsite worker is the air pathway.

For normal operation at Pantex, all possible hazardous chemicals were examined for further analysis based on their toxicity, concentration, and frequency of use. The HI is a summation of the HQ for all chemicals. The HQ is the value used as an assessment of noncancer toxic effects of chemicals (e.g., kidney or liver dysfunction). It is independent of cancer risk, which is calculated only for those chemicals identified as carcinogens. The HI was calculated for the No Action chemicals and all management alternative chemicals proposed to be emitted at the site. Using EPA guidance, an HI of ≤ 1.0 indicates that all noncancer exposure values meet OSHA standards; if the cancer risk is $\leq 1 \times 10^{-6}$ (the default value, not a regulatory standard), no further analysis is indicated. A cancer risk of $<1 \times 10^{-6}$ is considered acceptable by EPA (40 CFR 300.430) because this incidence of cancers cannot be distinguished from the cancer risk for an individual member of the population.

Information pertaining to OSHA-regulated exposure limits and toxicity profiles for all hazardous chemicals described in this PEIS may be found in the *Chemical Health Effects Technical Reference* (TTI 1996b).

No Action

Radiological Impacts. Radiological impacts to the public resulting from the No Action alternative are presented in table 4.5.3.9–1. HE fabrication has not been included in the analysis because activities associated with this fabrication mission do not result in radiological releases. The applicable impacts are representative of the aggregated total which is estimated to exist from all future baseline operational Pantex contributions. Total impacts are provided to compare with applicable regulations governing total site operations. To place doses to the public from the No Action alternative into perspective, comparisons are made with natural background radiation. As shown in table 4.5.3.9–1, the total dose to the maximally exposed member of the public from annual total site operations is within radiological limits and would be 5.8×10^{-5} mrem for the No Action alternative. The annual population dose within 80 km (50 mi) in 2030 would be 1.4×10^{-4} person-rem.

Total site doses to onsite workers from normal operation for the No Action alternative are presented in table 4.5.3.9–2. The estimated annual dose to involved workers for this alternative would be 10 mrem. The dose to the entire facility workforce (involved workforce) would be 10.7 person-rem. As stated in the methodology section 4.1.9, worker doses were referenced from the Radiation Exposures for DOE and DOE Contractor Employees 1992 Database which reports doses for similar types of operations; there are no doses incurred to the noninvolved workers since their job tasks are limited to HE fabrication.

TABLE 4.5.3.9–1.—*Potential Radiological Impacts to the Public Resulting from Normal Operation of Stockpile Management Alternatives at Pantex Plant*

Affected Environment	No Action Single-Shift Operation Total Site[a]	Downsize Assembly/Disassembly Three-Shift Operation Total Site[a]	Phaseout Assembly/Disassembly and High Explosives Fabrication Total Site[a]
Maximally Exposed Individual (Public)			
Atmospheric Release			
Dose[b] (mrem/yr)	5.8×10^{-5}	9.8×10^{-5}	0
Percent of natural background[c]	1.7×10^{-5}	2.9×10^{-5}	0
25-year fatal cancer risk	7.2×10^{-10}	1.2×10^{-9}	0
Liquid Release			
Dose[b] (mrem/yr)	0	0	0
Percent of natural background[c]	0	0	0
25-year fatal cancer risk	0	0	0
Atmospheric and Liquid Releases			
Dose[b] (mrem/yr)	5.8×10^{-5}	9.8×10^{-5}	0
Percent of natural background[c]	1.7×10^{-5}	2.9×10^{-5}	0
25-year fatal cancer risk	7.2×10^{-10}	1.2×10^{-9}	0
Population Within 80 Kilometers			
Atmospheric and Liquid Releases in 2030			
Dose (person-rem)	1.4×10^{-4}	5.4×10^{-4}	0
Percent of natural background[c]	1.5×10^{-7}	5.7×10^{-7}	0
25-year fatal cancers	1.8×10^{-6}	6.8×10^{-6}	0

[a] Includes impacts from all site operations.

[b] The applicable radiological limits for an individual member of the public from total site operations are 10 mrem/yr from the air pathways, 4 mrem/yr from the drinking water pathway, and 100 mrem/yr from all pathways combined (DOE Order 5400.5).

[c] Natural background radiation levels to the average individual is 334 mrem/yr; to the population within 80 km (50 mi) in 2030 is 95,300 person-rem.

Source: PX DOE 1995d; PX MH 1995a.

TABLE 4.5.3.9–2.—***Potential Radiological Impacts to Workers Resulting from Normal Operation of Stockpile Management Alternatives at Pantex Plant***

Affected Environment	No Action Single-Shift Operation	Downsize Assembly/Disassembly Three-Shift Operation	Phaseout Assembly/Disassembly and High Explosives Fabrication
Involved Workforce[a]			
Average worker dose[b] (mrem/yr)	10	10	0
25-year fatal cancer risk	$1.0x10^{-4}$	$1.0x10^{-4}$	0
Total dose (person-rem/yr)	10.7	3.0	0
Noninvolved Workforce[c] **(HE Fabrication)**			
Average worker dose[b] (mrem/yr)	0	0	0
25-year fatal cancer risk	0	0	0
Total dose (person-rem/yr)	0	0	0
Total Site Workforce[d]			
Dose (person-rem/yr)	10.7	3.0	0
25-year fatal cancers	0.11	0.030	0

[a] The involved worker is a worker associated with operations of the A/D facilities. The estimated number of involved workers considered at risk for exposure is 300 for the downsize/consolidate alternative. The 1,070 workers for the No Action alternative are all considered at risk for exposure.

[b] The radiological limit for an individual worker is 5,000 mrem/yr (10 CFR 835).

[c] The noninvolved worker is an onsite worker unassociated with operation of the A/D facilities in question. The estimated number of noninvolved workers is 50.

[d] The total site workforce is the sum of the number of involved and noninvolved workers. The estimated number of workers in the total site workforce is 350 for the downsize/consolidate alternative and 1,070 for the No Action alternative.

Source: DOE 1993n:7; PX MH 1995a.

Based on the radiological impacts associated with normal operation under the No Action alternative, all resulting doses are within radiological limits and are well below levels of natural background radiation. The associated risks of adverse health effects to the public and to workers would be small.

Hazardous Chemical Impacts. Hazardous chemical impacts to the public resulting from normal operation under No Action at Pantex are presented below. Analyses to support the values presented in this section are provided in appendix table E.3.4–9. This PEIS does not purport to provide the level of detail needed to go beyond a conservative screening process for hazardous chemicals. As such, the analysis in this PEIS for the No Action alternative should not be relied upon as a basis for judging the sites as having a hazardous chemical health concern. The model used in this PEIS to calculate HI and cancer risk only establishes a baseline for comparison of alternatives among sites. The baseline is then used to determine the extent by which each alternative adds or subtracts from the No Action HI and cancer risk to the public at each site.

The HI for the maximally exposed member of the public at Pantex resulting from normal operation under the No Action alternative would be $5.56x10^{-3}$ and the cancer risk would be $1.10x10^{-8}$. The HI to the onsite worker would be $6.14x10^{-3}$, and the cancer risk would be $4.48x10^{-7}$.

The HIs for the public and onsite worker are within acceptable health levels. The cancer risks to the public and the onsite worker are within the EPA default value of $1.0x10^{-6}$.

Management Alternatives

Downsize Assembly/Disassembly and High Explosives Fabrication

Radiological Impacts. Radiological impacts to the public resulting from downsizing the A/D mission are presented in table 4.5.3.9–1. These impacts are representative of the aggregated total which is estimated to exist from all future baseline operational Pantex contributions and from three-shift base case A/D operations at the site. HE fabrication has not been included in the analysis because activities associated with this fabrication mission do not result in radiological releases. Total impacts are provided to compare with applicable regulations governing total site operations. To place doses to the public from this alternative into perspective, comparisons are made to natural background radiation. As shown in table 4.5.3.9–1, the total dose to the maximally exposed member of the public from annual total site operations is within radiological limits and would be $9.8x10^{-5}$ mrem for this alternative. The annual population dose within 80 km (50 mi) in 2030 would be $5.4x10^{-4}$ person-rem. The impacts incurred from three-shift base case operations are very small, as is the case for normal baseline site operations.

Total site doses to onsite workers from normal operation for the downsize A/D mission are presented in table 4.5.3.9–2. The average annual dose to involved workers for this alternative would be 10 mrem. The dose to the entire facility workforce (involved workforce) would be 3.0 person-rem. As stated in the methodology section 4.1.9, worker doses were referenced from the Radiation Exposures for DOE and DOE Contractor Employees 1992 Database which reports doses for similar types of operations; there are no doses incurred to noninvolved workers since their job tasks only entail HE fabrication. There may also be small risks to construction workers who are involved with tasks that are in close proximity to potentially contaminated areas.

The contribution to radiological impacts from the storage of the strategic reserve at Pantex is included within the downsize A/D and HE fabrication mission. Radiological impacts incurred from storage of the strategic reserve are extremely small, therefore total site impacts would not be affected if the strategic reserve was not located at Pantex.

Hazardous Chemical Impacts. Hazardous chemical impacts for the public and for the onsite worker resulting from normal operation due to downsizing and/or consolidating the A/D and HE fabrication mission with nonintrusive pit reuse and storage of the strategic reserve of plutonium and uranium at Pantex are presented below. The HI and cancer risk would remain constant over 25 years of operation provided exposures remain the same. Analyses to support the values presented in this section are provided in appendix table E.3.4–10.

The HI for the maximally exposed member of the public would be $4.82x10^{-5}$ and the cancer risk would be $8.37x10^{-10}$ as a result of operation of the A/D and HE fabrication alternative in 2005. The HI to the onsite worker would be $1.30x10^{-4}$ and the cancer risk would be $3.40x10^{-8}$ as a result of operation of the A/D and HE fabrication alternative in 2005. Operation of the downsize A/D and HE fabrication mission would result in HIs to the public and onsite worker that are within acceptable health regulatory levels. The cancer risks to the public and the onsite worker are within the EPA default value of $1.0x10^{-6}$.

The options of not including the storage of the strategic reserve of uranium and/or the strategic reserve of plutonium would not increase, and may slightly decrease hazardous chemical emissions with operation of the downsized/consolidated A/D and HE fabrication mission. Therefore, the HI and cancer risk for the public and the onsite worker would not increase if the strategic reserves are not stored at Pantex.

Downsize Assembly/Disassembly

Radiological Impacts. Radiological impacts to the public resulting from downsizing the A/D mission are presented in table 4.5.3.9–1. These impacts are representative of the aggregated total which is estimated to exist from all future baseline operational Pantex contributions and from three-shift base case A/D operations at the site. Total impacts are provided to compare with applicable regulations governing total site operation. To place doses to the public from this alternative into perspective, comparisons are made to natural background radiation. As shown in table 4.5.3.9–1, the total dose to the maximally exposed member of the public from annual total site operations is within radiological limits and would be $9.8x10^{-5}$ mrem for this alternative. The annual population dose within 80 km (50 mi) in 2030 would be $5.4x10^{-4}$ person-rem. The impacts incurred from three-shift base case operations are very small, as is the case for normal baseline site operations.

Total site doses to onsite workers from normal operation for the downsize A/D mission are presented in table 4.5.3.9–2. The average annual dose to involved workers for this alternative would be 10 mrem. The dose to the entire facility workforce (involved workforce) would be 3.0 person-rem. As stated in the methodology section 4.1.9, all worker doses were referenced from the Radiation Exposures for DOE and DOE Contractor Employees 1992 Database which reports doses for similar types of operations; there are no doses incurred to noninvolved workers since their job tasks only entail HE fabrication. There may also be small risks to construction workers who are involved with tasks that are in close proximity to potentially contaminated areas.

The contribution to radiological impacts from the storage of the strategic reserve at Pantex is included within the downsize A/D mission. Radiological impacts incurred from storage of the strategic reserve are extremely small, therefore total site impacts would not be affected if the strategic reserve was not located at Pantex.

Hazardous Chemical Impacts. Hazardous chemical impacts for the public and for the onsite worker resulting from normal operation due to downsizing and/or consolidating the A/D mission with nonintrusive pit reuse and storage of the strategic reserve of plutonium and uranium at Pantex are presented below. The HI and cancer risk would remain constant over 25 years of operation provided exposures remain the same. This alternative includes phaseout of HE fabrication. Analyses to support the values presented in this section are provided in appendix table E.3.4–11.

The HI for the maximally exposed member of the public would be 2.42×10^{-3} and the cancer risk would be 8.06×10^{-10} as a result of operation of the downsize A/D mission in 2005. The HI for the onsite worker would be 1.57×10^{-3} and the cancer risk would be 3.28×10^{-8} as a result of downsize A/D operation in 2005. The HIs for the public and onsite worker are within acceptable health regulatory levels. The cancer risks to the public and onsite worker are within the EPA default value of 1.0×10^{-6}.

The options of not including the storage of the strategic reserve of uranium and/or the strategic reserve of plutonium would not increase, and may slightly decrease hazardous chemical emissions with operation of the downsized/consolidated A/D mission. Therefore, the HI and cancer risk for the public and the onsite worker would not increase if the strategic reserves are not stored at Pantex.

Phaseout of Assembly/Disassembly and High Explosives Fabrication

Radiological Impacts. Radiological impacts to the public resulting from the phaseout of the A/D mission at Pantex are presented in table 4.5.3.9–1. These impacts are representative of the aggregated total which is estimated to exist from all future baseline operational Pantex contributions. Total impacts are provided to compare with applicable regulations governing total site operation. To place doses to the public from this alternative into perspective, comparisons are made with natural background radiation. As shown in table 4.5.3.9–1, the total dose to the maximally exposed member of the public from annual total site operations is within radiological limits and would be 0 mrem for this alternative. The annual population dose within 80 km (50 mi) in 2030 would be 0 person-rem. If A/D operations are eliminated, there would be no other radiological contribution from any other site operation (i.e., HE fabrication).

Total site doses to onsite workers from normal operation for the phaseout of the A/D mission are presented in table 4.5.3.9–2. The average annual dose to involved workers for this alternative would be 0 mrem. The dose to the entire facility workforce (involved workforce) would be 0 person-rem. As stated in the methodology section 4.1.9, there are no doses incurred to noninvolved workers because their job tasks only entail HE fabrication. There may be small risks to construction/demolition workers who are involved with tasks that are in close proximity to potentially contaminated areas.

Radiological impacts incurred from the storage of the strategic reserve at Pantex are extremely small, therefore total site impacts would not be affected if the strategic reserve was not located at Pantex. Based on the radiological impacts associated with normal operation, all resulting doses would be within radiological limits and are well below levels of natural background radiation. The associated risks of adverse health effects to the public and to workers would be extremely small.

Hazardous Chemical Impacts. There are no hazardous chemical emissions associated with the phaseout of A/D and HE fabrication at Pantex. The HIs for the public and the onsite worker would be reduced to zero and the cancer risks to the public and the onsite worker would be reduced to zero as a result of the phaseout (see appendix table E.3.4–12). Therefore, there are no adverse health effects or cancer risk to the public or the onsite worker due to this alternative.

Sensitivity Analysis. Small differences are expected to exist between operation at the base and low and high case scenarios. Since the HIs are well within the acceptable health regulatory limits and the cancer risks are below the EPA default value, no adverse HI or cancer risk impacts are expected due to low or high case scenarios.

Radiological impacts may be subject to certain degrees of variance resulting from either high or low case operations. For the high case scenario, impacts to both the public and workers would be similar to the three-shift base case operations. For the low-case scenario, impacts to the public would be expected to fall within the increment (range) projected between the No Action and the downsize A/D mission alternatives (i.e., less than a 4.0×10^{-5} mrem/yr increase to the maximally exposed individual, and less than a 4.0×10^{-4} person-rem/yr increase to the population within 80 km [50 mi]). Impacts to the total site workforce would be expected to fall below those associated with three-shift base case operations (i.e., less than 3.0 person-rem/yr).

Based on the radiological impacts associated with normal operation of this alternative, all resulting doses would be within radiological limits and are well below levels of natural background radiation. The associated risks of adverse health effects to the public and to workers would be extremely small.

Potential Mitigation Measures. Radioactive airborne emissions to the general population and onsite exposures to workers could be reduced by implementing the latest technology for process and design improvements. For example, to reduce public exposure from emissions, improved building and work area control methods could be used to remove radioactivity from emissions to the environment. Similarly, the use of remote, automated, and robotic production methods are examples of techniques that are being developed which would reduce worker exposure (see section 3.5.4). There would be no additional mitigative measures anticipated for chemical hazards.

Facility Accidents. The proposed actions have the potential for accidents that may impact the health and safety of workers and the public. The potential for and associated consequences of reasonably foreseeable accidents that have been evaluated are summarized in this section and described in more detail in appendix F. The methodology used in the assessment is described in section 4.1.9. A list of documents reviewed for applicable accident data is provided in appendix table F.1.1–1. The potential impacts from accidents, ranging from high-consequence/low-probability to low-consequence/high-probability events, have been evaluated in terms of potential cancer fatalities that may result for noninvolved workers and the public. The risk of cancer fatalities has also been evaluated to provide an overall measure of accident impacts and is calculated by multiplying the accident annual frequency (or probability) of occurrence by the consequences (number of cancer fatalities). A figure is also provided showing the risk of latent cancer fatalities in the population within 80 km (50 mi) that may result from accidents for the alternatives. Specifically, the curves in each figure show the probability (vertical axis) that the number of cancer fatalities in the offsite population within 80 km (50 mi) (horizontal axis) will be exceeded. The curves reflect the probability of the accident.

In addition to the potential impacts to noninvolved workers and the offsite population, there are potential impacts to involved workers who would be located in the facilities associated with the proposed action. Quantitative statements of these impacts cannot be made until design details are developed further, at which time the number and location of facility workers, protective and mitigating features can be estimated to support detailed accident impact analyses; however, depending on the type of accident, facility workers in close proximity to the point of the accident could receive high levels of exposure to radiation and potentially fatal impacts.

The accident analyses in this PEIS have been closely coordinated with the Pantex Site-Wide EIS to ensure consistency. The Pantex Site-Wide EIS is a more detailed evaluation of Pantex operations than this PEIS. Consequently, if there are any differences between the two documents, this PEIS defers to the Pantex Site-Wide EIS as the more accurate analysis of potential impacts from accidents.

No Action. Under the No Action alternative, A/D, storage of strategic plutonium reserves, and HE fabrication would continue to be performed at Pantex with no changes to facilities and operations. Under existing conditions, potential accidents and their consequences have been addressed in facility safety documentation according to requirements in DOE orders.

Management Alternatives

Accident information on the management alternatives under consideration at Pantex (downsize A/D and HE fabrication, storage of strategic plutonium reserves, and phaseout of A/D and HE fabrication) is provided in this section.

Downsize of Assembly/Disassembly. A set of potential accidents has been postulated for the downsize A/D alternative for which there may be releases of radioactive materials or other hazardous effects that may impact onsite workers and the offsite population. The potential accidents analyzed are described in appendix F. The probability distribution showing the range of probable cancer fatalities that may result for the composite set of accidents identified in appendix F is shown in figure 4.5.3.9–1. For example, the probability of a weapons A/D accident causing more than 10 cancer fatalities is approximately 10^{-6} per year. The curves reflect the probability of the accidents occurring. The consequences for the composite set of accidents and their risks are shown in table 4.5.3.9–3.

If an accident were to occur, there would be an estimated $5.2x10^{-4}$ cancer fatalities in the population within 80 km (50 mi) of the site. A noninvolved worker located 1,000 m (3,281 ft) from the accident would have an increased likelihood of cancer fatality of $2.0x10^{-6}$. A maximally exposed individual located at the site boundary would have an increased likelihood of cancer fatality of $2.0x10^{-6}$. The risks for the combined EBA and BEBA composite set of accidents, reflecting both the probability of the accident occurring and the consequences, are also shown in table 4.5.3.9–3. For the same worker, the maximally exposed individual, and the population, the risks are $5.6x10^{-8}$, $5.6x10^{-8}$, and $1.5x10^{-5}$ cancer fatalities per year, respectively. Table 4.5.3.9–3 also shows the impacts for EBA and BEBA only.

Nonintrusive Modification Pit Reuse. A set of potential accidents can be postulated for the nonintrusive pit reuse for which there may be releases of radioactive materials or other hazardous effects that may impact onsite workers and the offsite popula-

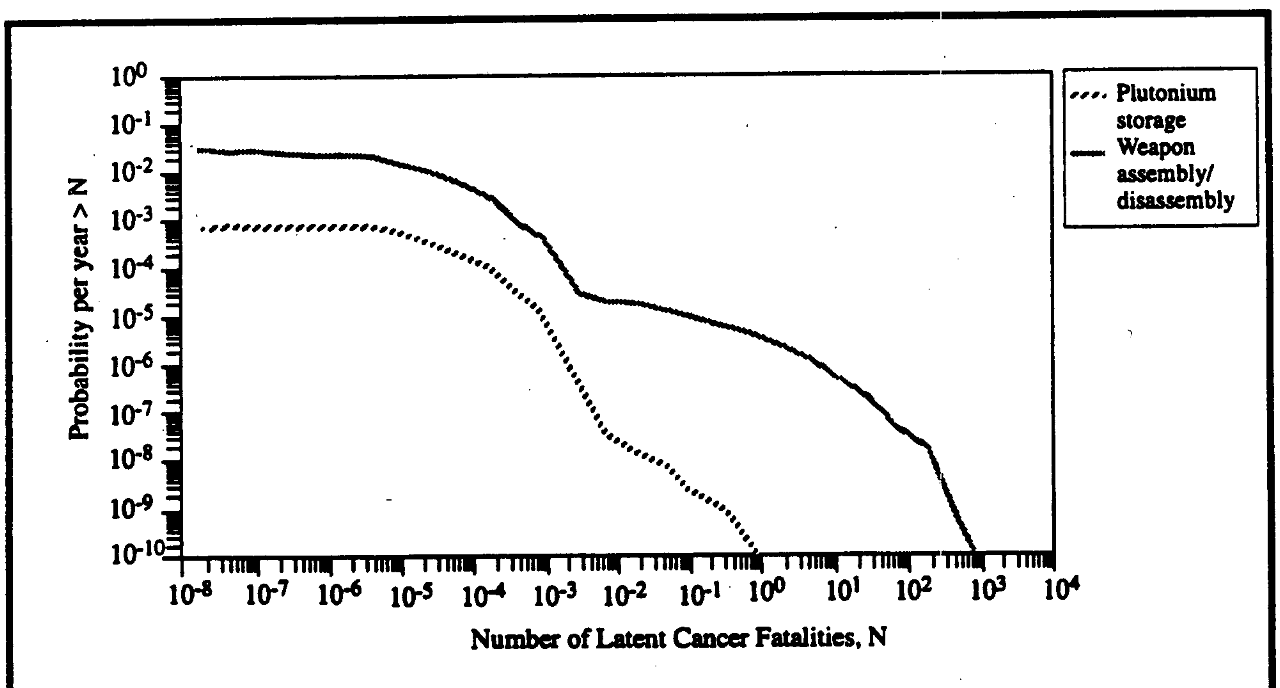


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FIGURE 4.5.3.9–1.—*Combined Evaluation Basis Accidents and Beyond Evaluation Basis Accidents—Cancer Fatalities Complementary Cumulative Distribution Functions for Stockpile Management Alternatives at Pantex Plant.*

TABLE 4.5.3.9–3.—*Impacts of Accidents for Downsize Assembly/Disassembly at Pantex Plant*

Parameter	Downsize Weapons Assembly/Disassembly			Storage of Plutonium Strategic Reserves		
	EBA	BEBA	EBA and BEBA Combined	EBA	BEBA	EBA and BEBA Combined
Composite Accident Frequency (Per Year)	0.028	$1.1x10^{-6}$	0.028	$6.0x10^{-4}$	$5.0x10^{-8}$	$6.0x10^{-4}$
Consequences						
Noninvolved Worker						
Cancer fatality[a]	$1.7x10^{-6}$	$6.2x10^{-3}$	$2.0x10^{-6}$	$2.3x10^{-6}$	$6.4x10^{-4}$	$2.3x10^{-6}$
Risk (cancer fatality per year)	$4.8x10^{-8}$	$7.4x10^{-9}$	$5.6x10^{-8}$	$1.4x10^{-9}$	$3.2x10^{-11}$	$1.4x10^{-9}$
Maximally Exposed Individual						
Cancer fatality[a]	$1.7x10^{-6}$	$8.0x10^{-3}$	$2.0x10^{-6}$	$9.0x10^{-7}$	$2.6x10^{-4}$	$9.2x10^{-7}$
Risk (cancer fatality per year)	$4.6x10^{-8}$	$9.7x10^{-9}$	$5.6x10^{-8}$	$5.4x10^{-10}$	$1.3x10^{-11}$	$5.5x10^{-10}$
Population Within 80 Kilometers[b]						
Cancer fatalities[c]	$4.8x10^{-4}$	0.94	$5.2x10^{-4}$	$1.0x10^{-4}$	0.03	$1.1x10^{-4}$
Risk (cancer fatalities per year)	$1.3x10^{-5}$	$1.1x10^{-6}$	$1.5x10^{-5}$	$6.2x10^{-8}$	$1.5x10^{-9}$	$6.4x10^{-8}$

[a] Probability (increased likelihood of cancer fatality to a hypothetical member of the public located at the site boundary or to a noninvolved worker as a result of exposure to the indicated dose) if the accident occurred.

[b] For the offsite population of 285,409, the average probability of cancer fatality/risk of cancer fatality (per year) for the combined EBA and BEBA is $1.8x10^{-4}/5.3x10^{-11}$ and $2.1x10^{-10}/1.4x10^{-12}$ respectively, for the listed alternative(s), downsize weapons A/D and storage of plutonium strategic reserves.

[c] Number of cancer fatalities in the population out to 80 km (50 mi) as a result of exposure to the indicated dose if the accident occurs.

Note: All values are mean values; BEBA - beyond evaluation basis accidents; EBA - evaluation basis accidents.

Source: Results shown are derived from accident analyses (see appendix F).

tion. Any such impacts, however, would be bounded by the impacts of accidents associated with the downsize A/D and/or plutonium storage activities and are therefore not addressed further.

High Explosives Fabrication. A set of potential accidents has been postulated for the HE fabrication mission for which there may be hazardous effects that may impact onsite workers and the offsite population. The potential accidents analyzed are described in appendix F. The chemical accident impacts are shown in table 4.5.3.9–4.

In addition to the chemical accident impacts, the potential physical effects from a catastrophic explosion of the entire contents of a process-related building was also considered. This accident would have a probability of occurrence less than the explosion considered above (i.e., less than $1.0x10^{-6}$ per year). The quantity of HE detonated could range up to 2.4 t (2.6 tons); the blast pressure could result in death (up to 20 m [66 ft]), lung damage (20 to 40 m [66 to 131 ft]), thoracic injury (40 to 60 m [131 to 197 ft]), and eardrum rupture (60 to 80 m [197 to 262 ft]), depending on an individual's distance from the accident. Injuries could also be caused by glass breakage and building debris.

Storage of Plutonium Strategic Reserves. A set of potential accidents has been postulated for the storage of plutonium strategic reserves for which there may be releases of radioactive materials that may impact collocated onsite workers and the offsite population. The potential accidents analyzed are described in appendix F. The probability distribution showing the range of potential cancer fatalities that may result for the composite set of accidents identified in appendix F is shown in figure 4.5.3.9–1. For example, the probability that a plutonium storage accident causes more than one cancer fatality is approximately $5x10^{-9}$ per year.

The curve reflects the probability of the accidents occurring. The consequences of the composite set of accidents and their risks are shown in table 4.5.3.9–3.

TABLE 4.5.3.9–4.—*Impacts of High Explosives Fabrication Accidents at Pantex Plant*

Accident Description	Accident Frequency (Per Year)	TLV-TWA	Concentration to: Noninvolved Worker (mg/m³)	Concentration to: Individual at Site Boundary (mg/m³)	Potential Impacts of Exceeding: TLV-TWA Limits[a]
Fire and Release of Chemical TATB	0.01		3.0	0.87	Liver damage, cyanosis, sore throat, muscular pain, kidney damage, and anemia
Concentration[a] (mg/m³)		1.5			
Distances[b] (m)		1,500			
Area (m²)		$2.0x10^5$			
Population[c]		0			
Fire and Release of Chemical TNT	0.01		3.0	0.87	Liver damage, cyanosis, sore throat, muscular pain, kidney damage, and anemia
Concentration[a] (mg/m³)		0.5			
Distances[b] (m)		3,100			
Area (m²)		$7.4x10^5$			
Population[c]		0			
Explosion and Elevated Release of TATB	10^{-4} to 10^{-6}		6.4	3.2	Liver damage, cyanosis, sore throat, muscular pain, kidney damage, and anemia
Concentration[a] (mg/m³)		1.5			
Distances[b] (m)		180 to 3,500			
Area (m²)		$1.1x10^6$			
Population[c]		0			
Explosion and Elevated Release of TNT	10^{-4} to 10^{-6}		2.4	1.2	Liver damage, cyanosis, sore throat, muscular pain, kidney damage, and anemia
Concentration[a] (mg/m³)		0.5			
Distances[b] (m)		170 to 3,700			
Area (m²)		$1.2x10^6$			
Population[c]		0			

[a] NIOSH 1990a.
[b] From facility (downwind); exceedance begins at facility, 0 meters, unless indicated otherwise.
[c] Offsite individual exposed to concentration exceeding the limit.
Note: TLV - threshold limit value; TWA - time weighted average; TATB - triaminotrinitrobenzene; TNT - trinitrotoluene.
Source: Results derived from accident analysis (see appendix F).

If an accident were to occur, there would be an estimated 1.1×10^{-4} cancer fatalities in the population within 80 km (50 mi) of the site. A noninvolved worker located 1,000 m (3,281 ft) from the accident would have an increased likelihood of cancer fatality of 2.3×10^{-6}. A maximally exposed individual located at the site boundary would have an increased likelihood of cancer fatality of 9.2×10^{-7}. The risks for the combined EBA and BEBA composite set of accidents, reflecting both the probability of the accident occurring and the consequences, are also shown in table 4.5.3.9–3. For the same worker, the maximally exposed individual, and the population, the risks are 1.4×10^{-9}, 5.5×10^{-10}, and 6.4×10^{-8} cancer fatalities per year, respectively. Table 4.5.3.9–3 also shows the impacts for EBA and BEBA only.

Storage of Uranium Strategic Reserves. A set of potential accidents has been postulated for the storage of uranium strategic reserves for which there may be releases of radioactive materials or other hazardous effects that may impact collocated onsite workers and the offsite population. Any such impacts, however, are expected to be bounded by the impacts of accidents associated with A/D, or storage of strategic plutonium reserves at Pantex and are therefore not addressed further.

Phaseout of Assembly/Disassembly and High Explosives Fabrication. A phaseout of both the A/D and HE fabrication missions at Pantex would have the effect of eliminating any potential for accidents over the long term related to A/D and HE fabrication activities. However, there would be a potential for accidents during the phaseout process that could impact workers and the public. These potential accidents and their consequences are addressed in each affected facility's safety analysis report and/or safety documentation applicable to the phaseout process.

4.5.3.10 *Waste Management*

This section summarizes the impacts on waste management at Pantex under No Action and for each of the proposed alternatives. There is no spent nuclear fuel or HLW associated with weapons A/D (which includes nonintrusive modification pit reuse and storage of strategic reserves of plutonium and uranium) or HE fabrication. Table 4.5.3.10–1 lists the projected waste generation rates and treatment, storage, and disposal capacities under No Action. Projections for No Action are based on single-shift operations and were derived from 1994 environmental data, with appropriate adjustments made for those changing operational requirements where the volume of wastes generated are identifiable. The projection does not include waste from future, yet uncharacterized, environmental restoration activities.

Table 4.5.3.10–2 provides the total estimated operational waste volumes projected to be generated at Pantex as a result of the various alternatives. The net increase or decrease over No Action is provided below in parentheses. The waste volumes generated and the resultant waste effluent can be found in table 3.4.1.2–3 for A/D and table 3.4.5.2–3 for HE fabrication. Both tables are based on surge operations (three shifts). Facilities that would support the Stockpile Stewardship and Management Program would treat and package all waste generated into forms that would enable long-term storage and/or disposal in accordance with the *Atomic Energy Act*, RCRA, and other applicable statutes as outlined in appendix section H.1.2.

The movement of the strategic reserve pits at Pantex to another DOE site location (an alternative in the Storage and Disposition Program) would have no impact on waste management at Pantex because storage of strategic reserve pits generates minimal waste. Waste generated during transition activities to EM and D&D of strategic reserve storage facilities would be negligible.

No Action. Under No Action, LLW, mixed LLW, hazardous, and nonhazardous wastes would continue to be generated at Pantex from the missions described in section 3.2.5. Pantex could also store, over the long term, certain quantities of plutonium pits; however, no impact on waste management is expected since such storage generates minimal additional waste.

Compactible portions of solid LLW would continue to be processed at the onsite solid waste compaction facility. Mixed waste would be treated and disposed of according to the Pantex Site Treatment Plan that was developed in accordance with the *Federal Facility Compliance Act* of 1992. Although the predominant workload in 1994 was disassembly operations, the activities were assumed to be representative of projected A/D and HE levels that characterize No Action operations. It is expected that generation

TABLE 4.5.3.10–1.—*Projected Waste Management Under No Action at Pantex Plant* [Page 1 of 2]

Category	Annual Generation (m^3)	Treatment Method	Treatment Capacity (m^3/yr)	Storage Method	Storage Capacity (m^3)	Disposal Method	Disposal Capacity (m^3/yr)
Low-Level							
Liquid	8[a]	Solidification onsite pending	12	Staged for processing	Varies[b]	None	NA
Solid	32[a]	Compaction	168	Staged for shipment	Included in liquid low-level	Shipped offsite to NTS	NA
Mixed Low-Level							
Liquid	4[a]	None-onsite encapsulation pending	Planned	Staged for treatment in accordance with Pantex Site Treatment Plan	1,470[c]	None	NA
Solid	46[a]	Compaction and open burning (HE only)	Variable	Staged for treatment in accordance with Pantex Site Treatment Plan	Included in liquid mixed low-level	Offsite planned	NA
Hazardous							
Liquid[d]	2	Incineration (offsite)[e]	Variable	Staged for shipment	Included in liquid mixed low-level	Shipped offsite	NA
Solid	31	Open burning[e]	Variable	Staged for shipment	Included in liquid mixed low-level	Shipped offsite	NA
Nonhazardous (Sanitary)							
Liquid	141,000	Evaporation and filtration	898,000[f]	None	NA	Playa 1	898,000 [f]
Solid	339	Compaction	1,020	None	NA	Landfill (offsite)	NA

TABLE 4.5.3.10–1.—*Projected Waste Management Under No Action at Pantex Plant* [Page 2 of 2]

Category	Annual Generation (m^3)	Treatment Method	Treatment Capacity (m^3/yr)	Storage Method	Storage Capacity (m^3)	Disposal Method	Disposal Capacity (m^3/yr)
Nonhazardous (Other)							
Liquid	Included in liquid sanitary	Carbon absorption/ filtration	Included in liquid sanitary	None	NA	Playa 1 and 2	Included in liquid sanitary
Solid	Included in solid sanitary	Compaction	Included in solid sanitary	None	NA	Landfill (onsite) - construction debris only	Expandable

[a] Assuming 260 weapons/yr, estimate based on extrapolation of table 4.13.1.2–3 (PX DOE 1996b).
[b] Total amount of storage capacity available for LLW is a function of the percentage of total capacity currently occupied by hazardous wastes and mixed LLW.
[c] Operating capacity. Permitted storage can accommodate both LLW and mixed LLW.
[d] Includes solvent-contaminated wastewater, explosive-contaminated wastewater, and spent organic solvents contaminated with explosives.
[e] HE - contaminated wastes only. Open burning done in thermal treatment units on a per burn basis.
[f] Permit limit.
Note: NA - not applicable.
Source: PX 1995a:2; PX DOE 1995i; PX DOE 1996b.

TABLE 4.5.3.10–2.—***Estimated Annual Generated Waste Volumes for Stockpile Management Alternatives at Pantex Plant***

Category	No Action[a] (m^3)	Downsize Assembly/Disassembly and High Explosives Fabrication[b] (m^3)	Downsize Assembly/Disassembly[c] (m^3)	Phaseout of Assembly/Disassembly and High Explosives Fabrication (m^3)
Low-Level				
Liquid	8	<0.1 (-8)	<0.1 (-8)	None (-8)
Solid	32	21 (-11)	21 (-11)	None (-32)
Mixed Low-Level				
Liquid	4	<0.1 (-4)	<0.1 (-4)	None (-4)
Solid	46	Minimal (-46)	Minimal (-46)	None (-46)
Hazardous				
Liquid	2	2 (0)	2 (-0.2)	None (-2)
Solid	31	30 (-1)	<0.1 (-31)	None (-31)
Nonhazardous (Sanitary)				
Liquid	141,000	148,000 (+7,060)	141,000 (-59)	None (-141,000)
Solid	339	357 (+18)	340 (+1)	None (-339)
Nonhazardous (Other)				
Liquid	Included in liquid sanitary	Included in liquid sanitary	Included in liquid sanitary	Included in liquid sanitary
Solid	Included in solid sanitary	Included in solid sanitary	Included in solid sanitary	Included in solid sanitary

[a] No Action volumes are from table 4.5.3.10–1 and are based on single-shift operations.

[b] Waste volumes for the increment due to HE fabrication are from table 3.4.5.2–3 and are based on surge operations (three shifts), which were added to downsize A/D volumes.

[c] Waste generation volumes for the downsize A/D Facility are from table 3.4.1.2–3.

Note: Waste generated volumes were rounded to three significant figures. Waste effluent volumes (i.e., after treatment and volume reduction), which are used in the narrative description of the impacts, are also found in tables 3.4.5.2–3 and 3.4.1.2–3.

Source: Appendix A.

rates would decrease through waste minimization efforts.

Management Alternatives

Downsize Assembly/Disassembly and High Explosives Fabrication. Downsizing and consolidating the A/D Facility with HE fabrication would impact existing and planned Pantex waste management activities by decreasing the generation of low-level, mixed, and hazardous wastes. The amount of waste generated from storage of the strategic reserve of plutonium and HEU is minimal. Waste generated during construction activities to modify existing buildings would consist of wastewater, nonhazardous solids, and hazardous wastes. The nonhazardous wastes would be disposed of by the contractor, as part of the construction project. The hazardous wastes would be shipped to a commercial RCRA-permitted treatment and disposal facility.

Following treatment and volume reduction, approximately 10 m^3 (14 yd^3) of LLW from sanitized and demilitarized weapons parts, lead shielding, desiccants, foam, and residue from decontamination and cleaning operations would require disposal. Assuming a land usage of 6,000 m^3/ha (3,200 yd^3/acres), this would require approximately 0.002 ha/yr (0.004 acres/yr) of LLW disposal area at NTS. Assuming 16.6 m^3 (21.7 yd^3) of LLW per shipment, one additional shipment to NTS every 2 years would be required.

The small amount of mixed LLW waste contains hazardous constituents or is contaminated with HE and/or solvents. This mixed LLW could be treated and disposed of through the use of existing and planned facilities in accordance with the Pantex Site Treatment Plan. HE residual materials, such as bulk HE-machining scrap and off-spec HE components and HE-contaminated materials (e.g., gloves, wipes and rags) and process water generated during HE fabrication operations, are the source of most of the waste material that must be processed. Currently, thermal treatment of HE material and HE-contaminated materials is the preferred permitted technique used to dispose of and decontaminate solid materials. HE-contaminated process water, generated by synthesis and formulation processes, vacuum pump seal water, and HE machining processes is collected in tanks and then treated with activated carbon filters to remove residual HE solids and solvents. Waste minimization and recycling would be used to reduce the amount of material that ultimately must be subjected to waste treatment processes. Scrap HE material and HE-contaminated process water that are recycled are not considered waste and are handled as in-plant operations. Existing and planned facilities are adequate to handle the 2.3 m^3 (601 gal) of liquid and 30 m^3 (39 yd^3) of solid hazardous wastes.

Approximately 148,000 m^3 (39,100,000 gal) of liquid nonhazardous waste that includes sanitary, utility and process wastewaters, and cooling tower blowdown would be processed using existing and planned waste facilities. Following volume reduction, 178 m^3 (233 yd^3) of solid nonhazardous wastes such as clean nonplutonium metals, packing materials, office trash, defective and damaged equipment, and industrial waste from utility and maintenance operations would be shipped to the currently utilized offsite landfill.

Downsize Assembly/Disassembly. Downsizing and consolidating the A/D Facility would impact existing and planned Pantex waste management activities by decreasing the generation of low-level, mixed low-level, hazardous, and nonhazardous wastes. Waste generated during construction activities to modify existing buildings would consist of wastewater, nonhazardous solids, and hazardous wastes. The nonhazardous wastes would be disposed of by the contractor, as part of the construction project, and the hazardous wastes would be shipped to a commercial RCRA-permitted treatment and disposal facility.

The impacts for LLW and mixed LLW are identical to those described above. The 2 m^3 (540 gal) of liquid and 0.05 m^3 (0.07 yd^3) of solid hazardous wastes such as rags, wipes, and cleaning solvents would have no impact on waste management activities at Pantex. Approximately 141,000 m^3 (37,200,000 gal) of liquid nonhazardous waste that includes sanitary, utility and process wastewaters, and cooling tower blowdown would be processed using existing and planned waste facilities. Following volume reduction, 170 m^3 (222 yd^3) of solid nonhazardous waste would be shipped to a currently utilized offsite landfill.

The phaseout of the HE Fabrication Facility would only occur as a part of the downsize A/D alternative at Pantex. This would decrease the generation of low-level, mixed, hazardous, and nonhazardous wastes from operations. However, waste would be generated from D&D activities associated with the phaseout of the HE fabrication mission. Total waste volumes from these activities over a 6-year period are shown in table 4.5.3.10–3.

Liquid LLW would be generated during the characterization phase and decontamination phase of the D&D process. The decontamination wash process for sampling equipment, personnel protective equipment, other equipment, and facilities would be the major sources. The estimated volumes of waste would require additional treatment capacity at Pantex. The solid LLW would require approximately 579 shipments to NTS and 1.6 ha (4 acres) of disposal area at NTS. Mixed LLW would be managed in accordance with the Pantex Site Treatment Plan and might require additional onsite treatment to handle the waste volume from D&D activities. Hazardous wastes would be packaged and shipped offsite to

TABLE 4.5.3.10–3.—*Estimated Decontamination and Decommissioning Wastes at Pantex Plant*

Category	Phaseout of High Explosives Fabrication (m^3)	Phaseout of Assembly/Disassembly and High Explosives Fabrication (m^3)
Low-Level		
Liquid	1,000	1,700
Solid	9,600	16,700
Mixed Low-Level		
Liquid	2,400	4,200
Solid	23,900	41,700
Hazardous		
Liquid	13,600	21,000
Solid	143,200	220,000
Nonhazardous (Sanitary)		
Liquid	596,000	1,175,000
Solid	None	None
Nonhazardous (Other)		
Liquid	None	None
Solid	2,367,000	4,660,000

Note: Waste generation volumes have been rounded to three significant figures.
Source: PX 1995a:5.

RCRA-permitted facilities using DOT-certified transporters. Additional temporary storage capacity may be required. Liquid sanitary waste would be collected from all buildings by the existing underground sewer pipe system and routed to the sanitary wastewater sewer treatment system. Solid nonhazardous waste such as rock, brick, glass, dirt, and certain plastics and rubber would be sent offsite for disposal.

Phaseout of Assembly/Disassembly and High Explosives Fabrication. With the phaseout of the A/D and HE fabrication missions, approximately 1 m^3 (323 gal) of liquid and 19 m^3 (25 yd^3) of solid LLW, 0.14 m^3 (38 gal) of liquid and 4 m^3 (5 yd^3) of solid mixed LLW, and 2 m^3 (601 gal) of liquid and 31 m^3 (41 yd^3) of solid hazardous wastes would no longer be generated from operations. Liquid and solid nonhazardous waste would decrease over time as facilities are deactivated and employment decreases to a caretaker level. However, waste would be generated from D&D activities associated with the phaseout of the HE fabrication and assembly missions. Total waste volumes from these activities over a 6-year period are shown in table 4.5.3.10–3.

Liquid LLW would be generated during the characterization phase and decontamination phase of the D&D process. The decontamination wash process for sampling equipment, personnel protective equipment, other equipment, and facilities would be the major sources of waste. The estimated volume of waste would require additional treatment capacity at Pantex. The solid LLW would require approximately 1,006 shipments to NTS and 2.8 ha (6.9 acres) of disposal area at NTS. Mixed LLW would be managed in accordance with the Pantex Site Treatment Plan and might require additional onsite treatment to handle the volume from D&D activities. Hazardous wastes would be packaged and shipped offsite to RCRA-permitted facilities using DOT-certified transporters. Additional temporary storage capacity may be required. Liquid sanitary waste would be collected from all buildings by the existing underground sewer pipe system and routed to the sanitary wastewater sewer treatment system. Solid nonhazardous waste such as rock, brick, glass, dirt, and certain plastics and rubber would be sent offsite for disposal.

Sensitivity Analysis. The waste volumes generated from the downsized and consolidated A/D or the downsized and consolidated A/D and HE fabrication facilities required to support a larger stockpile level (high case), operating on a single-shift basis, are bounded by the base case under surge operations. There would be no additional waste management impacts associated with the A/D or A/D and HE Fabrication Facility that would support a high case stockpile operating at a single shift. The volumes generated from the A/D or A/D and HE fabrication facilities required to support a low case stockpile would be reduced by a factor of at least three.

Potential Mitigation Measures. Waste quantities or waste forms could undergo additional reductions by utilizing emerging technologies, thereby further reducing or mitigating impacts. Pollution prevention and waste minimization would be incorporated in the final actions of the Stockpile Stewardship and Management Program at Pantex.

4.5.3.11 *Environmental Justice*

As discussed in section 4.14, any impacts to surrounding communities would most likely result from toxic or hazardous air pollutants and radiological emissions. Section 4.5.3.9, which describes public and occupational health impacts from normal operation, shows that potential radiological and chemical air emissions and releases are lower than regulatory limits. However, the cumulative effect of continuous, (or intermittent over time) very low exposures could have some impact on human health or the environment. Any adverse human health or environmental impacts that may occur would affect people living within communities located near Pantex. The analysis of the demographics data presented in appendix D for the communities surrounding Pantex indicates that even if there were any adverse health impacts to these communities, they would not appear to disproportionately affect minority or low-income populations.

4.6 Los Alamos National Laboratory

LANL was established in 1943 and currently occupies approximately 11,300 ha (28,000 acres) near Los Alamos, NM, in support of missions as discussed in section 3.2.6. The DOE property boundaries for the site are illustrated in figure 4.6–1, and the technical areas (TA)s are illustrated in figure 4.6–2.

4.6.1 Description of Alternatives

There are no facilities at LANL that would be phased out as a result of any of the proposed alternatives discussed in this PEIS.

No Action. LANL would continue to perform the missions described in section 3.2.6.

Stockpile Management Alternatives. The pit fabrication and intrusive and nonintrusive modification pit reuse missions (referred to hereafter as pit fabrication), the secondary and case fabrication mission, the HE fabrication mission, and a portion of the nonnuclear fabrication mission could be located at LANL. The HE fabrication mission could also be shared with LLNL, and the nonnuclear fabrication mission could be shared with SNL and LLNL.

Stockpile Stewardship Alternatives. The proposed Atlas Facility would be located at LANL and the proposed National Ignition Facility (NIF) could be located at LANL.

4.6.2 Affected Environment

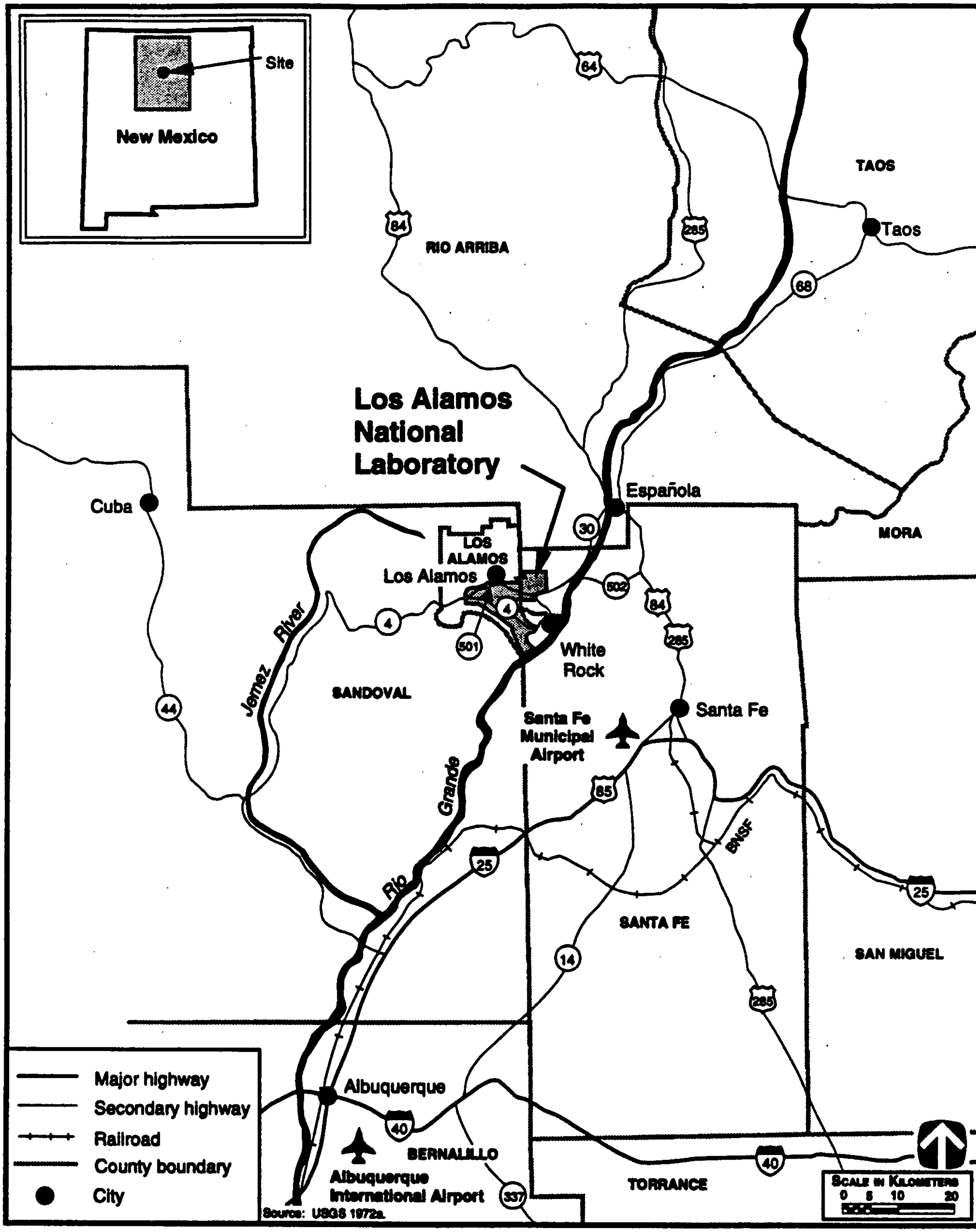
The following sections describe the affected environment at LANL for land resources, air quality, water resources, geology and soils, biotic resources, cultural and paleontological resources, and socioeconomics. In addition, the infrastructure, radiation and hazardous chemical environment, and waste management conditions at LANL are described.

4.6.2.1 *Land Resources*

LANL is located in north-central New Mexico, 97 km (60 mi) north-northeast of Albuquerque, 40 km (25 mi) northwest of Santa Fe, and 32 km (20 mi) southwest of Española in Los Alamos and Santa Fe Counties. The associated communities of Los Alamos and White Rock are in Los Alamos County. Figure 4.6–1 shows the geographical location of LANL. The 11,300-ha (28,000-acre) LANL site and adjacent communities are situated on the Pajarito Plateau, which consists of a series of finger-like mesas separated by deep canyons that run from the Jemez Mountains on the west toward the Rio Grande Valley on the east. Mesa tops range in elevation from approximately 2,400 m (7,800 ft) on the west to about 1,900 m (6,200 ft) on the east (LANL 1994a: II-1, II-2).

The developed acreage of LANL consists of 30 active TAs (see figure 4.6–2). The TAs potentially affected by the program are identified in figure 4.6–2. These TAs consist of laboratory facilities and support infrastructure. They account for only a small portion of the total land area at LANL. Most of LANL is undeveloped to provide security, safety, and expansion possibilities for future mission requirements. There are no agricultural activities present at LANL nor are there any prime farmlands. In 1977, DOE designated LANL as a National Environmental Research Park, which is used by the national scientific community as an outdoor laboratory to study the impacts of human activities on the pinyon-juniper woodland ecosystems (DOE 1985a:3,21).

Most developments within Los Alamos County are confined to mesa tops. Generalized land uses are shown in figure 4.6.2.1–1. The surrounding land is largely undeveloped with large tracts north, west, and south of the LANL site administered by the U.S. Forest Service (Santa Fe National Forest), the National Park Service (Bandelier National Monument), and Los Alamos County. The San Ildefonso Pueblo borders the LANL site to the east (LANL 1994a: II-1, II-2). The closest offsite residences to LANL are approximately 3 m (10 ft) from the northern boundary.



2883/SSM

FIGURE 4.6–1.—*Los Alamos National Laboratory, New Mexico, and Region.*

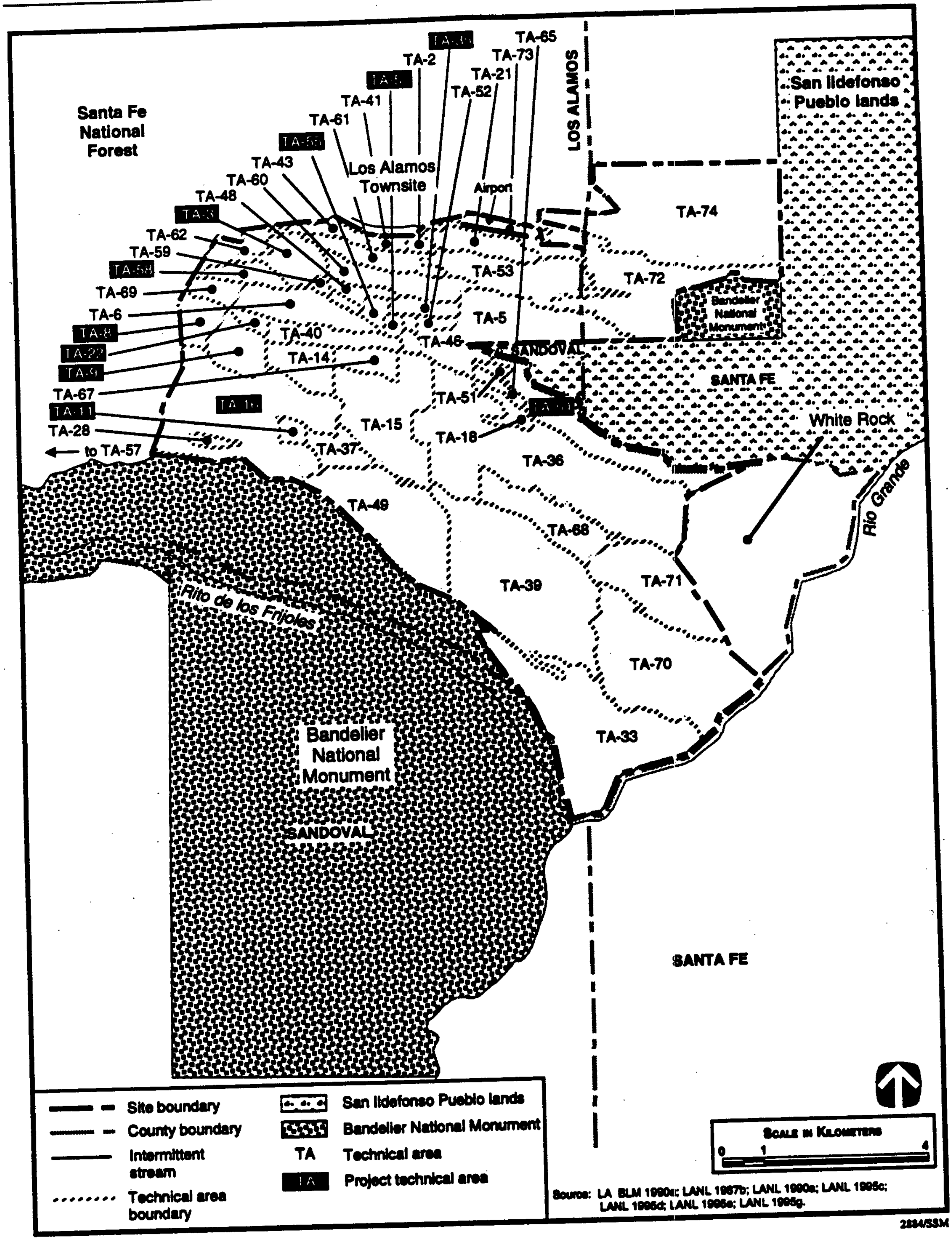


FIGURE 4.6–2.—*Technical Areas at Los Alamos National Laboratory.*

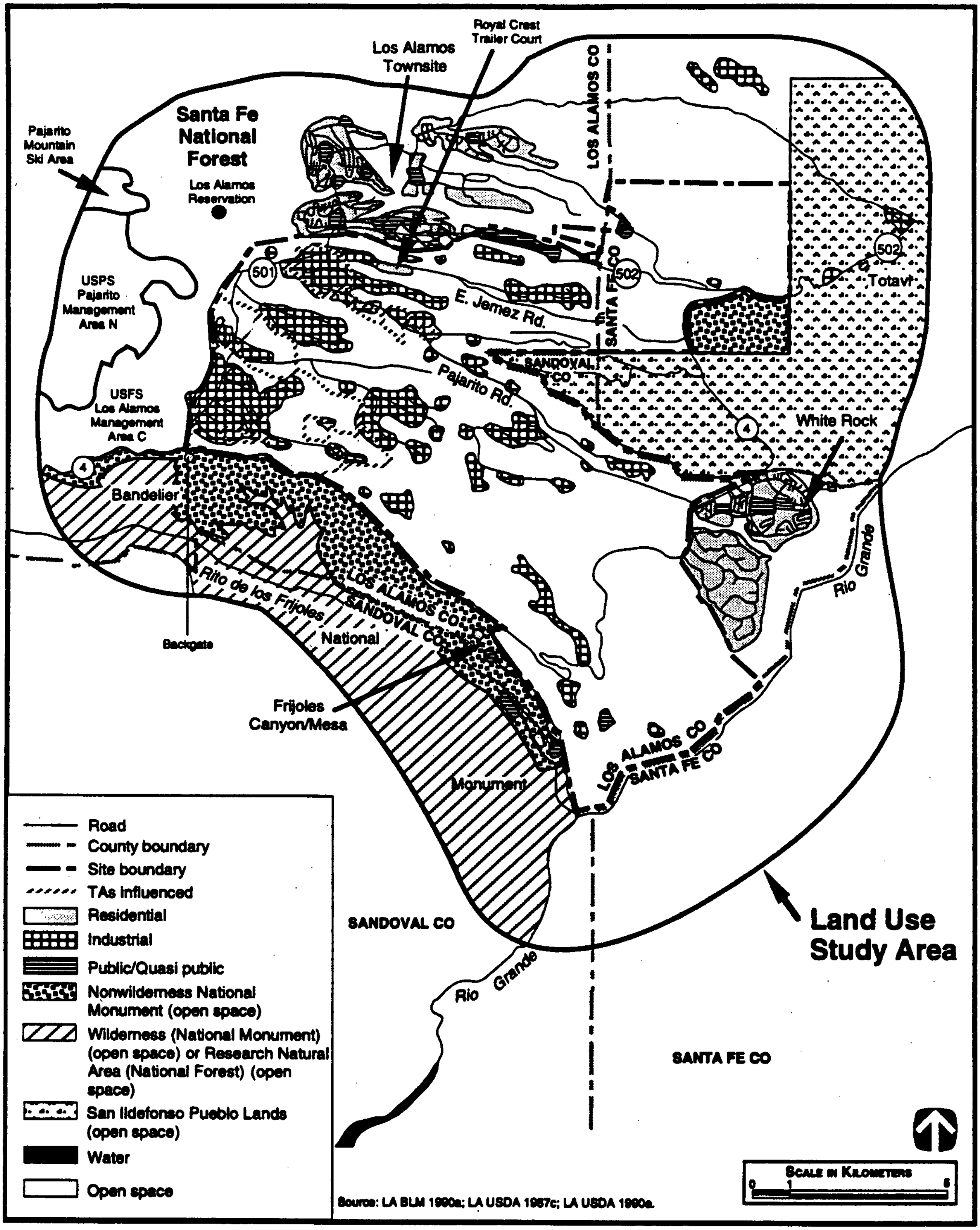


FIGURE 4.6.2.1–1.—*Generalized Land Use at Los Alamos National Laboratory and Vicinity.*

4.6.2.2 *Site Infrastructure*

Section 3.2.6 describes the current missions at LANL. To support these missions an infrastructure exists as shown in table 4.6.2.2–1.

TABLE 4.6.2.2–1.—*Baseline Characteristics for Los Alamos National Laboratory*

Characteristics	Current Value
Land	
Area (ha)	11,300
Roads (km)	250
Railroads (km)	0
Electrical	
Energy Consumption (MWh/yr)	381,425
Peak load (MWe)	87
Fuel	
Natural Gas (m^3/yr)	43,414,560
Liquid (L/yr)	0
Coal (t/yr)	0

Source: LANL 1995b:1.

4.6.2.3 *Air Quality*

The discussion of existing air quality includes a review of the meteorology and climatology in the vicinity of LANL. More detailed discussions of the air quality methodologies, input data, and atmospheric dispersion characteristics are presented in appendix section B.3.6.

Meteorology and Climatology. Los Alamos has a semiarid, temperate mountain climate. The climate averages for atmospheric variables such as temperature, pressure, moisture, and precipitation are based on observations made at the TA-59 LANL weather station from 1961 through 1993. The meteorological conditions described here are representative of conditions on the Pajarito Plateau at an elevation of approximately 2,250 m (7,400 ft) above sea level (LANL 1995s: II-8). In July, the average daily high temperature is 27.2 °C (81 °F), and the average nighttime low temperature is 12.8 °C (55 °F). The average January daily high is 4.4 °C (40 °F), and the average nighttime low is -8.3 °C (17 °F). The highest recorded temperature is 35 °C (95 °F), and the lowest recorded temperature is -27.8 °C (-18 °F). The large daily range in temperature of approximately 13 °C (23 °F) results from the site's relatively high elevation and dry, clear atmosphere, which allows high insolation during the day and rapid radiative losses at night (LANL 1995s: II-8).

The average annual precipitation is 47.6 cm (18.7 in) but is quite variable from year to year. The lowest recorded annual precipitation is 17.3 cm (6.8 in), and the highest is 77 cm (30.3 in). The maximum precipitation recorded for a 24-hour period is 8.8 cm (3.5 in) (LANL 1995s:II-11.) Because of the eastward slope of the terrain, there is a large east-to-west gradient in precipitation across the plateau. White Rock often receives about 13 cm (5 in) less annual precipitation than the TA-59 weather station, and the eastern flanks of the Jemez Mountains often receive about 13 cm (5 in) more (LANL 1994a:II-11).

Los Alamos winds are generally light, averaging 2.8 m/s (6.3 mph). Strong winds are most frequent during the spring when peak gusts often exceed 22 m/s (50 mph). The highest recorded wind gust was 34.4 m/s (77 mph). The semiarid climate promotes strong surface heating by day and strong radiative cooling by night. Because the terrain is complex, heating and cooling rates are uneven over the LANL area, which results in local thermally generated winds (LANL 1995s:II-11).

Ambient Air Quality. LANL is located within the New Mexico Intrastate AQCR 157. None of the areas within LANL and its surrounding counties are designated as nonattainment areas with respect to any of the NAAQS (40 CFR 81.332). A nonattainment area is an area that has air quality worse than designated by NAAQS for one or more criteria pollutants. Applicable NAAQS and New Mexico State ambient air quality standards are presented in appendix table B.3.1–1.

The criteria pollutants—nitrogen dioxide, carbon monoxide, hydrocarbons, particulate matter, and sulfur dioxide—make up approximately 79 percent of the stationary source emissions at LANL. The source of these criteria pollutants is combustion in power plants, steam plants, asphalt plants, and local space heaters. Toxic and other hazardous pollutants represent the remaining 21 percent of emissions from stationary sources at LANL. These emissions are generated by equipment surface cleaning, coating processes, and acid baths, and include gases, vapors, metal dusts, and miscellaneous emissions such as wood dust, hazardous gases, and plastics (LANL 1994a:VI-3, VII-1).

One Prevention of Significant Deterioration Class I Area, the Bandelier National Monument's Wilderness Study Area, borders LANL to the south. To date, LANL has not been subject to Prevention of Significant Deterioration requirements (LANL 1993b:III-20).

Ambient concentration limits for hazardous/toxic air pollutants (to be used by the state as one of the criteria in evaluating construction permit applications for a new emission source) have been approved by the New Mexico Environmental Improvement Board. The estimated 2005 No Action annual emission rates from LANL facilities are listed in appendix table B.3.6–1. Estimates of maximum ground-level concentrations at or beyond the LANL boundary are listed in table 4.6.2.3–1. Concentrations of criteria and hazardous/toxic air pollutants are in compliance with applicable guidelines and regulations. The hazardous/toxic air pollutant limits are one-hundredth of the recognized occupational exposure levels (e.g., 8-hour time-weighted threshold limit values).

Table 4.6.2.3–1 presents the baseline ambient air concentrations for criteria pollutants for 1992 and other pollutants of concern for 1990 at LANL. As shown in the table, baseline concentrations are in compliance with applicable guidelines and regulations.

4.6.2.4 *Water Resources*

This section describes the surface and groundwater resources at LANL.

Surface Water. The Rio Grande is the major surface water feature in north-central New Mexico. All surface water drainage and groundwater discharge from the Pajarito Plateau ultimately arrives at the Rio

TABLE 4.6.2.3–1.—*Comparison of Baseline Ambient Air Concentrations with Most Stringent Applicable Regulations and Guidelines at Los Alamos National Laboratory, 1990 and 1992* [Page 1 of 2]

Pollutant	Averaging Time	Most Stringent Regulation or Guideline (μg/m^3)	Baseline Concentration (μg/m^3)
Criteria Pollutant			
Carbon monoxide	8-hour	7,689[c]	115
	1-hour	11,578[c]	630
Lead	Calendar quarter	1.5[a]	[b]
Nitrogen dioxide	Annual	73[c]	3.8
	24-hour	145[c]	[b]
Ozone	1-hour	235[a]	139
Particulate matter[d]	Annual	50[a]	8
	24-hour	150[a]	21
Sulfur dioxide	Annual	40[c]	1.3
	24-hour	202[c]	[b]
	3-hour	1,300[a]	[b]
Mandated by New Mexico			
Hydrogen sulfide	1-hour	11[c]	[b]
Total reduced sulfur	30-minute	3[c]	[b]
Total suspended particulate[d]	Annual	60[c]	8
	30-day	90[c]	<21
	7-day	110[c]	<21
	24-hour	150[c]	21

TABLE 4.6.2.3–1.—*Comparison of Baseline Ambient Air Concentrations with Most Stringent Applicable Regulations and Guidelines at Los Alamos National Laboratory, 1990 and 1992* [Page 2 of 2]

Pollutant	Averaging Time	Most Stringent Regulation or Guideline (μg/m^3)	Baseline Concentration (μg/m^3)
Hazardous and Other Toxic Compounds[e]			
Acetic acid	8-hour	250[c]	2.87
Ammonia	8-hour	180[c]	4.27
2-Butoxyethanol	8-hour	1,200[c]	0.66
Chlorine	8-hour	f	0.07
Chloroform	8-hour	500[c]	2.61
Ethyl acetate	8-hour	14,000[c]	0.44
Ethylene glycol	8-hour	f	0.39
Formaldehyde	8-hour	15[c]	0.24
Heavy metals	8-hour	f	0.62
Heptane (n-heptane)	8-hour	f	9.06
Hexane (n-hexane)	8-hour	f	0.41
Hydrogen chloride	8-hour	f	3.41
Hydrogen fluoride	8-hour	f	1.29
Isopropyl alcohol	8-hour	9,800[c]	2.88
Kerosene	8-hour	f	1.27
Methyl alcohol	8-hour	f	3.14
Methyl ethyl ketone	8-hour	f	9.95
Methylene chloride	8-hour	f	5.90
Nickel	8-hour	10[c]	0.27
Nitric acid	8-hour	50[c]	3.53
Nitrogen oxide	8-hour	f	2.29
Nonmethane hydrocarbons	8-hour	f	15.83
Propane sultone	8-hour	400[c]	1.00
Stoddard solvent	8-hour	5,250[c]	1.41
Toluene	8-hour	f	13.2
1,1,2-Trichloroethane	8-hour	f	4.95
Trichloroethylene	8-hour	f	1.12
Tungsten (as W)	8-hour	50[c]	0.53
VM&P Naphtha	8-hour	13,500[c]	3.27
Welding fumes	8-hour	f	2.8
Xylene	8-hour	f	9.41

[a] Federal standard.
[b] No monitoring data available; baseline concentrations assumed less than applicable standard.
[c] State standard. The conversion from ppm to μg/m^3 for the ambient air quality standard is calculated with the corrections for temperature (530 °R) and pressure (elevation) 7,400 ft mean sea level.
[d] It is assumed that all particulate matter concentrations are total suspended particulate concentrations.
[e] Compounds listed are the major pollutants (11.34 kg/yr or more) of concern.
[f] No standard.
Source: 40 CFR 50; DOE 1995hh; LANL 1993b; LANL 1994a; NM EIB 1995a; NM EIB 1996a.

Grande. The Rio Grande at Otowi, just east of Los Alamos, has a drainage area of 37,037 square kilometers (km^2) (14,300 square miles [mi^2]) in southern Colorado and northern New Mexico (DOE 1995hh:4-26).

The major canyons that contain reaches of ephemeral streams inside LANL are Pajarito, Water, Ancho, and Chaquehui Canyons (figure 4.6.2.4–1) (DOE 1995hh:4-26).

Ephemeral streams in the lower portions of Ancho and Chaquehui Canyons extend to the Rio Grande without being depleted. In lower Water Canyon, the ephemeral stream is very short and does not extend to the Rio Grande. In Pajarito Canyon, Homestead Spring feeds an ephemeral stream 2- to 3-miles long (DOE 1995hh:4-26).

Springs between 2,408- and 2,713-m (7,900- and 8,900-ft) elevation on the eastern slope of the Jemez Mountains supply base flow throughout the year to the upper reaches of Cañon de Valle, Los Alamos, Pajarito, and Water Canyons. These springs discharge water perched in the Bandelier Tuff and Tschicoma Formation at rates from 0.0001 to 0.0085 m^3/s (0.0035 to 0.30 ft^3/s). The volume of flow from the springs is insufficient to maintain surface flow within more than the western third of the canyons before it is depleted by evaporation, transpiration, and infiltration (DOE 1995hh:4-26).

Eleven drainage areas, with a total area of 212 km^2 (82 mi^2) pass through the eastern boundary of LANL. Runoff from heavy thunderstorms and heavy snowmelt reaches the Rio Grande several times a year from some drainages. Los Alamos, Pajarito, and Water Canyons have drainage areas greater than 26 km^2 (10 mi^2). Pueblo Canyon has a drainage area of 21 km^2 (8 mi^2), while all others have less than 13 km^2 (5 mi^2). The overall flood risk to LANL is low because nearly all the structures are located on the mesa tops, from which runoff drains rapidly into the deep canyons (DOE 1995hh:4-26). The hydrological features at LANL are depicted in figure 4.6.2.4–1. No surface water is withdrawn at LANL for either drinking water or facility operations (DOE 1993j:4-76).

Los Alamos, Sandia, and Mortandad Canyons currently receive treated-industrial or sanitary effluent. Pueblo Canyon does not receive LANL effluents. Surface waters in these canyons are not a source of municipal, industrial, or agricultural water supply. Several times during the year heavy precipitation or snowmelt would cause waters from Pueblo, Los Alamos, or Sandia Canyons to extend beyond LANL boundaries and reach the Rio Grande (LANL 1995s:2-7).

In Mortandad Canyon, no surface runoff to LANL's boundary has occurred since studies were initiated in 1960. Pueblo Canyon received both untreated and treated industrial effluents from 1944 to 1964. It currently receives treated sanitary effluents from Los Alamos County treatment plants in its upper and middle reaches (DOE 1993j:4-76).

Existing wastewater generation from LANL is approximately 693 MLY (183 MGY) (DOE 1993j:4-76). Permitted effluent discharges at LANL emerge from 2 sanitary wastewater treatment facilities and 130 industrial outfalls. These outfalls include power plant discharges (1 outfall), boiler blowdown (2 outfalls), treated cooling water (38 outfalls), noncontact cooling wastewater (51 outfalls), radioactive waste treatment plant (1 outfall), HE wastewater (21 outfalls), photographic laboratory rinse wastewater (13 outfalls), printed circuit board process wastewater (1 outfall), and sanitary wastewater (2 outfalls) (LANL 1995s:D-3).

Surface Water Quality. The 1993 surface water quality monitoring results for the five onsite canyons are presented in table 4.6.2.4–1. The overall compliance for sanitary and industrial discharges during 1993 was 100 percent and 99.1 percent, respectively.

Water Rights and Permits. Water rights in New Mexico fall under the Doctrine of Prior Appropriations. Under this doctrine, the user who first appropriated water for a beneficial use has priority to use available water supply over a user claiming rights at a later time. All natural water flowing in streams and water courses in New Mexico is considered to be public and subject to appropriation for beneficial use. Beneficial use is the basis, measure, and limit of the right to use water. No water right, therefore, may be granted or claimed for more than the amount that can be beneficially used. DOE owns combined surface and groundwater rights. These rights include the withdrawal of 5,541.3 acre-ft/yr from a variety of

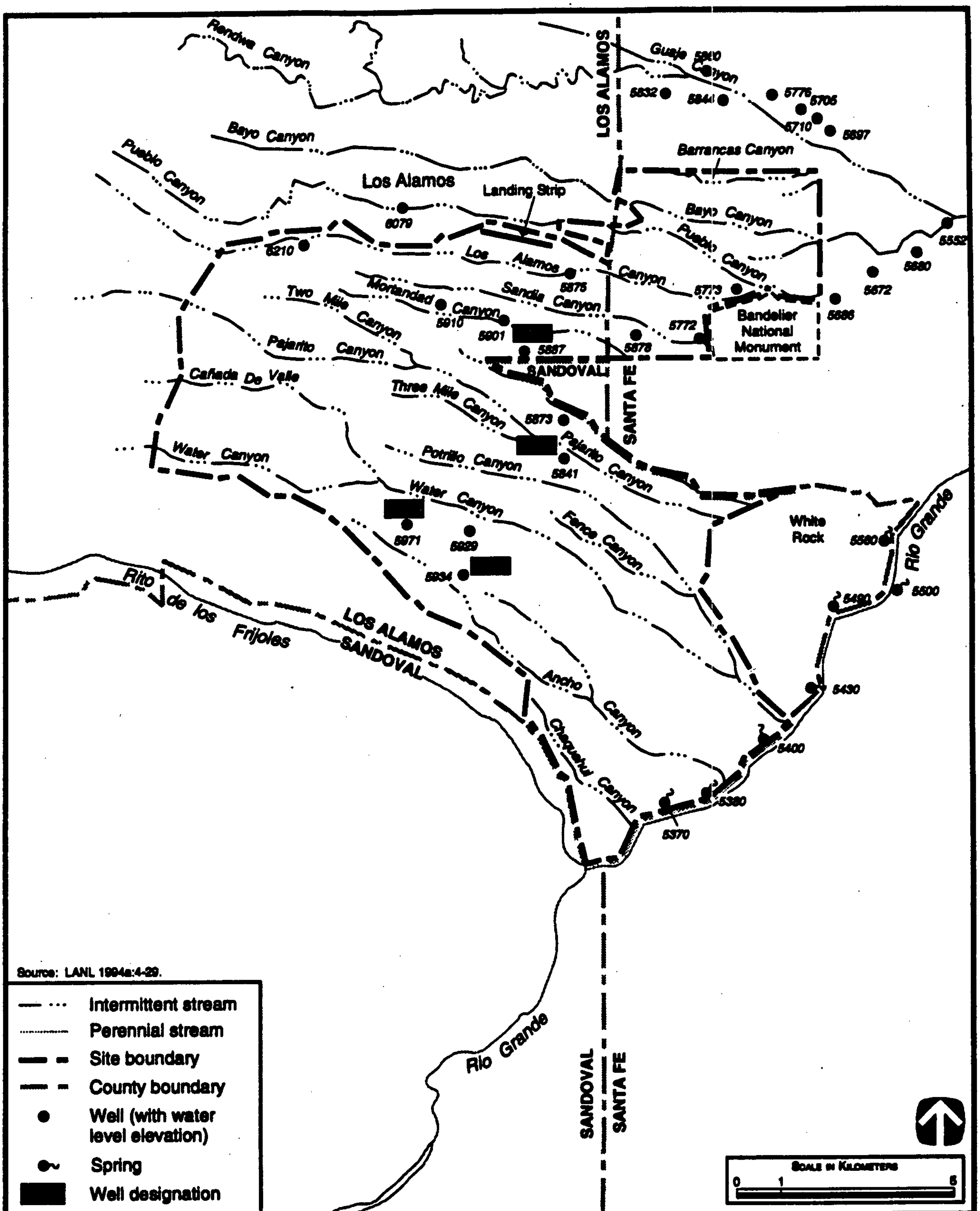


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Figure 4.6.2.4–1.—*Surface Water Features Near Los Alamos National Laboratory.*

TABLE 4.6.2.4–1.—*Surface Water Quality Mor g at Los Alamos National Laboratory, 1992*

Parameter	Unit of Measure	Water Quality Criteria[a]	Pajarito Canyon[b]	Acid-Pueblo Canyon[c]	DP Canyon[d]	Sandia Canyon[e]	Mortandad Canyon[f]
Radiological							
Cesium-137	pCi/L	120[g]	1.0 (1.5)	2.3 (1.3)	3.0 (1.3)	3.0 (1.2)	NA
Plutonium-238	pCi/L	1.6[g]	0.005(0.042)	0.019 (0.030)	0.036 (0.030)	0.004 (0.030)	0.748 (0.058)
Plutonium-239,-240	pCi/L	1.2[g]	0.006(0.028)	0.006 (0.020)	0.118 (0.024)	0.012 (0.020)	0.493 (0.046)
Strontium-90	pCi/L	400[g]	0(0.7)	2.2 (0.7)	0 (0)	1.0 (0.9)	33.7 (2.2)
Tritium	pCi/L	80,000[g]	600 (400)	600 (300)	800 (300)	600 (300)	13,100 (1,100)
Uranium	μg/L	20[h]	<0.2 (0)	<1.0 (0)	<1.0 (0)	<1.0 (0)	N/A
Nonradiological							
Bicarbonate	mg/L	NA	68	141	138	146	138
Calcium	mg/L	NA	28	.15	36	22	38
Carbonate	mg/L	NA	<5	<5	<5	<5	<5
Chloride	mg/L	250[i]	58	34	111	70	9
Fluoride	mg/L	2.0[i],4.0[j]	0.1	0.4	0.7	0.9	0.6
Magnesium	mg/L	NA	7.1	2.6	2.5	4.6	3.5
Nitrate	mg/L	10.0[j]	0.04	4.53	<0.04	2.8	18
pH	pH units	6.8-8.5[i]	7.9	7.3	7.8	8.6	8.2
Phosphorous	mg/L	NA	0	5.3	0.1	2.5	0.6
Potassium	mg/L	NA	5	N/A	7	N/A	5
Sodium	mg/L	NA	28	40	87	110	60
Sulfate	mg/L	250[i]	13	23	12	100	9
Total dissolved solids	mg/L	500[i]	228	404	356	558	302
Total hardness as $CaCO_3$	mg/L	NA	106	55	104	72	110

[a] For comparison purposes only.
[b] Mean of multiple samples.
[c] Surface water is monitored at two location in Acid-Pueblo Canyon. The monitoring results presented are from Pueblo 3.
[d] Two locations are normally monitored in Los Alamos Canyon; however, one location was dry at the time of sampling. Results are reported for location DPS-1.
[e] Three locations are monitored in Sandia Canyon. The monitoring results presented are from the sampling location with the highest concentration of the given parameter.
[f] Only one location in Mortandad Canyon is sampled (GS-1).
[g] DOE Derived Concentration Guides for drinking water (DOE Order 5400.5). Values are based on a committed effective dose of 100 mrem per year; however, because the drinking water Maximum Contaminant Level is based on 4 mrem per year, the number listed is 4 percent of the Derived Concentration Guide. All concentrations of radionuclides are determined by subtracting the instrument background environmental level from the monitored concentrations. A negative or zero incremental concentration means that the concentration at the sampling location is equivalent to the environmental level and that there is no significant impact from the facility.
[h] Proposed National Primary Drinking Water regulation (56 FR 33050).
[i] National Secondary Drinking Water regulation (40 CFR 143).
[j] National Primary Drinking Water regulation (40 CFR 141).
Note: NA - not applicable; N/A - not analyzed; radioactive counting uncertainties (± standard deviation) are shown in parentheses.
Source: LANL 1995s.

wells and surface diversions under licenses RG–485 through RG–488, 1503, 1802, and 1802–B. DOE also owns a contract for 1,200 acre-ft/yr (1,480 MLY) of San Juan/Chama Diversion water.

Groundwater. Groundwater in the LANL area exists in three modes—in shallow alluvium in canyons, perched groundwater and in the main aquifer. The main aquifer consists mostly of clastic sediments within the Santa Fe Group and the Puye Formation. Nearly all groundwater at LANL is obtained from deep wells that produce water from this aquifer. A minor amount of groundwater at LANL is obtained from springs. Most aquifers that lie beneath LANL, with the exception of perched zones, are considered Class II aquifers, having current sources of drinking water and other beneficial uses (DOE 1993j:4-77).

The Santa Fe Group consists of, in ascending order, the Tesuque Formation, Puye Conglomerate, and basaltic rocks of Chino Mesa. The Tesuque Formation contains thin, jointed, interbedded basalt flows that may yield large amounts of water. Some units have lower permeabilities that restrict the movement of water within the formation. The Puye Conglomerate overlies the Tesuque Formation and is highly permeable. When saturated, it yields large amounts of water to wells (LANL 1984a:3).

The depth to the top of the aquifer ranges from about 366 m (1,200 ft) on the west to about 183 m (600 ft) on the east (LANL 1984a:8). The total saturated thickness penetrated by production wells ranges up to approximately 518 m (1,700 ft). The most productive area lies in the central portion of the Pajarito Plateau and includes the Pajarito well field. The average drawdown for these wells is 12 m (39.4 ft). The rate of movement of water in the aquifer is approximately 12 to 29 m (39.4 to 95.1 ft) per year (LANL 1984a:7,8).

Groundwater Quality. Most of the wells in the Pajarito Plateau yield fresh water (total dissolved solids less than 500 mg/L), although some wells east of the site have a higher total dissolved solids content (1,000 mg/L or more). The primary, secondary, and radiochemical groundwater quality, as measured from wells and springs in the main aquifer were below the DOE derived concentration guides or the New Mexico standards applicable to a DOE drinking water system (DOE 1993j:4-77). As shown in table 4.6.2.4–2, all parameters were below the applicable water quality criteria or standard in the main aquifer in 1993.

Groundwater Availability and Use. LANL, the nearby communities of Los Alamos and White Rock, and Bandelier National Monument are entirely dependent on groundwater for their water supply. The water supply is primarily obtained from well fields. During 1993, total production from the wells for potable and nonpotable use was 5,519 MLY (1,458 MGY) (LANL 1995r:4). LANL's water system had an average demand equal to about 81 percent of its current allotment of 6,800 MLY (1,800 MGY).

Two new wells have been drilled recently at LANL, one of which began pumping in the summer of 1992. The new wells are expected to supplant the now abandoned Los Alamos field. Water is taken from depths of 245 to 550 m (804 to 1,805 ft).

Over the next 50 years, increases in water use may require one of the following: use of the 1,500 MLY (396 MGY) of San Juan-Chama water (releasing the water in exchange for excess pumping) and/or establishment of credit for return flow (DOE 1993j:4-79).

Based on No Action projections, the net growth in overall use is about 0.4 percent per year. Based on this growth rate, the present allotment would be fully used by about 2052. If San Juan-Chama water is added, the limit to the total available supply would be reached by about 2072.

4.6.2.5 *Geology and Soils*

Geology. LANL is located on the Pajarito Plateau. The surface of the plateau is dissected by deep, southeast-trending canyons separated by long, narrow mesas. The Pajarito Plateau is capped by the Bandelier Tuff, a geologic unit comprising a massive pumiceous tuff breccia of ash-flow origin and a succession of cliff-forming welded ash flows. The tuff is underlain by sedimentary and volcanic rocks of the Santa Fe Group (LA DOE 1979a:3-9).

LANL lies within seismic Zone 2 (appendix figure A.1–1). The strongest earthquake in the last 100 years within an 80-km (50-mi) radius was estimated to have a magnitude of 5.5 to 6 and a modified Mercalli intensity of VII. Studies suggest

TABLE 4.6.2.4–2.—*Groundwater Quality Monitoring at Los Alamos National Laboratory, 1993*

Parameter	Unit of Measure	Water Quality Criteria and Standards[b]	1993 Existing Conditions[a]			
			Test Well DT-9	Test Well DT-5A	Water Supply Well PM-5	Water Supply Well PM-2
Radiological						
Cesium-137	pCi/L	120[c]	2.1 (1.2)	2.3 (1.4)	0.2 (0.5)	1.4 (1.2)
Plutonium-238	pCi/L	1.6[c]	-0.014 (0.030)	-0.014(0.030)	<0.1 (0)	0.004 (0.030)
Plutonium-239, -240	pCi/L	1.2[c]	0.008 (0.030)	0.032(0.030)	0.03 (0.03)	0.127 (0.024)
Tritium	pCi/L	80,000[c]	300 (300)	400 (300)	400 (300)	500 (300)
Uranium, total	μg/L	20[d]	<2.0 (0)	<2.0 (0)	<1.0 (0)	<1.0 (0)
Nonradiological						
Chloride	mg/L	250[e]	2	2	4	2
Fluoride	mg/L	2.0[e], 4.0[f]	0.3	0.3	0.3	0.2
Nitrate	mg/L	10[f]	0.32	0.44	0.10	<0.04
pH	pH units	6.8-8.5[e]	8.2	8.0	7.6	8.2
Sulfate	mg/L	250[e]	3	3	3	4
Total dissolved solids	mg/L	500[e]	112	104	320	136

[a] All data come from groundwater from onsite stations. Samples were collected in 1993.
[b] For comparison purposes only.
[c] DOE Derived Concentration Guides for drinking water (DOE Order 5400.5). Values are based on a committed effective dose of 100 mrem per year. However, because the drinking water maximum contaminate level is based on 4 mrem per year, the number listed is 4 percent of the Derived Concentration Guide.
[d] Proposed National Primary Drinking Water Regulation (56 FR 33050).
[e] National Secondary Drinking Water regulation (40 CFR 143).
[f] National Primary Drinking Water regulations (40 CFR 141).
Note: Well locations are shown in figure 4.6.2.4–1; Parentheses ( ) indicate standard error of the mean.
Source: LANL 1995s.

that several faults have produced seismic events with a magnitude of 6.5 to 7.8 in the last 500,000 years (LANL 1987c:ix). LANL operates a seismic hazards program which monitors seismicity through a seismic network and conducts studies in paleoseismology. Major faults at LANL include the Pajarito, Rendija Canyon, and Guaje Mountain faults (figure 4.6.2.5–1). The Guaje Mountain fault had movement on it between 4,000 and 6,000 years ago. There is no evidence of movement along the Pajarito fault system during historical times (DOE 1995hh:4-19). The 100-year earthquake at Los Alamos is regarded as having a magnitude of 5, with an event of magnitude 7 being the maximum credible earthquake. These values are currently used in design considerations at LANL (LANL 1987c:43,53,54,58).

Geological concerns associated with the LANL area include potential downslope movements in association with regional seismic activity. Although isolated rockfalls commonly occur from the canyon rims, landslides are an unlikely hazard at Los Alamos because of the dry climate, deep water table, and the rock characteristics. Although the area has the potential for future volcanic eruptions, the periodicity and structural development of past eruptions indicate a very low probability of an event occurring within the next 1,000 years (LA DOE 1979a:3-17).

Soils. LANL is underlain by soil types varying in texture from clay and clay loam to gravel. Over 95 percent of the soils are developed on acidic volcanic rocks (LANL 1978a:6,7). Because of the topographic relief of the Pajarito Plateau, rock outcrops occur on greater than 50 percent of the site area.

Water and wind erosion of these soils varies from slight to severe depending on slope, soil grain size, amount of disturbance, and degree of protection. Shrink-swell potential ranges from low to high, correlating with the amount of swelling clays present (LANL 1978a:80). The soils are acceptable for standard construction techniques. No soils in Los Alamos County have been designated prime farmland or Soil of Statewide Importance for New Mexico.

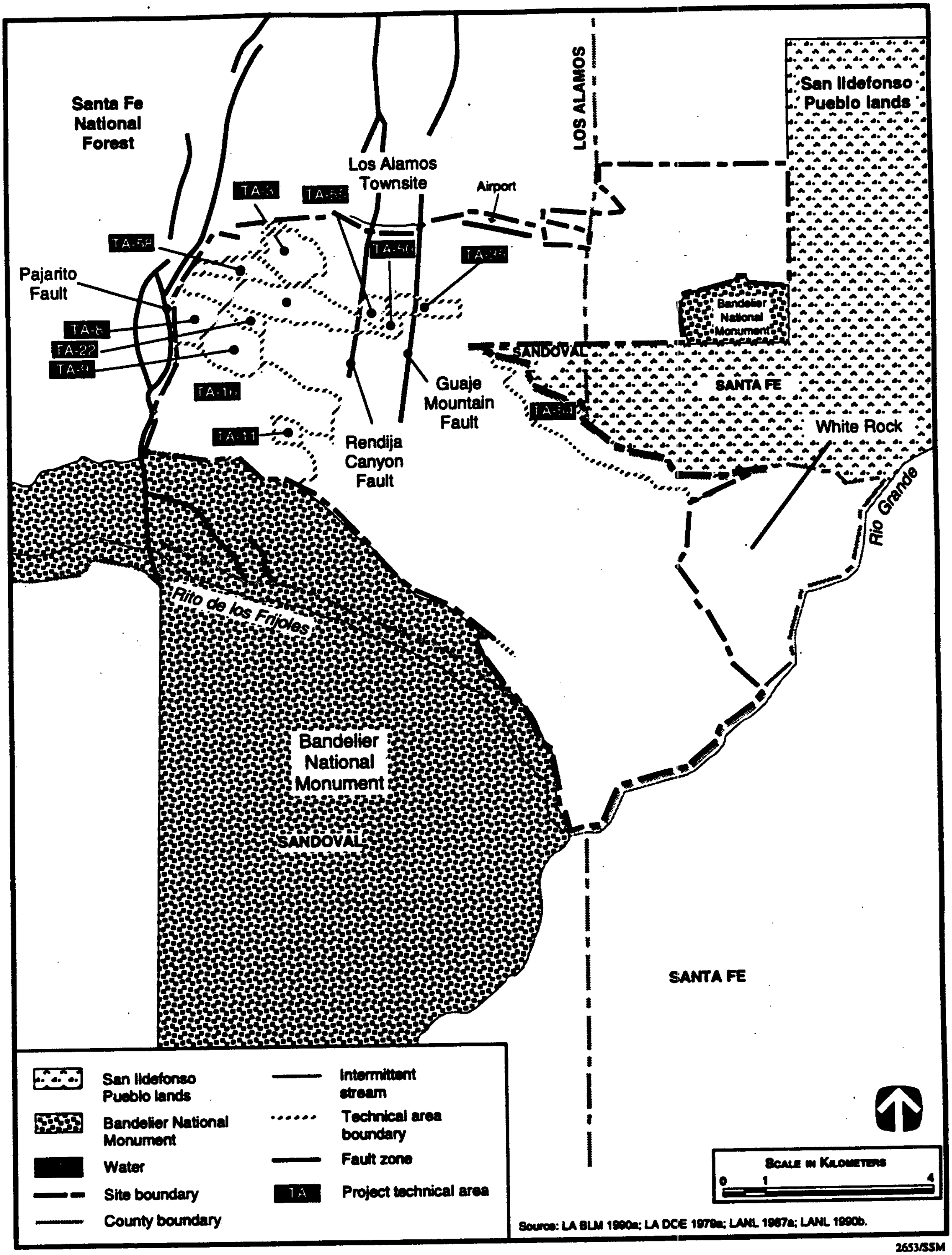


FIGURE 4.6.2.5–1.—*Major Fault Systems Near the Los Alamos National Laboratory Region.*

4.6.2.6 *Biotic Resources*

The following section describes biotic resources at LANL including terrestrial resources, wetlands, aquatic resources, and threatened and endangered species. A list of threatened and endangered species that may exist on or near LANL is presented in appendix C.

Terrestrial Resources. LANL lies within the Colorado Plateau Province. Ecosystems within the laboratory site itself are quite diverse due partly to the 1,500-m (5,000-ft) elevational gradient from the Rio Grande on the southeastern boundary to the Jemez Mountains, 20 km (12.4 mi) to the west, and to the many canyons with abrupt slope changes that dissect the site. Only a small portion of the total land area at LANL has been developed. The remaining land has been classified into six major vegetative communities as shown in figure 4.6.2.6–1. Within LANL, the predominant community types are juniper grassland in the eastern one-third, pinyon-juniper in the central one-third, and ponderosa pine in the western one-third. The juniper-grassland community is found along the Rio Grande on the eastern border of the Pajarito plateau and extends upward on the south-facing sides of the canyons at 1,700 to 1,900 m (5,600 to 6,200 ft). The pinyon-juniper community, generally found in the 1,900- to 2,100-m (6,200- to 6,900-ft) elevation range, includes large portions of the mesa tops and north-facing slopes at the lower elevations. The ponderosa pine community is found in the western portion of the plateau and on mesa tops in the 2,100- to 2,300 m (6,900- to 7,500-ft) elevation range. Coniferous trees are the dominant vegetation in the LANL environs, with pinyon pine (*Pinus edulis*) and one-seed juniper (*Juniperus monosperma*) predominant below 2,100 m (6,900 ft), and ponderosa pine (*Pinus ponderosa*) and Douglas fir (*Pseudotsuga menziesii*) predominant above that elevation (DOE 1995hh:4-39-4-42). Almost 350 vascular plant species have been found, or are likely to be found, on LANL (LA DOE 1979a:3-39).

Terrestrial animal species that can be found on or near LANL include 1 amphibian, 9 reptile, 189 bird, and 45 mammal species (LA DOE 1979a:3-46, C-1 to C-3). Undeveloped areas within LANL provide habitat for a diversity of terrestrial wildlife. Species lists have been compiled from observational data and published data, but the occurrence of some species has not been verified (LANL 1995i:f-1). Among vertebrates, the collared lizard (*Crotaphytus collaris*), eastern fence lizard (*Sceloporus undulatus*), and whiptail lizard (*Cnemidophorus spp.*) are some of the reptiles found at LANL. Typically, these are found at elevations between 1,910 and 2,134 m (6,265 and 7,000 ft). Bird species that nest in the area include the Mexican spotted owl (*Strix occidentalis lucida*), great-horned owl (*Bubo virginianus*), and red-tailed hawk (*Buteo jamaicensis*) among the raptors, and Say's phoebe (*Sayornis saya*), lesser goldfinch (*Carduelis psaltria*), and American robin (*Turdus migratorius*) among other types. Overwintering species include the scrub jay (*Aphelocoma coerulescens*), common raven (*Corvus corax*), and house finch (*Carduelis mexicanus*) (LANL 1992c; LANL 1995j).

Some of the larger mammals at LANL are the American black bear (*Ursus americanus*), coyote (*Canis latrans*), and raccoon (*Procyon lotor*), while the smaller species include the Mexican woodrat (*Neotoma mexicana*), deer mouse (*Peromyscus maniculatus*), Abert's squirrel (*Sciurus aberti*), and mountain cottontail (*Sylvilagus nuttalli*) (LANL 1995i:4-42). The most important and prevalent big game species at LANL are mule deer (*Odocoileus hemionus*) and elk (*Cervus canadensis*). LANL lands have traditionally been a transitional area for wintering elk and mule deer. More recently, these two species have been using LANL property on a year-round basis. Migratory birds and their nests and eggs are protected by the *Migratory Bird Treaty Act*. Eagles are similarly protected by the *Bald and Golden Eagle Protection Act*.

Throughout LANL's history, developments within various TAs have caused significant alterations in the terrain and the general landscape of the Pajarito Plateau. These alterations have resulted in significant changes in land use by most groups of wildlife species, particularly birds and larger mammals that have large seasonal and/or daily ranges. Certain projects required the segregation of large areas, such as mesa tops and, in some cases, project areas were secured by virtually impenetrable fences around their perimeters. These alterations have undoubtedly caused some species of wildlife, such as elk and deer, to alter their land use patterns by cutting off or altering seasonal and/or daily travel corridors to wintering areas, breeding habitat, foraging habitat,

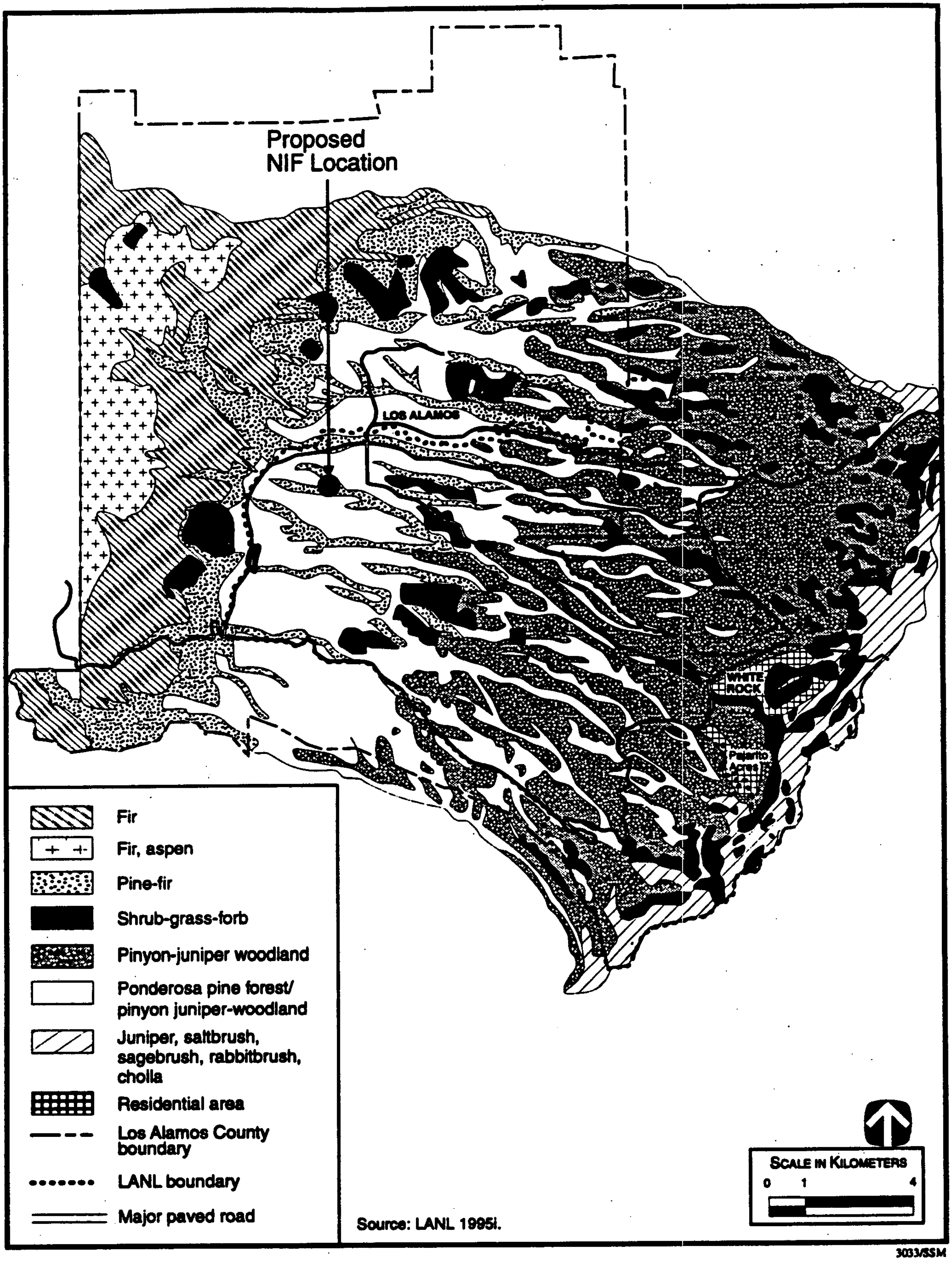


FIGURE 4.6.2.6–1.—*Distribution of Plant Communities at Los Alamos National Laboratory.*

and bedding areas, as well as other necessary habitats.

In 1980, elk were primarily using the southwestern portion of LANL (LA NERP 1981a). In addition, critical calving areas and important high-use areas were identified, all of which were primarily in the west and southwest part of LANL. Since 1980, the number of elk using LANL lands increased significantly. Studies of elk conducted from 1991 to 1993 (LANL 1995i:4-43) revealed increased use of habitats north and northeast of previously documented high-use areas (LA NERP 1981a). There have also been recent concerns about increases in motor vehicle accidents involving elk and deer in the LANL area (LANL 1995i:4-43). In general, however, little is known of habitat use patterns, population trends, and characteristics of elk on the Pajarito Plateau.

The proposed NIF would be located within an undeveloped portion of TA-58 that contains ponderosa pine. Wildlife present in the area would include those species typical of this forest type. A herd of elk and signs of black bears have been identified in the general site area (appendix I).

Wetlands. National Wetland Inventory maps show that most LANL wetlands occur in canyons that drain to the Rio Grande. Wetlands are found in most of the canyons on the laboratory site including Pueblo, Los Alamos, Sandia, Mortendad, Pajarito, Water, Ancho, Chaquchi, and White Rock (Rio Grande) Canyons. Wetlands have also developed in the vicinity of outfalls from LANL facilities. Most wetlands are classified as riverine intermittent, meaning they may contain flowing water part of the year and may contain pooled water or be dry the remainder of the year. Palustrine emergent and/or scrub-shrub wetlands are also indicated in sections of Pueblo, Los Alamos, Sandia, Pajarito, and Ancho Canyons. Most of the riverine and Palustrine wetlands known to exist at LANL are designated as temporary or seasonal by the National Wetlands Inventory maps. No wetlands exist in the immediate NIF site area (appendix I; DOE 1995hh:4-43).

Aquatic Resources. Aquatic habitats at LANL are limited to the Rio Grande and several springs and intermittent streams in the canyons. Some of these habitats currently receive NPDES-permitted wastewater discharges. The springs and streams at LANL do not support fish; however, many other aquatic species thrive in these waters (DOE 1995hh:4-43). No aquatic resources exist in the immediate NIF site area (appendix I).

The Rio Grande is located along the southeastern property boundary and supports populations of common carp (*Cyprinus Carpio*), chub (*Cyprinidae*), white sucker (*Catostomus commersoni*), and carpsucker (*Carpiodes spp.*). Game fish inhabiting the Rio Grande in the vicinity of LANL include the channel catfish (*Ictalurus punctatus*) and brown trout (*Salmo trutta*).

Threatened and Endangered Species. Twenty Federal- or state-listed threatened, endangered, and other special status species may be found on and in the vicinity of LANL (appendix table C–4). Four of these species have been observed on LANL. The Federal-listed species recorded onsite include the Mexican spotted owl (*Strix occidentalis lucida*), which has recently been observed nesting near TA-15 (two young were fledged from this nest during the 1995 breeding season) (DOE 1995hh:4-45), the bald eagle *(Haliaeetus leucocephalus)*, which winters along the Rio Grand River, and peregrine falcon *(Falco peregrinus)*, which historically nested onsite and occasionally still forages there. The state-threatened Jemez Mountain salamander (*Plethodon neomexicanus*) has also been observed onsite. LANL canyons provide suitable nesting, roosting, and foraging habitats for the Mexican spotted owl. No critical habitat for threatened or endangered species, as defined in the *Endangered Species Act* (50 CFR 17.11; 50 CFR 17.12), exists on LANL; however, critical habitat for the Mexican spotted owl has been designated in areas bordering the northern and western boundaries of LANL (60 FR 29914).

Suitable habitat exists within the proposed NIF location that could attract several of the special status species that potentially occur on LANL. These species include the Mexican spotted owl, gray vireo *(Vireo vicinior)*, southwestern willow flycatcher *(Empidonax traillii extimus)*, spotted bat *(Euderma maculatum)*, New Mexican meadow jumping mouse *(Zapus hudsonius luteus)*, and plant species such as giant helleborine orchid. Site-specific surveys would be required to verify the occurrence of these or any other sensitive species.

4.6.2.7 *Cultural and Paleontological Resources*

Prehistoric Resources. Prehistoric site types identified in the vicinity of LANL include large multiroom pueblos, field houses, talus houses, shrines, rock shelters, animal traps, hunting blinds, water control features, agricultural fields and terraces, quarries, rock art, trails, campsites, windbreaks, rock rings, and limited activity sites. Approximately 75 percent of LANL has been inventoried for cultural resources. Coverage for many inventories has been less than 100 percent; however, approximately 60 percent of LANL has received 100-percent coverage. More than 1,300 prehistoric sites have been recorded at LANL, and approximately 95 percent of these sites are considered eligible or potentially eligible for the NRHP. Two areas in the vicinity of LANL have been established as NRHP sites or districts: Bandelier National Monument (named as a monument in 1916) and Puye Cliffs Historical Ruins.

The 11 TAs potentially affected by project alternatives are shown in figure 4.6–2. Of these areas, all of TA-35 has been surveyed, while the other TAs have been partially surveyed. NRHP-eligible prehistoric resources have been identified in TAs -3, -8, -9, -16, -28, -37, -50, and -54 (LANL 1996e:1). New facility construction would occur only in TA-58, one third of which has been surveyed. The survey of TA-58 located no prehistoric resources. The unsurveyed two thirds of TA-58 may contain prehistoric resources. Prehistoric resources also may occur in areas needed for construction laydown, materials storage, and parking.

Historic Resources. Historic resources consist of homesteads, corrals, ditches, trash scatters, roads and trails, railroads, ranches, mines, remains of commercial ventures, and buildings associated with the Manhattan Project and the Cold War era. More than 80 historic resources have been recorded at LANL, and about 90 percent of the resources are considered eligible or potentially eligible for the NRHP.

The existing LANL facilities have been extensively modified and refurbished since 1943 when major construction occurred after World War II. The existing facilities are not likely to be considered NRHP eligible because they lack architectural integrity and may not be representative of a particular style. However, some of the facilities may be NRHP eligible based on their association with the broad historic theme of the Manhattan Project and initial nuclear production.

Portions of the proposed TA project areas have been surveyed. NRHP-eligible buildings exist in TAs -3, -8, -9, -16 (74 individual buildings); TA-22 (TA-22-1); TA-28; and TA-55. Structures at the front and back gates are also eligible for the NRHP. Additional NRHP-eligible historic resources may exist in other involved TAs. Some of the buildings requiring modification under the proposed alternatives may potentially be NRHP eligible.

Native American Resources. Native Americans in the area with concerns include the six Tewa-speaking Pueblos of the northern Rio Grande Valley (San Ildefonso, San Juan, Santa Clara, Nambe, Tesuque, and Pojoaque) and the Cochiti and Jemez Pueblos.

Cultural resources are of special importance to Native Americans. These resources located on the LANL site may consist of prehistoric sites with ceremonial features such as kivas, village shrines, petroglyphs, or burials, or traditional cultural properties with no observable manmade features. Consultations with local Native Americans to identify any such cultural resources have been conducted in the past and are ongoing. An ethnographic study is currently being conducted to identify traditional cultural properties in the area as part of the LANL site-wide EIS.

Paleontological Resources. Pajarito Plateau consists primarily of Pleistocene volcanic tuffs and compacted pumice and ashfalls of the Bandelier Formation. None of the formations within LANL are known to be fossiliferous.

4.6.2.8 *Socioeconomics*

Socioeconomic characteristics addressed at LANL include employment and regional economy, population and housing, and public finance. Statistics for employment and local economy are based on the regional economic area that encompasses seven counties in New Mexico around LANL. Statistics for population and housing, and public finance are presented for the ROI, a three-county area in which 88.1 percent of all LANL employees reside: Los Alamos County (48.3 percent), Rio Arriba County (20.8 percent), and Santa Fe County (19.0 percent) (appendix table D.1–5). More than half of the Los Alamos County employees reside in the unincorporated communities of Los Alamos and White Rock. Figure 4.6.2.8–1 presents a map of the counties and selected cities composing the LANL regional economic area and ROI. Supporting data is presented in appendix D.

Regional Economy Characteristics. Selected employment and regional economy statistics for the LANL regional economic area are summarized in figure 4.6.2.8–2. Between 1980 and 1990, the civilian labor force in the regional economic area increased from 74,759 to 100,257, a 34-percent increase (annual average increase of 3.4 percent). In 1994 unemployment in the regional economic area was 6.2 percent compared to 6.3 percent for New Mexico. The region's per capita income of $17,689 in 1993 was approximately 8.2 percent higher than New Mexico's per capita income of $16,346.

As shown in figure 4.6.2.8–2, the regional economic area and New Mexico have similar employment patterns. The service sector accounts for the largest share of total employment in both the region (31 percent) and in New Mexico (28 percent). Manufacturing employment accounted for 4 percent of the total regional employment but 6 percent of the total state employment.

Population and Housing. Between 1980 and 1992, the ROI population grew from 122,241 to 158,249, an increase of 29.5 percent (annual average increase of 2.5 percent). Within the ROI, however, Santa Fe County, increased by 39.6 percent (annual average increase of 3.3 percent). Population growth in Los Alamos was nearly stagnant during the same period. The unincorporated communities of Los Alamos and White Rock in Los Alamos County are included in the county population and housing analysis.

The number of housing units increased from 46,006 in 1980 to 63,386 units in 1990; an increase of 37.8 percent (annual average increase of 3.8 percent). The 1990 homeowner vacancy rate in the ROI was 2.3 percent. The rental vacancy rate for the ROI counties was 7.7 percent. Population and housing trends are summarized in figure 4.6.2.8–3.

Public Finance. Financial characteristics of the local jurisdictions in the LANL ROI that are most likely to be affected by the proposed action are presented in this section. The data reflect total revenues and expenditures of each jurisdiction's general fund, special revenue funds, and, as applicable, debt service, capital project, and expendable trust funds. School district boundaries may or may not coincide with county or city boundaries, but the districts are presented under the county where they primarily provide services. Major revenue and expenditure categories for counties, cities, and school districts are presented in appendix tables D.2.3–8 and D.2.3–9. Figure 4.6.2.8–4 summarizes 1994 local governments' revenues and expenditures. Fund balances, which are dollars carried over from previous years, are not included in figure 4.6.2.8–4. All jurisdictions assessed had positive fund balances.

4.6.2.9 *Radiation and Hazardous Chemical Environment*

The following section provides a description of the radiation and hazardous chemical environment at LANL. Also included are descriptions of health effects studies, a brief accident history, and emergency preparedness considerations.

Radiation Environment. Major sources of background radiation exposure to individuals in the vicinity of LANL are shown in table 4.6.2.9–1. All annual doses to individuals from background radiation are expected to remain constant over time. The total dose to the population changes as the population size changes. Background radiation doses are unrelated to LANL operations.

Releases of radionuclides to the environment from LANL operations provide another source of radiation exposure to individuals in the vicinity of LANL. The radionuclides and quantities released from LANL operations in 1993 are listed in *Environmental Surveillance at Los Alamos During 1993* (LA-12973-ENV). The doses to the public resulting from these releases and direct radiation are presented in table 4.6.2.9–2. These doses fall within regulatory limits (DOE Order 5400.5) and are small in comparison to background radiation. The releases were used in the development of the reference environment's (No Action) radiological releases in 2005.

Based on a dose-to-risk conversion factor of 500 cancer deaths per 1 million person-rem ($5x10^{-4}$ fatal cancers person-rem) to the public (appendix E), the

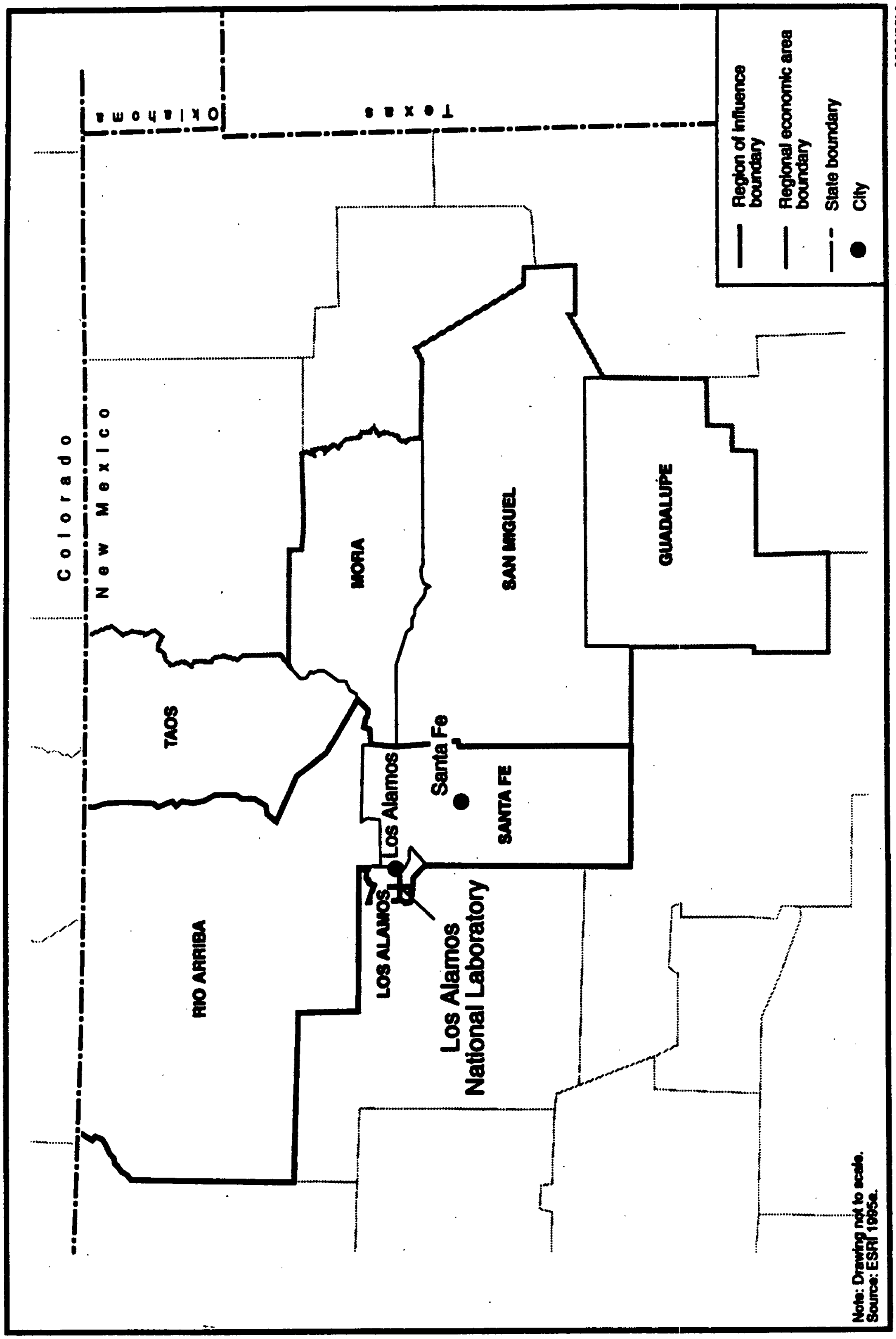
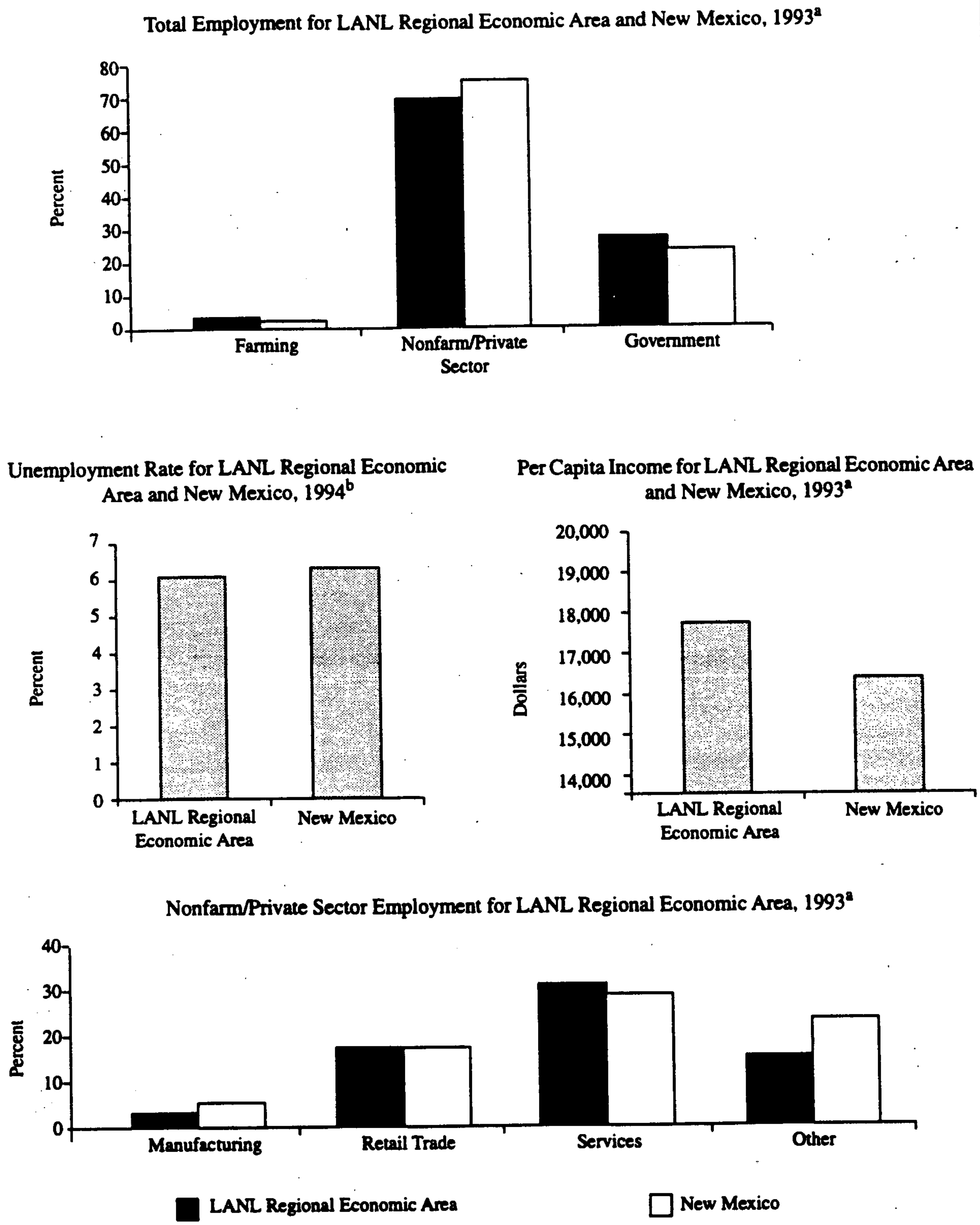


FIGURE 4.6.2.8-1.—*Regional Economic Area and Region of Influence for Los Alamos National Laboratory.*



[a] DOC 1995a.
[b] DOL 1995a.

FIGURE 4.6.2.8–2.—***Economy for Los Alamos National Laboratory Regional Economic Area and New Mexico.***

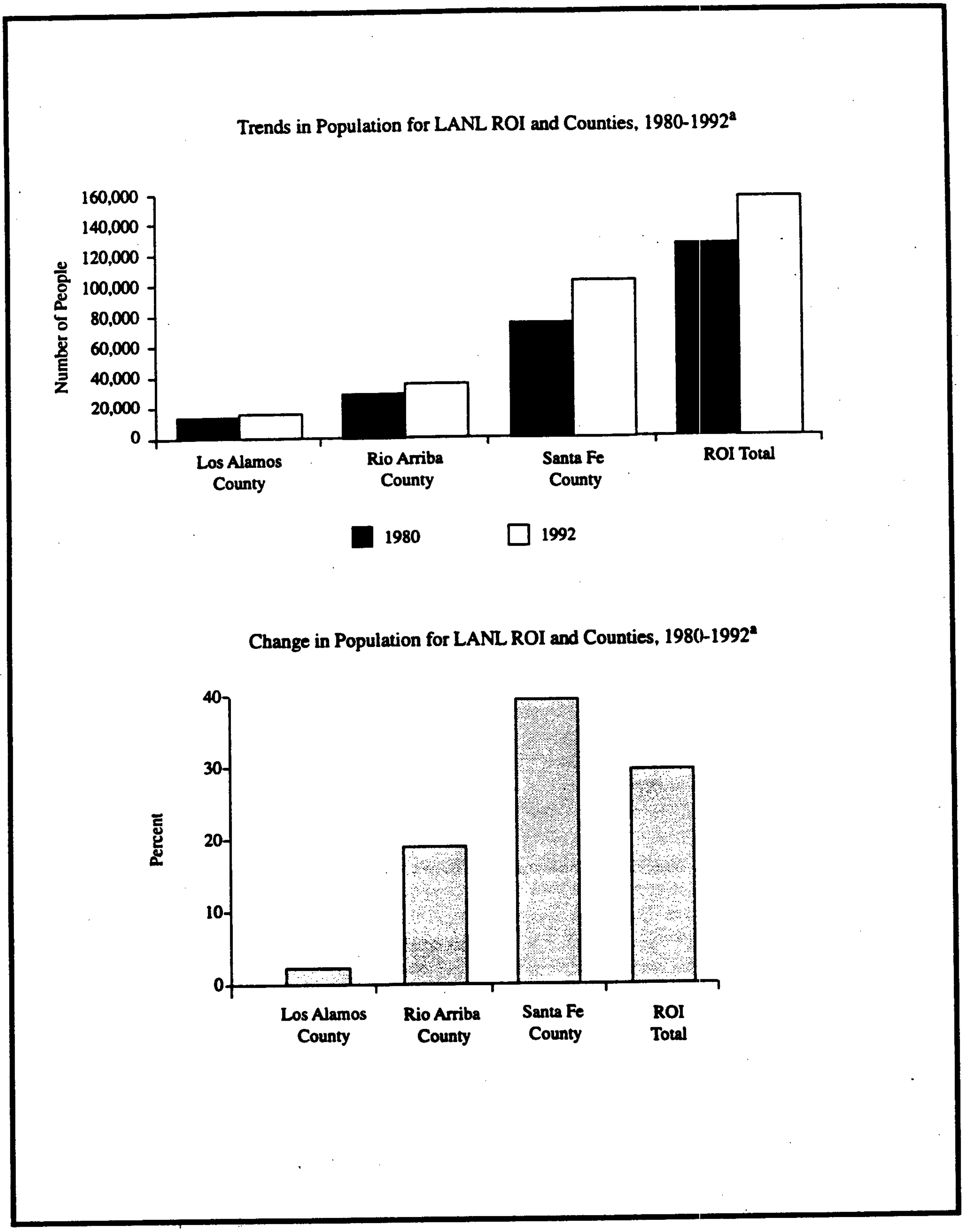
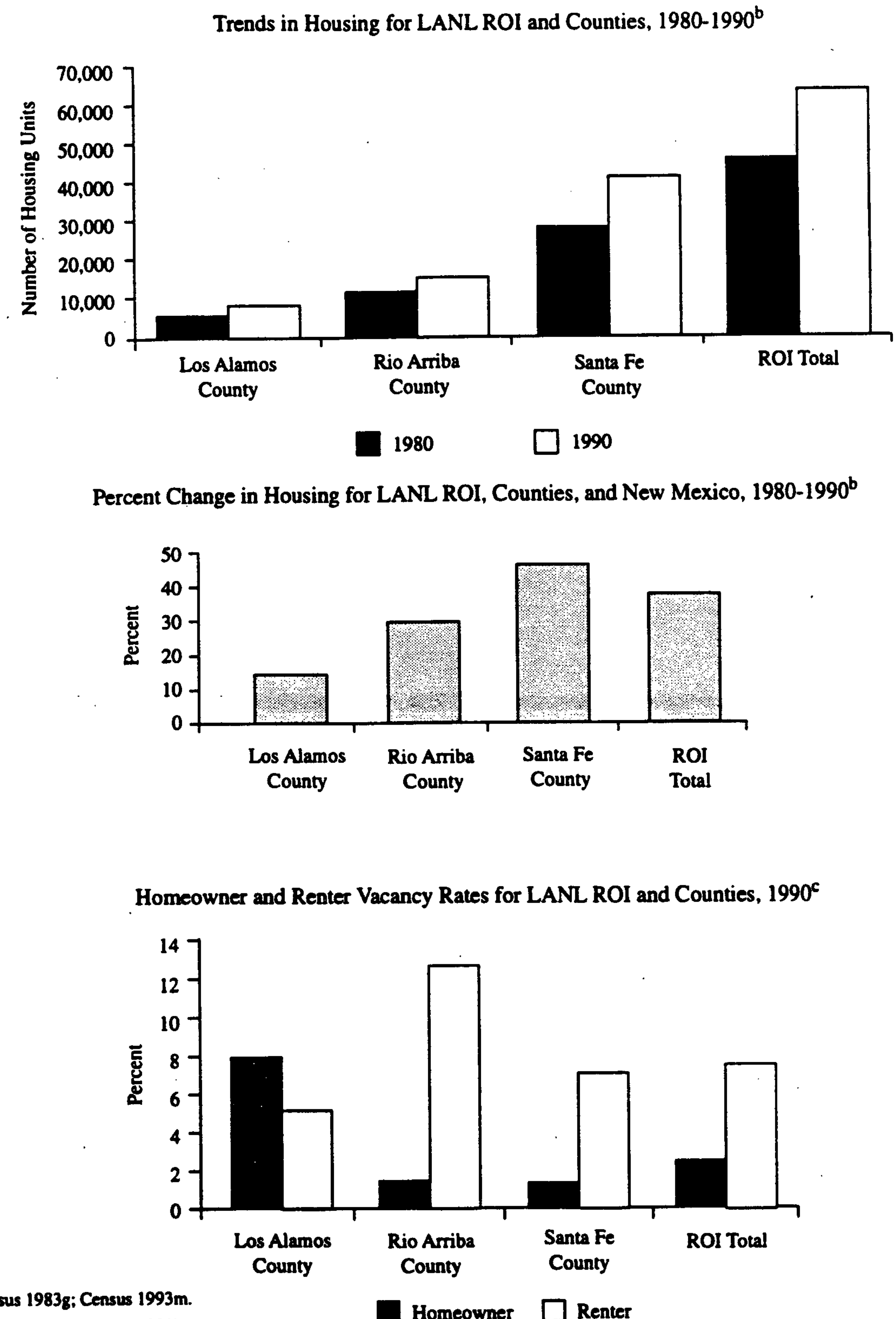


FIGURE 4.6.2.8–3.—*Population and Housing for Los Alamos National Laboratory Region of Influence* [Page 1 of 2].



[a] Census 1983g; Census 1993m.
[b] Census 1982o; Census 1991h.
[c] Census 1991h.

FIGURE 4.6.2.8–3.—*Population and Housing for Los Alamos National Laboratory Region of Influence* [Page 2 of 2].

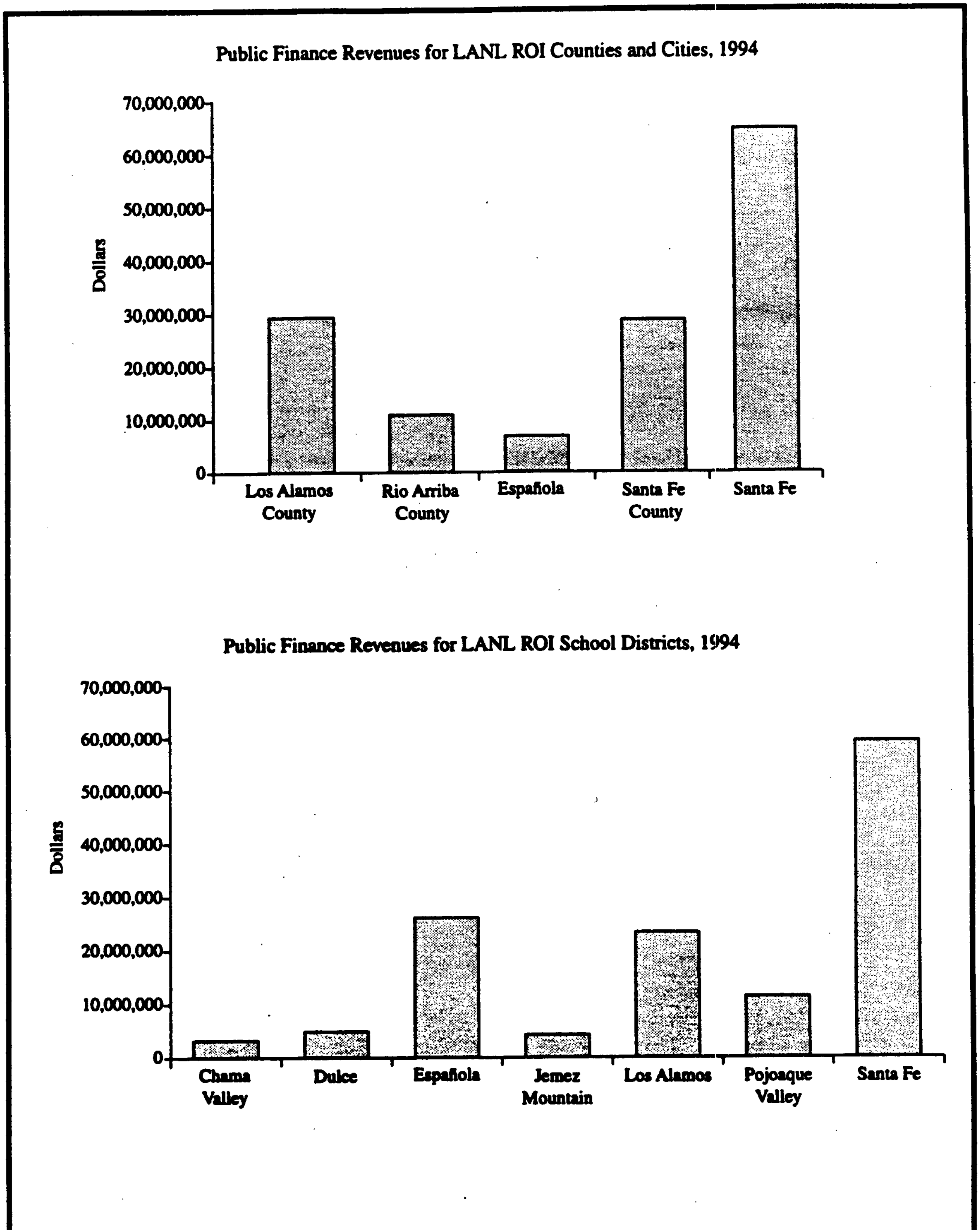
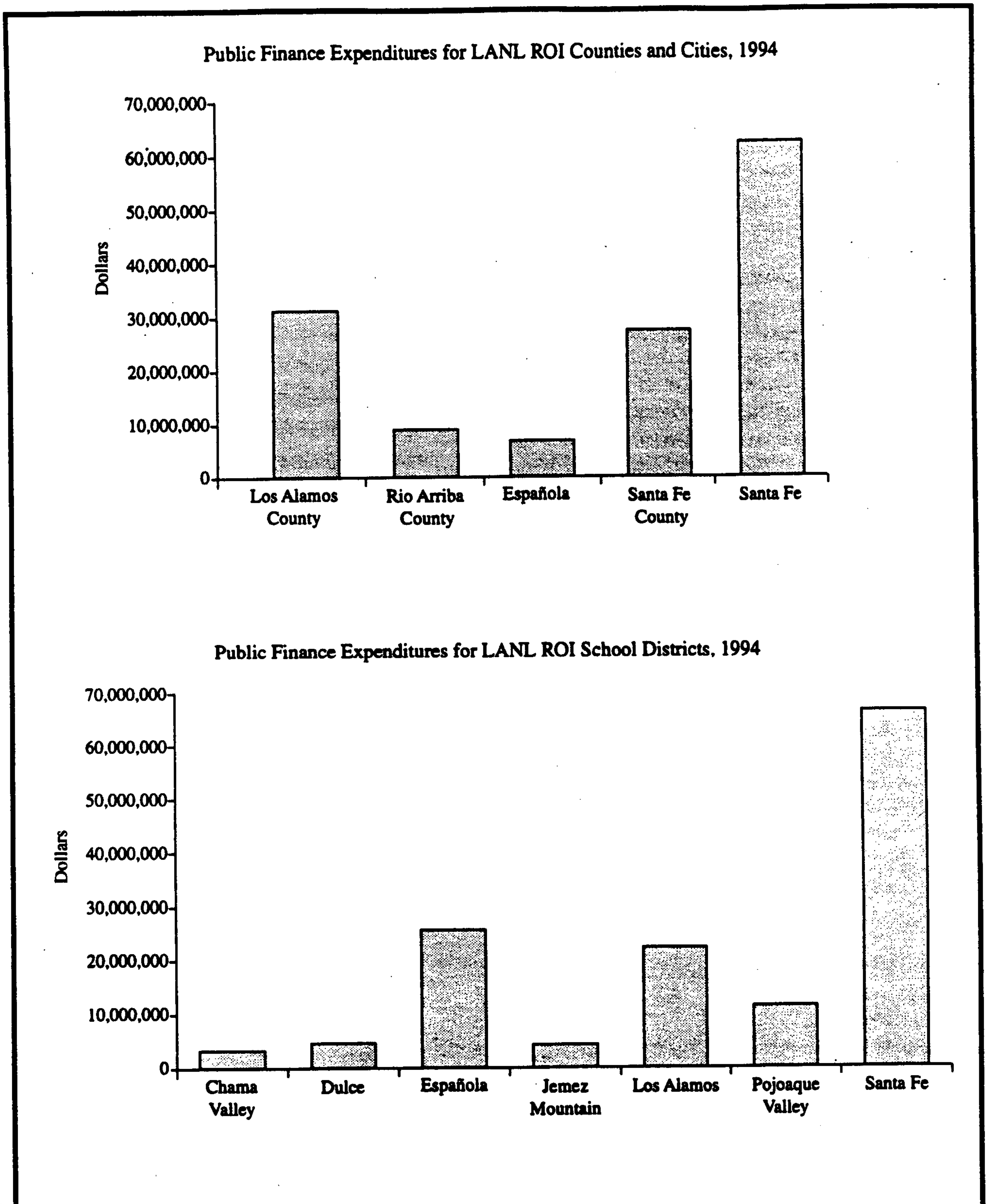


FIGURE 4.6.2.8–4.—*Local Government Public Finance for Los Alamos National Laboratory Region of Influence* [Page 1 of 2].



Source: LA City 1995a; LA County 1995a; LA School 1995b.

FIGURE 4.6.2.8–4.—*Local Government Public Finance for Los Alamos National Laboratory Region of Influence* [Page 2 of 2].

fatal cancer risk to the maximally exposed member of the public due to radiological releases from LANL operations in 1993 is estimated to be $3.3x10^{-6}$. That is, the estimated probability of this person dying of cancer at some point in the future from radiation exposure associated with 1 year of LANL operations is about 3 chances in 1 million. (Note that it takes several to many years from the exposure to radiation for a cancer to manifest itself).

Based on the same conversion factor, $1.5x10^{-3}$ excess fatal cancers were estimated from normal operation in 1993 to the population living within 80 km (50 mi) of LANL. The 1990 mortality rate, associated with cancer, for the entire U.S. population was 0.2 percent per year (Almanac 1993a:839). Based on the national rate, the number of fatal cancers expected during 1990 in the population living within 80 km (50 mi) of LANL was 438. This number of expected fatal cancers is much higher than the estimated $1.5x10^{-3}$ fatal cancers that could result from LANL operations in 1993.

Workers at LANL receive the same dose as the general public from background radiation, but also receive an additional dose from working in the facilities. Table 4.6.2.9–3 includes the average, maximum, and total occupational doses to LANL workers from operations in 1992. Except for the dose of less than 7,000 mrem to one worker, all other doses fall within regulatory limits (10 CFR 835). Based on a dose-to-risk conversion factor of

TABLE 4.6.2.9–1.—*Sources of Radiation Exposure to Individuals in the Vicinity, Unrelated to Los Alamos National Laboratory Operations*

Source	Committed Effective Dose Equivalent (mrem/yr)
Natural Background Radiation[a]	
Cosmic radiation	48
External terrestrial radiation	44
Neutron cosmic radiation	10
Internal terrestrial radiation	40
Radon in homes (inhaled)	200
Other Background Radiation[a,b]	
Diagnostic x rays and nuclear medicine	53
Weapons test fallout	<1
Air travel	1
Consumer and industrial products	10
Total	407

[a] LANL 1995s.
[b] NCRP 1987a.

TABLE 4.6.2.9–2.—*Doses to the General Public from Normal Operation at Los Alamos National Laboratory, 1993 (Committed Effective Dose Equivalent)*

Affected Environment	Atmospheric Releases		Liquid Releases		Total	
	Standard[a]	Actual	Standard[a]	Actual[b]	Standard[a]	Actual
Maximally exposed individual (mrem)	10	5.7	4	0.8	100	6.5
Population within 80 kilometers[c] (person-rem)	None	3.0	None	~0[d]	100	3.0
Average individual within 80 kilometers[e] (mrem)	None	0.014	None	~0[d]	None	0.014

[a] The standards for individuals are given in DOE Order 5400.5. As discussed in that order, the 10 mrem/yr limit for airborne emissions is required by the *Clean Air Act*, the 4 mrem/yr limit is required by the *Safe Drinking Water Act*, and the total dose of 100 mrem/yr is the limit from all pathways combined. The 100 person-rem value for the population is found in proposed 10 CFR 834 (58 FR 16268).
[b] The actual dose values given in this column conservatively include all water pathways, not just the drinking water pathway.
[c] In 1993, this population was approximately 219,000.
[d] Although the maximally exposed individual receives a dose, no population groups are exposed to any liquid pathways.
[e] Obtained by dividing the population dose by the number of people living within 80 km (50 mi) of the site.
Source: LANL 1995s.

400 fatal cancers per 1 million person-rem ($4x10^{-4}$ fatal cancers per person-rem) among workers (appendix E), the number of excess fatal cancers to LANL workers from operations in 1992 is estimated to be 0.077.

TABLE 4.6.2.9–3.—*Doses to the Onsite Worker from Normal Operation at Los Alamos National Laboratory, 1992*

Affected Environment	Onsite Releases and Direct Radiation	
	Standard[a]	Actual[b]
Average worker (mrem)	None	34
Maximally exposed worker (mrem)	5,000	~7,000[c]
Total workers (person-rem)	None	194

[a] 10 CFR 835. DOE's goal is to maintain radiological exposure as low as reasonably achievable.
[b] DOE 1993n:7; the number of badged workers in 1992 was approximately 5,700.
[c] Only one worker exceeded the worker dose standard.

A more detailed presentation of the radiation environment, including background exposures and radiological releases and doses, is presented in *Environmental Surveillance at Los Alamos During 1993* (LA-12973-ENV). In addition, the concentrations of radioactivity in various environmental media (e.g., air, water, and soil) in the onsite and offsite regions are presented in the same reference.

Chemical Environment. The background chemical environment important to human health consists of the atmosphere, which may contain hazardous chemicals that can be inhaled; drinking water, which may contain hazardous chemicals that can be ingested; and other environmental media with which people may come in contact (e.g., soil through direct contact or via the food pathway). The baseline data for assessing potential health impacts from the chemical environment are those presented in previous sections of this PEIS, particularly sections 4.6.2.3 on air quality and 4.6.2.4 on surface and groundwater quality.

Adverse impacts to the public can be minimized through administrative and design controls to decrease hazardous chemical releases to the environment and to achieve compliance with permit requirements. The effectiveness of these controls is verified through the use of monitoring information and inspection of mitigation measures. Health impacts to the public may occur during normal operation at LANL via inhalation of air containing hazardous chemicals released to the atmosphere from LANL operations. Risks to public health from ingestion of contaminated drinking water or direct exposure are also potential pathways.

Baseline air emission concentrations for hazardous air pollutants and their applicable standards are presented in section 4.6.2.3. These concentrations are estimates of the highest existing offsite concentrations and represent the highest concentrations to which members of the public could be exposed. These concentrations are compared with applicable guidelines and regulations. Information about estimating health impacts from hazardous chemicals is presented in appendix E.

Exposure pathways to LANL workers during normal operation may include inhaling the workplace atmosphere, drinking LANL potable water, and possible other contact with hazardous materials associated with work assignments. The potential for health impacts varies from facility to facility and from worker to worker, and available information is not sufficient to allow a meaningful estimation and summation of these impacts. However, workers are protected from hazards specific to the workplace through appropriate training, protective equipment, monitoring, and management controls. LANL workers are also protected by adherence to OSHA and EPA occupational standards that limit workplace atmospheric and drinking water concentrations of potentially hazardous chemicals. Appropriate monitoring, which reflects the frequency and amounts of chemicals utilized in the operation processes, ensures that these standards are not exceeded. Additionally, DOE requirements ensure that conditions in the workplace are as free as possible from recognized hazards that cause or are likely to cause illness or physical harm.

Health Effects Studies. Recent epidemiological studies have been conducted in the LANL area. One study, by Athas and Key (NM DOH 1993a), reported elevations in brain cancer incidence during the mid- to late-1980s, compared to state and national reference populations, but random fluctuation could not be ruled out. Breast cancer incidence rates in Los Alamos from 1970 to 1990 have remained level, but higher than New Mexico rates. Reproductive and demographic factors known to increase the risk of breast cancer have been prevalent in the county. Ovarian cancer incidence in the county from 1986 to 1990 was approximately two-fold greater than that observed in a New Mexico State reference population. In the mid- to late-1980s, a two-fold excess risk of melanoma was observed in Los Alamos County compared with a New Mexico State Reference population. A more recent study by Athas (NM DOH 1996a) observed a four-fold increase in thyroid cancer incidence during the late 1980s and early 1990s compared with the state as a whole, but the rate began to decline in 1994 and 1995. No statistically significant excess cancers were reported for male workers exposed to plutonium. However, statistically significant excesses in kidney cancer and lymphomatic leukemia were observed in male workers exposed to external radiation (HP 1994a: 577-588). An excess of death from suicides was reported among female radiation workers (LA Wiggs1987a). For a more detailed description of the studies reviewed and the findings, refer to appendix section E.4.7.

Accident History. A review of recent LANL annual environmental and accident reports indicates that there have been no significant adverse impacts to workers, the public, or the environment. This review was performed to provide an indication of the site's accident history. During the review period, from 1986 to 1990, site operations were much higher than in previous years and also higher than what is anticipated for the future.

Emergency Preparedness. Each DOE site has established an emergency management program that would be activated in the event of an accident. This program has been developed and maintained to ensure adequate response for most accident conditions and to provide response efforts for accidents not specifically considered. The emergency management program incorporates activities associated with emergency planning, preparedness, and response. The LANL Emergency Preparedness Plan is designed to minimize or mitigate the impact of any emergency upon the health and safety of employees and the public.

4.6.2.10 *Waste Management*

This section outlines the major environmental regulatory structure and waste management activities for LANL. A more detailed discussion of the ongoing waste management operation and the regulatory setting is provided in appendix section H.2.5.

DOE is working with Federal and state regulatory authorities to address compliance and cleanup obligations arising from its past operation of LANL and is engaged in several activities to bring its current operations into full regulatory compliance. These activities are set forth in permits and negotiated agreements that contain schedules for achieving compliance with applicable requirements and financial penalties for nonachievement of agreed upon milestones. These agreements have been reviewed to assure the proposed actions are allowable under the terms of these agreements.

LANL is not listed on the NPL. As a function of obtaining a RCRA permit, however, the *Hazardous and Solid Waste Amendments* of 1984 mandate that permits for treatment, storage, and disposal facilities include provisions for corrective action to mitigate releases from solid and hazardous waste facilities in operation and to clean up contamination in areas designated as solid waste management units at LANL. By the end of 1995, over 60 of the approximately 2,100 potential release sites identified had been remediated, no further action was proposed for 575 sites, and 1,100 sites were slated for investigation or cleanup; for the remaining sites, action is still pending. All cleanup activities are expected to be completed by 2010 (LANL 1996e:1).

Through its research activities, LANL manages a small quantity of spent nuclear fuel and five broad waste categories: TRU, low-level, mixed, hazardous, and nonhazardous wastes. Because there is no spent nuclear fuel or HLW associated with any of the proposed activities at LANL, there is no discussion in this PEIS of spent nuclear fuel or HLW generation and management at LANL. A discussion of the waste management activities associated with each of these categories follows.

Transuranic Waste. In 1993, LANL generated approximately 54 m^3 (70 yd^3) of TRU waste (LANL

1994b:6). The Plutonium Facility (TA-55) is the principal generator of liquid TRU waste at LANL. Process acidic and caustic wastewaters, evaporator distillates from the nitrate recovery area, cooling water from glove boxes, and wet vacuum seal water are the principal sources. Sludges that remain after treatment through filtration and residual evaporator bottoms are loaded into 208-L (55-gal) drums, solidified, and transported to Area G for storage. The liquid wastes remaining after filtration are transferred from TA-55 to the Radioactive Liquid Waste Treatment Facility (TA-50) by gravity drain in double-wall pipelines. After treatment at TA-50 involving sedimentation, clarification, and flocculation, the residual radioactive sludge is loaded into drums, solidified, and transported to Area G for storage. Most of LANL's TRU waste is currently stored on four asphalt pads. TRU wastes are currently being stored, until they can be shipped to WIPP if that facility can demonstrate compliance with the requirements of 40 CFR 191 and 40 CFR 268, or to another TRU waste disposal facility should WIPP prove unsatisfactory. Should additional treatment be necessary for disposal at WIPP, LANL would develop the appropriate treatment to meet the WIPP waste acceptance criteria and package the wastes in accordance with DOE, NRC, and DOT requirements for transport to WIPP for disposal. LANL is presently upgrading TRU waste storage facilities to comply with RCRA requirements under the terms of a consent order with the State of New Mexico.

LANL generates mixed TRU wastes. Newly generated mixed TRU wastes are identified, characterized, and stored in compliance with RCRA. In 1993, LANL generated approximately 255 m^3 (334 yd^3) of mixed TRU wastes (LANL 1994b:6). The *Federal Facility Compliance Act* of 1992 requires DOE to provide specific information to EPA and the State of New Mexico on LANL's mixed TRU waste streams, treatment facilities, and technology development activities. This waste category covers a broad range of physical matrix categories for LANL. The Federal Facility Compliance Order for the Site Treatment Plan requires treatment of all mixed wastes not in compliance with the land disposal provisions of RCRA. This compliance order is the implementation of the *Federal Facility Compliance Act* at LANL. The WIPP waste acceptance criteria specifies limiting parameters for waste containers, waste form, waste packaging, accompanying data, and miscellaneous requirements for packaging and RCRA. It is anticipated that some technology required for additional treatment of TRU wastes to attain additional treatment standards can be adapted from the technologies that must be brought online for mixed LLW. If DOE is successful in obtaining a no-migration petition for the disposal of mixed TRU wastes at WIPP, adherence with treatment standards under the land disposal restrictions would not be required.

Low-Level Waste. Both liquid and solid LLW are generated and managed by LANL. In 1993, LANL generated approximately 21,400 m^3 (5,653,000 gal) of liquid and 2,693 m^3 (3,523 yd^3) of solid LLW (LANL 1994b:6,9). Liquid LLW is generated from many areas throughout LANL: there are two wastewater treatment facilities used for treatment of aqueous LLW, one of which utilizes ion-exchange technology. As part of a new radioactive liquid waste treatment facility project, a facility for the solidification and subsequent volume reduction of the radioactive liquid waste treatment plant sludge containing plutonium, americium, and other radionuclides is proposed, but not funded at LANL.

Solid LLW is generated from many areas throughout LANL. Solid LLW such as paper, plastic, glassware, and rags are separated into compactible and noncompactible materials by the waste generators. Compactible bales are banded, wrapped and sealed in plastic, and moved to Area G for disposal in landfill pits, located at TA-54 (figure 4.6–2). LLW noncompactible items, such as large equipment and much of the D&D waste, generally are not packaged but delivered to the burial site in covered or enclosed vehicles. Continued construction at Area G is dependent on decisions made in conjunction with the LANL sitewide EIS being prepared by LANL.

Mixed Low-Level Waste. In 1993, LANL generated approximately 45 m^3 (59 yd^3) of mixed LLW (LANL 1994b:6). Mixed LLW includes solvents, pyrophoric substances, spray cans, scintillation vials, uranium-contaminated lithium hydride, miscellaneous reagent chemicals, vacuum pump oil contaminated with mercury, gas cylinders, and other contaminated material. It is stored at TA-54 Areas L and G. Currently, LANL does not dispose of mixed LLW. In accordance with the *Federal Facility Compliance Act* of 1992, LANL has developed a site treatment plan which covers management of all mixed waste at LANL. The State of New Mexico Environment Department issued a Compliance Order in the Site Treatment Plan for Mixed Waste in October 1995. The compliance order addresses land disposal restricted mixed waste. For mixed waste with identified treatment technologies, the plan provides a schedule for submitting permit applications, entering into contracts, initiating construction, conducting systems testing, starting operations, and processing mixed wastes. For mixed waste without an identified treatment technology, the plan includes a schedule for identifying and developing technologies, identifying the funding requirements for research and development (R&D), submitting treatability study notifications, and submitting R&D permit applications.

Mixed waste treatment skids are being designed to treat onsite hazardous and mixed waste streams that are not amenable to offsite treatment. Examples of the waste streams potentially amenable to skid treatment are reactive metals, plating wastes, acids, bases, ignitable liquids, spent solvents, and decontamination debris. Not all of the technologies to be included have been chosen. The mixed waste treatment skids would be housed in an existing LANL structure. An environmental restoration high-energy plasma technology is being tested as a technique for total destruction of mixed LLW that has been treated to land disposal restrictions standards. This technique will allow LANL to stay in compliance with the *Federal Facility Compliance Act* of 1992.

Hazardous Waste. LANL received a permit for treatment, storage, and disposal of hazardous waste under RCRA in November 1989, and for the *Hazardous and Solid Waste Amendments* of 1984 provisions from EPA on March 8, 1990. All hazardous waste treatment and storage facilities at LANL are either fully permitted or are operating under interim status, while other waste management facilities are being developed.

LANL produces a wide variety of hazardous wastes. In 1993, LANL generated approximately 84 t (93 tons) of RCRA-regulated, 460 t (507 tons) of state-regulated, and 124 t (137 tons) of TSCA-regulated solid hazardous wastes (LANL 1994b:6). Small volumes of almost all wastes listed under 40 CFR 261 are generated as a result of a wide variety of ongoing research. HE waste is generated during the processing and testing of various HE materials. All HE hazardous waste and potentially contaminated HE waste is picked up from the generating facility and treated by open detonation, open burning, or incineration at TAs -14, -15, -16, -36, and -39. Ash residue is then treated and, when its hazardous characteristic can be removed and it is determined that this residue does not contain radioactive constituents, it is disposed of onsite in the landfill, TA-54, Area J. The HE wastewater is treated by gravity settlement in a sump and discharged from NPDES-permitted outfalls. LANL is developing a HE wastewater treatment facility that will collect and treat these wastewaters with stepped filtration.

LANL does not landfill RCRA-hazardous waste onsite, but contracts with certified transporters to deliver hazardous waste to commercial offsite RCRA-permitted treatment, storage, and disposal facilities. Before waste is sent offsite, the potential treatment or disposal facility is inspected by LANL personnel. Operating records and permits are also reviewed. LANL has an EPA Letter of Authorization allowing disposal of solid PCB-contaminated articles at the TA-54, Area G landfill. Other PCB waste and liquid PCB-contaminated articles are sent offsite to TSCA-regulated disposal facilities. Asbestos mixed waste is buried at TA-54, Area G. Asbestos waste is shipped offsite to an approved disposal site in accordance with TSCA and NESHAP regulations. Infectious wastes are managed according to State of New Mexico regulations.

Nonhazardous Waste. In 1993, LANL generated 8,180 t (9,017 tons) of solid sanitary wastes (LANL 1994b:6). Solid sanitary wastes are generated routinely and include general facility refuse such as paper, cardboard, glass, wood, plastic, scrap, metal containers, dirt, and rubble. Solid sanitary wastes are segregated and recycled whenever possible. Trash is accumulated onsite in dumpsters, which are emptied on a regular basis by a commercial waste disposal firm and taken to the county sanitary landfill. The Los Alamos County landfill is located on property owned by DOE and is operated under a special-use permit. Approximately one-third of the solid sanitary waste disposed of at the county landfill originates from LANL. The Area J special waste landfill, which is operated by and is under the administrative control of LANL, receives only administratively controlled solid sanitary waste. Solid sanitary waste will be managed and disposed of at LANL until 2007, the year the existing sanitary landfill is expected to reach the end of its useful life. At that time, either a new landfill will have to be constructed or provisions made for offsite disposal.

LANL generates approximately 693,000 m^3 (183,000,000 gal) of liquid sanitary waste (DOE 1993j:3-54). A new sanitary wastewater treatment plant and collection system to replace 7 existing wastewater treatment facilities and 30 existing septic tanks have been completed. The new treatment plant will enable reuse of the treated wastewater for non-drinking water uses such as cooling and irrigation. The plant and collection system is designed to meet the requirements of LANL's existing Federal Facility Compliance Agreement and is expected to meet all of LANL's needs for the next 20 years.

4.6.3 Environmental Impacts

4.6.3.1 *Land Use*

No Action. Under No Action, DOE would continue current and planned activities at LANL as described in section 3.2.6. No additional land use impacts are anticipated at LANL beyond the effects of the existing and future activities that are independent of the proposed action.

Management Alternatives

Pit Fabrication. The existing plutonium facility at LANL would be modified to support this alternative. Additional land would not be used to implement the new mission. The proposed activity would be compatible and consistent with land use plans and policies. Impacts to land use are not expected.

Secondary and Case Fabrication. The secondary and case fabrication alternative at LANL would use existing facilities, equipment, and infrastructure to support production requirements for the secondary fabrication mission. Only minimal modifications to existing facilities at LANL would be required. Additional land would not be used to implement the new mission. These activities would be compatible and consistent with land use plans and policies. Impacts to land use are not expected.

High Explosives Fabrication. The proposed HE fabrication activities would be conducted in existing LANL facilities. No new facilities or structures would be required to support HE fabrication. Additional land would not be used to implement the mission. The proposed activity would be compatible and consistent with land use plans and policies. Impacts to land use are not expected.

Nonnuclear Fabrication. LANL would use existing facilities to support nonnuclear fabrication activities. Additional land would not be used to implement the mission. The proposed activity would be compatible and consistent with land use plans and policies. Impacts to land use are not expected.

Sensitivity Analysis. LANL would be able to accommodate the high and low case production operations for all management alternatives with base case production facilities. No land-use impacts are expected.

Stewardship Alternatives

Proposed National Ignition Facility. The proposed location of NIF at LANL is within TA-58. An estimated 4 ha (10 acres) of land for buildings, walkways, building access, and buffer space would be required to construct and operate NIF. The land required for the proposed NIF would represent approximately 1 percent of the land currently available for development within LANL. However, 4 ha (10 acres) represents an extremely small proportion of LANL's total land area of 111 km^2 (43 mi^2). The proposed NIF is compatible and consistent with land-use plans for this area. No impacts to LANL land-use plans or policies are expected.

Proposed Atlas Facility. The proposed Atlas Facility would include existing buildings located in a developed area within TA-35 at LANL. Modification activities would involve renovating the existing buildings for use in performing pulsed-power experiments. The area is currently used for similar types of activities. The proposed Atlas Facility activity would be compatible and consistent with land use plans for the area. Impacts to LANL land-use plans and policies are not expected.

Combined Program Impacts. Of the six potential Stockpile Stewardship and Management Program alternatives proposed for LANL, existing facilities would be modified for five of the alternatives. No additional land would be used to implement the mission. The proposed NIF would require clearing 4 ha (10 acres) of undeveloped land for buildings, walkways, and buffer space. The total land use impact from placing all potential Program alternatives at LANL would be the use of 4 ha (10 acres) of undeveloped land in TA-58 for the new NIF mission.

Potential Mitigation Measures. No mitigation measures for stockpile stewardship and management alternatives at LANL are anticipated.

4.6.3.2 *Site Infrastructure*

This section discusses site infrastructure at LANL for No Action and the modifications needed for actions due to construction and operation of stockpile stewardship and management facilities. A comparison of site infrastructure and facility resource needs for No

Action and the proposed alternatives is presented in table 4.6.3.2–1.

No Action. This alternative continues the management missions, described in section 3.2.6, of limited pit fabrication and selected nonnuclear fabrication, and the stewardship R&D missions. As stated in section 1.6.2, the Dual Axis Radiographic Hydrodynamic Test (DARHT) Facility is considered part of No Action. Impacts on site infrastructure would be minimal since the Pulsed High Energy Radiation Machine Emitting X-Rays (PHERMEX) Facility would be phased out as the DARHT Facility becomes operational. As shown in table 4.6.3.2–1, the site infrastructure would continue to adequately supply facility requirements.

Management Alternatives

Pit Fabrication. As shown in table 4.6.3.2–1, site infrastructure would require slight facility improvements to meet pit fabrication requirements. Only a slight increase over No Action requirements in electrical energy and natural gas use is expected. No other impacts to site infrastructure are expected.

Secondary and Case Fabrication. Site infrastructure would require slight facility improvements to meet secondary and case fabrication requirements. Table 4.6.3.2–1 shows the total site requirement with secondary and case fabrication and the change from No Action. Impacts to site infrastructure include a 9-percent increase in electrical energy use over No Action requirements. The electric power pool has sufficient capacity margins to accommodate the secondary and case fabrication mission. There would also be an increase in liquid fuel use.

High Explosives Fabrication. Site infrastructure would require minor facility improvements to meet HE fabrication requirements. Impacts to site infrastructure include an increase in liquid fuel use over No Action requirements. An 8-percent increase in natural gas use would occur, but there would be only a slight increase in electrical energy use over No Action requirements. This analysis assumes the entire HE mission is relocated to LANL. If it is shared with LLNL, the impact would be proportionately less.

Nonnuclear Fabrication. Minor site infrastructure facility improvements would be needed to meet nonnuclear fabrication requirements. As shown in table 4.6.3.2–1, only a slight increase in energy use is expected. No other impacts to site infrastructure are expected.

Sensitivity Analysis. No change in site infrastructure impacts are expected for the high and low production case for pit, secondary and case, and HE fabrication. For nonnuclear fabrication, the high production case would require using additional facilities, namely Buildings 300 and 301 at S-Site. Also, additional capital equipment would need to be added to increase processing, storage, and inventory control capability. No additional site infrastructure changes would be needed to meet the low production case.

Stewardship Alternatives

Proposed National Ignition Facility. As shown in table 4.6.3.2–1, site infrastructure would require slight facility improvements to meet the proposed NIF requirements. Impacts to site infrastructure include a 11-percent increase in electrical energy use, a 22-percent increase in peak electrical loads, and a 2-percent increase in natural gas use over No Action requirements. The electric power pool has sufficient capacity margins to accommodate the proposed NIF.

Proposed Atlas Facility. The LANL site infrastructure would require minor facility improvements to meet the proposed Atlas Facility requirements. Table 4.6.3.2–1 shows the expected change in site requirements to support the Atlas Facility. Impacts to site infrastructure include no increase in peak electrical load requirements due to utilization of existing generators currently used for other experiments and only a slight increase in electrical energy use over No Action requirements. No other impacts to site infrastructure are expected.

Combined Program Impacts. If all of the alternatives applicable to LANL were to be located there, the combined impacts would exceed current site infrastructure resources. The largest impact would be a 25-percent increase in electrical energy use with an associated 31-percent increase in peak electrical load. Natural gas use would increase by 10 percent. Consumption of liquid fuel, which is currently used for standby power only and shows no amount in table 4.6.3.2–1, would increase to about 197,400 L per year.

TABLE 4.6.3.2–1.—*Site Infrastructure Requirements and Changes for Stockpile Stewardship and Management Alternatives at Los Alamos National Laboratory*

Alternative	Electrical		Fuel		
	Energy (MWh/yr)	Peak Load (MWe)	Liquid (L/yr)	Gas (m^3/yr)	Coal (t/yr)
Current Resources	381,425	87	0	43,414,560	NA
No Action (2005)					
Total site requirement	381,425	87	0	43,414,560	NA
Change from current resources	0	0	0	0	NA
Nonnuclear Fabrication					
Total site requirement	381,950	87.2	0	43,414,900	NA
Change from No Action	525	0.23	0	340	NA
Pit Fabrication					
Total site requirement	386,905	87.7	0	43,445,460	NA
Change from No Action	5,480	0.7	0	30,900	NA
Secondary and Case Fabrication					
Total site requirement	417,425	92	100,000	43,414,560	NA
Change from No Action	36,000	5	100,000	0	NA
High Explosives Fabrication					
Total site requirement	387,025	88	94,600	47,064,560	NA
Change from No Action	5,600	1	94,600	3,650,000	NA
National Ignition Facility					
Total site requirement	423,425	107	2,800	44,224,560	NA
Change from No Action	42,000	20	2,800	810,000	NA
Atlas Facility					
Total site requirement	386,785	87	0	43,414,560	NA
Change from No Action	5,360	0[a]	0	0	NA
Combined Program Impacts					
Total site requirement	476,390	113.9	197,400	47,905,800	NA
Change from No Action	94,965	26.9	197,400	4,491,240	NA

[a] Generator power sources already in use by LANL.

Note: NA - not applicable.

Source: LANL 1995b:1; LANL 1995b:3; LANL 1995b:4; LANL 1995c; LANL 1995d; LANL 1995e; LANL 1995g; LANL 1996e:1; appendix I; appendix K.

Potential Mitigation Measures. No mitigation measures are anticipated.

4.6.3.3 *Air Quality*

No Action. No Action air quality utilizes estimated air emissions data from operations at LANL in 2005, assuming continuation of current site missions, to calculate pollutant concentrations at or beyond the LANL site boundary. Included in the criteria and toxic/hazardous emissions from LANL are those emissions estimated for operation of the DARHT Facility currently under construction. The emission rates for criteria and toxic/hazardous pollutants for No Action are presented in appendix table B.3.6–1. Table 4.6.3.3–1 presents the No Action pollutant concentrations calculated from the 2005 emission rates. In this table, pollutant concentrations are compared with applicable Federal and state regulations and guidelines. Concentrations are expected to remain within these standards.

Management Alternatives

Pit Fabrication. Operation of the Pit Fabrication Facility would generate criteria and toxic/hazardous pollutants resulting from the combustion of fossil fuels for space heating and manufacturing processes. The emissions consist of particulate matter, carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, and

TABLE 4.6.3.3–1.—*Estimated Concentrations of Pollutants from No Action and Stockpile Stewardship and Management Alternatives at Los Alamos National Laboratory* [Page 1 of 3]

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines (μg/m³)	2005 No Action (μg/m³)	Pit Fabrication (μg/m³)	Secondary and Case Fabrication (μg/m³)	High Explosives Fabrication (μg/m³)	Nonnuclear Fabrication (μg/m³)	Atlas Facility (μg/m³)	National Ignition Facility (μg/m³)	Combined Program Impacts (μg/m³)
Criteria Pollutant										
Carbon monoxide	8-hour	7,689[a]	115	116.81	138.97	139.17	115	115	117.45	165.59
	1-hour	11,578[a]	630	639.90	761.46	762.51	630	630	643.44	907.41
Lead	Calendar quarter	1.5[b]	0.00002	0.00002	0.01	0.00002	0.00002	0.00002	0.00002	0.01
Nitrogen dioxide	Annual	73[a]	3.84	3.84	16.82	6.36	3.84	3.84	4.05	19.55
	24-hour	145[a]	2	2	233.12	46.8	2	2	5.77	278.69
Ozone	1-hour	235[b]	139	139	139	139	139	139	139	139
Particulate matter	Annual	50[b]	8.01	8.01	8.04	8.04	8.01	8.01	8.03	8.09
	24-hour	150[b]	24.3	24.3	24.89	24.84	24.3	24.3	24.66	25.79
Sulfur dioxide	Annual	40[a]	1.3	1.3	6.63	1.3	1.3	1.3	1.3	6.63
	24-hour	202[a]	0.006	0.006	94.83	0.006	0.006	0.006	0.09	94.96
	3-hour	1,300[b]	0.03	0.03	467.43	0.03	0.03	0.03	0.40	467.8
Mandated by New Mexico										
Hydrogen sulfide	1-hour	11[a]	c	c	c	c	c	c	c	c
Total reduced sulfur	30-minute	3[a]	c	c	c	c	c	c	c	c
Total suspended particulates	Annual	60[a]	8	8.06	8.03	8.03	8	8	8.02	8.08
	30-day	90[a]	<21	<21	<21.59	<21.54	<21	<21	<21.36	<22.49
	7-day	110[a]	<21	<21	<21.59	<21.54	<21	<21	<21.36	<22.49
	24-hour	150[a]	21	21	21.59	21.54	21	21	21.36	22.49

TABLE 4.6.3.3–1.—*Estimated Concentrations of Pollutants from No Action and Stockpile Stewardship and Management Alternatives at Los Alamos National Laboratory* [Page 2 of 3]

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines (μg/m³)	2005 No Action (μg/m³)	Pit Fabrication (μg/m³)	Secondary and Case Fabrication (μg/m³)	High Explosives Fabrication (μg/m³)	Nonnuclear Fabrication (μg/m³)	Atlas Facility (μg/m³)	National Ignition Facility (μg/m³)	Combined Program Impacts (μg/m³)
Hazardous and Other Toxic Compounds										
Acetic acid	8-hour	250[a]	2.87	2.87	2.87	2.87	2.87	2.87	2.87	2.87
Ammonia	8-hour	180[a]	4.27	4.27	4.27	6.69	4.27	4.27	4.27	6.69
2-Butoxyethanol	8-hour	1,200[a]	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
Chlorine	8-hour	d	0.07	1.89	0.07	0.07	0.07	0.07	0.07	1.89
Chloroform	8-hour	500[a]	2.61	2.61	2.61	2.61	2.61	2.61	2.61	2.61
Ethyl acetate	8-hour	14,000[a]	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44
Ethylene glycol	8-hour	d	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39
Formaldehyde	8-hour	15[a]	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
Heavy metals	8-hour	d	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62
Heptane (N-heptane)	8-hour	d	9.06	9.06	9.06	9.06	9.06	9.06	9.06	9.06
Hexane (N-hexane)	8-hour	d	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
Hydrogen chloride	8-hour	d	3.41	3.41	3.41	4.01	3.41	3.41	3.41	4.06
Hydrogen fluoride	8-hour	d	1.29	1.29	1.29	1.54	1.29	1.29	1.29	1.54
Isopropyl alcohol	8-hour	9,800[a]	2.88	2.88	2.88	2.88	2.88	2.88	2.88	2.88
Kerosene	8-hour	d	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
Methyl alcohol	8-hour	d	3.14	3.46	3.14	3.14	3.14	3.14	3.14	3.14
Methyl ethyl ketone	8-hour	d	9.95	9.95	9.95	10.08	9.95	9.95	9.95	10.08
Methylene chloride	8-hour	d	5.90	5.90	5.90	5.90	5.90	5.90	5.90	5.90
Nickel	8-hour	10[a]	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
Nitric acid	8-hour	50[a]	3.53	3.53	3.53	3.53	3.53	3.53	3.53	3.53
Nitrogen oxide	8-hour	d	2.29	2.29	2.29	2.29	2.29	2.29	2.29	2.29
Nonmethane hydrocarbons	8-hour	d	15.83	15.83	15.83	15.83	15.83	15.83	15.83	15.83
Propane sultone	8-hour	d	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Stoddard solvent	8-hour	5,250[a]	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41
Toluene	8-hour	d	13.26	13.26	13.26	13.38	13.26	13.26	13.26	13.38
Tungsten (as W) (insoluble)	8-hour	50[a]	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53

TABLE 4.6.3.3–1.—*Estimated Concentrations of Pollutants from No Action and Stockpile Stewardship and Management Alternatives at Los Alamos National Laboratory* [Page 3 of 3]

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines (μg/m³)	2005 No Action (μg/m³)	Pit Fabrication (μg/m³)	Secondary and Case Fabrication (μg/m³)	High Explosives Fabrication (μg/m³)	Nonnuclear Fabrication (μg/m³)	Atlas Facility (μg/m³)	National Ignition Facility (μg/m³)	Combined Program Impacts (μg/m³)
Hazardous and Other Toxic Compounds (Continued)										
1,1,2-Trichloroethane	8-hour	[d]	4.95	4.95	4.95	4.95	4.95	4.95	4.95	4.95
Trichloroethylene	8-hour	[d]	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12
VM&P naphtha	8-hour	13,500[a]	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27
Welding fumes	8-hour	[d]	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80
Xylene	8-hour	[d]	9.41	9.41	9.41	9.41	9.41	9.41	9.41	9.41

[a] State standard or guideline. The conversion from ppm to μg/m³ for ambient air quality standards is calculated with the corrections for temperature (530°R) and pressure (elevation) (7,400 ft mean sea level).
[b] Federal standard.
[c] No monitoring data available, concentration assumed less than applicable standard.
[d] No standard.

Source: 40 CFR 50; DOE 1995hh; LANL 1995b:1; LANL 1995c; LANL 1995d; LANL 1995e; LANL 1995g; NM EIB 1995a; NM EIB 1996a; appendix I.

VOCs. Emission rates of criteria and toxic/hazardous pollutants for annual operation of the Pit Fabrication Facility are presented in appendix table B.3.6–1. Table 4.6.3.3–1 presents the concentrations of criteria and toxic/hazardous pollutants resulting from No Action and those generated from operation of the Pit Fabrication Facility. Concentrations of pollutants resulting from operation of this facility added to No Action concentrations are expected to remain within Federal and state regulations.

Secondary and Case Fabrication. The Secondary and Case Fabrication Facility would generate criteria and toxic/hazardous emissions resulting from operation of the plant boiler, component manufacturing, and chemical processes. Reasonably available control technology would be used to minimize pollutant emissions. This would include using HEPA filters to contain particulate emissions and providing liquid scrubbing prior to HEPA filtration to remove chemical vapors such as nitric acid. Emission rates for criteria and toxic/hazardous pollutants for the secondary and case fabrication mission are presented in appendix table B.3.6–1. Table 4.6.3.3–1 presents the concentrations of criteria and toxic/hazardous pollutants resulting from No Action and those generated from operation of the secondary and case fabrication mission. The resulting concentrations of criteria and toxic/hazardous pollutants are expected to remain within Federal and state regulations and guidelines. Modeled estimates for the 24-hour concentration of nitrogen dioxide, however, are above the applicable standard.

High Explosives Fabrication. Gaseous emissions of criteria and toxic/hazardous air pollutants would be generated from HE fabrication. These emissions would result from open burn/open detonation of nonradioactive scrap HE and HE-contaminated waste, plant boiler operation, cleaning operations using solvents, and formulation and synthesis operations. Emission rates for criteria and toxic/hazardous pollutants for HE fabrication are presented in appendix table B.3.6–1. Table 4.6.3.3–1 presents the concentrations of criteria and toxic/hazardous pollutants resulting from No Action and those generated from HE fabrication. The resulting concentrations of criteria and toxic/hazardous pollutants are expected to be within Federal and state regulations and guidelines.

Nonnuclear Fabrication. Aerial emissions of combustion by-products from the slight increase in process steam usage would result in an increase of 159 kg (350 lb) of VOCs. This emission rate is based upon the increase of natural gas combustion needed to generate an additional 1 million British thermal units of energy. Pollutant emissions of combustion by-products for steam and gas heating systems for normal building operations are not considered, as the facilities are existing and no increases in emissions would occur as a result of the proposed activity. Table 4.6.3.3–1 presents the concentrations of criteria and toxic/hazardous pollutants resulting from No Action and nonnuclear fabrication. Concentrations of pollutants resulting from operation of nonnuclear fabrication added to No Action concentrations are expected to remain within Federal and state regulations.

Sensitivity Analysis. Impacts to air quality from either the low or high case scenario of the program alternative would result in higher and lower concentrations of criteria and toxic/hazardous pollutants for the high and low case, respectively. The concentrations of pollutants for the high case pit fabrication, HE, and nonnuclear fabrication missions are expected to be within applicable Federal and state regulations and guidelines. The 24-hour concentration of nitrogen dioxide for the high case secondary and case fabrication mission is above applicable standards and guidelines.

Stewardship Alternatives

Proposed National Ignition Facility. Operation of the proposed NIF would generate criteria and toxic/hazardous pollutants resulting from the combustion of boiler fuel for heating, operation of diesel generators, and solvent cleaning processes. The emissions consist of particulate matter, carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, and VOCs. Boiler fuel is assumed to be natural gas. Emission rates of criteria and toxic/hazardous pollutants for annual operation of the proposed NIF are presented in appendix table B.3.6–1. Table 4.6.3.3–1 presents the concentrations of criteria and toxic/hazardous pollutants resulting from No Action and those generated from operation of the proposed NIF. Concentrations of pollutants resulting from operation of the proposed NIF added to No Action concentrations are expected to remain within Federal and state regulations.

Proposed Atlas Facility. Operation of the Atlas Facility would not typically generate criteria pollutants; however, for purposes of this analysis it is anticipated that small amounts of lead or other similar heavy metals might be released as a volatilized metal from the target chamber following certain occasional experiments. Toxic/hazardous emissions would be generated by the Atlas Facility following each experiment due to the evaporation of solvents used to clean the inside of the target chamber. The quantity of air emissions resulting from each experiment are small and therefore require no facility air filtration or scrubbers. Emission rates of criteria and toxic/hazardous pollutants for annual operation of the proposed Atlas Facility are presented in appendix table B.3.6–1. Table 4.6.3.3–1 presents the concentrations of criteria and toxic/hazardous pollutants resulting from No Action and those generated from operation of the proposed Atlas Facility. Concentrations of pollutants resulting from operation of the proposed Atlas Facility added to No Action concentrations are expected to remain within Federal and state regulations.

Combined Program Impacts. The combined Program impacts to air quality, assuming that each of the proposed stewardship and management alternatives are located at LANL, are presented in table 4.6.3.3–1. The table presents total program concentrations of criteria and toxic/hazardous pollutants derived by adding the contribution from each alternative. The contribution to air pollutants was determined for each alternative independently from each of the other alternatives. Therefore, adding the respective contributions presents a conservative estimate of the combined impacts to air quality since the maximum pollutant concentration for each alternative would not occur at the same time or location at or beyond the site boundary.

Using this conservative estimate of the combined impacts to air quality at LANL, the data indicate that the 24-hour concentration of nitrogen dioxide may result in a concentration above the applicable State of New Mexico ambient air quality standard. All other criteria and/or toxic/hazardous air pollutants are expected to be within applicable standards.

Potential Mitigation Measures. The use of reasonably available control technology may contribute to the reduction of concentrations of nitrogen dioxide.

4.6.3.4 *Water Resources*

Environmental impacts associated with the construction and operation of the potential stockpile stewardship and management facilities at LANL could affect surface and groundwater resources. All water required for construction or operation would be supplied from groundwater. The proposed sites for the new or modified facilities would be outside the 100- and 500-year floodplains. A description of the activities that would continue at LANL is provided in section 3.2.6. Table 4.6.3.4–1 presents existing surface water and groundwater resources and the potential changes to water resources at LANL resulting from the proposed alternatives. The total site water resources requirements for each alternative including No Action are displayed in this table. Combined program impacts if all alternatives were implemented at LANL are also listed.

Surface Water

No Action. Since there would be no construction under No Action, no additional construction water would be required or discharged. Current wastewater discharge would remain at 693 MLY in the No Action year 2005.

Management Alternatives

Pit Fabrication. Existing facilities would be modified at TA-55 to accept the pit fabrication mission. Modification activities would take place in TAs atop mesas and would not be affected by a 500-year flood. No surface water would be withdrawn for stockpile stewardship and management activities. Impacts to surface water resources associated with runoff and wastewater discharged during the modification phase would be negligible.

During operation, sanitary and other liquid wastes would be treated at the Los Alamos Sanitary Treatment Facility. Treated wastewater would then be discharged to the canyons. The additional sanitary wastewater generated by the processes would be approximately 12.3 MLY (3.2 MGY). This repre-

TABLE 4.6.3.4–1.—*Potential Changes to Water Resources from Stockpile Stewardship and Management Alternatives at Los Alamos National Laboratory* [Page 1 of 2]

Affected Resource Indicator	No Action Single-Shift Operation 2005	Pit Fabrication Three-Shift Operation	Secondary and Case Fabrication Three-Shift Operation	High Explosives Fabrication Three-Shift Operation	Nonnuclear Fabrication Three-Shift Operation	National Ignition Facility	Atlas Facility	Combined Program Impacts
Construction								
Water Availability and Use								
Water source	Ground	Ground	Ground	Ground	Ground	Ground	Ground	Ground
Total site water operation requirement[a] (MLY)	0[b]	5,760	5,761	5,760	5,760	5,763	5,760	5,764
Percent change from No Action water use (5,760 MLY)	NA	0	0.02	0	0	0.05	0	0.07
Water Quality								
Wastewater discharge to surface waters[c]	0[b]	693	693.9	693	693	693.4	693	694.3
Percent change from No Action wastewater discharges (693 MLY)	NA	0	0.13	0	0	0.06	0	0.18
Operation								
Water Availability and Use								
Water source	Ground	Ground	Ground	Ground	Ground	Ground	Ground	Ground
Total site water operation requirement (MLY)	5,760	5790	5,815	5,773	5,808	5,912	5,760	6,059
Percent change from No Action water use (5,760 MLY)	NA	0.5	1	0.2	0.8	2.6	0	5.2
Percent change from current use (5,519 MLY)	4.4	4.9	5.4	4.6	5.2	7.1	4.4	9.8
Percent of groundwater allotment (6,800 MLY)	85	85	86	85	85	87	85	89
Water Quality								
Wastewater discharge to surface waters[c]	693	705	713	706	694	711	693	757
Percent change from No Action wastewater discharge (693 MLY)	NA	1.8	2.9	1.8	0.08	2.6	0	9.2
Percent change from current wastewater discharge (693 MLY)	0	1.8	2.9	1.8	0.08	2.6	0	9.2

TABLE 4.6.3.4–1.—*Potential Changes to Water Resources from Stockpile Stewardship and Management Alternatives at Los Alamos National Laboratory* [Page 2 of 2]

Affected Resource Indicator	No Action Single-Shift Operation 2005	Pit Fabrication Three-Shift Operation	Secondary and Case Fabrication Three-Shift Operation	High Explosives Fabrication Three-Shift Operation	Nonnuclear Fabrication Three-Shift Operation	National Ignition Facility	Atlas Facility	Combined Program Impacts
Floodplain								
Actions in 100-year floodplain	NA	None	None	None	None	None	None	None
Actions in 500-year floodplain	NA	None	None	None	None	None	None	None

[a] Total water requirements for construction at LANL are based on a 4-year period for Atlas Facility, a 2-year period for nonnuclear fabrication and HE fabrication, a 4-year period for secondary and case fabrication, and a 5-year period for the proposed NIF.

[b] No construction water would be used or construction wastewater generated. Total site water use and wastewater discharged would be the same as No Action operation.

[c] NPDES permit is required for stormwater discharges.

Note: NA - not applicable; MLY - million liters per year.

Source: LANL 1995b:1; LANL 1995c; LANL 1995d; LANL 1995e; LANL 1995g; LANL 1996e:1; appendix I; appendix K.

sents an increase of approximately 1.8 percent over the projected sanitary wastewater generation rate of 693 MLY (183 MGY).

Secondary and Case Fabrication. During operation, nonhazardous sanitary liquid wastes would be disposed of by a sanitary collection system. Sanitary process and support liquids are sent by drain to the sanitary wastewater treatment plant (TA-46) and treated similarly to municipal sewage. The additional sanitary wastewater generated by the processes would be approximately 20.4 MLY (5.4 MGY). This represents an increase of approximately 2.9 percent over the projected sanitary wastewater generation rate of 693 MLY (183 MGY). No additional impacts to surface water are anticipated.

While brief downpours can cause local flash flooding, especially in canyons, streams, and other low spots, most of the LANL TAs, including TA-55, are located atop the finger mesas near drainage ditches and are not subject to flooding.

High Explosives Fabrication. During modification activities, no additional sanitary liquid waste or other liquid wastes would be generated. During operation, sanitary liquid and other liquid wastes would be treated at the Los Alamos Sanitary Treatment Facility before being discharged to the canyons. The HE fabrication processes would generate approximately 12.8 MLY (3.38 MGY) of additional sanitary wastewater. This represents an increase of approximately 1.8 percent over the projected sanitary wastewater generation rate of 693 MLY (183 MGY). Treated effluent would be monitored to comply with NPDES-permitted and other applicable discharge requirements. No adverse impacts to surface water or surface water quality are expected.

All proposed HE facilities and buildings at the Los Alamos HE Facility are located above the critical flood elevation of the potential flood source (i.e., river, dam, levee, and precipitation).

Nonnuclear Fabrication. An additional 0.005 MLY (0.001 MGY) of wastewater would be discharged during construction. Sanitary and other liquid wastes would be treated at the Los Alamos Sanitary Treatment Facility and then discharged to the canyons. The processes associated with nonnuclear fabrication would generate approximately 0.57 MLY (0.151 MGY) of additional sanitary wastewater. This represents approximately a 0.08-percent increase in the annual projected sanitary wastewater generation rate of 693 MLY (183 MGY). Treated effluent would be monitored to comply with NPDES permits and with applicable discharge requirements. No adverse impacts to surface water or surface water quality are expected.

Stewardship Alternatives

Proposed National Ignition Facility. The proposed NIF is expected to generate an additional 17.8 MLY (4.7 MGY) of sanitary wastewater. This amount would represent a 2.6-percent increase in the annual projected sanitary wastewater generation rate of 693 MLY (183 MGY). Consolidation of LANL's sewer system was completed in 1994 to bring all treatment systems into compliance with Federal and state regulations. Capacity of the consolidated sewer system would be sufficient to meet project requirements.

Because the canyons south and north of the NIF location are more than 20 m (65.6 ft) deep, the 100-year floodplain is contained within the canyons. Because of the depth of the canyons, impacts from a 500-year flood event are unlikely.

Proposed Atlas Facility. Existing buildings at TA-35 would be renovated for the proposed Atlas Facility. During modification activities and operations, a minimal amount of wastewater would be generated. Current wastewater capacities would be able to meet the additional requirements for the Atlas Facility. Additional information regarding the Atlas Facility at LANL is presented in appendix K. No additional wastewater would be discharged to surface water during construction, modification, or operation activities.

Groundwater

No Action. Water supply at LANL is provided by three DOE-owned well fields. Springs in the area produce approximately 1 percent of the water supply. Approximately 5,760 MLY (1,522 MGY) of water is produced.

Since there would be no construction or modifications under No Action, no additional groundwater for construction would be required. Baseline conditions and operations, described in section 4.6.2.4, would continue, and groundwater withdrawal would remain at 5,760 MLY (1,522 MGY) in 2005. No additional impacts to groundwater quality are anticipated since there are no direct discharges to groundwater.

Management Alternatives

Pit Fabrication. Water requirements for both the building modification activities and operation phase would be supplied from local groundwater sources. Minimal water would be needed during the building modification activities.

During operation, an additional 30.2 MLY (7.98 MGY) of water would be required to support pit fabrication activities, which is a 0.52-percent increase over the No Action groundwater withdrawal of 5,760 MLY (1,522 MGY). The projected water requirements for modification activities and operation would not constitute significant increases in the total amount of groundwater currently withdrawn by LANL and would not affect water supply in the area. The additional amount would still be below the LANL maximum allotment of 6,800 MLY (1,796 MGY).

Secondary and Case Fabrication. Approximately 1 MLY (0.26 MGY) of groundwater would be required for construction and modification activities.

Operation of the secondary and case fabrication facilities would require approximately 55 MLY (14.5 MGY), which is less than a 1-percent increase over the projected groundwater withdrawal of 5,760 MLY (1,522 MGY). The projected water requirements during operation would not constitute significant increases in the total amount of groundwater currently withdrawn by LANL and would not affect water supply in the area. The additional amount would still be below the LANL maximum allotment of 6,800 MLY (1,796 MGY).

High Explosives Fabrication. No additional groundwater would be needed for HE fabrication building modification activities. During modification, no wastewater would be discharged to groundwater. Adverse impacts to groundwater are not expected.

Operation of the HE fabrication facilities would require approximately 13 MLY (3.4 MGY), which is an increase of less than 1 percent over the projected groundwater withdrawal of 5,760 MLY (1,522 MGY). The projected water requirements during operation would not constitute significant increases in the total amount of groundwater currently withdrawn by LANL and would not affect water supply in the area. The additional amount of water would still be below the LANL maximum allotment of 6,800 MLY (1,796 MGY).

Nonnuclear Fabrication. Approximately 0.004 MLY of additional groundwater would be needed for building modification activities for nonnuclear fabrication. Operation of the nonnuclear fabrication facilities would require approximately 48.3 MLY (12.76 MGY), which is a 0.8-percent increase in the projected groundwater use of 5,760 MLY (1,522 MGY). The projected water requirements during operation would not constitute significant increases in the total amount of groundwater currently withdrawn by LANL, and would not affect water supply in the area.

Groundwater Quality. No process wastes from the proposed management alternatives would be discharged directly to the groundwater, and all treated wastewater discharges to the canyons would be monitored to comply with NPDES permit and other applicable discharge requirements. Given normal safeguards and precautions, no adverse impacts to groundwater quality are expected.

Sensitivity Analysis. The effluent discharges to surface waters resulting from the high stockpile case are expected to be similar or slightly greater than the volumes generated by the surge three-shift operation alternatives. The low case scenario would discharge a slightly larger volume of treated effluent compared to the No Action volume. Additional impacts to surface water quality would be negligible. Groundwater quality is not expected to be impacted by the low or high case production scenario at LANL.

Stewardship Alternatives

Proposed National Ignition Facility. During the proposed NIF's 5-year construction period, approximately 3 MLY (0.8 MGY) of water would be required. This amount is a 0.05-percent increase in the (2005) projected groundwater withdrawal of 5,760 MLY (1,522 MGY). Operation of the proposed NIF would require approximately 152 MLY (40.2 MGY), of which 17.8 MLY (4.7 MGY) would be for domestic use. This amount is a 2.6-percent increase in the projected groundwater withdrawal of 5,760 MLY (1,522 MGY). The projected water requirements during operation would not constitute significant increases in the total amount of groundwater projected to be withdrawn by LANL and would not affect water supply in the area. This additional amount would still be below the LANL maximum allotment of 6,800 MLY (1,800 MGY).

Proposed Atlas Facility. Existing buildings at TA-35 would require renovation for the proposed Atlas Facility. During modification activities and operation, a minimal amount of water would be required. Current water capacities would be able to meet the additional requirements for the proposed Atlas Facility. Additional information regarding the Atlas Facility at LANL is presented in appendix K.

Groundwater Quality. No process wastes from the proposed stewardship alternative would be discharged directly to the groundwater, and all treated wastewater discharges to the canyons would be monitored to comply with NPDES permit and other applicable discharge requirements. Given normal safeguards and precautions, no adverse impacts to groundwater quality are expected.

Combined Program Impacts. The combined Program impacts to water resources if each proposed alternative were implemented at LANL are shown in table 4.6.3.4–1. A negligible amount of water would be required for modification activities. Approximately 6,059 MLY (1,600 MGY) of groundwater would be required to operate the facilities; this represents a 5.2-percent increase in projected groundwater use and 89 percent of the current groundwater allotment at LANL. Wastewater discharges during construction and operation of the facilities would total approximately 0.6 MLY (0.2 MGY) and 64 MLY (17 MGY), respectively. All wastewater would be discharged to surface waters and would be monitored to comply with NPDES permit and other applicable discharge requirements. Given normal safeguards and precautions, no adverse impacts to surface water or groundwater quality are expected.

Potential Mitigation Measures. Because appropriate erosion and runoff management measures would be implemented during construction to comply with NPDES stormwater management regulations, no mitigation measures should be necessary. Stormwater measures include erosion control measures such as silt fences, dikes, and sediment traps to divert runoff away from disturbed areas and stabilization practices that cover soils with materials such as riprap or mulch in order to prevent direct exposure of soils to runoff.

4.6.3.5 *Geology and Soils*

The proposed alternatives for LANL would have no adverse impact on the geological resources described in section 4.6.2.5. Although a moderate seismic risk exists at LANL, this would be considered during design, construction, and operation of any new functions. The existing seismic risk does not preclude safe implementation and operation of the new functions. The LANL stockpile management alternatives and the proposed Atlas Facility would use existing structures within their current footprints. There would be a nominal amount of area required for equipment staging, material laydown, and parking. Existing facility space or developed areas would be used for these activities. Modification activities, with the exception of the erection of seismic reinforcement, would be within the existing building structures. There is sufficient parking for construction workers in lots adjacent to work areas.

The proposed NIF would require additional acreage, but would not adversely affect geological resources. Control measures would be used to minimize any soil erosion. Potential changes to geology and soils associated with the proposed alternatives at LANL are discussed below.

No Action. Under No Action, DOE would continue current and planned activities at LANL. Any impacts to geology and soils would be independent of and unaffected by the proposed action.

Management Alternatives

Pit Fabrication. All new functions would be accommodated within existing structures; therefore, modification and operation activities would not affect geological conditions. Soil disturbance is not expected. The properties and conditions of the soils underlying the proposed site place no limitations on modification activities and operation. Soils would not adversely affect the safe operation of project facilities.

During implementation and operation of the new functions, seismic activity in the area could pose a potential hazard to the facilities and personnel at LANL. Modifications of site facilities to accommodate new pit fabrication functions would take into account the moderate seismic risk in the LANL area. All facilities would be designed for earthquake-generated ground acceleration in accordance with DOE O 420.1 and accompanying safety guides. Secondary effects from seismic activities, such as soil liquefaction or landslides, are not expected because of the depth of groundwater and relatively stable topography on top of the mesas. Hazards resulting from the return of volcanism during implementation or operation are unlikely (see section 4.6.2.5). Potential health impacts from accidents associated with geological hazards are discussed in section 4.6.3.9.

Secondary and Case Fabrication. Impacts to geology and soils from secondary and case fabrication at LANL would be similar to those described above for pit fabrication.

High Explosives Fabrication. Impacts to geology and soils from HE fabrication at LANL would be similar to those described above for pit fabrication.

Nonnuclear Fabrication. Impacts to geology and soils from nonnuclear fabrication at LANL would be similar to those described above for pit fabrication.

Sensitivity Analysis. The high or low case operation scenario for the proposed stockpile management alternatives at LANL would not affect geology or soils.

Stewardship Alternatives

Proposed National Ignition Facility. The construction and operation of the proposed NIF at LANL would not adversely affect geological resources. NIF would require the clearing of an estimated 4 ha (10 acres) of land for buildings, walkways, building access, and buffer space. Soil impacts during construction would be short term and minor with appropriate erosion and sediment control measures. Net soil disturbance during operation would be less than for construction because areas temporarily used for equipment and material laydown would be restored. Seismic risks would be taken into account during construction and operation of the proposed NIF (see appendix I).

Proposed Atlas Facility. The design, installation, and operation of the Atlas Facility in existing buildings at LANL would have no impact on geological resources. Seismic risks would be taken into account during design, implementation, and operation of the Atlas Facility (see appendix K).

Potential Mitigation Measures. No mitigation measures for stockpile stewardship and management alternatives at LANL are anticipated.

4.6.3.6 *Biotic Resources*

The following sections address impacts to terrestrial resources, wetlands, aquatic resources, and threatened and endangered species at LANL. Although most alternatives would not impact these resources, the proposed NIF would result in a loss of terrestrial habitat and possible impacts to threatened and endangered species.

No Action. Under No Action, the limited replacement pit fabrication, selected nonnuclear fabrication, and stewardship R&D missions described in section 3.2.6 would continue at LANL. There would be no changes to current biotic resource conditions at the site as described in section 4.6.2.6.

Management Alternatives

Pit Fabrication. The pit fabrication and intrusive and nonintrusive modification pit reuse mission at LANL would utilize existing facilities within the boundaries of a number of the site's TAs. No new construction would be required and wastewater would be released through existing NPDES-permitted discharges. The operation of pit manufacturing facilities at LANL is not expected to impact biotic resources.

Secondary and Case Fabrication. The secondary and case fabrication mission, would take place in existing structures located within a number of the site's TAs. No new construction would be required and wastewater would be released through existing NPDES permitted discharges. The operation of the secondary and case fabrication mission facilities at LANL is not expected to impact biotic resources.

High Explosives Fabrication. The HE fabrication mission would take place in existing structures located within a number of the site's TAs. No new construction would be required and wastewater would be released through existing NPDES-permitted discharges. The operation of HE fabrication mission facilities at LANL is not expected to impact biotic resources.

Nonnuclear Fabrication. Nonnuclear fabrication mission elements that would be moved to LANL would be located in existing buildings within a number of the site's TAs. No new construction would be required and wastewater would be released through existing NPDES-permitted discharges. The relocation of the nonnuclear fabrication mission to LANL is not expected to impact biotic resources.

Sensitivity Analysis. Implementation of either a low or high case workload for the stockpile management alternatives would not affect biological resources at LANL.

Stewardship Alternatives

Proposed National Ignition Facility

Terrestrial Resources. The proposed NIF would be located within TA-58, an undeveloped area containing ponderosa pine. Construction of new facilities would result in the disturbance of approximately 4 ha (10 acres) of habitat. This would cause a fragmentation of the wooded habitat present on the site. Proper erosion and sediment control measures would reduce the potential for disturbance of habitat adjacent to the construction area. During construction, animal species within the disturbed area would be either destroyed or displaced depending upon whether they were able to move from the area.

During construction and operation, fencing around the proposed NIF could cause a localized constraint on the movement of the resident elk herd in the area of the site. Wildlife may also be disturbed by the increased level of human activity associated with the project.

Wetlands. Construction and operation of the proposed NIF is not expected to affect wetlands since this resource is not located on or near the proposed site.

Aquatic Resources. Construction and operation of the proposed NIF is not expected to affect aquatic resources since this resource is not located on or near the proposed site.

Threatened and Endangered Species. The construction of the proposed NIF at LANL would disturb a small amount of habitat suitable for several special status species which potentially exist onsite. If present, less mobile species such as the New Mexican meadow jumping mouse *(Zapus hudsonius luteus)* and plant species could be lost during construction. Construction could also disturb potential foraging or nesting habitat for the Mexican spotted owl (*Strix occidentalis lucida*), gray vireo *(Vireo vicinior)*, southwestern willow flycatcher *(Empidonox traillii extimus)*, and spotted bat *(Euderma maculata)*. Some species such as the spotted owl may be further disturbed by the increased level of human activity (i.e., noise and lighting) associated with the project. Informal consultation under the *Endangered Species Act* may be necessary regarding the Mexican spotted owl.

Proposed Atlas Facility. The proposed Atlas Facility would be located at TA-35, located near the center of Pajarito Mesa, which is immediately north and east of Pajarito Canyon. The facility would be placed in existing TA-35 buildings, with the exception of a limited number of associated structures (e.g., storage tanks and a concrete pad), which would be constructed adjacent to existing buildings. No natural habitat would be disturbed and runoff volumes would not change appreciably from present levels; thus, impacts to biotic resources from construction and operation of the proposed Atlas Facility would not be expected.

Potential Mitigation Measures. Limiting the area to be disturbed, revegetating with native species, and implementing a soil erosion and sediment control plan would help to lessen short- and long-term impacts to terrestrial species and habitats. Disturbance to wildlife living in areas adjacent to new facilities may be minimized by preventing workers from entering undisturbed areas. It may be necessary to survey the site for the nests of migratory birds prior to construction and to avoid clearing operations during the breeding season. If any threatened or endangered species exist on the site, specific mitigation measures would be developed in conjunction with the USFWS.

4.6.3.7 *Cultural and Paleontological Resources*

For the discussion of impacts, the term cultural resources includes prehistoric, historic, and Native American resources. Cultural and paleontological resources may be affected directly through ground disturbance, building modification, visual intrusion of the project to the historic setting or environmental context of historic sites, visual and audio intrusions to Native American resources, reduced access to traditional use areas, and unauthorized artifact collecting and vandalism. Cultural resources surveys have been conducted in portions of the involved TAs. Some NRHP-eligible prehistoric and historic resources may be affected by the proposed actions. Site-specific surveys and evaluations would be conducted in conjunction with the *National Historic Preservation Act* and tiered NEPA documents. No impacts to Native American resources are anticipated. Geological strata at LANL are not known to be fossiliferous.

No Action. Under No Action, DOE would continue existing and planned missions at LANL as described in section 3.2.6. Any impacts to cultural or paleontological resources would be independent of and unaffected by the proposed action.

Management Alternatives

Pit Fabrication. Pit fabrication and intrusive modification pit reuse would necessitate reconfiguring and upgrading existing facilities within TAs -3, -8, -35, -50, -54, and -55. A nominal area would be required for equipment staging, material laydown, and parking during the modification of the facilities. All of TA-35 has been surveyed, and no cultural resources were identified. Portions of TAs -3, -8, -50, -54, and -55 have been surveyed and contain NRHP-eligible prehistoric and/or historic resources. Additional prehistoric and historic resources may exist on unsurveyed portions of the involved TAs. NRHP-eligible resources would be identified through project-specific inventories and evaluations, and any project-related effects would be addressed in tiered NEPA documentation. Impacts to Native American resources are not expected as a result of the alternative but would be identified through consultation with the potentially affected tribes. None of the geological formations at LANL are known to be fossiliferous.

Secondary and Case Fabrication. Replacing secondary and case fabrication would use existing facilities within the boundaries of TAs -3, -8, -50, -54, and -55. Some of these buildings would need modifications. A nominal area within existing buildings and developed areas would be required for equipment staging, material laydown, and parking during the facilities modification. Portions of each of the involved TAs have been surveyed and contain NRHP-eligible prehistoric and/or historic resources. Some additional NRHP-eligible sites may exist in unsurveyed portions of the involved TAs. Some prehistoric and historic resources may be affected by the proposed action. NRHP-eligible resources would be identified through project-specific surveys, inventories, and evaluations, and any project-related effects would be addressed in tiered NEPA documentation. Impacts to Native American resources are not expected but would be identified through consultation with potentially affected tribes. None of the geological formations at LANL are known to be fossiliferous.

High Explosives Fabrication. HE fabrication would take place in TAs -9, -16, -28, and -37. Only minimal new equipment is needed; no facility construction or modification is necessary to conduct the HE fabrication mission at LANL. No impacts to cultural or paleontological resources are anticipated. Sharing this mission with LLNL would have no impact on cultural and paleontological resources at LANL.

Nonnuclear Fabrication. Nonnuclear fabrication would use existing facilities within TAs -3, -16, -22, and -35. Additional equipment and building modifications would be necessary. These modifications largely involve electrical upgrades, and no ground disturbance is expected. Impacts to prehistoric, Native American, or paleontological resources are not anticipated. Some of the facilities to be modified under this alternative have been declared eligible for inclusion in the NRHP. Any project-related effects to historic resources would be addressed in tiered NEPA and *National Historic Preservation Act* documentation.

Sensitivity Analysis. The high and low case scenarios for the proposed stockpile management alternatives at LANL would have the same impacts to cultural and paleontological resources as the base case production facilities.

Stewardship Alternatives

Proposed National Ignition Facility. Surveys indicate that no prehistoric or historic archaeological sites or structures exist on the proposed NIF location in TA-58. Paleontological remains are unlikely to exist in the proposed location because the Pajarito Plateau, comprised of Pleistocene volcanic tuffs and the Bandelier Formation, does not contain fossiliferous deposits. No Native American resources have been identified to date in the proposed location but some may be identified through consultation with the potentially affected tribes.

Proposed Atlas Facility. Existing buildings in TA-35 would be renovated to implement the proposed Atlas Facility. Some additional land would be required for the placement of concrete pads, storage tanks, and transportable office and diagnostic space. All of TA-35 has been surveyed for cultural resources and none were identified. All of the involved buildings were constructed in either 1980 or 1990 (appendix K) and are not NRHP eligible. No impacts to Native American or paleontological resources are expected.

Potential Mitigation Measures. If NRHP-eligible sites cannot be avoided though project design or siting, and the facility would cause adverse impacts, then a Memorandum of Agreement would need to be negotiated among DOE, the New Mexico SHPO, and the Advisory Council on Historic Preservation. The Memorandum of Agreement would formalize mitigation measures agreed to by these consulting parties. Mitigation measures could include describing and implementing intensive inventory and evaluation studies, data recovery plans, site treatments, and monitoring programs. The appropriate level of data recovery for mitigation would be determined through consultation with the New Mexico SHPO and the Advisory Council on Historic Preservation in accordance with Section 106 of the *National Historic Preservation Act*. Mitigation measures for specific NRHP-eligible sites would be identified during tiered NEPA documentation.

If Native American resources could not be avoided through project design or siting, then acceptable mitigation measures to reduce project impacts on them would be determined in consultation with the affected Native American groups. In accordance with the *Native American Graves Protection and Repatriation Act* and the *American Indian Religious Freedom Act*, such mitigations may include, but would not be limited to, appropriately relocating human remains, planting vegetation screens to reduce visual or noise intrusion, increasing access to traditional use areas during operation, or transplanting or harvesting important Native American plant resources.

4.6.3.8 *Socioeconomics*

No Action. Under No Action, the existing missions at LANL as described in section 3.2.6 would continue with no new employment or in-migration of workers. Projections for regional economy and employment rates, population and housing changes, and public finance characteristics are presented in appendix D.

By 2002, the DAHRT Facility would be operational at LANL. A total of 80 jobs would be generated as a result of operation of this facility. This increase in workers has been considered in the No Action analysis for LANL.

Regional Economy and Employment. Total employment in the regional economic area is projected to grow slightly less than 2 percent annually between 1995 and 2000, reaching approximately 122,700 in the latter year. Long-range projections show employment growth averaging slightly more than 1 percent annually between 1995 and 2000 and then slowing to less than 1 percent between 2021 and 2030, reaching approximately 164,400 persons. Site employment at LANL is expected to total 6,546 in 2005. The unemployment rate in the regional economic area was 6.2 percent in 1994 and is expected to remain at this level into the near future. Per capita income is projected to increase from approximately $18,314 in 1995 to $26,801 in 2030.

Population and Housing. Annual ROI county and city population and housing growth is projected to be less than 2 percent over the period 1995 to 2005 and then is expected to slow to about 1 percent in the period 2006 to 2030. Annual increases between 2006 and 2030 are expected to be a little more than 1 percent. Population in the ROI is projected to increase from 167,400 in 1995 to 245,100 by 2030. The total number of housing units in the ROI is projected to increase from 70,100 in 1995 to 102,700 in 2030.

Public Finance. Between 2000 and 2005, all ROI county, city, and school district total revenues are projected to increase at an annual average of less than 1.6 percent. Total expenditures are projected to increase at an annual average of less than 1.5 percent during the same period. These rates of increase should continue until 2030.

Management Alternatives

Pit Fabrication

Regional Economy and Employment. Modification-related activities for the Pit Fabrication Facility would require 138 direct workers during the peak construction year and would generate approximately an additional 90 indirect jobs in the regional economic area. As a result of the modification activities, total employment for the LANL regional economic area would increase by much less than 1 percent. This increase would reduce the unemployment rate from 6.2 percent under the No Action alternative to approximately 6 percent. Per capita income for the LANL regional economic area would increase very slightly over No Action projections.

Operation employment at LANL would begin phasing in as the modification phase nears completion. Operation of the facility in the base case surge mode would generate 260 new direct jobs, but would generate no indirect jobs because there are no closely related industries in the regional economic area. As a result of the operation of the facility, total employment for the LANL regional economic area would increase by much less than 1 percent. This increase would reduce regional unemployment from the 6.2 percent No Action estimate to approximately 6.0 percent. Per capita income for the LANL regional economic area would increase by much less than 1 percent over No Action projections. Changes in employment and per capita income resulting from the operation of the Pit Fabrication Facility are shown in figure 4.6.3.8–1.

Population and Housing. Population in the LANL ROI during peak construction would not increase over No Action projections. Available workers in the regional economic area and ROI would be sufficient to fill all of the direct and indirect jobs generated by the modification activities for the facility.

There would not be enough available workers to fill all of the direct operation jobs. Approximately 20 workers would in-migrate to fill positions at the Pit Fabrication Facility. The ROI population over No Action for full operation at LANL is shown in figure 4.6.3.8–2. Vacant housing in the ROI is sufficient to house the in-migrating workers and their families.

Public Finance. Modification of the Pit Fabrication Facility would not require in-migrating workers. Therefore, changes to local finances compared to No Action projections would be attributed to income increases and would be negligible.

Changes in revenues and expenditures compared to No Action projections due to operation of the facility at LANL are shown in figure 4.6.3.8–3. In 2005 the percent increase in total ROI revenues and expenditures over No Action projections would be negligible with the exception of the Los Alamos school district which would be expected to experience increases of approximately 1 percent.

Secondary and Case Fabrication

Regional Economy and Employment. Modification-related activities for the Secondary and Case Fabrication Facility would generate a total of 55 direct jobs during the peak construction year and would generate an additional 36 indirect jobs in the regional economic area. As a result of the modification activities, total employment for the LANL regional economic area would increase by less than 1 percent. This increase would reduce regional unemployment from the 6.2 percent No Action estimate to approximately 6.1 percent. Per capita income for the LANL regional economic area would increase very slightly over No Action projections as a result of modification activities for the Secondary and Case Fabrication Facility.

Facility operation-related employment at LANL would begin phasing in as the modification phase nears completion. Operation of the facility in the base

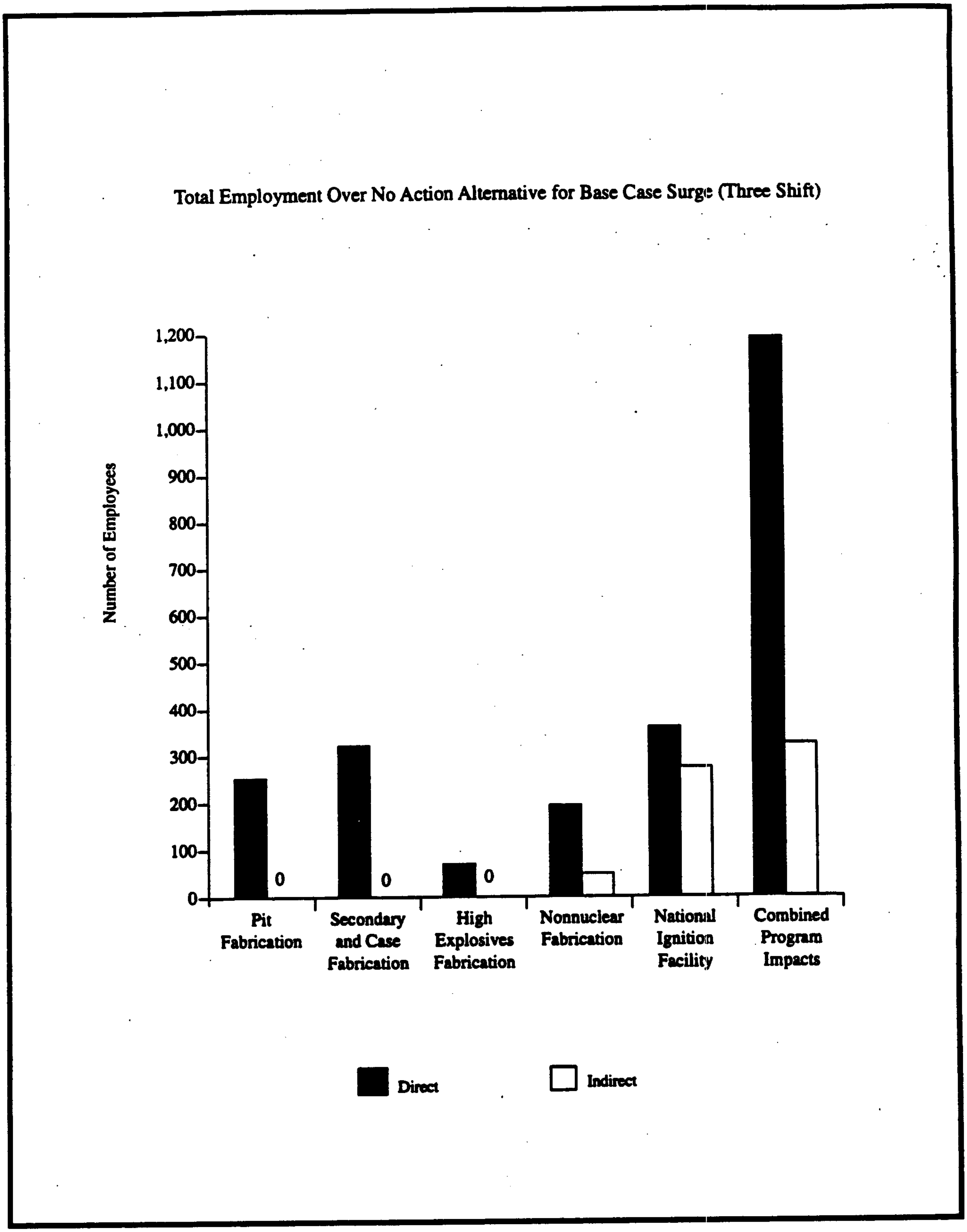
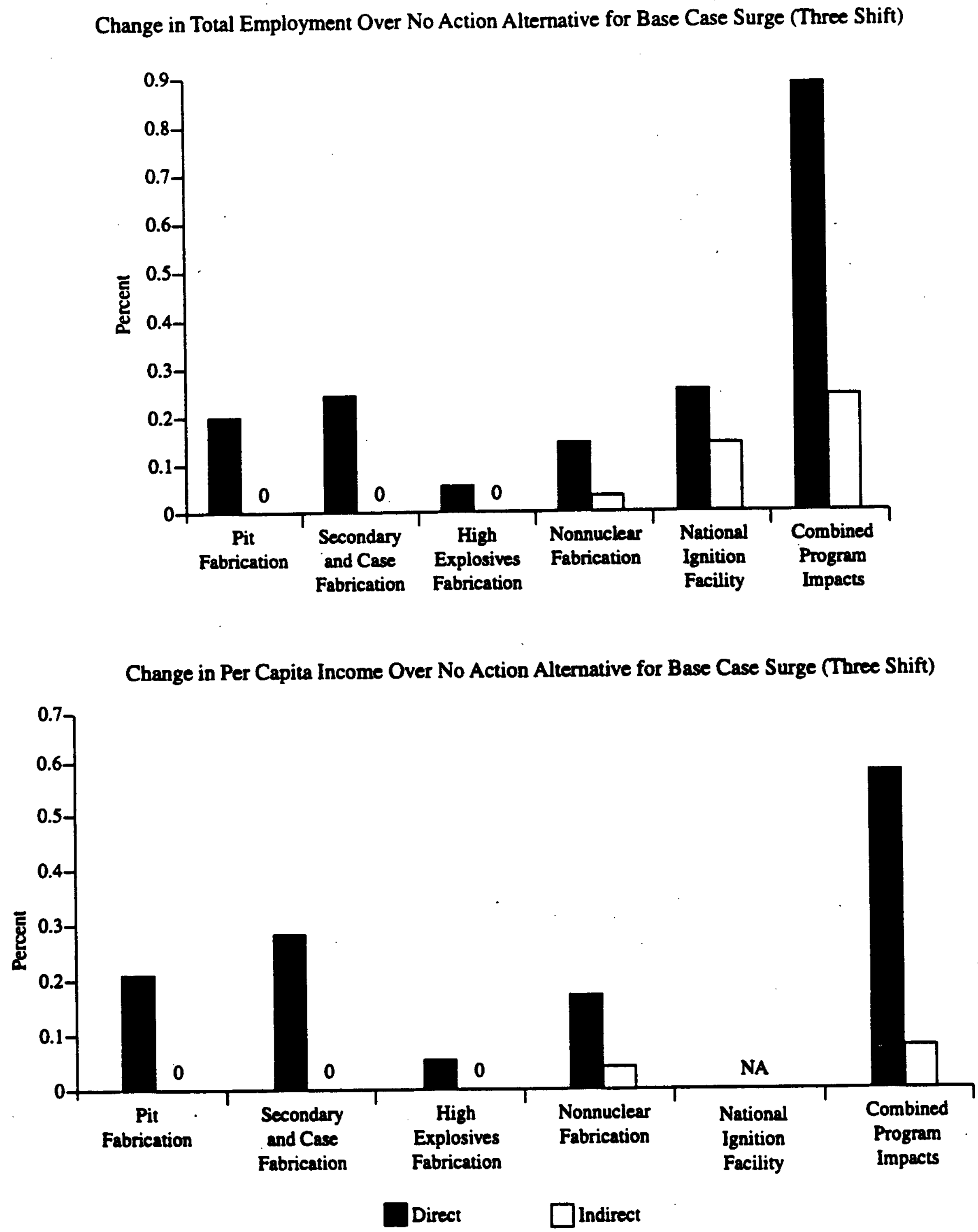


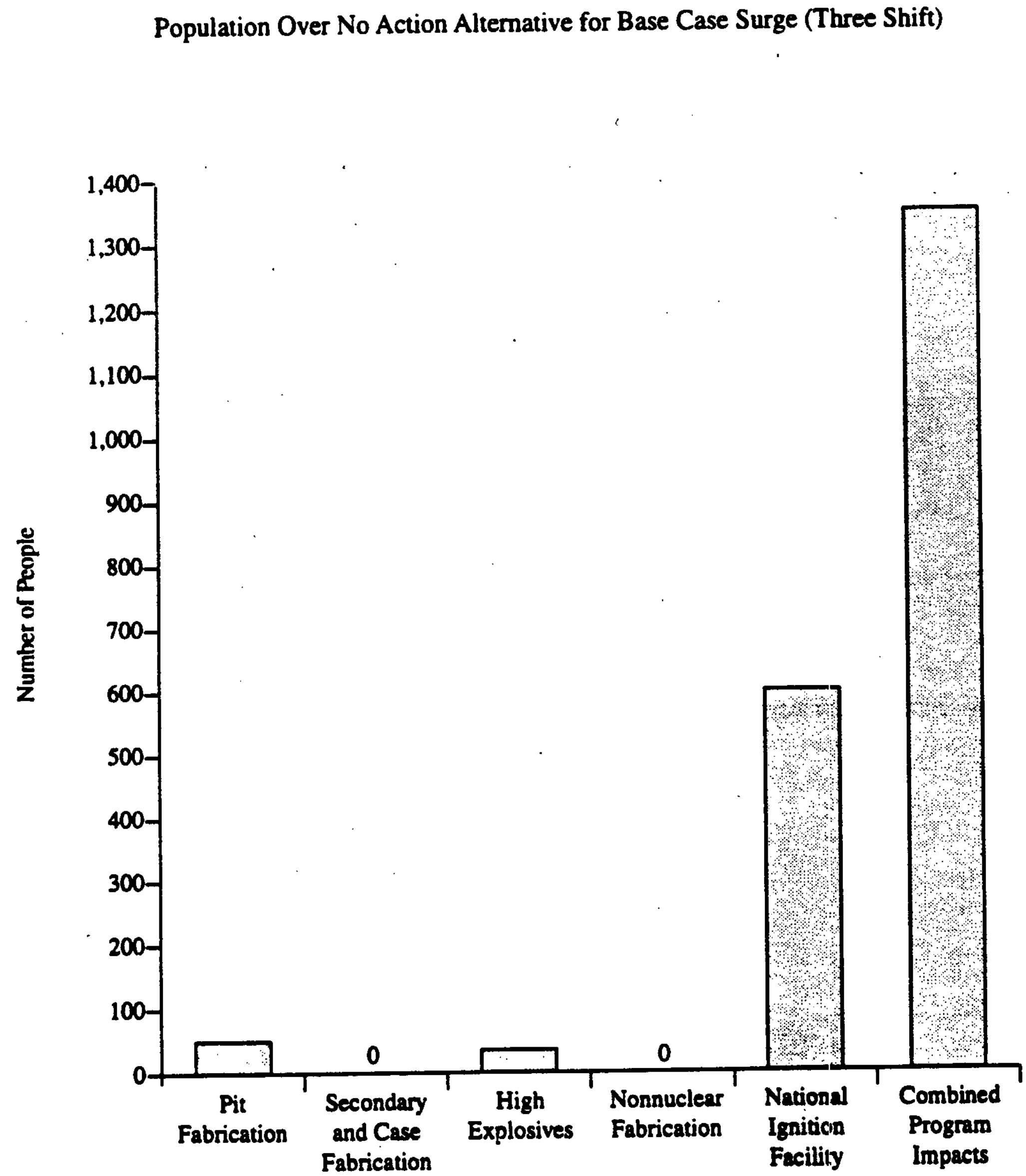
FIGURE 4.6.3.8–1.—*Employment and Income Changes Resulting from Stewardship and Management Alternatives in the Los Alamos National Laboratory Regional Economic Area, 2005* [Page 1 of 2].



Note: No Action projections are baseline for comparing proposed alternatives; base case surge does not apply to NIF operation; NA - not applicable.

Source: Socio 1996b.

FIGURE 4.6.3.8–1.—*Employment and Income Changes Resulting from Stewardship and Management Alternatives in the Los Alamos National Laboratory Regional Economic Area, 2005* [Page 2 of 2].



Note: No Action projections are baseline for comparing proposed alternatives; base case surge does not apply to National Ignition Facility operation.
Source: Socio 1996b.

FIGURE 4.6.3.8–2.—***Population Changes Resulting from Stewardship and Management Alternatives in the Los Alamos National Laboratory Region of Influence, 2005.***

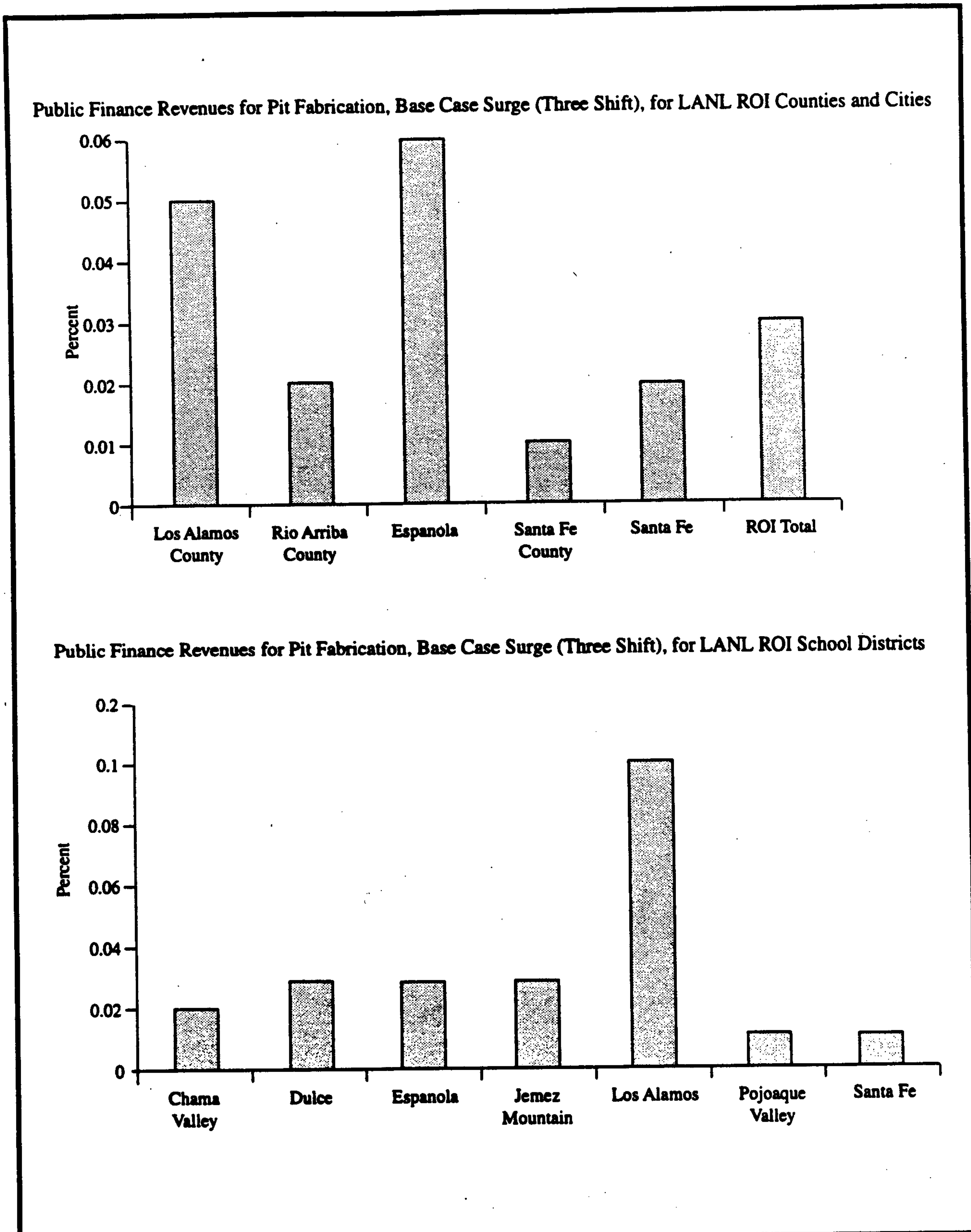
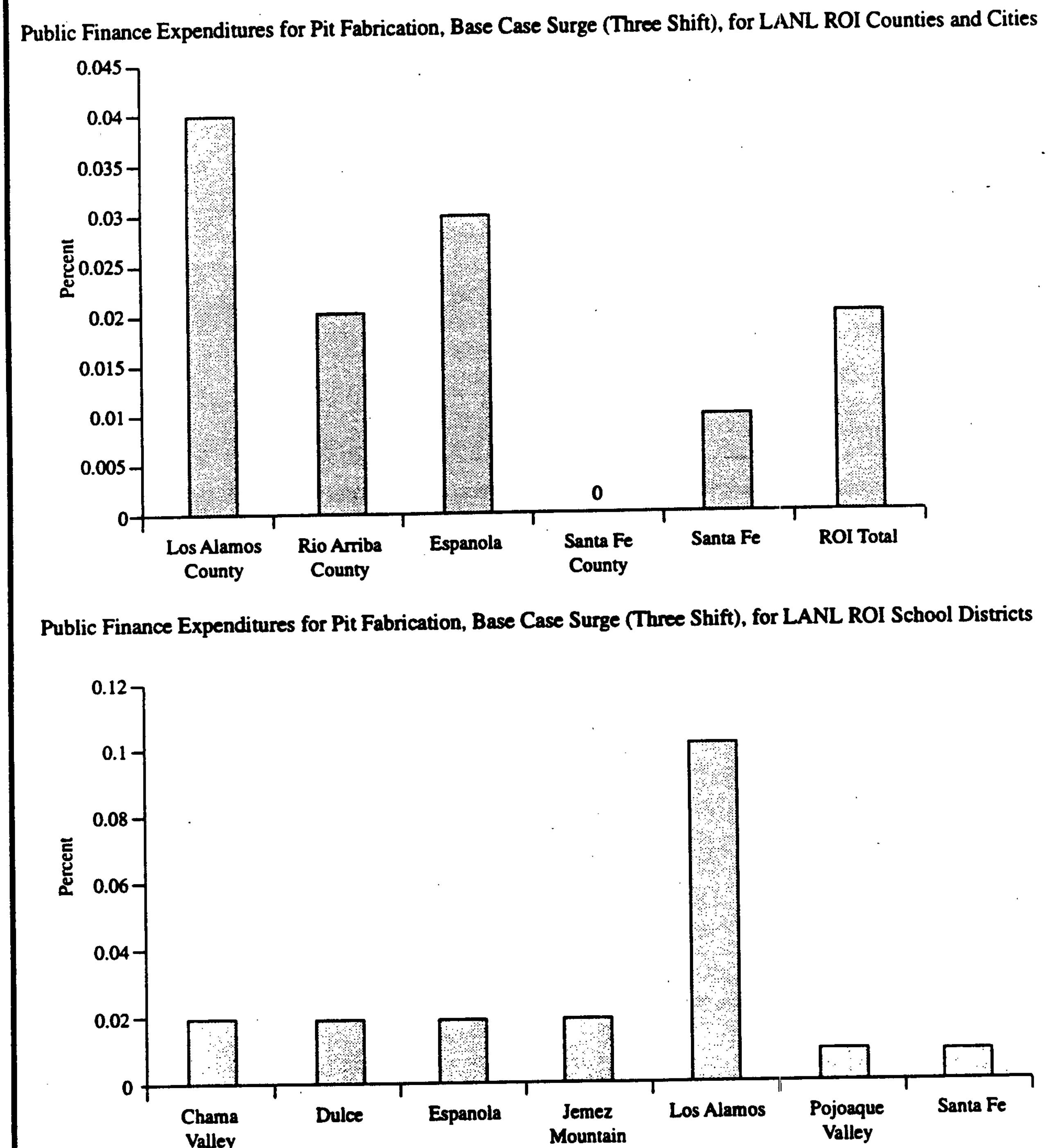


FIGURE 4.6.3.8–3.—***Percent Change from No Action Alternative in County, City, and School District Total Revenues and Expenditures in the Los Alamos National Laboratory Region of Influence with Pit Fabrication, Base Case Surge, 2005*** **[Page 1 of 2].**



Source: Socio 1996b.

FIGURE 4.6.3.8-3.—*Percent Change from No Action Alternative in County, City, and School District Total Revenues and Expenditures in the Los Alamos National Laboratory Region of Influence with Pit Fabrication, Base Case Surge, 2005* [Page 2 of 2].

case surge mode would require 321 new direct workers but would generate few additional indirect jobs in the regional economic area because there are no closely related industries in the regional economic area. As a result of the operation of the facility, total employment for the LANL regional economic area would increase by less than 1 percent. This increase would reduce regional unemployment from the 6.2 percent No Action estimates to approximately 6.0 percent. Per capita income for the LANL regional economic area would increase by less than 1 percent over No Action projections. Changes in employment and per capita income resulting from the operation of the Secondary and Case Fabrication Facility are shown in figure 4.6.3.8–1.

Population and Housing. Population in the LANL ROI during construction or operation of the Secondary and Case Fabrication Facility would not increase over No Action projections. Available workers in the regional economic area and ROI would be sufficient to fill all of the jobs generated by construction and operation of the facility.

Public Finance. Construction and operation of the Secondary and Case Fabrication Facility would not require in-migrating workers. Therefore, changes to local finances compared to No Action projections would be due to income increases and would be negligible.

High Explosives Fabrication

Regional Economy and Employment. Modification-related activities for the facility would require 46 direct workers during the peak construction year and would generate an additional 30 indirect jobs in the regional economic area. As a result of the modification activities, total employment for the LANL regional economic area would increase by less than 1 percent. Unemployment would decrease from the 6.2 percent No Action estimates to approximately 6.1 percent. Per capita income for the LANL regional economic area would increase very slightly over No Action projections as a result of modification activities for the HE Facility.

Facility operation-related employment at LANL would begin phasing in as the modification phase nears completion. Operation of the facility in the base case surge mode would require 67 new direct workers but would generate only a few indirect jobs because there are no closely related industries in the regional economic area. As a result of the operation of the HE Facility, total employment for the LANL regional economic area would increase by much less than 1 percent. The No Action regional unemployment of 6.2 percent would decrease to 6.1 percent. Per capita income for the LANL regional economic area would increase slightly over No Action projections. Changes in employment and per capita income resulting from the operation of the HE Facility are shown in figure 4.6.3.8–1.

Population and Housing. Population in the LANL ROI during peak construction would not increase over No Action projections. Available workers in the regional economic area and ROI would be sufficient to fill all of the direct and indirect jobs generated by construction of the HE Facility.

There would not be enough available workers in the regional economic area and ROI to fill all of the jobs generated by operation of the facility. Approximately 10 additional workers would have to in-migrate into the ROI to fill the new direct jobs. Population in the LANL ROI during full operation would increase by approximately 30 people over No Action projections. The ROI population over No Action for full operation at LANL is shown in figure 4.6.3.8–2. No additional housing units would be needed to meet such a small population increase.

Public Finance. Modification of the HE Facility would not require in-migrating workers. Therefore, changes to local finances compared to No Action projections would be due to income increases and would be negligible.

Changes in revenues and expenditures compared to No Action projections due to operation of the HE Facility at LANL are shown in figure 4.6.3.8–4. In 2005, the percent increase in total ROI revenues and expenditures over No Action projections would be negligible.

Nonnuclear Fabrication

Regional Economy and Employment. Modification-related activities for the facility would require a total of six workers during the peak construction year and would generate an additional four indirect jobs in

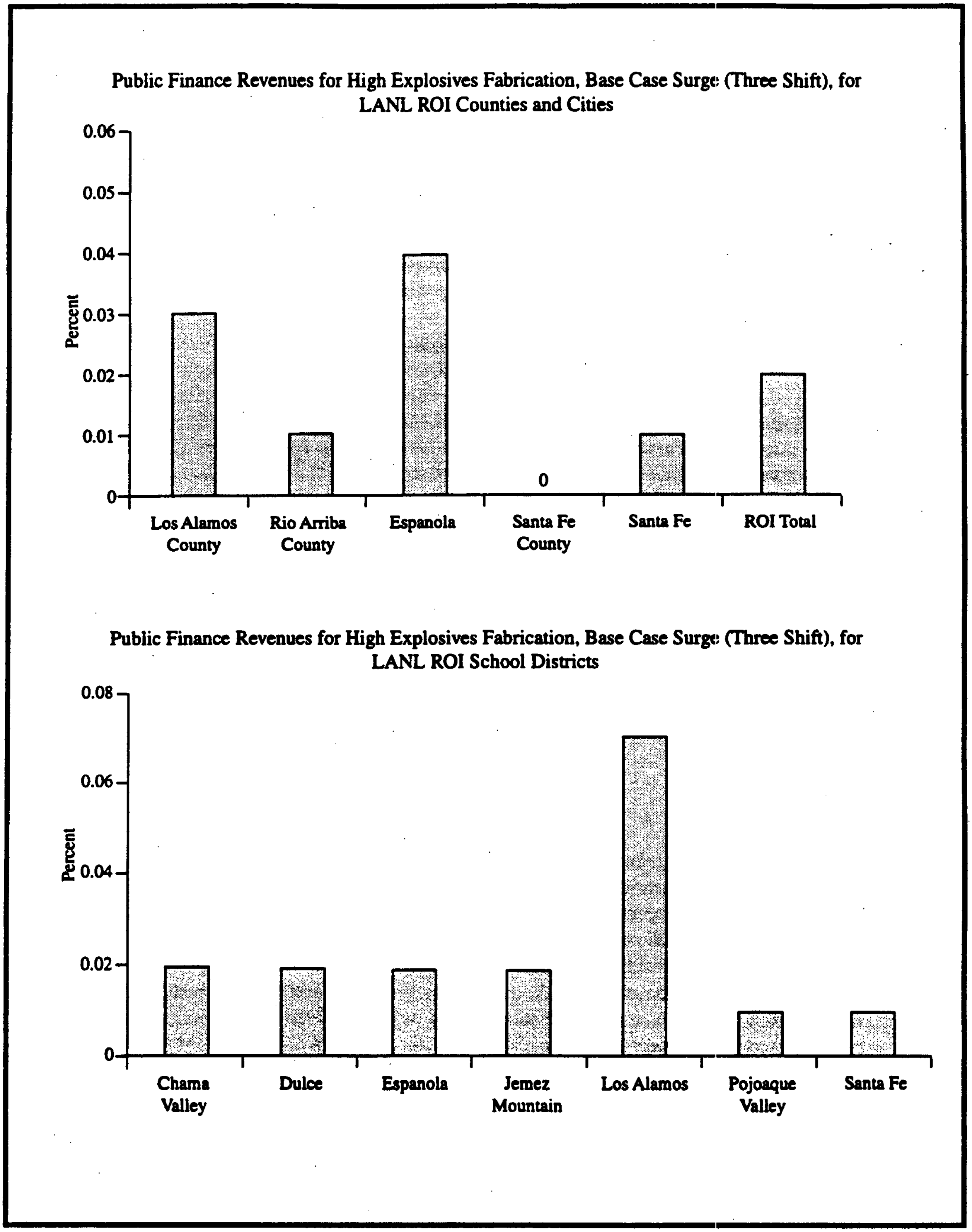


FIGURE 4.6.3.8–4.—*Percent Change from No Action Alternative in County, City, and School District Total Revenues and Expenditures in the Los Alamos National Laboratory Region of Influence with High Explosives Fabrication, Base Case Surge, 2005* [Page 1 of 2].

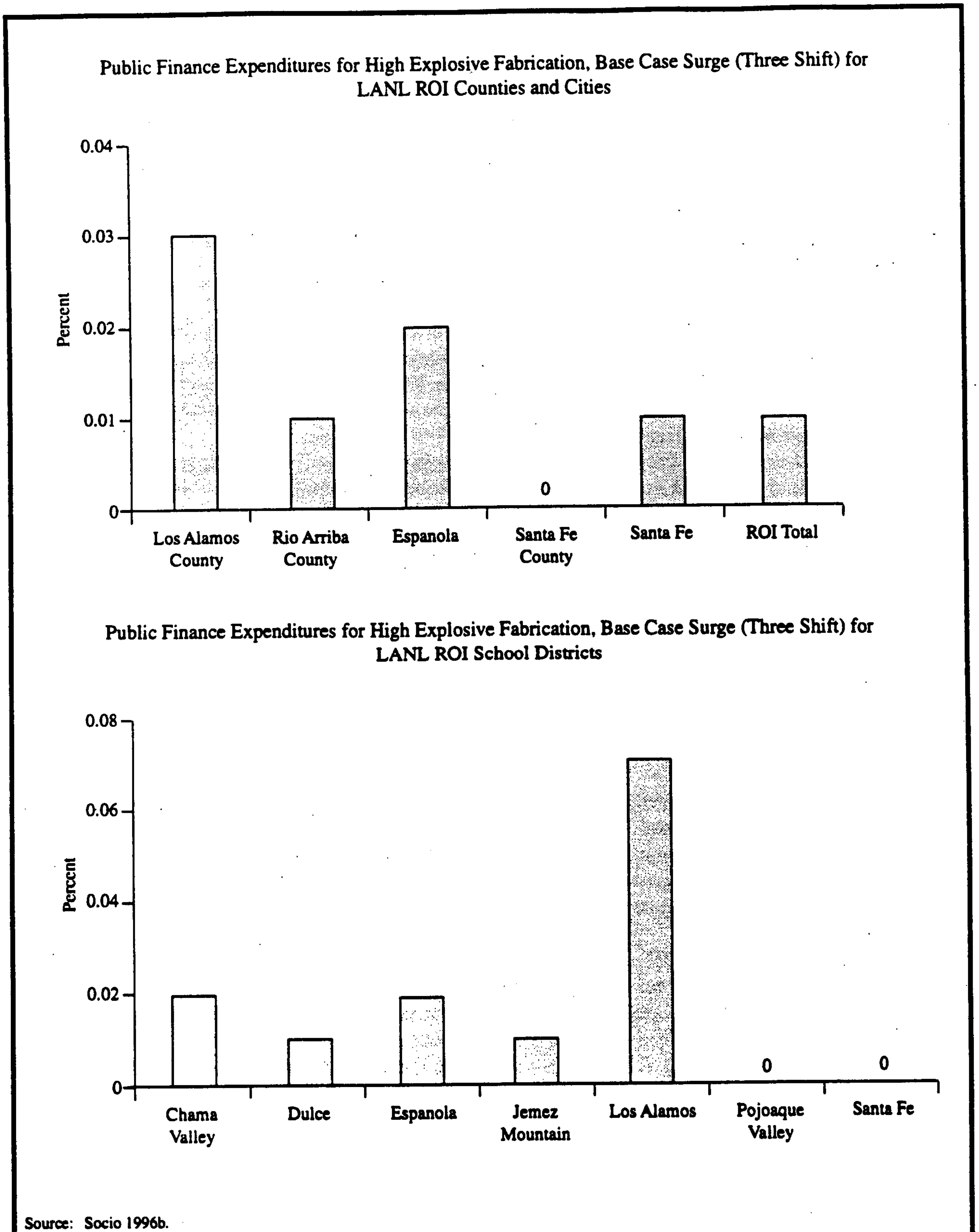


FIGURE 4.6.3.8–4.—*Percent Change from No Action Alternative in County, City, and School District Total Revenues and Expenditures in the Los Alamos National Laboratory Region of Influence with High Explosives Fabrication, Base Case Surge, 2005* [Page 2 of 2].

the regional economic area. As a result of the modification activities, total employment and per capita income would not noticeably increase. The unemployment rate would remain unchanged.

Facility operation-related employment at LANL would begin phasing in as the modification phase nears completion. Operation of the facility in the base case surge mode would require 194 new direct workers and would generate approximately 46 indirect jobs in the regional economic area. As a result of the operation of the facility, total employment for the LANL regional economic area would increase by less than 1 percent. Unemployment would decrease from 6.2 percent under the No Action alternative to 6.0 percent. Per capita income for the LANL regional economic area would increase by less than 1 percent over No Action projections. Changes in employment and per capita income resulting from the operation of the Nonnuclear Fabrication Facility are shown in figure 4.6.3.8–1.

Population and Housing. Population in the LANL ROI during peak construction and full operation would not increase over No Action projections. There would be enough workers available in the regional economic area and ROI to fill all of the direct and indirect jobs generated by the modification and operation of the Nonnuclear Fabrication Facility.

Public Finance. Construction and operation of the Nonnuclear Fabrication Facility would not require in-migrating workers. Therefore, changes to local finances compared to No Action projections would be due to income increases and would be negligible.

Partial Nonnuclear Fabrication. LANL may not receive the entire nonnuclear mission. Reservoirs and/or plastics may be excluded from the mission. If this occurs, the full operation employment increment would range from 57 to 232 direct jobs. For these options, in-migration would not be required. Socioeconomic effects on regional economy, employment, population, and housing would be less than for the full nonnuclear mission. These changes would be minimal.

Sensitivity Analysis. There would be no change in the number of construction workers required to complete any of the facilities for LANL (pit manufacturing, secondary and case fabrication, HE or nonnuclear fabrication) for either the high or low case. Operation of any of the facilities for the high case level would require fewer workers than would the base case surge operation. For the low case, worker requirements would decrease further causing slightly smaller increases in regional economy, population and housing, and public finance than occurred in either the base case surge or high case levels. These changes would be negligible.

Stewardship Alternatives

Proposed National Ignition Facility. The following is a summary of the socioeconomic effects of construction of the proposed NIF at LANL. See appendix I for a more detailed, project-specific discussion.

Regional Economy and Employment. Construction of NIF would require 270 construction workers during the peak year of construction and would generate approximately 860 additional indirect jobs in the regional economic area. Employment for operation would begin phasing in as the construction phase nears completion. Operation of the facility would require 330 direct workers and would generate 270 additional indirect jobs in the regional economic area. Construction and operation of NIF would have only minimal affects on the regional economy and employment.

Population and Housing. Both construction and operation of the facility would require workers and their families to in-migrate to the ROI. This in-migration would cause a slight increase in the population of the ROI. Vacant housing in the ROI is sufficient to handle these increases.

Public Finance. Both revenues and expenditures would increase as a result of the construction and operation of NIF. Increases due to construction would peak in 1998 and then decline as construction nears completion in 2002. Increases due to operation of the facility would peak in 2003 and continue through the duration of NIF operations.

Proposed Atlas Facility. The Atlas Facility at LANL would not have any identified socioeconomic impact over No Action.

Combined Program Impacts. If the pit fabrication, secondary and case fabrication, HE, and nonnuclear fabrication missions and the NIF were all located at LANL, the resulting benefits to the regional economy would be greater than from any one mission. Increases in total employment would be about 1 percent while per capita income would increase less than 1 percent. There would be sufficient available labor in the projected labor force to fill any construction-related employment requirements, but not enough to fill operation-related employment requirements. Approximately 1,349 people (workers and their families) would in-migrate into the LANL ROI to fill the available operation jobs. Although there would be a small population increase in the ROI, vacant housing would not be sufficient to house all in-migrating workers during full operation. Approximately 250 houses would need to be constructed over the No Action estimates. However, based on past building rates, new construction would be able to meet this demand. As shown in figure 4.6.3.8–5, the increase in ROI total revenues and expenditures over No Action projections would be approximately 0.7 and 0.6 percent, respectively. The Los Alamos School District would experience the greatest revenue and expenditure increases at approximately 3.1 percent.

Potential Mitigation Measures. No mitigation measures are anticipated for the stockpile stewardship and management alternatives at LANL.

4.6.3.9 *Radiation and Hazardous Chemical Environment*

This section describes the radiological and hazardous chemical releases and their associated impacts which could result from No Action and proposed alternatives at LANL. Within this section, impacts resulting from the base case scenario are quantitatively discussed, and a sensitivity analysis of the high and low case scenarios is qualitatively discussed.

Summaries of the prevailing radiological impacts at LANL to the public and to workers associated with normal operation are presented in tables 4.6.3.9–1 and 4.6.3.9–2, respectively; accident radiological impacts are presented in figure 4.6.3.9–1 and tables 4.6.3.9–3 through 4.6.3.9–7. The impact assessment methodology is described in section 4.1.9, and further supplementary methodological information is presented in appendixes E and F.

Normal Operation. There would be no radiological releases during the construction or modification of any facilities to support the Stockpile Stewardship and Management Program. However, limited hazardous chemical releases (e.g., small spills of diesel fuel from equipment refueling) may occur due to construction activities for the base case scenario and may increase slightly for the high case scenario. The concentration of these releases is expected to be well within the regulated exposure limits and would not result in any adverse health effects.

Water from processes containing hazardous chemicals is not discharged directly into surface water or groundwater that serves as potable water. Process water that may contain hazardous chemicals is treated before discharge. Furthermore, discharges of wastewater through NPDES-permitted outfalls which can be attributed to the activities associated with normal operations and operations of the stockpile stewardship and management alternatives at LANL are expected to be below NPDES limits. Water quality would not be adversely affected. Thus, the primary pathway considered for the public and the onsite worker is the air pathway.

For normal operation at LANL, all possible hazardous chemicals were examined for further analysis based on their toxicity, concentration, and frequency of use. The HI is a summation of the HQ for all chemicals. The HQ is the value used as an assessment of noncancer toxic effects of chemicals (e.g., kidney or liver dysfunction). It is independent of cancer risk, which is calculated only for those chemicals identified as carcinogens. The HI was calculated for the No Action chemicals and all alternative chemicals proposed to be added (the increment) at the site to yield cumulative levels for the site. An HI of ≤1.0 indicates that all noncancer exposure values meet OSHA standards; if the cancer risk is $\leq 1 \times 10^{-6}$ (the default value, not a regulatory standard), no further analysis is indicated. A cancer risk of 1×10^{-6} is considered acceptable by EPA (40 CFR 300.430) because this incidence of cancers cannot be distinguished from the cancer risk for an individual member of the population. Information pertaining to OSHA-regulated exposure limits and toxicity profiles for all hazardous chemicals described in this PEIS may be found in the *Chemical Health Effects Technical Reference* (TTI 1996b).

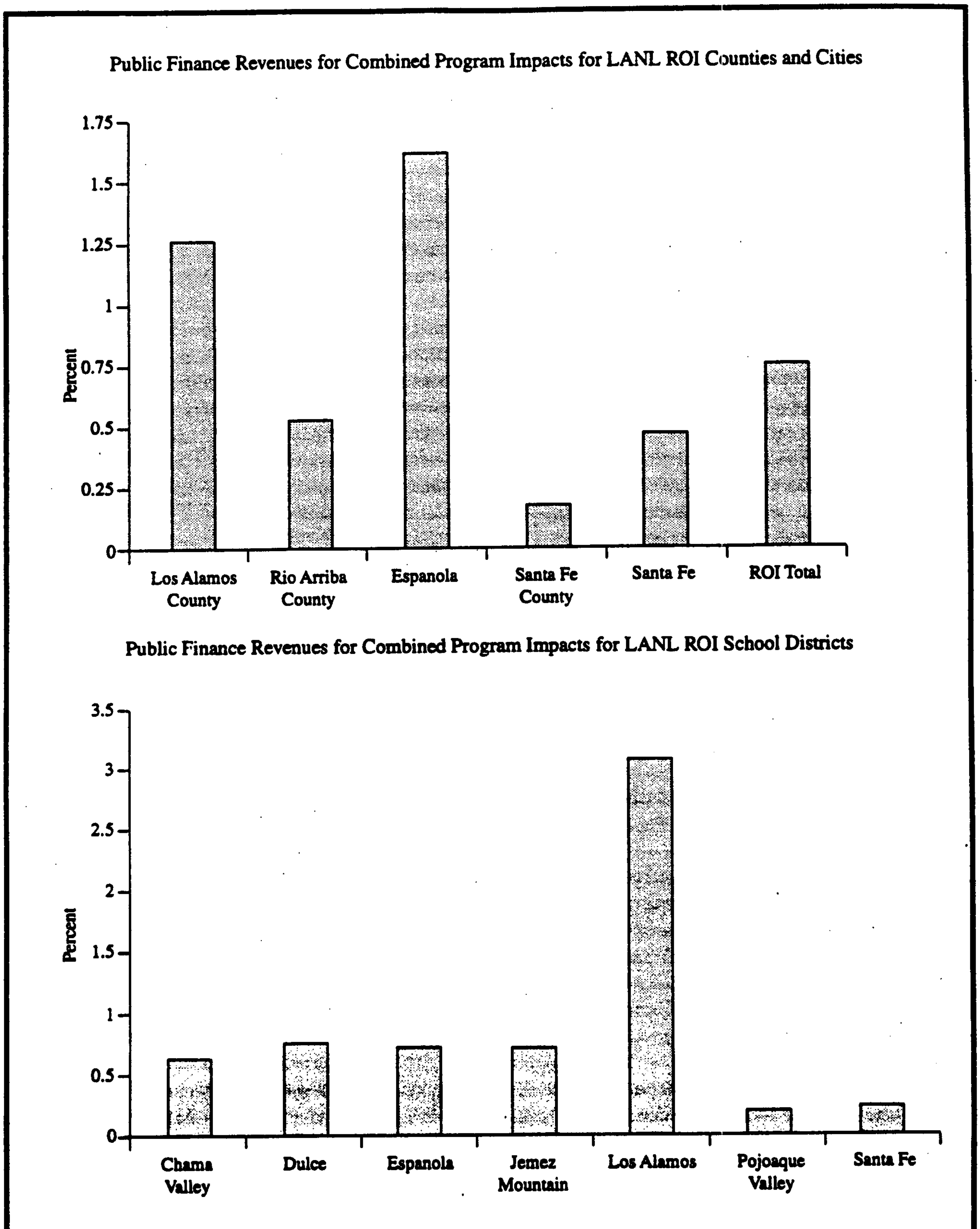
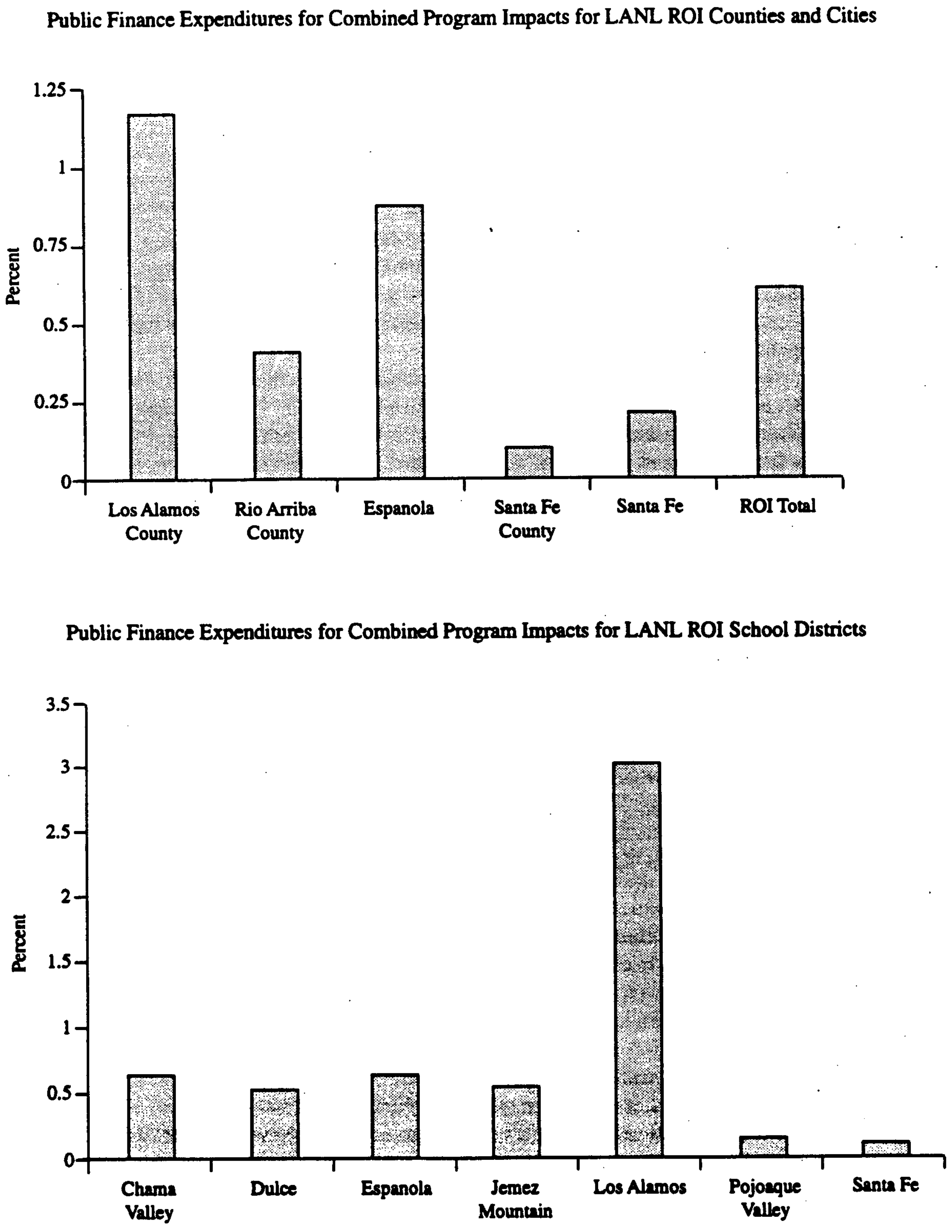


FIGURE 4.6.3.8–5.—*Percent Change from No Action Alternative in County, City, and School District Total Revenues and Expenditures in the Los Alamos National Laboratory Region of Influence with Combined Program Impacts, 2005* [Page 1 of 2].



Source: Socio 1996b.

FIGURE 4.6.3.8–5.—*Percent Change from No Action Alternative in County, City, and School District Total Revenues and Expenditures in the Los Alamos National Laboratory Region of Influence with Combined Program Impacts, 2005* [Page 2 of 2].

No Action

Radiological Impacts. Radiological impacts to the public resulting from the No Action alternative are presented in table 4.6.3.9–1. These impacts are representative of the aggregated total which is estimated to exist from all future baseline operational contributions (including pit fabrication R&D). Total impacts are provided to compare with applicable regulations governing total site operations. To place doses to the public from the No Action alternative into perspective, comparisons are made to natural background radiation. As shown in table 4.6.3.9–1, the total dose to the maximally exposed member of the public from annual total site operations is within radiological limits and would be 6.5 mrem for the No Action alternative. The annual population dose within 80 km (50 mi) in 2030 would be 2.7 person-rem.

Total site doses to onsite workers from normal operation for the No Action alternative are presented in table 4.6.3.9–2. The estimated annual dose to the entire facility workforce for this alternative would be 196 person-rem. The presented noninvolved worker impacts were not modeled due to the unavailability of certain site-specific information.

Potential radiological impacts to the public and workers in tables 4.6.3.9–1 and 4.6.3.9–2 include the addition of the phased containment option (preferred alternative) representing the DARHT Facility and the phaseout of the PHERMEX Facility at LANL. Based on the radiological impacts associated with normal operation under the No Action alternative, all resulting doses would be within radiological limits and are well below levels of natural background radiation. The associated risks of adverse health effects to the public and to workers would be small.

Hazardous Chemical Impacts. Hazardous chemical impacts to the public resulting from normal operation under No Action at LANL are presented below. Analyses to support the values presented in this section are provided in appendix table E.3.4–13. This PEIS does not purport to provide the level of detail needed to go beyond a conservative screening process for hazardous chemicals. As such, the analysis in this PEIS for the No Action alternative should not be relied upon as a basis for judging the sites as having a hazardous health concern of alternatives among sites. The model used to calculate HI and cancer risk in this PEIS only establishes a baseline for comparison of alternatives among sites. The baseline is then used to determine the extent to which each alternative adds or subtracts from the No Action HI and cancer risk to the public at each site.

The HI for the maximally exposed individual of the public at LANL resulting from normal operation under the No Action alternative would be 3.01×10^{-2}, and the cancer risk would be 5.15×10^{-6}. The HI for the onsite worker would be 4.65×10^{-2} and the cancer risk would be 1.54×10^{-4}. The HIs for the public and onsite worker are within acceptable health levels.

Cancer risks to the public and to the onsite worker exceed the EPA default value as a result of the emissions of methylene chloride; 1,1,2-trichloroethane; and trichloroethylene associated with operations under the No Action alternative at LANL.

Mitigation measures such as substituting less toxic solvents or modifying processes are proposed to reduce or eliminate the emissions of all hazardous chemicals due to operations under the No Action alternative with particular attention to methylene chloride; 1,1,2-trichloroethane; and trichloroethylene.

Management Alternatives

Pit Fabrication

Radiological Impacts. Radiological impacts to the public resulting from the pit fabrication alternative are presented in table 4.6.3.9–1. These impacts are representative of the aggregate total which is estimated to exist from all future baseline operational LANL contributions and from three-shift base case operations for pit fabrication at the site. Total impacts are provided to compare with applicable regulations governing total site operations. To place doses to the public from this alternative into perspective, comparisons are made to natural background radiation. As shown in table 4.6.3.9–1, the total dose to the maximally exposed member of the public from annual total site operations is within radiological limits and would be 6.5 mrem for this alternative. The annual population dose within 80 km (50 mi) in 2030 would be 2.7 person-rem. The impacts incurred from three-shift base case operations are negligible when compared to those existing for the normal baseline site operations (see table 4.6.3.9–1).

TABLE 4.6.3.9–1.—*Potential Radiological Impacts to the Public Resulting from Normal Operation of Stockpile Stewardship and Management Alternatives at Los Alamos National Laboratory*

Affected Environment	No Action Total Site	Pit Fabrication Three-Shift Operation Total Site[c]	Secondary and Case Fabrication Three-Shift Operation[a] Total Site[c]	National Ignition Facility Total Site[c]	Atlas Facility Total Site[c]	Combined Program Total[b] Total Site[c]
Maximally Exposed Individual (Public)						
Atmospheric Release						
Dose[d] (mrem/yr)	5.7	5.7	5.9	5.7	5.7	5.9
Percent of natural background[e]	1.7	1.7	1.7	1.7	1.7	1.7
25-year fatal cancer risk	$7.1x10^{-5}$	$7.1x10^{-5}$	$7.4x10^{-5}$	$7.1x10^{-5}$	$7.1x10^{-5}$	$7.4x10^{-5}$
Liquid Release						
Dose[d] (mrem/yr)	0.80	0.80	0.80	0.80	0.80	0.80
Percent of natural background[e]	0.24	0.24	0.24	0.24	0.24	0.24
25-year fatal cancer risk	$1.0x10^{-5}$	$1.0x10^{-5}$	$1.0x10^{-5}$	$1.0x10^{-5}$	$1.0x10^{-5}$	$1.0x10^{-5}$
Atmospheric and Liquid Releases						
Dose[d] (mrem/yr)	6.5	6.5	6.7	6.5	6.5	6.7
Percent of natural background[e]	1.9	1.9	2.0	1.9	1.9	2.0
25-year fatal cancer risk	$8.1x10^{-5}$	$8.1x10^{-5}$	$8.4x10^{-5}$	$8.1x10^{-5}$	$8.1x10^{-5}$	$8.4x10^{-5}$
Population Within 80 Kilometers						
Atmospheric and Liquid Releases in 2030						
Dose (person-rem)	2.7	2.7	3.2	2.8	2.7	3.3
Percent of natural background[e]	$2.8x10^{-3}$	$2.8x10^{-3}$	$3.4x10^{-3}$	$2.9x10^{-3}$	$2.8x10^{-3}$	$3.5x10^{-3}$
25-year fatal cancers	0.034	0.034	0.040	0.035	0.034	0.041

[a] Assumes operations are located at TA-3.

[b] Conservative assumption poses existence of maximally exposed individual at multiple locations simultaneously.

[c] Includes impacts from No Action.

[d] The applicable radiological limits for an individual member of the public from total site operations are 10 mrem/yr from the air pathways, 4 mrem/yr from the drinking water pathway, 100 mrem/yr from all pathways combined (DOE Order 5400.5).

[e] Natural background radiation levels to average individual is 342 mrem/yr; to the population within 80 km (50 mi) in 2030 is 95,200 person-rem.

Note: Impacts from the Phased Containment Option (preferred alternative) representing the DARHT Facility are included within the No Action values presented in the table. However, PHERMEX Facility operations at LANL will be phased out and are therefore not included. Annual incremental doses of $1.7x10^{-5}$ mrem to the maximally exposed individual and $8.6x10^{-5}$ person-rem to the population are incurred from the pit fabrication alternative.

Source: DOE 1995hh; LANL 1995e; LANL 1995g; LANL 1995s; appendix I; appendix K.

TABLE 4.6.3.9–2.—*Potential Radiological Impacts to Workers Resulting from Normal Operation of Stockpile Stewardship and Management Alternatives at Los Alamos National Laboratory*

Affected Environment	No Action	Pit Fabrication Three-Shift Operation	Secondary and Case Fabrication Three-Shift Operation[a]	National Ignition Facility	Atlas Facility	Combined Program Total
Involved Workforce[b]						
Average worker dose[c] (mrem/yr)	NA	380	2.2	30	0	NA
25-year fatal cancer risk	NA	3.8×10^{-3}	2.2×10^{-5}	3.0×10^{-4}	0	NA
Total dose (person-rem/yr)	NA	55.6	0.33	8.0	0	64
Noninvolved Workforce[d]						
Average worker dose[c] (mrem/yr)	34	34	34	34	34	NA
25-year fatal cancer risk	3.4×10^{-4}	3.4×10^{-4}	3.4×10^{-4}	3.4×10^{-4}	3.4×10^{-4}	NA
Total dose (person-rem/yr)	196	196	196	196	196	196
Total Site Workforce[e]						
Dose (person-rem/yr)	196	252	196	204	196	260
25-year fatal cancers	2.0	2.5	2.0	2.0	2.0	2.6

[a] Assumes operations are located at TA-3.

[b] The involved worker is a worker associated with operation of the pit fabrication, secondary and case fabrication, NIF, and other facilities. The dose presented for the involved workforce is only that incremental dose received from the pit fabrication, secondary and case fabrication, NIF, and Atlas Facility. The total dose received by the involved workforce would be higher than that received by the noninvolved workforce from these operations. The estimated number of involved workers is 267 at the proposed NIF, 146 for pit fabrication, and 151 for secondary and case fabrication.

[c] The radiological limit for an individual worker is 5,000 mrem/yr (10 CFR 835).

[d] The noninvolved worker is an onsite worker not associated with operation of the proposed stockpile stewardship and management facilities. The maximum estimated number of noninvolved workers is 5,770 for each of the stockpile stewardship and management alternatives.

[e] The total site workforce is the sum of the number of involved and noninvolved worker impacts. The estimated numbers of badged workers in the total site workforce for each of the radiologically concerned alternatives are 5,916 for pit fabrication, 5,921 for secondary and case fabrication, 6,037 for the proposed NIF, and 5,770 for No Action.

Note: Impacts to workers presented in this table include the addition of the Phased Containment Option (preferred alternative) representing the DARHT Facility and the phasing out of the PHERMEX Facility at LANL; NA - not applicable.

Source: DOE 1993n:7; DOE 1995hh; LANL 1995b:6; LANL 1995e; LANL 1995g; appendix I; appendix K.

Total site doses to onsite workers from normal operation for the pit fabrication mission are presented in table 4.6.3.9–2. The average annual dose to involved workers for this alternative would be 380 mrem. The dose to the entire facility workforce (involved workforce) would be 55.6 person-rem. As stated in the methodology section 4.1.9, all worker doses were referenced either from alternative-specific working group data reports or from the Radiation Exposures for DOE and DOE Contractor Employees 1992 Database which reports doses for similar types of operations. The presented noninvolved worker impacts were not modeled due to the unavailability of certain site-specific information. There may also be small risks to construction workers who are involved with tasks that are in close proximity to potentially contaminated areas.

Hazardous Chemical Impacts. Hazardous chemical impacts for the public and for the onsite worker resulting from normal operation of the pit fabrication alternative at LANL are presented below. The pit fabrication alternative includes intrusive and nonintrusive modification pit reuse. The HI and cancer risk would remain constant over 25 years of operation provided exposures remain the same. Analyses to support the values presented in this section are provided in appendix table E.3.4–14.

The incremental HI for the maximally exposed member of the public would be 2.10×10^{-4}, and the incremental cancer risk would be zero as a result of operation of the pit fabrication mission in the year 2005. The incremental HI for the onsite worker would be 1.75×10^{-4}, and the incremental cancer risk would be zero as a result of operation of the pit fabrication mission in 2005.

The total site operation and the increment associated with the pit fabrication alternative would result in HIs for the public (0.030) and onsite worker (0.047) that are within acceptable health levels. The cancer risks to the public (5.15×10^{-6}) and to the onsite worker (1.54×10^{-4}) slightly exceed the EPA default value of 1×10^{-6}.

Cancer risks to the public and to the onsite worker exceed the EPA default value as a result of the No Action emissions of chloroform; methylene chloride; 1,1,2-trichloroethane; and trichloroethylene. Incremental emissions due to the pit fabrication mission cause only a minimal increase in the HI for the public and onsite worker and, therefore, this alternative is not expected to increase the cancer risk for the public and the onsite worker.

Secondary and Case Fabrication

Radiological Impacts. Radiological impacts for the public resulting from the secondary and case fabrication alternative are presented in table 4.6.3.9–1. These impacts are representative of the aggregate total which is estimated to exist from all future baseline operational LANL contributions and from three-shift base case operation for secondary and case fabrication at the site. Total impacts are provided to compare with applicable regulations governing total site operations. To place doses for the public from this alternative into perspective, comparisons are made to natural background radiation. As shown in table 4.6.3.9–1, the total dose to the maximally exposed member of the public from annual total site operations is within radiological limits and would be 6.7 mrem for this alternative. The annual population dose within 80 km (50 mi) in 2030 would be 3.2 person-rem. The impacts incurred from three-shift base case operations are small when compared to those existing for the normal baseline site operations (see No Action column in table 4.6.3.9–1).

Total site doses to onsite workers from normal operation for the secondary and case fabrication mission are presented in table 4.6.3.9–2. The average annual dose to involved workers for this alternative would be 2.2 mrem. The dose to the entire facility workforce (involved workforce) would be 0.33 person-rem. As stated in the methodology section 4.1.9, all worker doses were referenced from the Radiation Exposures for DOE and DOE Contractor Employees 1992 Database which reports doses for similar types of operations. The presented noninvolved worker impacts were not modeled due to the unavailability of certain site-specific information. There may also be small risks to construction workers who are involved with tasks that are in close proximity to potentially contaminated areas.

Hazardous Chemical Impacts. Hazardous chemical impacts for the public and for the onsite worker resulting from the normal operation of the secondary and case fabrication alternative at LANL are presented below. The HI and cancer risk would remain constant over 25 years of operation provided exposures remain the same. Analyses to support the values presented in this section are provided in appendix table E.3.4–15.

The incremental HI for the maximally exposed member of the public would be 9.43×10^{-4} and the incremental cancer risk would be zero as a result of operation of the secondary and case fabrication mission in 2005. The incremental HI for the onsite worker would be 7.89×10^{-4} and the incremental cancer risk would be zero as a result of operation of the secondary and case fabrication mission in 2005.

Total site operations of the secondary and case fabrication mission would result in HIs (HI is applicable only to noncarcinogenic risks) for the public (0.031) and the onsite worker (0.047) that are within acceptable health levels. The cancer risks for the public (5.15×10^{-6}) and the onsite worker (1.54×10^{-4}) slightly exceed the EPA default value of 1×10^{-6} using extremely conservative stack assumptions (i.e., a stack flow of 0.1 ft/sec). Using the same emissions values and average LANL stack flow, the cancer risk values drop by 2 to 3 orders of magnitude (i.e., 100 to 1,000 times lower).

Cancer risks for the public and for the onsite worker exceed the EPA default value as a result of the No Action emissions of methylene chloride; 1,1,2-trichloroethane; and trichloroethylene. When average LANL stack flows are used, the cancer risk for the public and the onsite worker do not exceed the default value for any alternative. Incremental emissions due to the secondary and case fabrication mission cause only a minimal increase in HI (noncarcinogenic risks) for the public and onsite worker and no additional cancer risk for the public and the onsite worker.

High Explosives Fabrication

Radiological Impacts. There are no radiological impacts associated with this alternative.

Hazardous Chemical Impacts. Hazardous chemical impacts for the public and for the onsite worker resulting from normal operation of the HE fabrication alternative at LANL are presented below. The HI and cancer risk would remain constant over 25 years of operation provided exposures remain the same. Analyses to support the values presented in this section are provided in appendix table E.3.4–16.

The incremental HI for the maximally exposed individual of the public would be 3.99×10^{-3} and the incremental cancer risk would be zero as a result of operation of the HE fabrication mission in 2005. The incremental HI for the onsite worker would be 3.33×10^{-3} and the incremental cancer risk would be zero as a result of operation of the HE fabrication mission in 2005.

Total site operations of the HE fabrication mission would result in HIs for the public (0.034) and the onsite worker (0.05) that are within acceptable health levels. The cancer risks for the public (5.15×10^{-6}) and the onsite worker (1.54×10^{-4}) slightly exceed the EPA default value of 1×10^{-6}. Incremental emissions due to the HE fabrication mission cause only a minimal increase in HI for the public and onsite worker and no additional cancer risk for the public and the onsite worker.

Cancer risks for the public and for the onsite worker exceed the EPA default value as a result of the No Action emissions of chloroform, methylene chloride; 1,1,2-trichloroethane; and trichloroethylene.

Sharing of the HE Fabrication alternative mission with LLNL would be expected to reduce emissions of hazardous chemicals by up to 50 percent. Therefore, HI and cancer risk impacts may be reduced up to 50 percent as a result of HE fabrication mission sharing with LLNL. This would bring the cancer risk to an acceptable level of 1×10^{-6}.

Nonnuclear Fabrication

Radiological Impacts. There are no radiological impacts associated with this alternative.

Hazardous Chemical Impacts. Hazardous chemical impacts for the public and for the onsite worker resulting from normal operation of the nonnuclear fabrication alternative at LANL are presented below. The nonnuclear fabrication alternative includes detonators and the option of adding reservoirs, plastics, or both to this mission. The HI and cancer risk would remain constant over 25 years of operation provided exposures remain the same. Analyses to support the values presented in this section are provided in appendix table E.3.4–17.

The incremental HI to the maximally exposed member of the public would be 2.61×10^{-5} and the incremental cancer risk would be zero as a result of operation of the nonnuclear fabrication mission in 2005. The incremental HI for the onsite worker would be 3.15×10^{-6}, and the incremental cancer risk would be zero as a result of operation of the nonnuclear fabrication mission in 2005.

Total site operations and the incremental effect of the nonnuclear fabrication mission would result in HIs for the public (0.03) and the onsite worker (0.047) that are within acceptable health levels. The cancer risks for the public (5.15×10^{-6}) and the onsite worker (1.54×10^{-4}) slightly exceed the EPA default value of 1×10^{-6}.

Cancer risks for the public and for the onsite worker exceed the EPA default value due to the No Action emissions of chloroform methylene chloride; 1,1,2-trichloroethane; and trichloroethylene. Incremental emissions due to the nonnuclear fabrication mission cause only a minimal increase in HI for the public and onsite worker and no additional cancer risk for the public and the onsite worker.

The emissions of hazardous chemicals may not increase, and may slightly decrease if the options of not including reservoirs, plastics, or both in the nonnuclear fabrication alternative is implemented. Therefore, it is not expected that there would be any increase in HI or cancer risk for the public or for the onsite worker by not including reservoirs, plastics, or both in the nonnuclear fabrication alternative at LANL.

Sensitivity Analysis. Radiological impacts may be subject to certain degrees of variance resulting from either high or low case operations. For the high case scenario, impacts to both the public and worker would be similar to the three-shift base case operations. For the low-case scenario, impacts to the total workforce would be expected to fall within the increment (range) projected between that of No Action and the pit fabrication alternative (less than 55.6 person-rem/year increase to the total site workforce). Impacts for the public would be expected to fall within the increment (range) projected between that of No Action and the secondary and case fabrication alternative (less than 0.2 mrem/year to the maximally exposed individual, and less than 0.5 person-rem/year for the population).

Based on the radiological impacts associated with normal operation of this alternative, all resulting doses would be within radiological limits and are well below levels of natural background radiation. The associated risks of adverse health effects for the public and to workers would be small.

Operations under the low case scenario for pit, secondary and case, HE, and nonnuclear fabrication are not expected to increase the emissions of hazardous chemicals at LANL. Since the HIs are well within the acceptable health limits, there are no adverse HI impacts for the public and the onsite worker expected. The low case scenario probably would not contribute to the expected adverse effects of cancer risk for the public and onsite worker.

Operations under the high case scenario for pit and secondary and case fabrication may increase the emissions of hazardous chemicals at LANL. Since the HIs are well within the acceptable health limits, there are no expected adverse HI impacts for the public and the onsite worker. The high case scenario probably would also not increase cancer risk for the public and onsite worker above the EPA default value.

Operations under the high case scenario for HE fabrication may result in up to a two-fold increase in the emissions of hazardous chemicals at LANL. Since the HIs are well within the acceptable health limits, no adverse HI impacts for the public and the onsite worker are expected. The high case scenario probably would not increase the cancer risk for the public and onsite worker above the EPA default value.

Operations under the high case scenario for nonnuclear fabrication may result in up to a three-fold increase in the emissions of hazardous chemicals at LANL. Since the HIs are well within the acceptable health limits, no adverse HI impacts for the public and the onsite worker are expected. The high case scenario may, however, contribute to the adverse effects of cancer risk for the public and onsite worker unless mitigation steps are implemented.

Stewardship Alternatives

Proposed National Ignition Facility

Radiological Impacts. Radiological impacts for the public resulting from normal operation of the proposed NIF for the enhanced option scenario are presented in table 4.6.3.9–1. These impacts are representative of the aggregate total which is estimated to exist from all future baseline operational LANL contributions and from enhanced option operations of the proposed NIF at the site. Total impacts are provided to compare with applicable regulations governing total site operations. To place doses for the public from this alternative into perspective, comparisons are made to natural background radiation. As shown in table 4.6.3.9–1, the total dose to the maximally exposed member of the public from annual total site operations is within radiological limits and would be 6.5 mrem for this alternative. The annual population dose within 80 km (50 mi) in 2030 would be 2.8 person-rem. The impacts incurred from proposed NIF operations are small when compared to those existing for the normal baseline site operations (see No Action column in table 4.6.3.9–1).

Total site doses to onsite workers from normal operation for the proposed NIF are presented in table 4.6.3.9–2. The average annual dose to involved workers for this alternative would be 30 mrem. The dose to the entire facility workforce (involved workforce) would be 8.0 person-rem. The presented noninvolved worker impacts were not modeled due to the unavailability of certain site-specific information. There may also be small risks to construction workers who are involved with tasks that are in close proximity to potentially contaminated areas.

Based on the radiological impacts associated with normal operation of this alternative, all resulting doses would be within radiological limits and are well below levels of natural background radiation. The associated risks of adverse health effects for the public and to workers would be small.

Hazardous Chemical Impacts. No hazardous chemical impacts are expected from operation of the NIF (see appendix I). Therefore, HIs and cancer risks for the public and onsite workers were not calculated nor assessed.

Proposed Atlas Facility

Radiological Impacts. There are no radiological impacts associated with this alternative. Total site doses and impacts characteristic of this alternative are equal to the No Action alternative.

Hazardous Chemical Impacts. Minimal hazardous chemical impacts are expected from operation of the Atlas Facility (see appendix K). Therefore, HIs and cancer risks for the public and onsite workers were not calculated nor assessed.

Combined Program Impacts

Radiological Impacts. Radiological impacts to the public and to workers from the simultaneous operation of all LANL site alternatives (both management and stewardship) would result in very small increases over the No Action or the largest individual alternative. All Program totals would be within radiological limits and are well below levels of natural background radiation. The associated risks of adverse health effects to the public and to workers would be small.

Combined Program impacts due to hazardous chemical emissions from operation of the No Action alternative and the incremental chemical emissions incurred by the management alternatives (pit fabrication, secondary and case fabrication, HE fabrication, and nonnuclear fabrication) would result in a cumulative HI for the public of 0.035 and a cumulative cancer risk of $5.15x10^{-6}$. The cumulative HI for the onsite worker would be 0.051 and the cumulative cancer risk would be $1.54x10^{-4}$.

The cumulative Program HIs (noncarcinogenic effects) for the public and the onsite worker are within acceptable health levels since the HIs do not exceed the value of 1. Concern for potential health effects is heightened when the HI exceeds 1. Cumulative cancer risks for the public and the onsite worker exceed the cancer risk default value of $1x10^{-6}$ under No Action when extremely conservative stack parameters are used. When average LANL stack flows are used, the cancer risk for the public and the onsite workers do not exceed this default value for any alternatives. The incremental chemical emissions due to operations associated with all of the management alternatives did not increase the cancer risks.

Potential Mitigation Measures. Radioactive airborne emissions to the general population and onsite exposures to workers could be reduced by implementing the latest technology for process and design improvements. For example, to reduce public exposure from emissions, improved building and work area control methods could be used to remove radioactivity from the releases to the environment. Similarly, the use of remote, automated and robotic production methods are examples of techniques that are being developed which would reduce worker exposure (see section 3.5).

Measures such as substituting less-toxic solvents or modifying processes are proposed to reduce or eliminate the emissions of all hazardous chemicals due to site operations, with particular attention to methylene chloride; 1,1,2-trichloroethane; and trichloroethylene.

Facility Accidents. The proposed actions have the potential for accidents that may impact the health and safety of workers and the public. The potential for and associated consequences of reasonably foreseeable accidents that have been evaluated are summarized in this section and described in more detail in appendix F. The methodology used in the assessment is described in section 4.1.9. A list of documents reviewed for applicable accident data is provided in appendix table F.1.1–1. The potential impacts from accidents, ranging from high-consequence/low-probability to low-consequence/high-probability events, have been evaluated in terms of potential cancer fatalities that may result for noninvolved workers and the public. The risk of cancer fatalities has also been evaluated to provide an overall measure of accident impacts and is calculated by multiplying the accident annual frequency (or probability) of occurrence by the consequences (number of cancer fatalities). A figure is also provided showing the risk of latent cancer fatalities in the population within 80 km (50 mi) that may result from accidents for the alternatives. Specifically, the curves in each figure show the probability (vertical axis) that the number of cancer fatalities in the offsite population within 80 km (50 mi) (horizontal axis) will be exceeded. The curves reflect the probability of the accident.

In addition to the potential impacts to noninvolved workers and the offsite population, there are potential impacts to involved workers who would be located in the facilities associated with the proposed action. Quantitative statements of these impacts cannot be made until design details are developed further, at which time the number and location of facility workers protective and mitigating features can be estimated to support accident impact analyses. However, depending on the type of accident, facility workers in close proximity to the point of the accident could receive high levels of exposure to radiation, with potentially fatal impacts.

No Action. Under the No Action alternative, limited pit fabrication, nonnuclear fabrication, and stewardship R&D would continue to be performed at LANL with no changes to facilities and operations. Under existing conditions, potential accidents and their consequences have been addressed in facility safety documentation according to requirements in DOE orders.

Management Alternatives. This section provides accident information on the four management alternatives under consideration at LANL: pit fabrication, secondary and case fabrication, HE fabrication, and nonnuclear fabrication.

Pit Fabrication. A set of potential accidents has been postulated for the pit fabrication and intrusive and nonintrusion modification pit reuse alternative for which there may be releases of radioactive materials or other hazardous effects that may impact onsite workers and the offsite population. The accident impacts of greatest interest are those associated with pit fabrication and/or intrusive modification. Any potential accident impacts associated with nonintrusive modification would be bounded by the intrusive modification activity impacts. The potential accidents analyzed are described in appendix F. The probability distribution showing the range of probable cancer fatalities that may result for the composite set of accidents identified in appendix F is shown in figure 4.6.3.9–1. For example, the probability of a pit fabrication accident causing more than 0.1 cancer fatalities is approximately 10^{-6} per year. The curve reflects the probability of the accidents occurring. The impacts for the composite set of accidents are shown in table 4.6.3.9–3. If an accident were to occur, there would be an estimated 1.2×10^{-4} cancer fatalities in the population within 80 km (50 mi) of the site. A noninvolved worker located 1,000 m (3,281 ft) from the accident would have an increased likelihood of cancer fatality of 6.4×10^{-7}. A

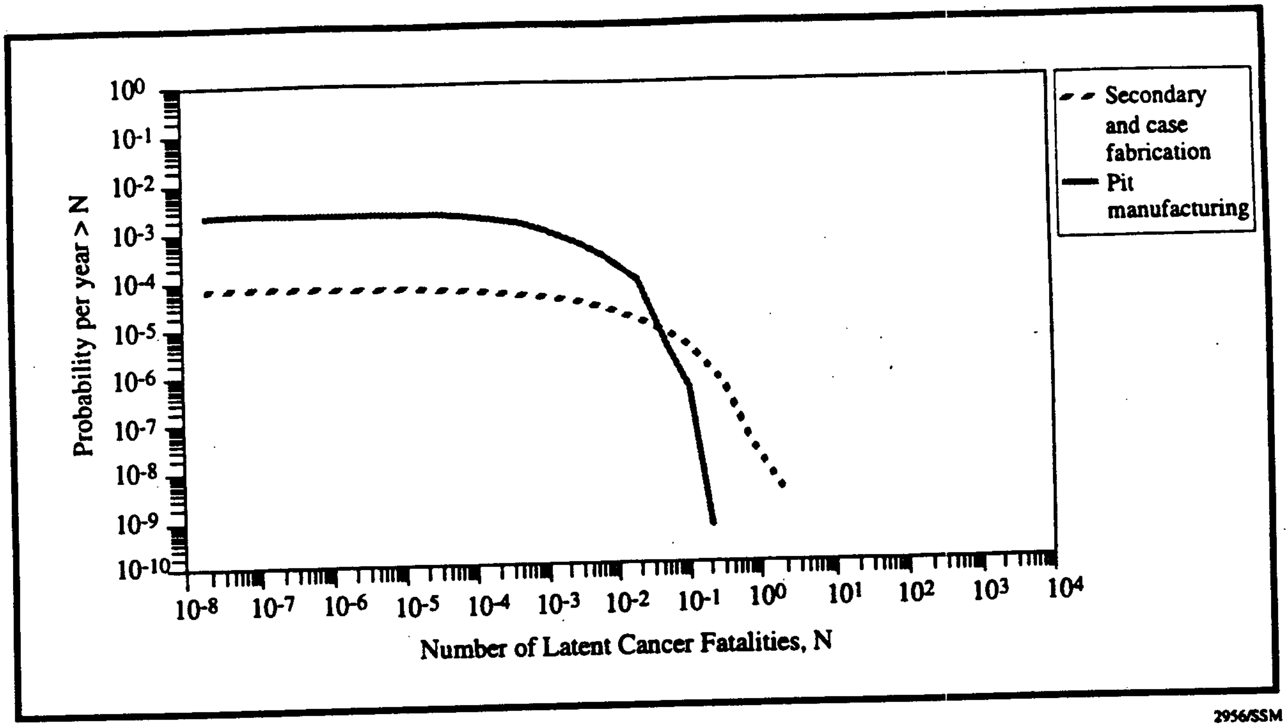


FIGURE 4.6.3.9–1.—*Combined Evaluation Basis Accidents and Beyond Evaluation Basis Accidents—Cancer Fatalities Complementary Cumulative Distribution Functions for Stockpile Management Alternatives at Los Alamos National Laboratory.*

maximally exposed individual located at the site boundary would have an increased likelihood of cancer fatality of 4.3×10^{-7}. The risks for the composite set of accidents, reflecting both the probability of the accident occurring and the consequences, are also shown in table 4.6.3.9–3. For the same worker, maximally exposed individual, and population, the risks would be 3.3×10^{-8}, 2.2×10^{-8}, and 6.2×10^{-6} cancer fatalities per year, respectively. There is also a potential for chemical accident impacts as shown in table 4.6.3.9–4.

Secondary and Case Fabrication. A set of potential accidents has been postulated for the secondary and case fabrication alternative for which there may be releases of radioactive materials or other hazardous effects that may impact onsite workers and the offsite population. The potential accidents analyzed are described in appendix F. The probability distribution showing the range of probable cancer fatalities that may result for the composite set of accidents identified in appendix F is shown in figure 4.6.3.9–1. For example, the probability of a secondary and case fabrication accident causing more than one cancer fatality is approximately 10^{-8} per year. The curve reflects the probability of the accidents occurring. The impacts of the composite set of accidents are shown in table 4.6.3.9–3. If an accident were to occur, there would be an estimated 0.02 cancer fatalities in the population within 80 km (50 mi) of the site. A noninvolved worker located 862 m (2,828 ft) from the accident would have an increased likelihood of cancer fatality of 6.8×10^{-5}. For a maximally exposed individual located at the site boundary, there would be an increased likelihood of cancer fatality of 8.4×10^{-5}. The risks for the combined EBA and BEBA composite set of accidents, reflecting both the probability of the accident occurring and the consequences, are also shown in table 4.6.3.9–3. For the same worker, maximally exposed individual and population, the risks would be 4.1×10^{-9}, 5.1×10^{-9}, and 1.2×10^{-6} cancer fatalities per year, respectively. Table 4.6.3.9–3 also shows the impacts for EBAs only and BEBAs only. There is also a potential for chemical accidents and impacts as shown in table 4.6.3.9–5.

High Explosives Fabrication. A set of potential accidents has been postulated for the HE fabrication alternative for which there may be hazardous effects that may impact onsite workers and the offsite popula-

TABLE 4.6.3.9–3.—*Impacts of Accidents for Pit and Secondary and Case Fabrication and Intrusive and Nonintrusive Modification Pit Reuse at Los Alamos National Laboratory*

Parameter	Pit Fabrication and Intrusive Modification Pit Reuse			Secondary and Case Fabrication		
	EBA	BEBA	EBA and BEBA Combined	EBA	BEBA	EBA and BEBA Combined
Composite Accident Frequency (Per Year)	0.0152	$1.0x10^{-6}$	0.0152	$6.0x10^{-5}$	$5.0x10^{-7}$	$6.0x10^{-5}$
Consequences						
Noninvolved Worker						
Cancer fatality[a]	$6.4x10^{-7}$	$3.8x10^{-5}$	$6.4x10^{-7}$	$6.3x10^{-5}$	$6.2x10^{-4}$	$6.8x10^{-5}$
Risk (cancer fatality per year)	$3.3x10^{-8}$	$3.8x10^{-4}$	$3.3x10^{-8}$	$3.8x10^{-9}$	$3.1x10^{-10}$	$4.1x10^{-9}$
Maximally Exposed Individual						
Cancer fatality[a]	$4.3x10^{-7}$	$2.6x10^{-5}$	$4.3x10^{-7}$	$7.9x10^{-5}$	$7.7x10^{-4}$	$8.4x10^{-5}$
Risk (cancer fatality per year)	$2.2x10^{-8}$	$2.6x10^{-11}$	$2.2x10^{-8}$	$4.7x10^{-9}$	$3.9x10^{-10}$	$5.1x10^{-9}$
Population Within 80 Kilometers [b]						
Cancer fatality[c]	$1.2x10^{-4}$	$7.1x10^{-3}$	$1.2x10^{-4}$	0.018	0.18	0.02
Risk (cancer fatalities per year)	$6.2x10^{-6}$	$7.1x10^{-9}$	$6.2x10^{-6}$	$1.1x10^{-6}$	$8.9x10^{-8}$	$1.2x10^{-6}$

[a] Probability (increased likelihood) of cancer fatality to a hypothetical member of the public located at the site boundary or to a noninvolved worker as a result of exposure to the indicated dose if the accident occurred.

[b] For the offsite population of 287,977 for pit fabrication and 281,812 for secondary fabrication, the average probability of cancer fatality/risk of cancer fatality (per year) for the combined EBA and BEBA is $4.2x10^{-10}/2.2x10^{-11}$ and $7.1x10^{-8}/4.3x10^{-12}$ respectively, for the listed alternative(s), pit fabrication, and secondary and case fabrication.

[c] Number of cancer fatalities in the population out to 80 km (50 mi) as a result of exposure to the indicated dose if the accident occurs.

Note: All values are mean values; BEBA - beyond evaluation basis accidents; EBA - evaluation basis accidents.

Source: Results shown are derived from accident analyses in appendix F.

TABLE 4.6.3.9–4.—*Impacts of Chemical Accidents for Pit Fabrication at Los Alamos National Laboratory*

Accident Description	Accident Frequency (Per Year)	IDLH	TLV-STEL	TLV-TWA	Concentration to: Noninvolved Worker (mg/m^3)	Concentration to: Individual at Site Boundary (mg/m^3)	Potential Impacts of Exceeding: IDLH Limits[a]	Potential Impacts of Exceeding: TLV Limits[a]
Confined Release of Nitric Acid	10^{-6} to 10^{-4}				1.1	0.50	Irreversible health effects	Irritations of the eyes, mucous membranes and skin, delayed pulmonary edema, and bronchitis and dental erosion
Concentration[a] (mg/m^3)		260	10	5				
Distances[b] (m)		22	260	390				
Area (m^2)		64	$7.1x10^3$	$1.5x10^4$				
Population[c]		0	0	0				
Unconfined Release of Nitric Acid	10^{-6}				26	12	Irreversible health effects	Irritations of the eyes, mucous membranes and skin; delayed pulmonary edema; and bronchitis and dental erosion
Concentration[a] (mg/m^3)		260	10	5				
Distances[b] (m)		230	1,900	2,900				
Area (m^2)		$6.5x10^3$	$2.9x10^5$	$6.8x10^5$				
Population[c]		0	19	330				

[a] NIOSH 1990a.
[b] From facility (downwind); exceedance begins at facility, 0 meters.
[c] Offsite individuals exposed to concentration exceeding limit.
Note: IDLH - immediately dangerous to life and health; TLV - threshold-limit value; STEL - short-term exposure limit; TWA - time-weighted average.
Source: Model result (see appendix F).

TABLE 4.6.3.9–5.—*Impacts of Chemical Accidents for Secondary and Case Fabrication at Los Alamos National Laboratory*

					Concentrations to:		Potential Impacts of Exceeding:	
Accident Description	Accident Frequency (Per Year)	IDLH	TLV-STEL	TLV-TWA	Noninvolved Worker (mg/m^3)	Individual at Site Boundary (mg/m^3)	IDLH Limits[a]	TLV Limits[a]
Fire and release of lithium oxide	10^{-6} to 10^{-4}				>230	230	Irreversible health effects	Burns to the eyes, skin, mouth, and esophagus; muscular twitches; mental confusion; and blurred vision
Concentration[a] (mg/m^3)		55	-	0.025				
Distance[b] (m)		84 to 2,200		46 to >$9x10^4$				
Area (m^2)		$3.8x10^5$		>$5.7x10^8$				
Population[c]		520		>24,000				
Hydrogen fluoride release	10^{-6} to 10^{-4}				>32	32	Irreversible health effects	Irritation or burning to skin, eyes, nose and throat; pulmonary edema; and bronchitis
Concentration[a] (mg/m^3)		36	5	2.5				
Distance[b] (m)		800	2,800	4,400				
Area (m^2)		$5.7x10^4$	$5.9x10^5$	$1.4x10^6$				
Population[c]		0	820	1,500				
Hydrogen cyanide release	10^{-6} to 10^{-4}				>20	20	Irreversible health effects	Nausea, vomiting, gasping for breath, weakness, and at high levels, asphyxiation and death
Concentration[a] (mg/m^3)		56	5	-				
Distance[b] (m)		460	2,000					
Area (m^2)		$2.0x10^4$	$3.3x10^5$					
Population[c]		0	430					

[a] NIOSH 1990a.
[b] From facility (downwind); exceedance begins at facility, 0 meters, unless indicated otherwise.
[c] Offsite individuals exposed to concentration exceeding limit.
Note: IDLH - immediately dangerous to life and health; TLV - threshold-limit-value; STEL - short-term exposure limit; TWA - time-weighted average.
Source: Derived from accident analysis (see appendix F).

tion. The potential accidents analyzed are described in appendix F. The consequences of the accidents are shown in table 4.6.3.9–6.

In addition to the chemical accident impacts, there are the potential physical effects from a catastrophic explosion of the entire contents of a process related building, which would have a probability of occurrence less than the explosion considered above (i.e., less than 1.0×10^{-6} per year). The quantity of HE detonated could range up to 18 t (19.8 tons); the blast pressure could result in death (at up to 40 m [131 ft]), lung damage (at 80 m [262 ft]), thoracic injury (at 130 m [420 ft]), and eardrum rupture (at 160 m [525 ft]), depending on an individual's distance from the accident. Injuries could also be caused by glass breakage and building debris.

Nonnuclear Fabrication. The impacts of potential accidents associated with nonnuclear fabrication activities at LANL were previously addressed in *Nonnuclear Consolidation Environmental Assessment* (DOE/EA-0792, June 1993) where it was determined that the then current accident profile would not change as a result of the relocation of nonnuclear fabrication functions to LANL. The present proposed action to transfer the nonnuclear fabrication mission to LANL is not expected to change the accident profile that presently exists at the site.

Stewardship Alternatives. Accident information on the two proposed stewardship alternatives under consideration at LANL, the NIF and the Atlas Facility, is provided in this section.

Proposed National Ignition Facility. Studies of potential accidents associated with the proposed NIF have been performed. A bounding accident was postulated based on a preliminary hazard analysis. The bounding accident assumes a severe earthquake of 1 G horizontal ground acceleration occurring during a maximum-credible-yield fusion experiment. Beamlines streaking into the target chamber and building structures other than the target area building would fail during the postulated earthquake. The collapsed beamlines and building structures would provide a pathway for acute atmospheric releases of tritium in the tritium processing system, activated gases in the air, and activated material in the target chamber.

The frequency of this severe earthquake is estimated at 1×10^{-4} per year. The joint frequency of the severe earthquake during the maximum-credible-yield fusion experiment would be less than 2×10^{-8} per year. The radiological impacts of the accident, presented in table 4.6.3.9–7, were estimated using the GENII computer code.

Proposed Atlas Facility. Studies of potential accidents associated with the proposed Atlas Facility have been performed. The results of the studies indicate that the bounding case accident for a site worker involves electrocution from a high energy power source or mechanical collapse of the overhead crane. Both scenarios have an equal likelihood of occurrence. The impact to a site worker in these scenarios could be death. However, the likelihood of occurrence is less than once in 100 years of operation. The most likely accident that could result in an impact to collocated workers involves exposure to emissions and effluents from a capacitor bank fire. In this scenario, a collocated worker would receive minimal exposure to smoke and sprinkler system water containing mineral oil from a Marx module. The impact to a collocated worker in this scenario would be temporary irritation and discomfort; however, the likelihood of occurrence is less than once in 10,000 years of operation. In the event of a fire, all site and collocated workers would be evacuated.

The most likely accident scenario that could result in an impact to the public involves exposure to emissions and effluents from a capacitor bank fire. In this scenario, a member of the public could receive minimal exposure to smoke. The impact to a member of the public in this scenario would be less than that experienced by a collocated worker. Exposure to the smoke could result in very mild and temporary irritation and discomfort. There are no probable accidents which would result in an adverse impact to the public.

4.6.3.10 *Waste Management*

This section summarizes the impacts on waste management at LANL under No Action as well as for each of the proposed alternatives. There is no spent nuclear fuel or HLW associated with pit fabrication, secondary and case fabrication, HE fabrication, nonnuclear fabrication, the proposed Atlas Facility, or the proposed NIF; therefore, there is no further discussion of these wastes for LANL. Table 4.6.3.10–1 lists the projected waste generation rates and treatment, storage, and disposal capacities under No Action. Projections for

TABLE 4.6.3.9–6.—*Accident Impacts for High Explosives Fabrication at Los Alamos National Laboratory*

Accident Description	Accident Frequency (per year)	TLV-TWA	Concentrations to: Noninvolved Worker (mg/m^3)	Concentrations to: Individual at Site Boundary (mg/m^3)	Potential Impacts of Exceeding: TLV-TWA Limits
Fire and release of chemical TATB	0.01 to 10^{-4}		>50	50	Liver damage, cyanosis, sore throat, muscular pain, kidney damage, and anemia
Concentration[a] (mg/m^3)		1.5			
Distances[b] (m)		2,400			
Area (m^2)		4.7×10^5			
Population[c]		2			
Fire and release of chemical TNT	0.01 to 10^{-4}		>50	50	Liver damage, cyanosis, sore throat, muscular pain, kidney damage, and anemia
Concentration[a] (mg/m^3)		0.5			
Distances[b] (m)		5,000			
Area (m^2)		1.8×10^6			
Population[c]		25			
Explosion and elevated release of TATB	10^{-4} to 10^{-6}		6.4	6.7[d]	Liver damage, cyanosis, sore throat, muscular pain, kidney damage, and anemia
Concentration[a] (mg/m^3)		1.5			
Distances[b] (m)		180 to 3,500			
Area (m^2)		1.1×10^6			
Population[c]		8			
Explosion and elevated release of TNT	10^{-4} to 10^{-6}		2.4	2.5[d]	Liver damage, cyanosis, sore throat, muscular pain, kidney damage, and anemia
Concentration[a] (mg/m^3)		0.5			
Distances[b] (m)		170 to 3,700			
Area (m^2)		1.2×10^6			
Population[c]		9			

[a] NIOSH 1990a.
[b] From facility (downwind); exceedance begins at facility, 0 meters, unless indicated otherwise.
[c] Offsite individual exposed to concentration exceeding limit.
[d] Individual at 510 m (1,673 ft) from boundary (individual at boundary is exposed to concentrations of approximately two times lower)
Note: TLV - threshold limit value; TWA - time weighted average; TATB - triaminotrinitrobenzene; TNT - trinitrotoluene.
Source: Results derived from accident analysis (see appendix F).

TABLE 4.6.3.9–7.—***Consequences and Risk of the Bounding Proposed National Ignition Facility Accident at Los Alamos National Laboratory***

	Conceptual Design	Enhanced Baseline Option
Workers Onsite		
Dose (person-rem)	13	21
Fatal cancers	0	0
Risk (cancer fatalities per year)	$1x10^{-10}$	$2x10^{-10}$
Maximally Exposed Individual		
Dose (rem)	$2x10^{-3}$	$3x10^{-3}$
Fatal cancers	$8x10^{-7}$	$1x10^{-6}$
Risk (cancer fatalities per year)	$2x10^{-14}$	$3x10^{-14}$
Population Within 80 Kilometers		
Dose (person-rem)	290	490
Fatal cancers	0	0
Risk (cancer fatalities per year)	$3x10^{-9}$	$5x10^{-9}$

Source: Appendix I.

No Action were derived from 1993 environmental data, with the appropriate adjustments made for those changing operational requirements where the volume of wastes generated is identifiable. The projection does not include wastes from future, as yet uncharacterized, environmental restoration activities.

Table 4.6.3.10–2 provides the total estimated operational waste volumes projected to be generated at LANL as a result of the various proposed alternatives. The net increase over No Action is provided below in parentheses. The waste volumes generated from the various alternatives and the resultant waste effluent used in the impact analysis can be found in section 3.3 for the stewardship alternatives and section 3.4 for the management alternatives. The waste volumes for the management alternatives are based on surge operations (three shifts). Facilities that would support the Stockpile Stewardship and Management Program at LANL would treat and package all waste generated into forms that would enable long-term storage and/or disposal in accordance with the *Atomic Energy Act*, RCRA, and other applicable statutes as outlined in appendix section H.1.2.

No Action. Under No Action, TRU, low-level, mixed, hazardous, and nonhazardous wastes would continue to be generated at LANL from the missions outlined in section 3.2.6. The decrease in solid LLW is due to the phase out of the PHERMEX Facility as the new DARHT Facility with contained firing becomes operational. LANL would continue to treat, store, and dispose of its legacy and newly generated wastes in current and planned facilities.

Liquid TRU waste would continue to be generated by the Plutonium Facility (TA-55). The residual TRU waste sludge that remains after treatment would continue to be loaded into 208-L (55-gal) steel drums, solidified, and transported to Area G for storage. Solid TRU waste would be characterized, certified to meet the criteria for acceptance at WIPP, and placed in storage at Area G while awaiting shipment to WIPP or an alternate facility. Plans are to develop a new facility for characterizing and processing solid TRU waste. This new facility is projected to be operational in 2006.

Liquid LLW would be neutralized and solidified in two onsite treatment facilities. Solid LLW would be compacted, packaged, and stored for disposal either in an onsite, expanded Area G LLW burial site or through other disposal options. Liquid mixed waste would undergo neutralization/pH adjustment, oxidation/reduction, precipitation, chelation/flocculation, and filtration. Both liquid and solid mixed waste would be treated and disposed of according to the LANL Site Treatment Plan, which was developed pursuant to the *Federal Facility Compliance Act* of 1992. The resulting waste would then be stored in a RCRA-permitted facility in DOT-approved containers until it is shipped to an offsite DOE disposal facility. Some of this waste would be placed in interim storage until new technologies for treatment and disposal are identified and evaluated. Liquid sanitary wastes would be treated by a consolidation and collection system and discharged to NPDES-permitted sanitary tile fields. Solid nonhazardous waste would be disposed of in a regional commercial disposal facility.

TABLE 4.6.3.10–1.—*Projected Waste Management Under No Action at Los Alamos National Laboratory* [Page 1 of 2]

Category	Annual Generation (m^3)	Treatment Method	Treatment Capacity (m^3/yr)	Storage Method	Storage Capacity (m^3)	Disposal Method	Disposal Capacity (m^3)
Transuranic							
Liquid	0.1	Pretreatment at TA-50: neutralization, clariflocculation, filtration, precipitate, and cement mixing	132,659	NA	NA	NA	NA
Solid	54	Volume reduction	51,989	Storage pads at TA-54, modified LLW burial pits and shafts	24,355	None: Federal repository in the future	None
Mixed Transuranic							
Liquid	None	Included in TRU	Included in TRU	Included in TRU	Included in TRU	Included in TRU	Included in TRU
Solid	255	Included in TRU	Included in TRU	Included in TRU	Included in TRU	Included in TRU	Included in TRU
Low-Level							
Liquid	21,400	Chemical treatment and ion-exchange, solidification, and volume reduction (vial crusher)	45 m^3/hour	Chemical and Ion-Exchange Plant at TA-50 and the Chemical Plant at TA-21	663	Treated effluent is discharged to the environment. Residual sludge is solidified and disposed of at TA-54, Area G, as solid LLW.	None
Solid	2,500	Compaction	76	TA-54 in Area G	Variable	Currently, solid LLW goes to TA-54, Area G, for burial. Continued construction of Area G is under evaluation in the site-wide EIS.	24 to 28 ha

TABLE 4.6.3.10–1.—*Projected Waste Management Under No Action at Los Alamos National Laboratory* [Page 2 of 2]

Category	Annual Generation (m^3)	Treatment Method	Treatment Capacity (m^3/yr)	Storage Method	Storage Capacity (m^3)	Disposal Method	Disposal Capacity (m^3)
Mixed Low-Level							
Liquid	0	Neutralization, precipitation, oxidation, thermal treatment, solidification, volume reduction, and liquid scintillation cocktail vials	Capabilities under development per site treatment plan for mixed wastes	RCRA-permitted buildings (not built yet) and interim status container storage areas	583	Capabilities under development per site treatment plan for mixed wastes	None
Solid	45	None	Capabilities under development per site treatment plan	TA-54, Area L, or Area G	1,864	Capabilities under development per site treatment plan for mixed wastes	None
Hazardous							
Liquid	273	Thermal treatment, treatment tanks, neutralization, precipitation, and evaporation	Varies depending on the waste stream	Thermal treatment TAs -14, -15, -16, -36, and -39 and storage and treatment at TA-54, Area L	502	Offsite	NA
Solid	669	Thermal treatment and flashpad	Varies depending on the waste stream	See above	See above	See above	See above
Nonhazardous (Sanitary)							
Liquid	692,827	Filtration, settling, and stripping	1,060,063	NA	NA	Permitted discharge sanitary tile fields	2,271,240 L/day
Solid	5,453	None	None	NA	NA	Offsite county landfill and onsite landfill Area J	NA
Nonhazardous (Other)							
Liquid	See sanitary	See sanitary	See sanitary	See sanitary	See sanitary	See sanitary	See sanitary
Solid	See sanitary	See sanitary	See sanitary	See sanitary	See sanitary	See sanitary	See sanitary

Note: NA - not applicable.

Source: LANL 1990a; LANL 1994b.

TABLE 4.6.3.10–2.—*Estimated Annual Generated Waste Volumes for Stockpile Stewardship and Management Alternatives at Los Alamos National Laboratory* [Page 1 of 2]

Category	No Action[a] (m^3)	Pit Fabrication[b] (m^3)	Secondary and Case Fabrication[c] (m^3)	High Explosives Fabrication[d] (m^3)	Nonnuclear Fabrication (Full Scope)[e] (m^3)	Atlas Facility[f] (m^3)	National Ignition Facility[g] (m^3)	Combined Program Impacts (m^3)
Transuranic								
Liquid	0.1	5 (+5)	0.1 (+0)	0.1 (+0)	0.1 (+0)	0.1 (+0)	0.1 (+0)	5 (+5)
Solid	54	97 (+43)	54 (+0)	54 (+0)	54 (+0)	54 (+0)	54 (+0)	97 (+43)
Mixed Transuranic								
Liquid	0	0 (+0)	0 (+0)	0 (+0)	0 (+0)	0 (+0)	0 (+0)	0 (+0)
Solid	255	257 (+2)	255 (0)	255 (0)	255 (0)	255 (0)	255 (0)	257 (+2)
Low-Level								
Liquid	21,400	21,400 (+15)	21,600 (+192)	21,400 (0)	21,400 (0)	21,400 (0)	21,400 (+0.6)	21,600 (+208)
Solid	2,500	2,880 (+386)	3,190 (+690)	2,500 (minimal)	2,500 (0)	2,500 (0)	2,500 (+3)	3,580 (+1,080)
Mixed Low-Level								
Liquid	0	0 (+0)	30 (+30)	0 (0)	0 (0)	0 (0)	2 (+2)	32 (+32)
Solid	45	45 (0)	153 (+108)	45 (0)	45 (0)	45 (0)	45 (+0.3)	153 (+108)
Hazardous								
Liquid	273	275 (+2)	333 (+60)	277 (+4)	284 (+11)	273 (+<1)	275 (+2)	353 (+80)
Solid	669	669 (+0)	885 (+216)	682 (+13)	669 (+0.1)	670 (+<1)	677 (+8)	906 (+237)

TABLE 4.6.3.10–2.—***Estimated Annual Generated Waste Volumes for Stockpile Stewardship and Management Alternatives at Los Alamos National Laboratory*** **[Page 2 of 2]**

Category	No Action[a] (m^3)	Pit Fabrication[b] (m^3)	Secondary and Case Fabrication[c] (m^3)	High Explosives Fabrication[d] (m^3)	Nonnuclear Fabrication (Full Scope)[e] (m^3)	Atlas Facility[f] (m^3)	National Ignition Facility[g] (m^3)	Combined Program Impacts (m^3)
Nonhazardous (Sanitary)								
Liquid	693,000	705,000 (+12,300)	713,000 (+20,200)	699,000 (+5,900)	694,000 (+568)	694,000 (+710)	711,000 (+17,900)	751,000 (+57,600)
Solid	5,450	6,000 (+552)	6,610 (+1,160)	5,450 (Included in liquid)	5,460 (+10)	5,460 (+7)	11,500 (+6,000)	13,200 (+7,730)
Nonhazardous (Other)[a]								
Liquid	Included in sanitary	Included in sanitary	Included in sanitary	6,930[h] (+6,930)	25[i] (+25)	Included in sanitary	Included in sanitary	6,960 (+6,960)
Solid	Included in sanitary	Included in sanitary	3,000[i] (+3,000)	28[i] (+28)	3[i] (+3)	Included in sanitary	Included in sanitary	3,030 (+3,030)

[a] No Action volumes are from table 4.6.3.10–1.
[b] Pit fabrication volumes are from table 3.4.3.2–3.
[c] Secondary fabrication volumes are from table 3.4.4.3–3 and are based on surge operations (three shifts).
[d] HE fabrication volumes are from table 3.4.5.3–4 and are based on surge operations (three shifts).
[e] Nonnuclear fabrication volumes are from table 3.4.2.3–3 and are based on surge operations (three shifts).
[f] Atlas Facility volumes are from table 3.3.2.3–3.
[g] NIF volumes are from table 3.3.2.2–3 and are based on conceptual designs.
[h] Treated process water.
[i] Recyclable wastes.
Note: Waste generation volumes were rounded to three significant figures. Waste effluent volumes are shown in section 3.3 and 3.4 tables for each alternative.

Management Alternatives

Pit Fabrication. Over the 3-year construction period, it is estimated that approximately 27 t (30 tons) of TRU waste and 54 t (60 tons) of LLW would be generated. These numbers assume that about 20 glove boxes from the 300 Area and 10 glove boxes from the 400 Area would be removed. The glove boxes should meet the definition of LLW; whereas, approximately two-thirds of the associated piping and ventilation ductwork would be considered TRU waste. Assuming a density of 1,500 kg/m^3, this is a volume of 6 m^3/yr (8 yd^3/yr) of TRU waste and 12 m^3/yr (16 yd^3/yr) of LLW. The TRU waste would be packaged to meet the WIPP Waste Acceptance Criteria and stored until it is shipped to WIPP for disposal. This would require two additional truck shipments over the entire construction period. The LLW would be packaged to meet the Area G waste disposal criteria. This would require approximately 0.003 ha (0.007 acres) of LLW disposal area for the entire construction project. Liquid and solid hazardous waste generated during construction would be packaged and shipped offsite to RCRA-permitted treatment and disposal facilities.

Treatment and processing of liquid and solid TRU, and solid mixed TRU wastes to meet the WIPP Waste Acceptance Criteria would result in 60 m^3 (78 yd^3) of TRU waste and 2 m^3 (3 yd^3) of solid mixed TRU waste to be packaged in accordance with DOE and NRC requirements for transport to WIPP for disposal. Seven additional truck shipments per year would be required to transport this waste to WIPP. There is adequate excess capacity at LANL liquid radwaste treatment facilities to handle the 15 m^3 (3,940 gal) of liquid LLW. Following treatment and processing, 393 m^3 (514 yd^3) of solid LLW would require disposal at the Area G LLW disposal site. Assuming a land usage factor of 12,500 m^3/ha (6,630 yd^3/acres), approximately 0.03 ha/yr (0.08 acres/yr) of LLW disposal area at LANL would be required.

The LANL Site Treatment Plan for mixed waste was developed pursuant to the *Federal Facility Compliance Act*. The mixed waste streams identified at LANL have been combined into 30 treatability groups, each with a preferred treatment option. The type of mixed wastes generated by pit fabrication would fit into 1 of the established 30 treatability groups and would not create new treatability groups or new preferred treatment options. Minimal impacts would result from the 2 m^3 (555 gal) of liquid hazardous waste that would be staged in the onsite hazardous waste accumulation area and shipped to offsite commercial RCRA-permitted treatment, storage, and disposal facilities. Minimal impacts would result from the 12,300 m^3 (3.25 million gal) of liquid sanitary waste that would be routed to the TA-46 sanitary wastewater treatment facilities. Minimal impacts would result from the 552 m^3 (722 yd^3) of solid nonhazardous waste that would be disposed of in offsite industrial and sanitary landfills.

Secondary and Case Fabrication. The Secondary and Case Fabrication Facility would not generate any TRU waste. The 192 m^3 (50,700 gal) of liquid LLW would have little impact on LANL radwaste treatment facilities as there is adequate capacity to handle the increase. After treatment and volume reduction, 349 m^3 (456 yd^3) of solid LLW would require disposal in the Area G LLW disposal site. Assuming a land usage factor of 12,500 m^3/ha (6,630 yd^3/acres), approximately 0.03 ha/yr (0.07 acres/yr) of LLW disposal area would be required.

The type of mixed wastes generated by secondary and case fabrication would fit into 1 of the established 30 treatability groups and would not require the creation of new treatability groups or new preferred treatment options. The 30 m^3 (7,930 gal) of liquid mixed wastes and 108 m^3 (141 yd^3) of solid mixed wastes generated annually may impact the available storage capacity of the main areas for future mixed waste storage in RCRA-permitted hazardous waste management units. Minimal impacts would result from the 60 m^3 (15,900 gal) of liquid hazardous waste and 216 m^3 (283 yd^3) of solid hazardous waste that would be staged in the onsite hazardous waste accumulation area and shipped to offsite commercial RCRA-permitted treatment, storage, and disposal facilities. Minimal impacts would result from the 20,200 m^3 (5.35 million gal) of liquid sanitary waste that would be routed to septic tanks or sanitary wastewater treatment facilities. After volume reduction, minimal impacts would result from the 639 m^3 (836 yd^3) of solid nonhazardous waste that would be disposed of in offsite industrial and sanitary landfills.

High Explosives Fabrication. The HE Fabrication Facility would not generate any TRU waste, or mixed

LLW. Minimal quantities of solid LLW would be generated annually either from handling depleted uranium parts during subassembly operations or from processing of materials returned from the stockpile with slight contamination. The operational life of the Area G LLW disposal site would not be impacted. Minimal impacts would result from the 4 m^3 (925 gal) of liquid hazardous waste and 13 m^3 (16 yd^3) of solid hazardous waste that would be staged in the onsite hazardous waste accumulation area and shipped to offsite commercial RCRA-permitted treatment, storage, and disposal facilities. Minimal impacts would result from the 5,900 m^3 (1.56 million gal) of liquid sanitary waste that would be routed to septic tanks or sanitary wastewater treatment facilities. Minimal impacts would result from the 17 m^3 (22 yd^3) of solid nonhazardous waste that would be disposed of in offsite industrial and sanitary landfills.

Nonnuclear Fabrication. The Nonnuclear Fabrication Facility would not generate any TRU, low-level, or mixed low-level wastes. Minimal impacts would result from the 11 m^3 (3,000 gal) of liquid hazardous waste and 0.1 m^3 (0.13 yd^3) of solid hazardous waste that would be staged in the onsite hazardous waste accumulation area and shipped to offsite commercial RCRA-permitted treatment, storage, and disposal facilities. Minimal impacts would result from the 568 m^3 (150,000 gal) of liquid sanitary waste that would be discharged to the sanitary wastewater system and the 11 m^3 (15 yd^3) of solid nonhazardous waste that would be disposed of in offsite industrial and sanitary landfills.

Sensitivity Analysis. The waste volumes generated from the pit, secondary and case, HE, and nonnuclear fabrication alternatives required to support a larger stockpile level (high case) operating on a single-shift basis are bounded by the base case under surge operations. There would be no additional waste management impacts associated with the alternatives that would support a high case stockpile operating at a single shift. The volumes generated from the proposed alternatives required to support a low case stockpile would be reduced by a factor of at least 3.

Stewardship Alternatives

Proposed National Ignition Facility. The proposed NIF would not generate any TRU waste. The 0.6 m^3 (159 gal) of liquid LLW could be treated with existing onsite capabilities with no impact. The 3 m^3 (4 yd^3) of solid LLW would have a minimal impact on the operational life of the Area G LLW disposal site. Assuming a land usage factor of 12,500 m^3/ha (6,630 yd^3/acres), 0.0002 ha/yr (0.0006 acres/yr) of LLW disposal area would be required.

The LANL Site Treatment Plan for mixed waste was developed pursuant to the *Federal Facility Compliance Act*. The mixed waste streams identified at LANL have been combined into 30 treatability groups, each with a preferred treatment option. The type of mixed wastes generated by the proposed NIF would fit into 1 of the established 30 treatability groups and would not require the creation of new treatability groups or new preferred treatment options. The 2 m^3 (528 gal) of liquid mixed LLW and the 0.3 m^3 (0.4 yd^3) of solid mixed LLW generated would not impact the available storage capacity of the main areas for future mixed waste storage in RCRA-permitted hazardous waste management units. Minimal impacts would result from the 2 m^3 (608 gal) of liquid hazardous waste and 8 m^3 (10 yd^3) of solid hazardous waste that would be staged in the onsite hazardous waste accumulation area and shipped to offsite commercial RCRA-permitted treatment, storage, and disposal facilities. The 17,900 m^3 (4.72 million gal) of liquid sanitary waste would not be expected to impact the existing sanitary wastewater treatment system. Minor impacts would result from the 6,050 m^3 (7,910 yd^3) of solid nonhazardous waste that would be disposed of in offsite industrial and sanitary landfills.

Proposed Atlas Facility. For purposes of this analysis it is assumed that a small amount (<1 m^3 annually) of liquid or solid hazardous waste would be generated by occasional experiments involving lead or other simulant materials. This waste would be staged in the onsite hazardous waste accumulation area and shipped to offsite commercial RCRA-permitted treatment, storage, and disposal facilities. Minimal impacts would result from the generation of 710 m^3 (188,000 gal) of liquid sanitary waste as there is adequate capacity within the existing sanitary wastewater treatment system to handle the increase. Minimal impacts would result from the 9 m^3 (12 yd^3) of solid nonhazardous waste that would be disposed of at the Los Alamos County landfill.

Combined Program Impacts. If all the proposed stockpile stewardship and management alternatives listed in table 4.6.3.10–2 were located at LANL, the impacts from TRU and mixed TRU wastes would be identical to those discussed for the pit fabrication alternative. Following treatment and volume reduction, approximately 745 m^3 (925 yd^3) of solid LLW would require disposal at the Area G LLW disposal site. An estimated 0.06 ha (0.15 acres) of LLW disposal area would be required. The impacts from mixed low-level and hazardous wastes are identical to those discussed for the secondary and case fabrication alternative. The 57,600 m^3 (15.2 million gal) of liquid sanitary wastes would not be expected to impact the sanitary wastewater treatment system since adequate capacity exists to handle this increase. After volume reduction, approximately 7,270 m^3 (9,510 yd^3) of solid sanitary waste would require disposal. This increase could require the construction of a new sanitary landfill sooner than currently planned.

Potential Mitigation Measures. Waste quantities or waste forms could undergo additional reductions by utilizing emerging technologies, thereby further reducing or mitigating impacts. Pollution prevention and waste minimization would be considered in determining the final actions of the Stockpile Stewardship and Management Program at LANL.

4.6.3.11 *Environmental Justice*

As discussed in section 4.14, any impacts to surrounding communities would most likely result from toxic or hazardous air pollutants and radiological emissions. Section 4.6.3.9, which describes public and occupational health impacts from normal operation, shows that potential chemical air emissions and releases are not within the generally acceptable threshold of regulatory concern. This information is based on the conservative programmatic assumptions and modeling detailed in appendix E. However, the cumulative effect of continuous (or intermittent over time) very low exposures could have some impact on human health or the environment. Any adverse human health or environmental impacts that may occur would affect people living within communities located near LANL. The analysis of the demographic data presented in appendix D for the communities surrounding LANL indicates that if there were any adverse health impacts to these communities, they would not appear to disproportionately affect minority or low-income populations.

4.7 Lawrence Livermore National Laboratory

LLNL was established in 1952 and currently occupies approximately 332 ha (821 acres) next to Livermore, CA (Livermore Site), and 2,800 ha (7,000 acres) at Site 300, approximately 29 km (18 mi) southeast of Livermore in support of missions discussed in section 3.2.7. The locations of the sites are illustrated in figure 4.7–1. Figure 4.7–2 shows the DOE property boundaries for the Livermore Site.

4.7.1 Description of Alternatives

No Action. LLNL would continue to perform the missions described in section 3.2.7.

Stockpile Management Alternatives. The secondary and case fabrication mission, the HE fabrication mission, and a portion of the nonnuclear fabrication mission could be located at LLNL. The HE fabrication mission could also be shared with LANL.

Stockpile Stewardship Alternatives. The Contained Firing Facility (CFF) would be located at Site 300 and the proposed NIF could be located at the Livermore Site.

4.7.2 Affected Environment

The following sections describe the affected environment at the LLNL main site (Livermore Site) and Site 300 for land resources, air quality, water resources, geology and soils, biotic resources, cultural and paleontological resources, and socioeconomics. In addition, the infrastructure, radiation and hazardous chemical environment, waste management conditions, and current intersite transport issues are described.

4.7.2.1 *Land Resources*

LLNL consists of two sites: the main facility (approximately 332 ha [821 acres]) at Livermore, and Site 300 (approximately 2,800 ha [7,000 acres]) in the Tracy Hills, approximately 29 km (18 mi) east of the Livermore Site. Both sites are owned by the Federal Government and administered, managed, and controlled by DOE.

Livermore Site. Generalized land uses within the Livermore Site and in the immediate vicinity are shown in figure 4.7.2.1–1. The site itself is categorized into a variety of land uses, with the vast majority dedicated to R&D. The R&D designation includes office facilities, light and heavy laboratories, and light industrial facilities in direct support of programmatic endeavors. A significant portion of the site is classified as undeveloped and industrial uses occupy a substantial amount of land. There are no prime farmlands on the Livermore Site.

The Livermore Site is bordered on the east by Greenville Road. Land use on the east is primarily agricultural. The South Bay Aqueduct, a branch of the California Aqueduct, crosses Greenville Road just south of the Livermore Site. Patterson Pass Road borders the Livermore Site on the north. Land to the immediate north of Patterson Road is light industrial and vacant land. The Patterson Reservoir and filtration plant, part of the South Bay Aqueduct system, are located northeast of the site. The Livermore Site is bordered on the west by South Vasco Road. Land use to the west is primarily urban residential, with some vacant land.

The Livermore Site is bordered on the south by East Avenue. Sandia National Laboratories, Livermore, is located immediately adjacent and south of East Avenue. A small light-industrial park is located on the southwest corner of East Avenue and South Vasco Road. The remainder of lands south of the Livermore Site and Sandia National Laboratories, Livermore, are primarily agricultural, comprised of vineyards and rangeland primarily used for grazing. There are also some rural residences in these areas. The closest residences to the boundaries of the Livermore Site are 0.4 km (0.25 mi) to the east, 0.56 km (0.35 mi) to the west, 2.0 km (1.2 mi) to the north, and 0.8 km (0.50 mi) to the south.

Site 300. Generalized land uses within Site 300 and in the immediate vicinity are shown in figure 4.7.2.1–2. The site itself consists of a large percentage of undeveloped territory and land dedicated to both R&D and industrial functions. There are no prime farmlands on Site 300. No significant land use changes are projected for Site 300 at present (LLNL 1995k:16-19).

The majority of the land surrounding Site 300 is agricultural and is primarily used for grazing sheep and

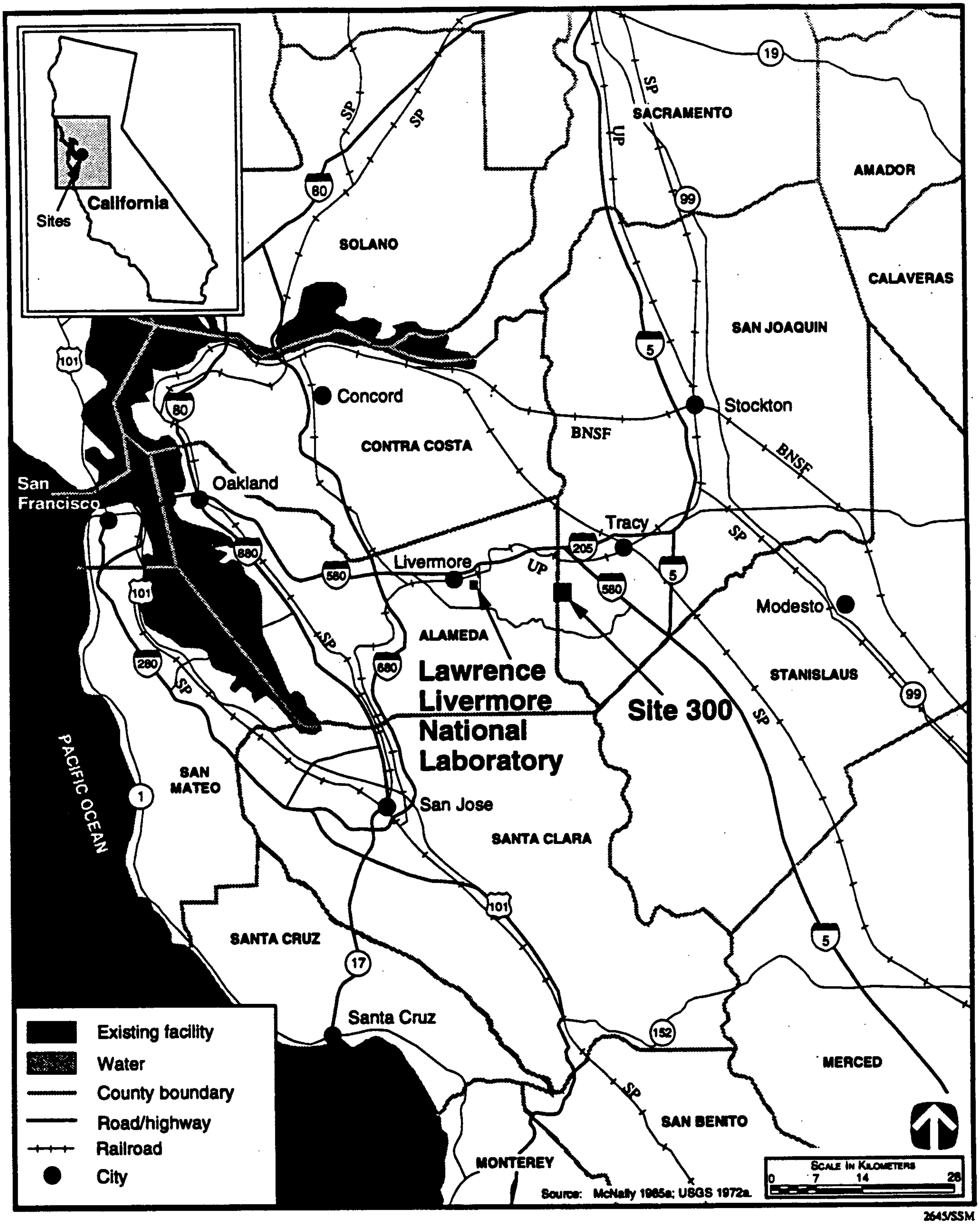


FIGURE 4.7–1.—*Lawrence Livermore National Laboratory, Livermore Site, and Site 300, California, and Region.*

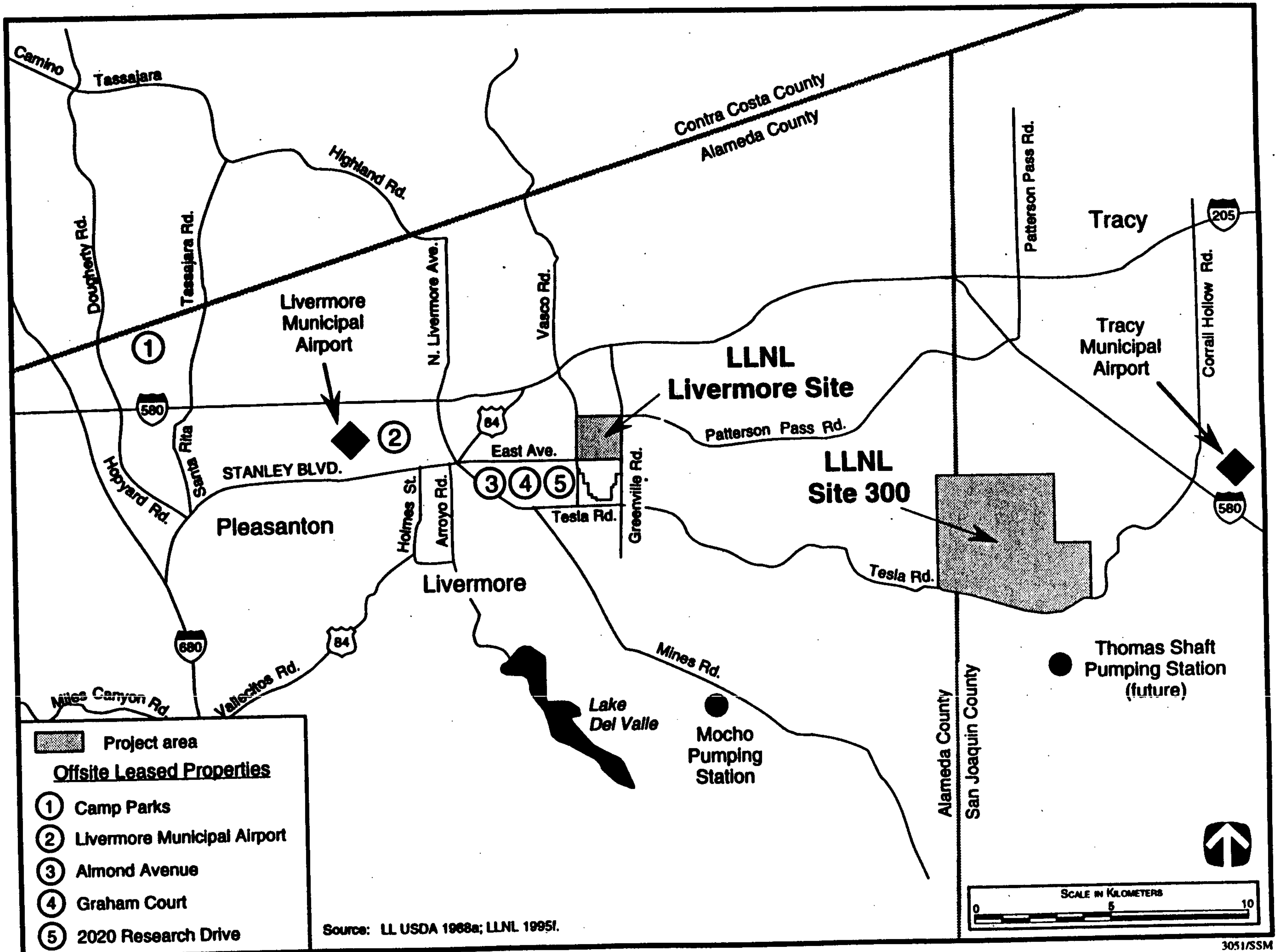


FIGURE 4.7-2—*Lawrence Livermore National Laboratory, Livermore Site, and Site 300 Relative to Surrounding Communities.*

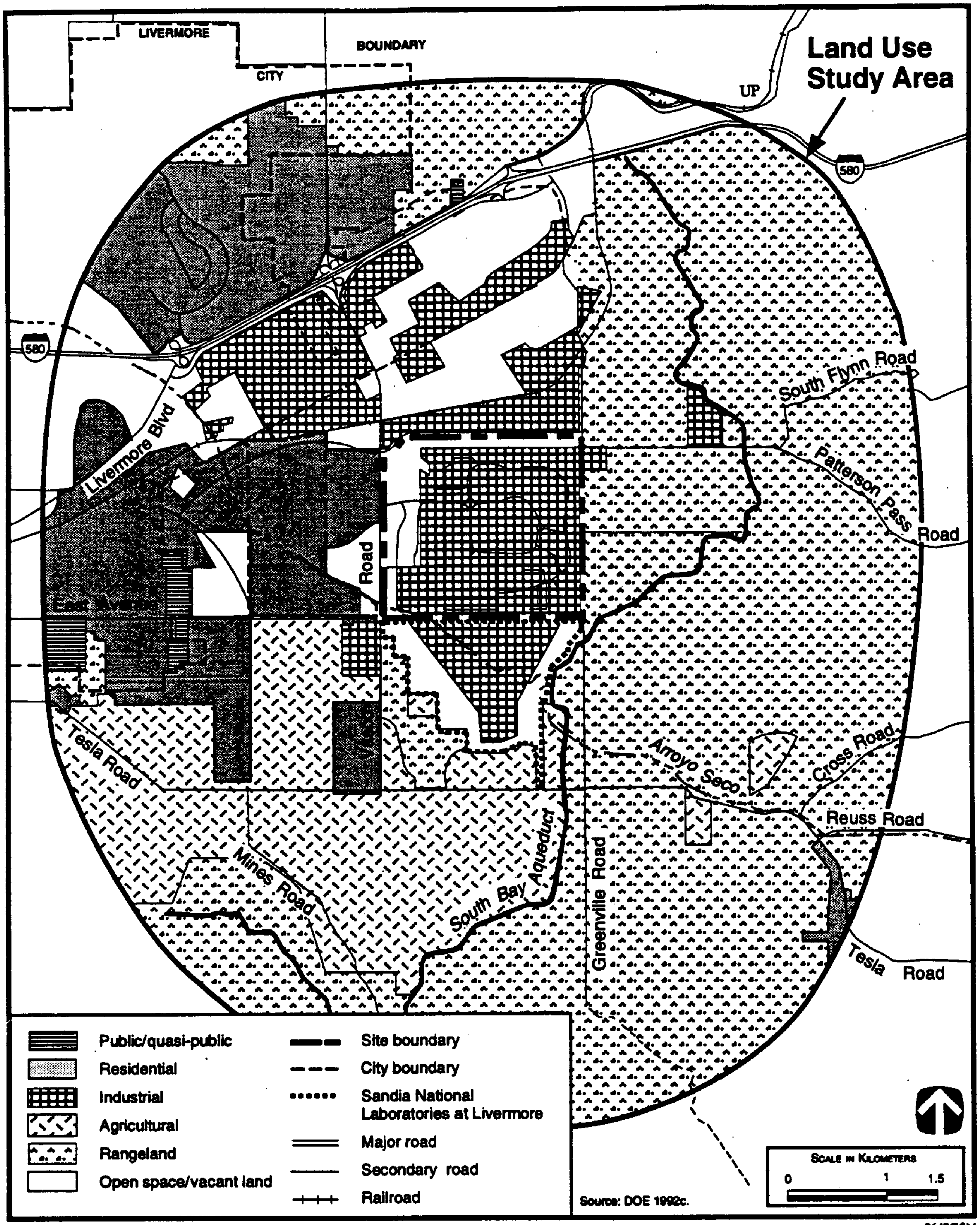


Figure 4.7.2.1–1.—*Generalized Land Use at Lawrence Livermore National Laboratory and Vicinity.*

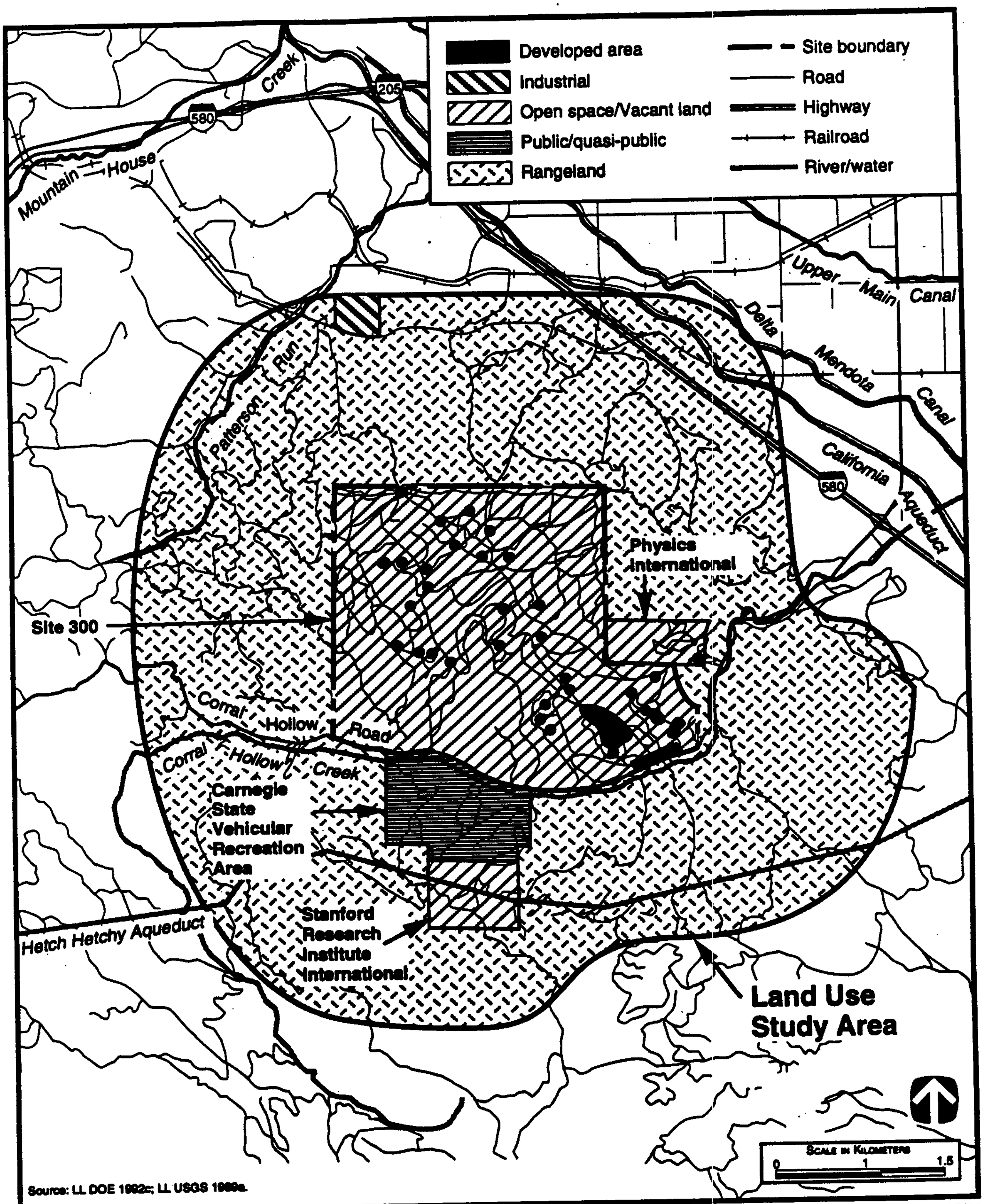


FIGURE 4.7.2.1–2.—*Generalized Land Use at Site 300 and Vicinity.*

cattle. There are two, privately operated, research and testing facilities located near Site 300. Physics International is located adjacent to the east boundary, and Stanford Research Institute International is approximately 0.97 km (0.60 mi) south of the site. Both of these facilities conduct HE testing similar to that conducted at Site 300 (LL DOE 1992c:4-6). Corral Hollow Road borders Site 300 on the south. Adjacent to the western portion of Site 300, across Corral Hollow Road, is the Carnegie State Vehicular Recreation Area. This area covers approximately 6,483 ha (16,020 acres) and is operated by the California Department of Parks and Recreation, Off-Highway Motor Vehicle Recreation Division, for the exclusive use of off-road vehicles. Several rural residences are located along Corral Hollow Road, west of Site 300 and the Carnegie State Vehicular Recreation Area. The closest residences to the boundaries of Site 300 are 0.48 km (0.3 mi) to the east, 0.16 km (0.1 mi) to the west, 3.5 km (2.2 mi) to the north, and 0.72 km (0.45 mi) to the south. The nearest urban area is the city of Tracy, approximately 13 km (8.1 mi) to the northeast.

4.7.2.2 *Site Infrastructure*

Section 3.2.7 describes the current missions at LLNL. To support these missions an infrastructure exists as shown in table 4.7.2.2–1.

TABLE 4.7.2.2–1.—*Baseline Characteristics for Lawrence Livermore National Laboratory*

Characteristics	Current Value	
Land	**Main Site**	**Site 300**
Area (ha)	332	2,800
Roads (km)	24	40
Railroads (km)	0	0
Electrical		
Energy consumption (MWh/yr)	327,716	15,661
Peak Load (MWe)	57.2	2.6
Fuel		
Natural Gas (m^3/yr)	14,160,000	NA
Liquid (L/yr)	31,688	43,527
Coal (t/yr)	0	0

Note: NA - not applicable.
Source: LLNL 1995i:1.

4.7.2.3 *Air Quality*

This section describes existing air quality, including a review of the meteorology and climatology in the vicinity of the Livermore Site and Site 300. More detailed discussions of the air quality methodologies, input data, and atmospheric dispersion characteristics are presented in appendix section B.3.7.

Meteorology and Climatology. The climate at the Livermore Site, Site 300, and the surrounding region is classic Mediterranean with hot dry summers and cold wet winters. The average annual temperature at the Livermore Site is 12.5 °C (54.5 °F); the normal seasonal temperature range is defined by winter nighttime lows in the vicinity of 0 °C (32 °F) and summer daytime highs around 38 °C (100.4 °F). The highest and lowest annual precipitation on record are 78.2 cm (30.8 in) and 13.8 cm (5.4 in), respectively. Prevailing winds at the Livermore Site are from the west and southwest. The climate at Site 300, while similar to the Livermore Site, is modified by higher elevation and more pronounced relief. The temperature range is somewhat more extreme than the Livermore Site. Topography significantly influences surface wind patterns at Site 300 with prevailing winds from the west-southwest (LLNL 1993b:1-2,1-3).

Ambient Air Quality. The Livermore Site is located within the San Francisco Bay Area Air Quality Management District. With respect to attainment of the NAAQS (40 CFR 50), this area has been designated as follows: A part of Alameda County, which is in the San Francisco Bay Area Air Quality Management District, is designated as nonattainment for carbon monoxide (with a classification of moderate ≤12.7 ppm) and ozone (with a classification of moderate) (40 CFR 81.305). Site 300 is located within the San Joaquin Valley Unified Air Pollution Control District. The area is classified as a nonattainment area for ozone (with a classification of serious) and PM_{10} (with a classification of serious) (40 CFR 81.305). Applicable NAAQS and California State ambient air quality standards are presented in appendix table B.3.1–1.

The primary emission sources of criteria air pollutants at the Livermore Site and Site 300 are numerous boilers, solvent cleaning operations, emergency generators, and various experimental, testing, and process sources. Emission estimates for these sources are presented in appendix table B.3.7–1.

Several PSD Class I areas have been designated in the vicinity of the Livermore Site, including Point Reyes National Wilderness Area, approximately 89 km (55 mi) to the northwest; and Desolation National Wilderness Area, Mokelumne National Wilderness Area, Emigrant National Wilderness Area, Hoover National Wilderness Area, and Yosemite National Park, approximately 160 to 190 km (100 to 120 mi), respectively, to the east and northeast. Since the promulgation of the PSD regulations (40 CFR 52.21) in 1977, no PSD permits have been required for any emission sources at the Livermore Site.

The State of California employs a health-risk based program for toxic air pollutants. As required by the *California Air Toxic "Hot Spots" Information and Assessment Act* of 1987 (AB2588), the Bay Area Air Quality Management District and the San Joaquin Valley Unified Air Pollution Control District requested that the Livermore Site and Site 300 assess the impact of toxic air emissions on the surrounding area. The risks at the Livermore Site were found to be below the threshold values that are used to determine need for further evaluation. The Site 300 toxic air pollutant inventory has been completed and will be submitted to the San Joaquin Valley Unified Air Pollution Control District for review to determine if a risk assessment is required (LLNL 1993b:2-24).

The "Hot Spots" program, however, is not applicable to the other stockpile stewardship and management candidate sites. To compare with the other stockpile stewardship and management candidate sites, the predicted maximum 8-hour concentrations for toxic air pollutants are provided. Table 4.7.2.3–1 presents the baseline ambient air concentrations for criteria pollutants and other hazardous/toxic air pollutants of concern at the Livermore Site and Site 300. As shown in the table, criteria pollutant baseline concentrations are in compliance with applicable guidelines and regulations, with the exception of 1-hour nitrogen dioxide at the Livermore Site.

4.7.2.4 *Water Resources*

This section describes the surface and groundwater resources at LLNL. This site includes the facilities in the Livermore Valley and at Site 300, referred to here as Livermore Site and Site 300, respectively.

TABLE 4.7.2.3–1.—*Comparison of Baseline Ambient Air Concentrations with Most Stringent Applicable Regulations and Guidelines at the Livermore Site and Site 300, 1993 and 1994*
[Page 1 of 2]

Pollutant	Averaging Time	Most Stringent Regulation or Guideline (μg/m³)	Livermore Site Baseline Concentration (μg/m³)	Site 300 Baseline Concentration (μg/m³)
Criteria Pollutant				
Carbon monoxide	8-hour	10,000[a]	55.79	4.96
	1-hour	23,000[b]	187.80	39.68
Lead	Calendar quarter	1.5[a]	<0.01	c
	30-day	1.5[b]	<0.01	c
Nitrogen dioxide	Annual	100[a]	5.46	0.28
	1-hour	470[b]	1,082.64	183.54
Ozone	1-hour	180[b]	c	c
Particulate matter	Annual	30[b]	0.78	0.03
	24-hour	50[b]	15.32	0.91
Sulfur dioxide	Annual	80[a]	0.07	<0.01
	24-hour	105[b]	1.42	0.09
	3-hour	1,300[a]	9.35	0.71
	1-hour	655[b]	14.35	2.12

TABLE 4.7.2.3–1.—*Comparison of Baseline Ambient Air Concentrations with Most Stringent Applicable Regulations and Guidelines at the Livermore Site and Site 300, 1993 and 1994* [Page 2 of 2]

Pollutant	Averaging Time	Most Stringent Regulation or Guideline (μg/m³)	Livermore Site Baseline Concentration (μg/m³)	Site 300 Baseline Concentration (μg/m³)
Mandated by California				
Beryllium	30-day	0.01[d]	0.000089	0.000049
Hydrogen sulfide	1-hour	42[b]	[c]	[c]
Sulfates	24-hour	25[b]	[c]	[c]
Vinyl chloride	24-hour	26[b]	[c]	[c]
Hazardous and Other Toxic Compounds				
Acetone	8-hour	[e]	8.11	0.12
Benzene	8-hour	[e]	0.99	<0.01
2-Butoxyethanol	8-hour	[e]	1.52	[c]
Carbon tetrachloride	8-hour	[e]	2.03	[c]
Chlorofluorocarbons	8-hour	[e]	86.28	0.44
Chloroform	8-hour	[e]	1.87	<0.01
Ethanol	8-hour	[e]	3.19	<0.01
Formaldehyde	8-hour	[e]	0.53	0.01
Gasoline	8-hour	[e]	[c]	0.98
Glycol ethers (other)	8-hour	[e]	0.03	0.14
Hexane	8-hour	[e]	0.59	[c]
Hydrogen chloride	8-hour	[e]	0.64	0.16
Isopropyl alcohol	8-hour	[e]	7.23	<0.01
Methanol	8-hour	[e]	9.41	[c]
Methyl ethyl ketone	8-hour	[e]	3.35	<0.01
Methylene chloride	8-hour	[e]	1.33	<0.01
Naphthalene	8-hour	[e]	0.73	[c]
Styrene	8-hour	[e]	12.59	[c]
Tetrahydrofuran	8-hour	[e]	0.61	[c]
Toluene	8-hour	[e]	3.81	0.05
1,1,1-Trichloroethane	8-hour	[e]	9.73	[c]
Trichloroethylene	8-hour	[e]	1.74	0.01
Xylene	8-hour	[e]	2.20	0.01

[a] Federal standard.
[b] State standard.
[c] No monitoring data available, baseline concentration assumed to be less than applicable standard/threshold value.
[d] San Francisco Bay Area Air Quality Management District ambient concentration guide.
[e] No standard.
Source: 40 CFR 50; CA EPA 1993a; LLNL 1995i:1.

Surface Water

Livermore Site. The main surface water features at the Livermore Site are the Arroyo Las Positas and Arroyo Seco. Arroyo Las Positas drains in the hills directly east and northeast of the Livermore Site and usually flows only after storms (figure 4.7.2.4–1). This channel enters the Livermore Site from the east, is diverted along a storm ditch around the northern edge of the site, and exits the site at the northwest corner. Arroyo Seco flows through the very southwest corner of the Livermore Site. Arroyo Las

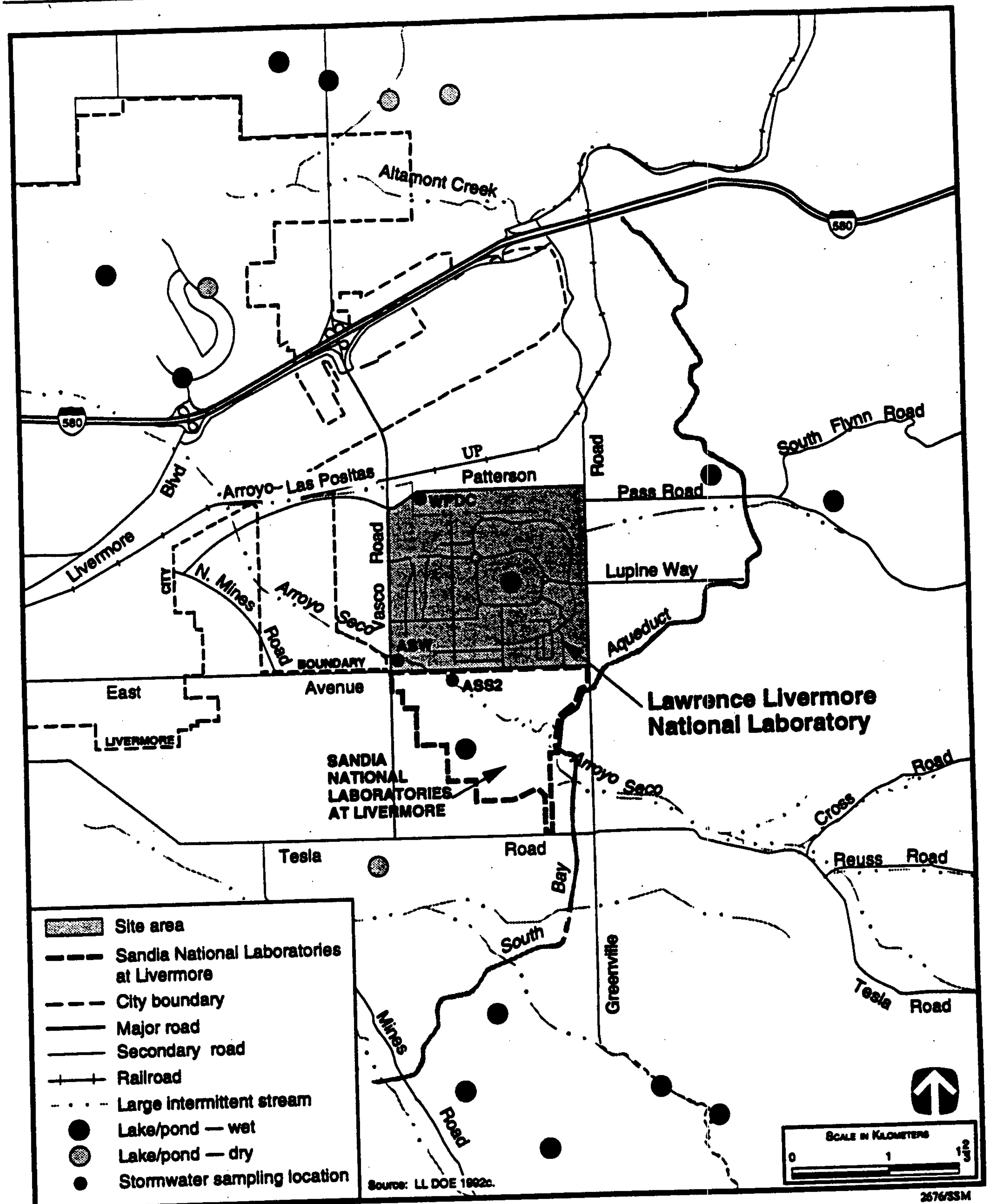


FIGURE 4.7.2.4–1.—*Surface Water Features Near Lawrence Livermore National Laboratory, Livermore Site, and Vicinity.*

Positas flows into Arroyo Seco west of the site. Both stream channels are dry for most of the year.

Nearly all surface water runoff at the Livermore Site is discharged into Arroyo Las Positas; only surface water runoff along the southern boundary and some storm drains in the southwest corner of the Livermore Site drain into Arroyo Seco (LL DOE 1992c:4-147). The locations of hydrological features are shown in figure 4.7.2.4–1.

Two areas on the Livermore Site are within the 100-year floodplains of the Arroyo Las Positas and Arroyo Seco. However no existing onsite structures are within the 100-year floodplain. The channels routing Arroyo Las Positas and Arroyo Seco through the Livermore Site would be able to contain a 100-year flood. The 500-year flood levels have not been delineated.

The total annual water use at the Livermore Site is currently 968 MLY (256 MGY). LLNL receives water from two suppliers. During the summer months, June through August, deliveries are taken primarily from the Alameda County Flood Control and Water Quality Conservation District Zone 7. This water is a mixture of groundwater and water from the South Bay Aqueduct of the State Water Project. For the remainder of the year, LLNL's water usually is supplied from the Hetch-Hetchy Aqueduct.

Approximately 400 MLY (106 MGY) of wastewater from the Livermore Site is discharged to the city of Livermore sewer system and processed at the Livermore Water Reclamation Plant (LLNL 1994a:5-1). This wastewater includes sanitary and industrial discharges from the Livermore Site and Sandia National Laboratories. The discharges are permitted by the city of Livermore and monitored for pH, selected metals, and radioactivity (LLNL 1994a:5-2). LLNL also monitors the waters of the Livermore Site, Site 300, and surrounding areas, as well as stormwater runoff.

Site 300. There are no perennial streams at or near Site 300. The canyons that dissect the hills and ridges at Site 300 drain into intermittent streams. The majority of these onsite streams drain to the south into Corral Hollow Creek, also intermittent, which flows east along the southern boundary of Site 300 in the San Joaquin Valley. In addition to these streams, 24 springs and 2 vernal pools exist onsite. Some surface water discharge occurs from cooling towers and other process runoff areas.

A tapline from the Hetch-Hetchy Aqueduct has been constructed with a capacity of 1.9 MLD (0.502 MGD) or 693 MLY (183 MGY). However, Site 300 has not been connected to the service as of yet. Site 300 is planning to use a new water supply from the San Francisco Water Department via the Aqueduct and the Coast Ridge Tunnel (LLNL 1991b:6).

At Site 300, stormwater, cooling tower water, and groundwater that has been treated to remove contaminants are discharged to onsite or adjacent drainages in accordance with NPDES permit conditions. Approximately 4.8 MLY (1.3 MGY) of wastewater is discharged to the wastewater sewage pond. The maximum capacity of the sanitary wastewater sewage pond in the General Services Area is 12 MLY (3.2 MGY).

Based on the flow and stream channel widths, 100-year flood events would be contained within the channels except for portions of Greenville Road (LL DOE 1992c:6-9). There is no information available for delineating the 500-year floodplain at Site 300. The lined drainage retention basin at Site 300 mitigates effects from significant flooding.

Surface Water Quality

Livermore Site. Offsite surface water bodies in the vicinity of the Livermore Site are routinely monitored for radioactive parameters. In addition, stormwater runoff at the Livermore Site is routinely monitored for radioactive and nonradioactive parameters. Approximately 25 percent of the stormwater runoff generated within the site drains into the lined Central Drainage Retention Basin, and the remainder drains either directly, or via a system of storm sewers and ditches, into Arroyo Seco or Arroyo Las Positas. Table 4.7.2.4–1 summarizes the monitoring results at the Livermore Site for 1993. Maximum concentrations of gross beta were above their comparison criteria at least once in 1993. There was one instance of noncompliance with wastewater permit limits in 1994: a discharge of methylene chloride. This event was reported to the city of Livermore Water Reclamation Plant. Table 4.7.2.4–2 summarizes the surface water monitoring results from the Arroyo Seco at the Livermore Site.

Site 300. At Site 300, surface water samples analyzed in 1994 for gross beta and tritium showed concentrations below maximum contaminant levels for drinking water, except for gross alpha radiation for one sampling event. No concentrations were above comparison criteria in 1993.

Surface Water Rights and Permits. LLNL holds several permits pertaining to local, state, and Federal regulations: NPDES permits; Waste Discharge Requirements permits for any discharge of wastes that could adversely affect the beneficial uses of water; a city of Livermore Water Reclamation Plant permit for wastewater discharges to the city sanitary sewer system; and California Department of Fish and Game permits for streambed alteration for any work that may disturb or impact rivers, streams, or lakes.

Groundwater

Livermore Site. Groundwater at the Livermore Site occurs in an upper unconfined zone overlying a series of semiconfined aquifers. The two geologic units containing the most important aquifers are the surface valley-fill deposits (shallow alluvial aquifer) and the Livermore Formation (semi-confined aquifer).

The Livermore Site is located within the Spring subbasin of the Livermore Valley groundwater basin. The aquifers are locally recharged by the stream runoff from precipitation and controlled releases from the South Bay Aqueduct, direct rainfall, irrigation, and treated groundwater infiltration. In addition, stream channels and ditches, and gravel pits west of the city of Livermore also recharge the shallow alluvial aquifer. Groundwater is also naturally discharged from the basin at Arroyo de la

TABLE 4.7.2.4–1.—***Stormwater Quality Monitoring at the Livermore Site, 1993***

Parameter	Unit of Measure	Water Quality Criteria[a]	Water Body Concentration Range	
			ASW[b]	WPDC[c]
Radiological				
Alpha (gross)	pCi/L	15[d]	0.27-10.8	1.4-10.5
Beta (gross)	pCi/L	20[e]	3.0-20.8	4.1-18.4
Tritium	pCi/L	80,000[f]	239-531	75.7-194
Nonradiological				
Arsenic	mg/L	0.05[d]	<0.002-0.0029	<0.002-0.0054
Bis (2-Ethylhexyl) phthalate	mg/L	NA	<10-12	<10-13
Chromium	mg/L	0.1[d]	<0.005-0.0059	<0.005
Chloride	mg/L	250[g]	<1-19	1-24
pH	pH unit	6.5 - 8.5[g]	6.7[h]	6.9[h]
Sulfate	mg/L	250[f]	<2-42	5.2-220
Total alkalinity (as $CaCO_3$)	mg/L	NA	11-46	18-72
Total dissolved solids	mg/L	500[g]	110[g]	95[h]
Zinc	mg/L	5[g]	0.33[g]	0.24[h]

[a] For comparison only.
[b] Storm effluent sampling location (SW corner of the site).
[c] Storm effluent sampling location (NW corner of the site).
[d] Primary Drinking Water Regulations (40 CFR 141).
[e] Proposed National Primary Drinking Water Regulations; Radionuclides (56 FR 33050).
[f] DOE's Derived Concentration Guides for water (DOE Order 5400.5). Values are based on a committed effective dose equivalent of 100 mrem per year; however, because the drinking water maximum contaminant level is absed on 4 mrem per year, the number listed is 4 percent of the Derived Concentration Guides.
[g] National Secondary Drinking Water Regulations (40 CFR 143).
[h] No range could be provided; based on one sampling event.

Note: NA - not applicable.

Source: LLNL 1994a.

TABLE 4.7.2.4–2.—*Maximum Concentrations of Constituents in Surface Water of the Arroyo Seco at the Livermore Site, 1993*

Parameter	Unit of Measure	Water Quality Criteria[a]	Water Body Concentration Range ASS2[b]
Radiological			
Alpha (gross)	pCi/L	15[c]	1.08-5.9
Beta (gross)	pCi/L	50[d]	3.5-9.7
Tritium	pCi/L	20,000[c]	74-374
Nonradiological			
Bis (2-Ethylhexyl)-phthalate	mg/L	NA	34
Chloride	mg/L	250[e]	<1-6.2
Fluoride	mg/L	4[c]	<1-0.065
Nitrate/nitrite as NO_3	mg/L	10[c]	1.4-2.4
Sulfate	mg/L	250[c]	<2-25

[a] For comparison only.
[b] Stormwater runoff sampling location along the Arroyo Seco.
[c] National Primary Drinking Water Regulations (40 CFR 141).
[d] Proposed National Primary Drinking Water Regulations; Radionuclides (56 FR 33050).
[e] National Secondary Drinking Water Regulations (40 CFR 143).
Note: NA - not applicable.
Source: LLNL 1994a.

Laguna located 18 km (11 mi) southwest of the Livermore Site (LL DOE 1992c:4-151). Depth to the shallow alluvial aquifer beneath the Livermore Site ranges from approximately 9 to 34 m (30 to 110 ft). Groundwater generally flows westward throughout much of the site and southwest in the southeast area of the Livermore Site.

Site 300. At Site 300, there are two regional aquifers or major waterbearing zones: an aquifer in the sandstones and conglomerates of the Neroly Formation and a deep confined aquifer also located in the Neroly Formation. The deep confined aquifer (122 to 152 m deep [400 to 499 ft]), beneath the southern part of the site within the Neroly Formation, provides the water supply for Site 300. In addition, there are a number of local perched groundwater zones. These are not significant aquifers, because water quality is poor and yields are low. Groundwater flow in the deep confined aquifer is controlled by the sandstone beds (LLNL 1995n:E.2.4-27). North of the Patterson Anticline, which is roughly in the center of Site 300, (figure 4.7.2.4–2) water moves to the northeast, and south of the Anticline it moves to the southeast (LLNL 1994a:8-5). Runoff that has concentrated in Elk Ravine and Corral Hollow Creek recharges local bedrock aquifers. No aquifers in the Site 300 area are considered sole source aquifers under the *Safe Drinking Water Act* (SDWA).

Groundwater Quality

Livermore Site. Groundwater in the vicinity of the Livermore Site is generally suitable as a domestic, municipal, agricultural, and industrial supply, with the exception of groundwater less than 91 m (300 ft) deep (LL DOE 1992c:4-164). A network of groundwater monitoring and extraction wells at the Livermore Site is routinely monitored for radioactive and nonradioactive parameters. Maximum concentrations of gross alpha, nitrate/nitrite, trichloroethylene, and tritium were above their water quality criteria/standard in 1993. The maximum concentrations for tritium are found in one localized well within the Livermore Site boundary (LLNL 1994a:7-14), and pose no threat to water supplies.

VOCs have been detected in the onsite groundwater and in the area around the Livermore Site. All site practices known to contribute VOCs to groundwater have been discontinued. Investigations, however, have determined that VOC-contaminated water is present under 85 percent of the Livermore Site. The

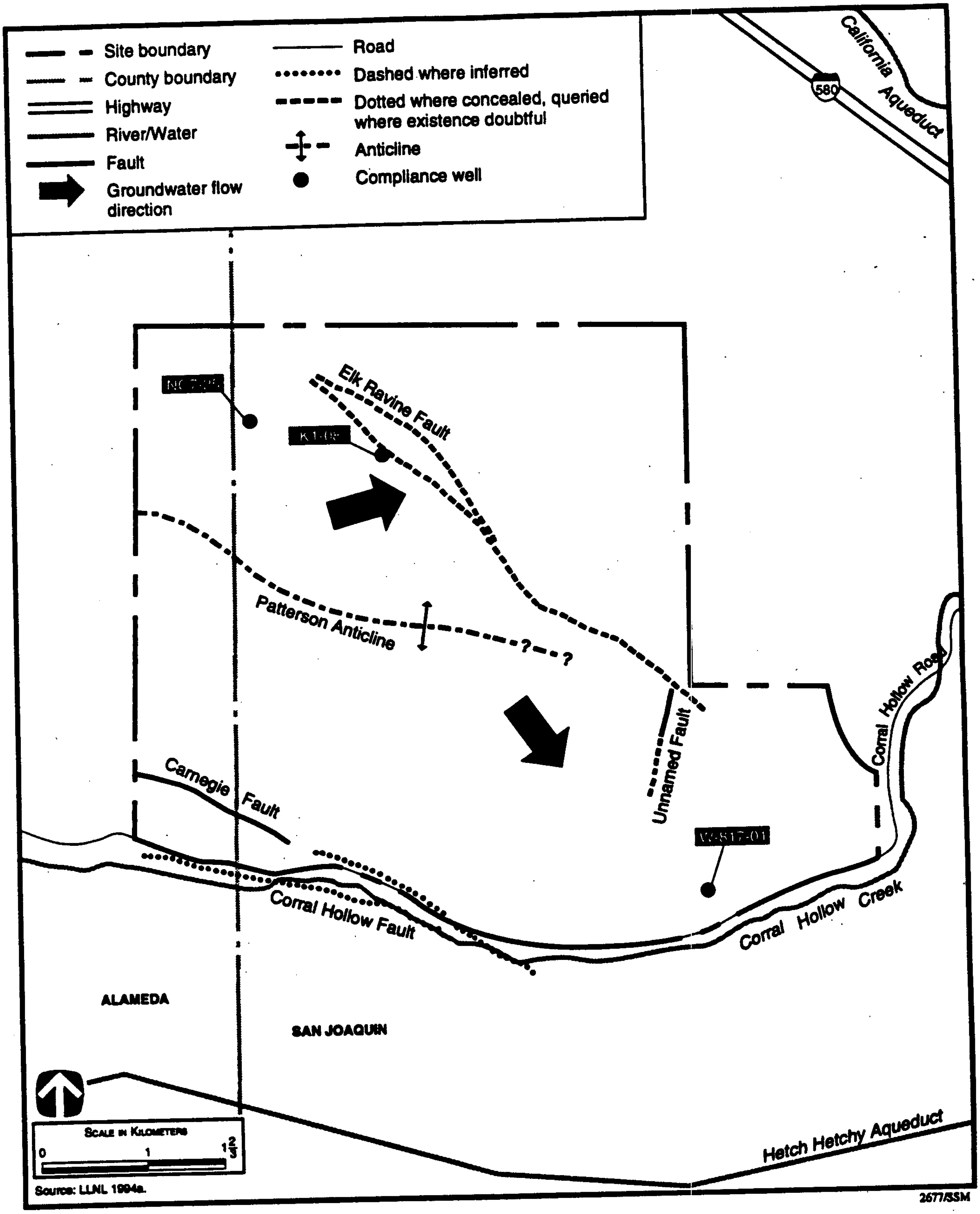


FIGURE 4.7.2.4–2.—*Groundwater Flow Direction and Structural Features at Lawrence Livermore National Laboratory, Site 300.*

contaminant plumes have migrated off site in two areas. One plume containing mainly tetrachloroethylene extends from the southwest corner of the Livermore Site about 762 m (2,500 ft) west of Vasco Road under private property. It is migrating to the northwest at a rate of about 21 m (68.9 ft) per year. Three municipal supply wells are situated within about 4.4 km (2.4 mi) of this plume. The other plume, which contains primarily trichloroethylene, extends about 244 m (800 ft) south onto DOE property administered by Sandia National Laboratories, Livermore. LLNL is working with EPA and the State of California to identify appropriate remedial measures.

Approximately 150 million L (34.3 million gal) of groundwater in the southwest corner of the facility have been treated to remove VOCs. The treated water is discharged either to a recharge basin south of the site or to stream channels in accordance with NPDES permit limitations.

Site 300. At Site 300, groundwater is sampled quarterly from inactive and active water supply wells and monitoring wells. Samples are analyzed for radioactive and nonradioactive parameters (table 4.7.2.4–3). Maximum concentrations of arsenic, gross alpha, nitrate/nitrite, trichloroethylene, tritium, and uranium were above their water quality criteria/standard at least once in 1993 (LLNL 1994a: 7-17-7-18). Currently, LLNL is investigating and identifying characteristics of the groundwater contamination at Site 300. Several plumes of VOCs and tritium have been identified in shallow and deeper bedrock aquifers in this and adjacent offsite areas (LLNL 1994a:7-16–7-17). LLNL is working with the EPA and California to remediate these plumes.

Groundwater Availability and Use

Livermore Site. The Livermore Site relies on imported surface water for its municipal, commercial, residential, and agricultural uses, supplemented only by a relatively small amount of treated groundwater used for irrigation and cooling tower makeup. The water from the supply wells is blended with imported surface water before distribution to the public.

Site 300. At Site 300, approximately 90 MLY (23.8 MGY) of water are extracted from two groundwater supply wells located in the southeast portion of the site. Other water supply wells located near Site 300 are used for recreation, stock watering, and potable purposes.

Groundwater Rights and Permits. Groundwater rights in the State of California are traditionally associated with Correlative Rights, which are derived from the concept that water users will share the resource during droughts, based on the relative areal extent of the land owned by the competing landowners. If no competition for water exists, then landowners can withdraw groundwater to the extent that they exercise their rights reasonably in relation to the similar rights of others. Because the majority of the water supply at Site 300 is from onsite wells, the present water restriction is the capacity and recharge of the wells.

4.7.2.5 *Geology and Soils*

Geology

Livermore Site. The Livermore Site is located within the California Coast Ranges, an area of north-northwest trending ranges and valleys. Livermore Valley, an exception to this trend, forms an east-west structural basin defined by branches of the San Andreas fault system. The Livermore Site occupies a smooth land surface that slopes gently to the northwest.

The Livermore Site is underlain by late Tertiary and Quaternary rocks that lie on basement rocks of the Franciscan assemblage, which consist of severely deformed sandstone, shale, and chert. In the Livermore area, this unit is mainly sandstone. The Livermore Valley topographic and structural basin was formed in Pliocene time by movements along faults to the east and west. The basin is filled with 1,219 m (4,000 ft) of Pliocene to Holocene alluvial gravels, sands, and lacustrine clays of the Livermore Formation. Late Quaternary alluvial deposits immediately underlie the Livermore Site.

The historically active, northwest-trending Calaveras fault zone, the easternmost branch of the San Andreas fault system in the San Francisco Bay area, traverses the western margin of Livermore Valley. The Concord-Green Valley fault and parallel trending Greenville fault zone define the eastern boundary of Livermore Valley. In addition, two other capable

TABLE 4.7.2.4–3.—*Groundwater Quality Monitoring at Site 300, 1993*

Parameter	Unit of Measure	Water Quality Criteria and Standards[a]	Well K1-08[b]	Well NC7-25[c]	W-817-01[d]
Radiological					
Alpha (gross)	pCi/L	15[e]	-0.11-1.62	23-29.7	NA
Beta (gross)	pCi/L	50[f]	2.1-3.2	18.6-26.5	NA
Radium-226	pCi/L	3[e]	-0.17-0.460	0.73-1.2	NA
Tritium	pCi/L	20,000[e]	<43.2-24.3	233,000-298,000	<45.9-22.4
Uranium-233,234	pCi/L	20[g]	0.86-1.84	10-12.7	NA
Uranium-235	pCi/L	24[g]	0.013-0.241	0.30-0.86	NA
Uranium-238	pCi/L	24[g]	0.54-0.81	7.6-12.2	NA
Nonradiological					
Arsenic	mg/L	0.05[e]	0.012-0.017	0.0048-0.0068	0.036-0.058
Chromium	mg/L	0.1[e]	<0.01	NA	<0.005-0.0037
1,2-Dichloroethene	mg/L	0.005[e]	NA	<0.0005-<0.001	<0.0005
Lead	mg/L	0.015[e]	<0.002	<0.0002	<0.002-<0.1
Nitrate/nitrite	mg/L	10[e]	5.2-8.1	NA	71-81
RDX	mg/L	NA	NA	NA	<30-117
Tetrachloroethylene	mg/L	0.005[e]	NA	NA	<0.0005
1,1,1-Trichloroethane	mg/L	0.2[e]	NA	<0.0005	NA
Trichloroethylene	mg/L	0.005[e]	NA	0.0005	<0.0005
Trichlorotrifluoro-ethane	NA	NA	NA	0.001	NA

[a] For comparison only.
[b] Onsite monitoring well near Pit 1.
[c] Onsite monitoring well near Pit 7.
[d] Onsite monitoring well near HE Processing Area.
[e] National Primary Drinking Water Regulations (40 CFR 141), maximum contaminant level.
[f] Proposed National Primary Drinking Water Regulations; Radionuclides (56 FR 33050).
[g] DOE Derived Concentration Guide for drinking water (DOE Order 5400.5). Values are based on a committed effective dose of 100 mrem per year; however, because the drinking water maximum contaminant level is based on 4 mrem per year, the number listed is 4 percent of the Derived Concentration Guide.

Note: NA - not applicable; mg/L - milligrams per liter; pCi/L - picocuries per liter. Well locations are shown in figure 4.7.2.4–1.

Source: LLNL 1994a.

faults, the Las Positas and Verona faults, as well as several inactive faults, cut the southern part of Livermore Valley. The Livermore Site lies in an area of historically inactive faulting, 1.6 km (1.0 mi) north of the Las Positas fault zone and less than 3.2 km (2.0 mi) west of the Greenville fault zone (figure 4.7.2.5–1).

The Livermore Site lies within seismic Zone 4 (figure A.1–1). The Calaveras fault has had several earthquakes of Richter magnitude 5.0 or greater in the last 150 years. A maximum probable earthquake greater than magnitude 7.0 is possible. In 1980, an earthquake sequence on the Greenville fault produced two earthquakes of magnitude 5.5 and 5.6. There are also surface indications of other recent seismic events, and the maximum credible earthquake estimated for this fault zone is magnitude 6.6±0.2. Although the Las Positas fault zone has no recorded historical movement, a portion of the Las Positas fault from northeast of Arroyo Mocho to a point 229 m (751 ft) east of Greenville Road lies in a special studies zone under the *Alquist-Priolo Act*. This act requires that active fault location studies be performed before building permits can be issued for most classes of construction (LLNL 1984a:49). The maximum credible

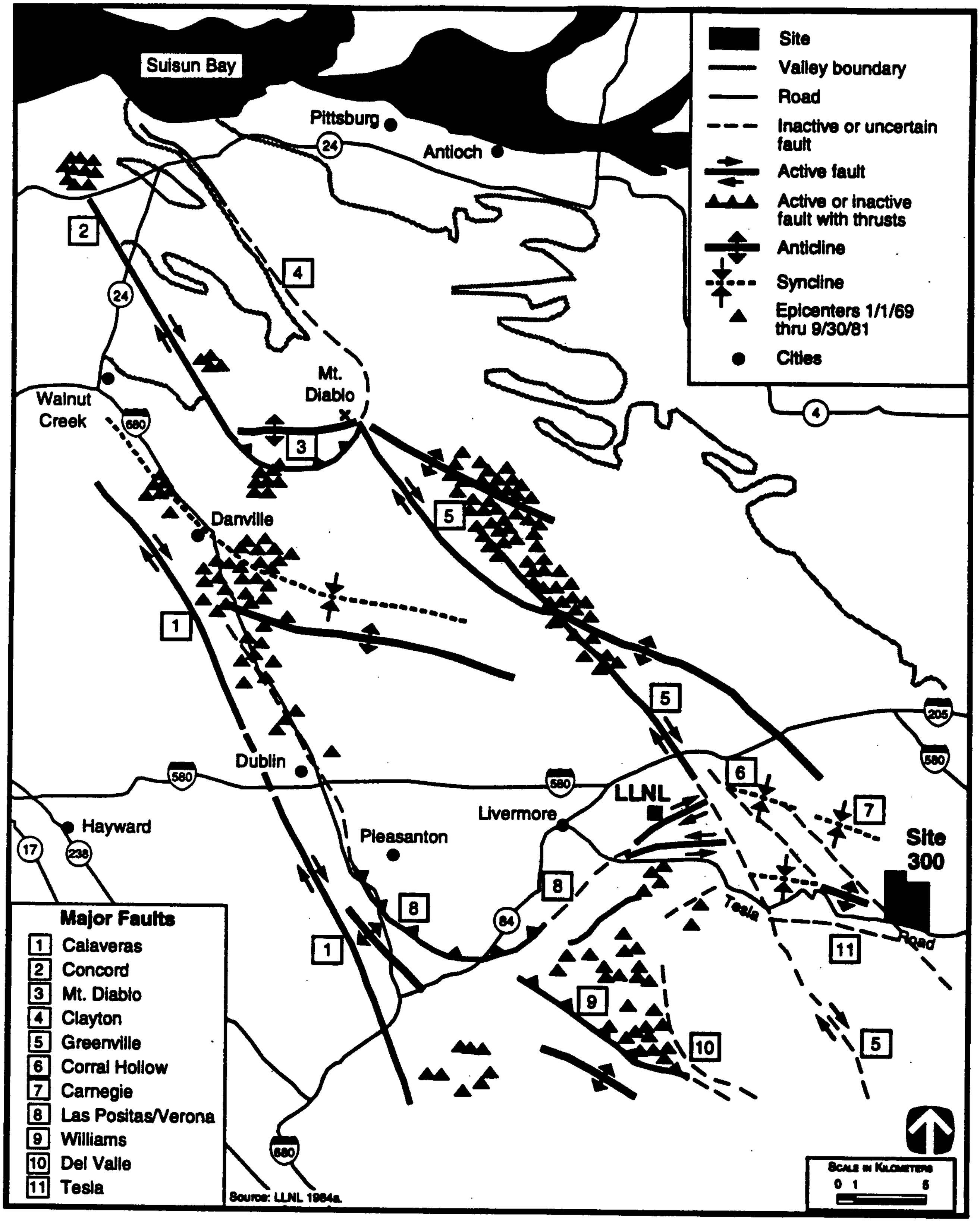


FIGURE 4.7.2.5–1.—*Major Faults and Earthquake Epicenters of Livermore Valley, California.*

earthquake for this fault zone is magnitude 6.0±0.5 (modified Mercalli intensity VI or greater) (LLNL 1984a:52). The potentials for surface faulting, damage from liquefaction, and slope instability at the Livermore Site are all low (LL DOE 1992c:4-84,4-86). The potential for volcanic activity is low as well (DOE 1995cc:4-66).

Site 300. Site 300 is located at the eastern margin of the California Coast Ranges, 16 km (10 mi) east of Livermore Valley. The site lies in an area of northwest-trending steep hills and ridges separated by ravines and is underlain by Eocene to Pliocene sedimentary rocks that rest on a basement of the Cretaceous Great Valley Sequence. Late Miocene to Pliocene interbedded sandstones, siltstones, and claystones are exposed in much of the site. Cretaceous, Eocene, and Early Miocene rocks are also present along the northern and southern borders of the site. These rocks are locally overlain by Quaternary alluvial and terrace deposits and Holocene colluvium, alluvium, and valley fill deposits.

Site 300 lies within seismic Zone 4 (appendix figure A.1–1). Two major faults cut Site 300. The Carnegie and Corral Hollow faults cross the southern boundary of the site; Holocene movement has occurred along these faults (LLNL 1991d:1). The combined Corral Hollow-Carnegie fault zone may be capable of generating an earthquake of Richter magnitude 6.5 to 7.1. The inactive northwest-trending Elk Ravine fault cuts across the northeast section of the site. Site 300 facilities are not within a special studies zone. The principal seismic hazard would be the ground shaking associated with movement along either the Corral Hollow-Carnegie fault or Greenville fault, 8 km (5 mi) to the west of Site 300 (LLNL 1983a:49-52). Surface faulting at Site 300 in areas adjacent to the active Carnegie fault is possible, while the potential for liquefaction at Site 300 is low. The potential for seismically induced landslides at Site 300 still exists (LL DOE 1992c:4-87,4-89).

Soils

Livermore Site. The Livermore Site is located on soils originally classified as the Rincon-San Ysidro association. These soils are nearly level, loamy textured, shallow to very deep soils on older fans and floodplains. The hazard of erosion is slight to moderate. Several of these soils, including the Rincon, San Ysidro, and Zamora Series soils, have moderate to high shrink-swell potential (LL USDA 1966a:17). Recently, the entire area under the Livermore Site has been redesignated as urban and built-up land. There are no prime or unique farmland soils located at the Livermore Site.

Site 300. Site 300 soils in Alameda County belong to the Altamont-Diablo association. Soils in San Joaquin County have different designations than Alameda County soils, but the properties of these soils are identical. The water erosion hazard of these soils is slight to severe; the wind erosion hazard is slight. Many soils have a high shrink-swell potential. There is no prime or unique farmland on Site 300.

4.7.2.6 *Biotic Resources*

The following section describes biotic resources at the Livermore Site and Site 300 including terrestrial resources, wetlands, aquatic resources, and threatened and endangered species. A list of the threatened and endangered species that may be found on or in the vicinity of the Livermore Site and Site 300 is presented in appendix C.

Terrestrial Resources. The Livermore Site and Site 300 are located in the California Chaparral Province. The U.S. Forest Service has classified the general vegetation type of the region as annual grasslands (USDA 1977a).

Livermore Site. The Livermore Site includes developed areas surrounded by security zones of mostly grassland. Developed land area includes approximately 78 percent of the site. The undeveloped land in the security zones is grassland dominated by nonnative grasses such as ripgut brome (*Bromus diandrus*) and slender oat (*Avena barbata*). Arroyo Seco, a stream bed which runs across the southwestern corner of the site, is steep-sided and forms a relatively undisturbed habitat. Both native trees (such as red willow [*Salix spp.*] and California walnut [*Juglans hindsii*]) and introduced species (such as black locust [*Robinia pseudo-acacia*] and almond [*Prunus amygdalus*]) are present (LL DOE 1992c:4-91).

Five species of amphibians, 2 species of reptiles, 31 species of birds, and 10 species of mammals have been reported at the Livermore Site (LL DOE

1992d:F-33,F-36,F-39). Wildlife at the site includes species that are found in the grassland habitat of the security zones and those that live in the developed areas or along the arroyos. Species found in the security zones include the western fence lizard (*Sceloporus occidentalis*), western meadowlark (*Sturnella neglecta*), black-tailed jackrabbit (*Lepus californicus*), and California ground squirrel (*Spermophilus beecheyi*). Nesting birds within the laboratory complex include the American crow (*Corvus brachyrhynchos*), American robin (*Turdus migratorius*), Anna's hummingbird (*Calypte anna*), white-throated swift (*Aeronautes saxatalis*), California quail (*Callipepla californica*), and house sparrow (*Passer domesticus*). Bird species observed along Arroyo Seco include the mourning dove (*Zenaida macroura*), acorn woodpecker (*Melanerpes formicivorus*), sharp-shinned hawk (*Accipiter striatus*), and turkey vulture (*Cathartes aura*) (LL DOE 1992c:4-95). Game animals include the California quail and desert cottontail (*Sylvilagus auduboni*). Raptors present on site include the red-tailed hawk (*Buteo jamaicensis*), Cooper's hawk (*Accipiter cooperii*), and golden eagle (*Aquila chrysaetos*), while carnivores present include the coyote (*Canus latrans*) and red fox (*Vulpes vulpes*). Migrating birds present on site, as well as their nests and eggs, are protected by the *Migratory Bird Treaty Act*. Eagles are similarly protected by the *Bald and Golden Eagle Protection Act*.

Site 300. Five plant communities are found on Site 300 (figure 4.7.2.6–1). In addition, approximately 5 percent of the site has been disturbed. Introduced grassland is the largest community, covering 81 percent of the site. Native grassland, which covers 10 percent of the site, is the second most abundant community type. Coastal sage scrub and oak woodland plant communities occupy about 2 percent of the Site 300 area. Northern riparian woodland is considered rare on Site 300. Grazing has not been permitted on the site since 1953; thus, the area has more native grasses and herbs than neighboring property. Controlled burning of about 810 ha (2,000 acres) each year is conducted as a means of wildfire control and to aid in maintaining native grass communities. A total of 342 species of plants has been recorded on Site 300 (LL DOE 1992c:4-92; LL DOE 1992d:F-4).

Studies of Site 300 have identified 21 species of amphibians and reptiles, 79 species of birds, and 27 species of mammals (appendix J). Because of the abundance of grassland communities, species favoring this habitat type are most abundant on the site. Common animals found at Site 300 include the gopher snake (*Pituophis melanoleucus*), western meadowlark, savannah sparrow (*Passerculus sandwichensis*), California ground squirrel, and deer mouse (*Peromyscus maniculatus*). In addition, springs and the surrounding vegetation provide important habitat for a number of song birds and game animals (LL DOE 1992c:4-96,4-97). Game animals at Site 300 include the mule deer (*Odocoileus hemionus*), desert cottontail, and California quail. Hunting is not permitted onsite (LLNL 1992a:3). Additional important species found at Site 300 include raptors, such as the great-horned owl (*Bubo virginianus*) and northern harrier (*Circus cyaneus*), and carnivores, such as the coyote and bobcat (*Lynx rufus*). As is the case for the Livermore Site, migratory birds and eagles are protected by Federal legislation.

Wetlands

Livermore Site. Wetlands at the Livermore Site are limited to several small areas along Arroyo Las Positas, located at and downstream from culverts that channel runoff from surrounding areas. Two areas, totaling 0.12 ha (0.3 acres), are dominated by saltgrass (*Distichlis spicata*). A species of sedge (*Carex spp.*) is also common. One saltgrass wetland has both standing and flowing water and areas of very wet soil. The other saltgrass wetland is drier, with sandy soil. A third, smaller wetland (0.04 ha [0.1 acres]) is located in a culvert. Cattail (*Typha spp.*) is the dominant plant in this wetland with other species such as sedge and saltgrass also commonly observed. Both standing and flowing water have been observed in this area, and the soil is sandy (LL DOE 1992d:G-16).

Site 300. Wetlands at Site 300 were delineated according to methods contained in the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* (January 10, 1989). Site 300 contains 2.7 ha (6.7 acres) of wetlands. The wetland areas are small and scattered on the site in approximately 16 locations. Many of the wetlands are associated with natural springs, although one is

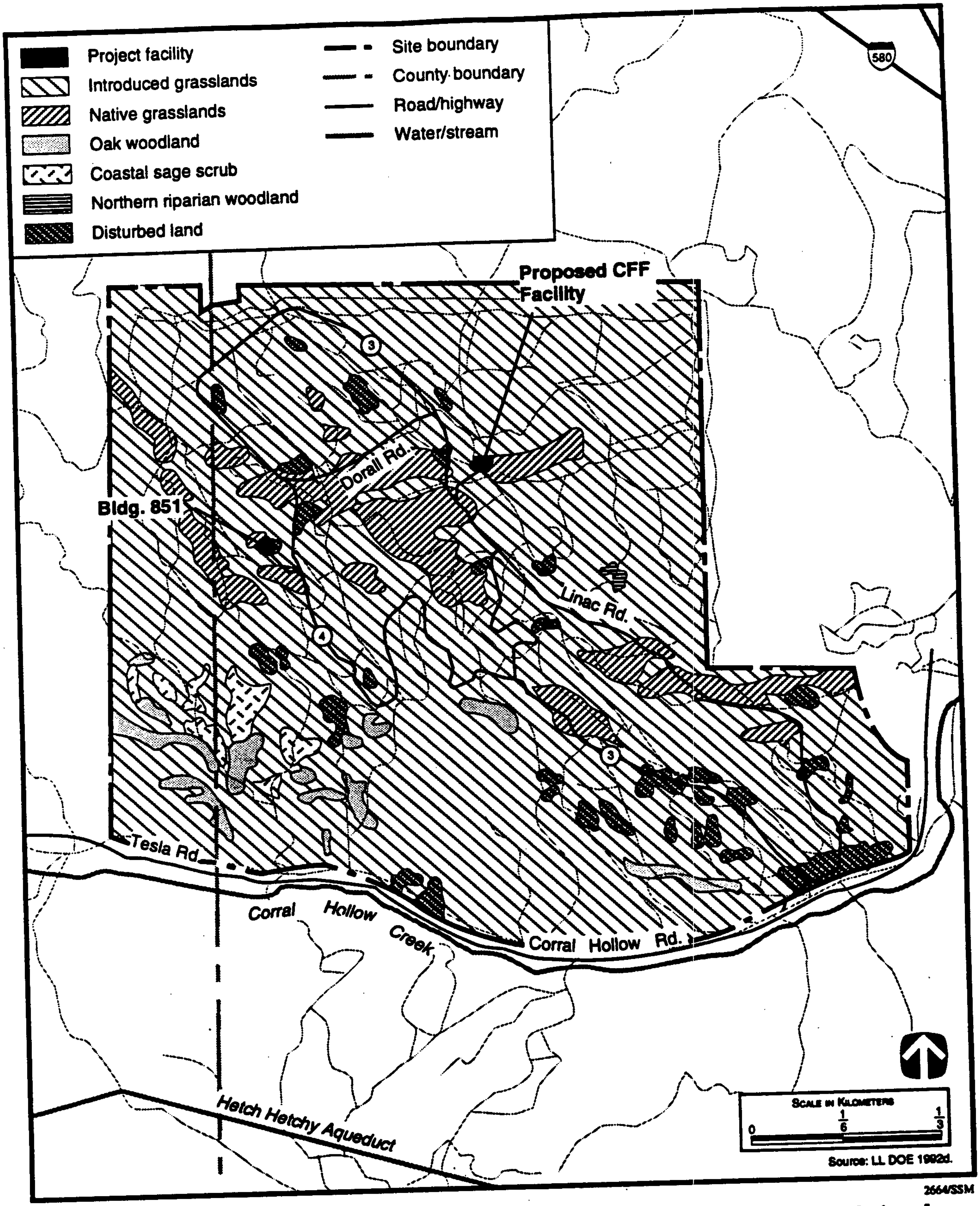


FIGURE 4.7.2.6–1.—*Distribution of Plant Communities at Lawrence Livermore National Laboratory, Site 300.*

associated with a vernal pool, and several have been artificially created from Site 300 runoff. Many of the wetlands associated with springs are at the bottom of deep canyons. Typical wetland vegetation associated with these springs include cattail, rush (*Juncus spp.*), willow, and cottonwood (*Populus spp.*) (LL DOE 1992c:4-112; LL DOE 1992d:G-19,G-46-G-48).

Aquatic Resources

Livermore Site. Potential aquatic habitat on the Livermore Site consists of an intermittent drainage system, seeps, springs, ditches, and a groundwater retention basin. The intermittent drainage system comprises westward-flowing arroyos that contain water during the winter months. Arroyos on the site include Arroyo Las Positas, located along the northern edge of the Livermore Site, and Arroyo Seco, which crosses the southwest corner of the site. Because of their temporary nature, the arroyos do not support fish. The seeps, springs, and ditches also do not support fish; however, the groundwater retention basin contains a population of mosquito fish (*Gambusia affinis*) (LLNL 1995i:3).

Site 300. Potential aquatic habitat on Site 300 consists of vernal pools, ponds, springs, and drainages. There is one perennial stream on the site. A sewage lagoon is located on the property, but it does not support any fish populations (LL DOE 1992c:4-95). Ponds located in the southeast-central portion of the site, and springs and drainages located throughout the site, do not support fish populations (LLNL 1992a:1).

Threatened and Endangered Species

Livermore Site. Forty-six Federal- and state-listed threatened, endangered, and other special status species may be found on and in the vicinity of the Livermore Site (appendix table C–5). Eleven of these species have been observed on the Livermore Site, including the Federal-listed bald eagle (*Haliaeetus leucocephalus*). The other observed species include state special concern species. Although suitable habitat for several listed species exists onsite, potential occurrence of most of the species in appendix table C–5 is minimal due to the lack of suitable habitat and negative survey results. Site surveillance would be required to verify the occurrence of any listed species. No critical habitat for threatened and endangered species, as defined in the *Endangered Species Act* (50 CFR 17.11; 50 CFR 17.12), exists on the Livermore Site.

Site 300. Forty-eight Federal- and state-listed threatened, endangered, and other special status species may be found on and in the vicinity of Site 300 (appendix table C–5). Twenty-four of these species have been observed on Site 300. These species include the Federal-listed American peregrine falcon (*Falco peregrinus anatum*) and large-flowered fiddleneck (*Amsinckia grandiflora*), and Federal-proposed endangered Alameda whipsnake (*Masticophis lateralis euryxanthus*) and California red-legged frog (*Rana aurora draytoni*). The other observed species include the state-listed Swainson's hawk and state special concern species. Potential occurrence of most of the other species listed in table C–5 is minimal due to lack of suitable habitat and negative survey results. Site surveillance would be required to verify their occurrence. No critical habitat for threatened and endangered species, as defined in the *Endangered Species Act* (50 CFR 17.11; 50 CFR 17.12), exists on Site 300.

4.7.2.7 *Cultural and Paleontological Resources*

Prehistoric Resources. The Livermore Site covers 332 ha (820 acres), 259 ha (640 acres) of which have been developed. Four cultural resources surveys have been conducted for undeveloped areas of the facility. No prehistoric resources were identified, and records searches indicated that no prehistoric resources had been previously recorded on or near the Livermore Site. Prehistoric sites identified in the vicinity of the Livermore Site and Site 300 include villages, campsites, rockshelters, and limited activity locations, including lithic scatters, hearths, and concentrations of fire-affected rocks. A cultural resources management plan is being developed to address issues of resource identification and maintenance.

A 1981 survey of Site 300 identified a quarry site, two prehistoric rockshelters, and one prehistoric rockshelter/historic graffiti site (LL DOE 1981a:2F.58). These sites were recorded but have not been evaluated to determine their eligibility for the NRHP.

Historic Resources. No historic sites have been recorded for the Livermore Site; however, buildings and facilities associated with the World War II-era Livermore Naval Air Station and themes in nuclear weapons development and other research projects may still be present. Because the Livermore Site was established in 1952, existing structures are not associated with the Manhattan Project or initial nuclear production. A formal NRHP evaluation of the buildings and facilities is currently being initiated.

The 1981 survey for parts of Site 300 resulted in 21 recorded historic sites, including historic graffiti, trash scatters, cabins, a foundation, a mine tunnel, a power/telegraph pole, and a townsite. The townsite, Carnegie, is a state-registered landmark. Most of the sites are associated with an industrial mining and manufacturing complex built in Corral Hollow Canyon between 1891 and 1918. Additional archival research is being conducted to clarify the characteristics of the Carnegie townsite. Site 300 was established in 1953; existing structures are not associated with the Manhattan Project or initial nuclear production.

Native American Resources. Native American groups known to have used Alameda and San Joaquin counties include the Costanoans (or Ohlone), Northern Yokuts, and Eastern Miwok. These groups were hunters and gatherers who relied on a variety of resources including deer, elk, antelope, fish, birds, nuts, and fruits. Individual tribes usually had a permanent village and occupied smaller campsites on a seasonal basis. The Northern Valley Yokuts and Eastern Miwok were decimated after European contact due to disease and acculturation, and no longer exist as a group. It is estimated that there are approximately 130 people of Costanoan (Ohlone) descent still living in the San Francisco Bay region.

Sacred and important Native American resources that might be found in the vicinity of the Livermore Site and Site 300 include burials, cremations, vision quest sites, and traditional use areas. Initial consultation with identified local Native American groups to determine important resources has begun.

Paleontological Resources. Most of the surficial and near-surface sediments of the Livermore Site are alluvial deposits of the Livermore Formation. They range in age from latest Pleistocene (15,000 to 20,000 years) to 100,000 years or greater and are not known to be fossiliferous. The only vertebrate fossil deposits in the vicinity of the Livermore Site are in the Quaternary deposits of the surrounding low hills of the east Livermore Valley, but the fossils are few in number and quite scattered. They have been tentatively identified as Rancholabrean and Blancan in age (Pleistocene) and consist of bone fragments of mammoth and giant ground sloth.

Geological formations with paleontological materials at Site 300 are the Franciscan Complex and the Cierbo and Neroly Formations. The Franciscan Complex gravels are known to contain Icthyosaurus fossils; however, no known localities have been recorded within Site 300. The Cierbo Formation outcrops extensively in the northwest quarter of Site 300 and contains Miocene oyster shells. Because these paleontological materials are relatively common, marine invertebrate assemblages are considered to have relatively low research potential.

More than 75 percent of Site 300 is Neroly Formation. Miocene (Caledonian age) mammal fossil deposits have been found within the Neroly Formation in the vicinity of Site 300 and Corral Hollow. Plant leaf and stem fossils have been recovered from the lower Neroly Formation. An assortment of vertebrate taxa are also represented, including camelids, mastodon, early horses, beavers, squirrels, and shrews. Fossil finds are generally widely scattered and consist of no more than several bone fragments. Numerous fossil bones and bone fragments from the Neroly Formation have been found on the south side of Corral Hollow Creek, adjacent to the facility and along a fire trail and road improvement areas within Site 300. The Neroly Formation paleontological locality within Site 300 is being assessed. The paleontological resources on Site 300 may have moderate research potential and may contribute data to aid paleoenvironmental reconstruction.

4.7.2.8 *Socioeconomics*

Socioeconomic characteristics addressed at LLNL include employment and regional economy, population, housing, and public finance. Employment and regional economy statistics are presented for the regional economic area that encompasses 22 counties in California around LLNL. Statistics for the remaining socioeconomic characteristics are presented for the ROI, a three-county area in which approximately 86 percent of all LLNL employees reside: Alameda County (57 percent), Contra Costa County (13 percent), and San Joaquin County (16 percent). There are no other counties where more than 3 percent of LLNL employees reside. Figure 4.7.2.8–1 presents a map of counties and selected cities composing the LLNL regional economic area and ROI. Supporting data are presented in appendix D.

Regional Economy Characteristics. Selected employment and regional economy statistics for the LLNL regional economic area are summarized in figure 4.7.2.8–2. The civilian labor force in the regional economic area grew a total of 26 percent between 1980 and 1990, an average annual growth rate of 2.6 percent. Total regional economic area employment in 1994 was 4,068,974, and the unemployment rate was 7.6 percent. In comparison, state unemployment was 8.6 percent. Total personal income in the regional economic area in 1993 was $454 billion, and per capita income was $25,179. State per capita income in 1993 was $21,894.

As shown in figure 4.7.2.8–2, the LLNL regional economic area and the State of California have similar employment patterns with the manufacturing, retail trade, and services sector providing almost the same proportion of nonfarm employment in both regions. The service sector accounts for the largest share of nonfarm private sector employment in both California (32 percent) and the region (38 percent).

Population and Housing. In 1992, population in the ROI totalled 2,652,248. The ROI population increased 26 percent between 1980 and 1992 (about 2 percent annually), a somewhat slower rate of increase than the state population growth of 31 percent (approximately 2.5 percent annually) during the same period. Total population increases within the ROI ranged from over 18 percent (about 1.5 percent annually) in Alameda County to about 45 percent (3.8 percent annual growth) in San Joaquin County during the same period.

The number of housing units in the ROI increased 18 percent during the 1980s (1.8 percent annually). Increases in the number of housing units in the ROI counties ranged from 13 percent (1.3 percent annually) in Alameda County to 25 percent (2.5 percent annually) in Contra Costa County. These growth rates compare to the 21-percent increase in housing units in California during the same period. In 1990, the regional homeowner vacancy rate averaged 1.6 percent, and the rental vacancy rate averaged 5.6 percent. These vacancy rates were comparable to the homeowner and rental vacancy rates for the entire state. Figure 4.7.2.8–3 summarizes population and housing trends for the LLNL ROI.

Public Finance. Financial characteristics of the local jurisdictions in the LLNL ROI that are most likely to be affected by the proposed action are presented in this section. The data reflect total revenues and expenditures of each jurisdiction's general fund, special revenue funds, and, as applicable, debt service, capital project, and expendable trust funds. School district boundaries may or may not coincide with county or city boundaries, but the districts are presented under the county where they primarily provide services. Major revenue and expenditure fund categories for counties, cities, and school districts are presented in appendix tables D.2.3–10 and D.2.3–11. Figure 4.7.2.8–4 summarizes 1994 local government revenues and expenditures. Fund balances, which are dollars carried over from previous years, are not included in figure 4.7.2.8–4. All jurisdictions assessed had positive fund balances.

4.7.2.9 *Radiation and Hazardous Chemical Environment*

The following section provides a description of the radiation and hazardous chemical environment at LLNL. Also included are descriptions of health effects studies, a brief accident history, and emergency preparedness considerations.

Radiation Environment. Major sources of background radiation exposure to individuals in the vicinity of LLNL are shown in table 4.7.2.9–1. All annual doses to individuals from background radiation are expected to remain constant over time. The total dose to the population would result only from changes in the size of the population. Background radiation doses are unrelated to LLNL operations.

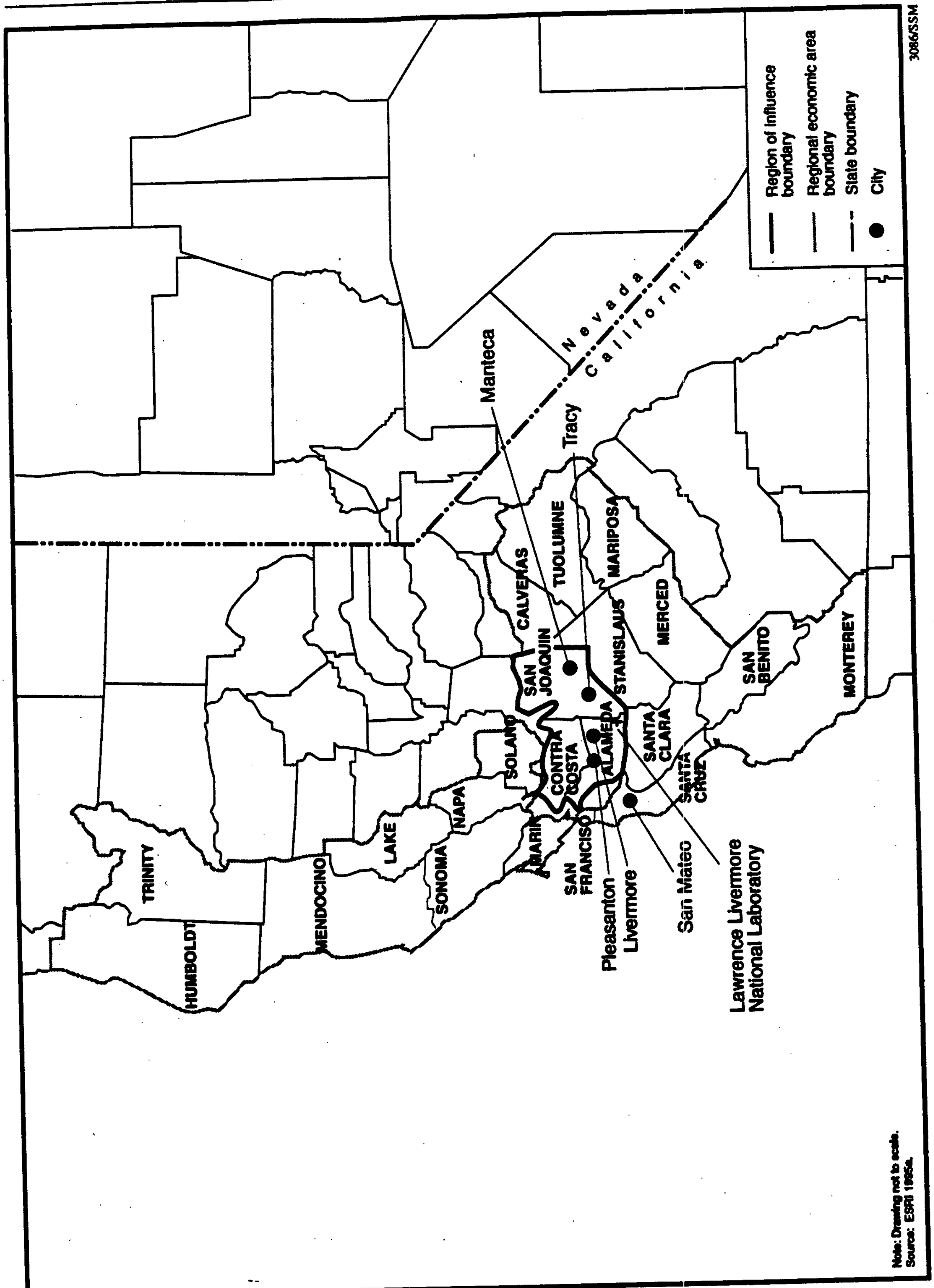
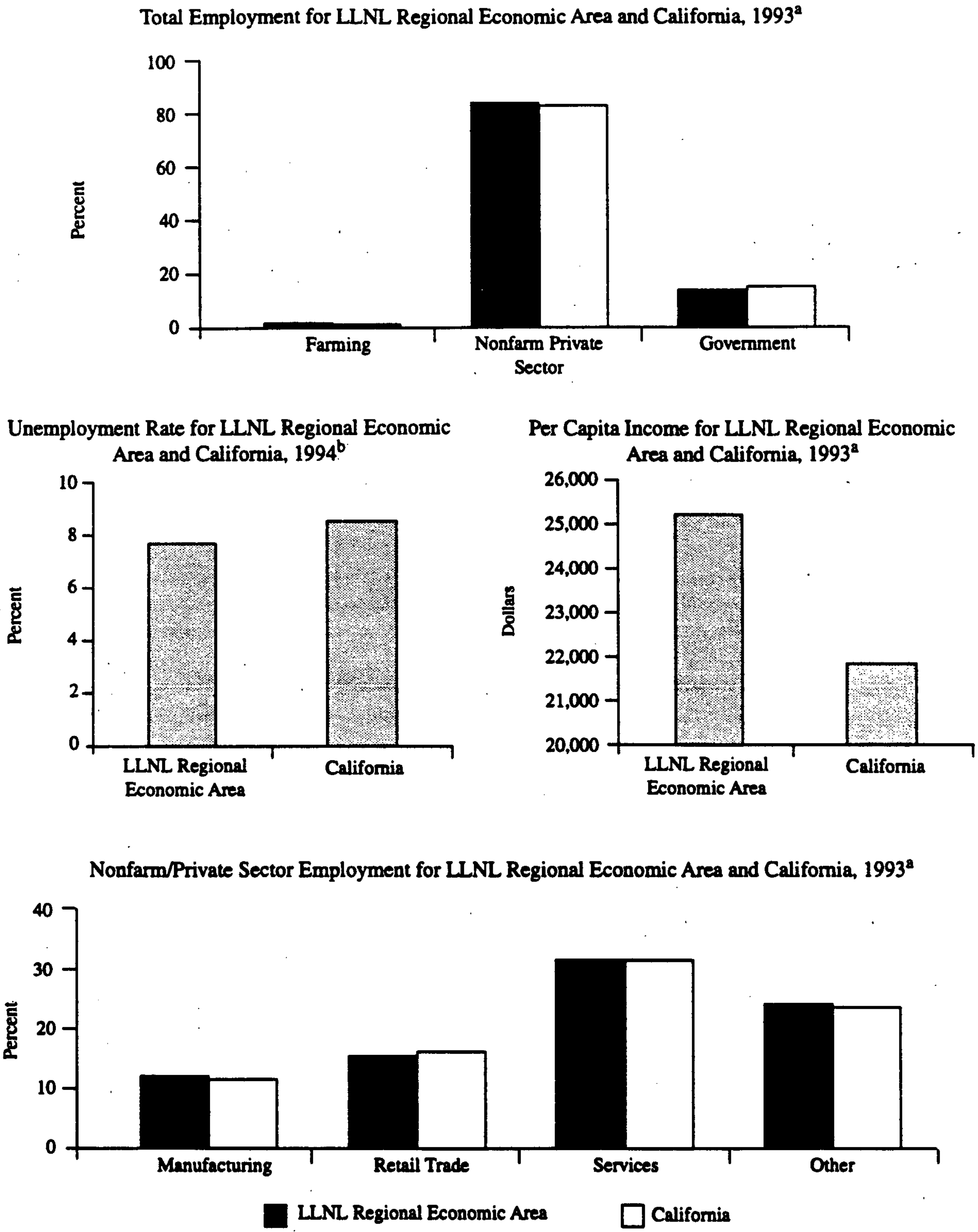


FIGURE 4.7.2.8–1.—*Regional Economic Area and Region of Influence for Lawrence Livermore National Laboratory.*



[a]DOC 1995a.
[b]DOL 1995a.

FIGURE 4.7.2.8–2.—*Economy for the Lawrence Livermore National Laboratory Regional Economic Area and California.*

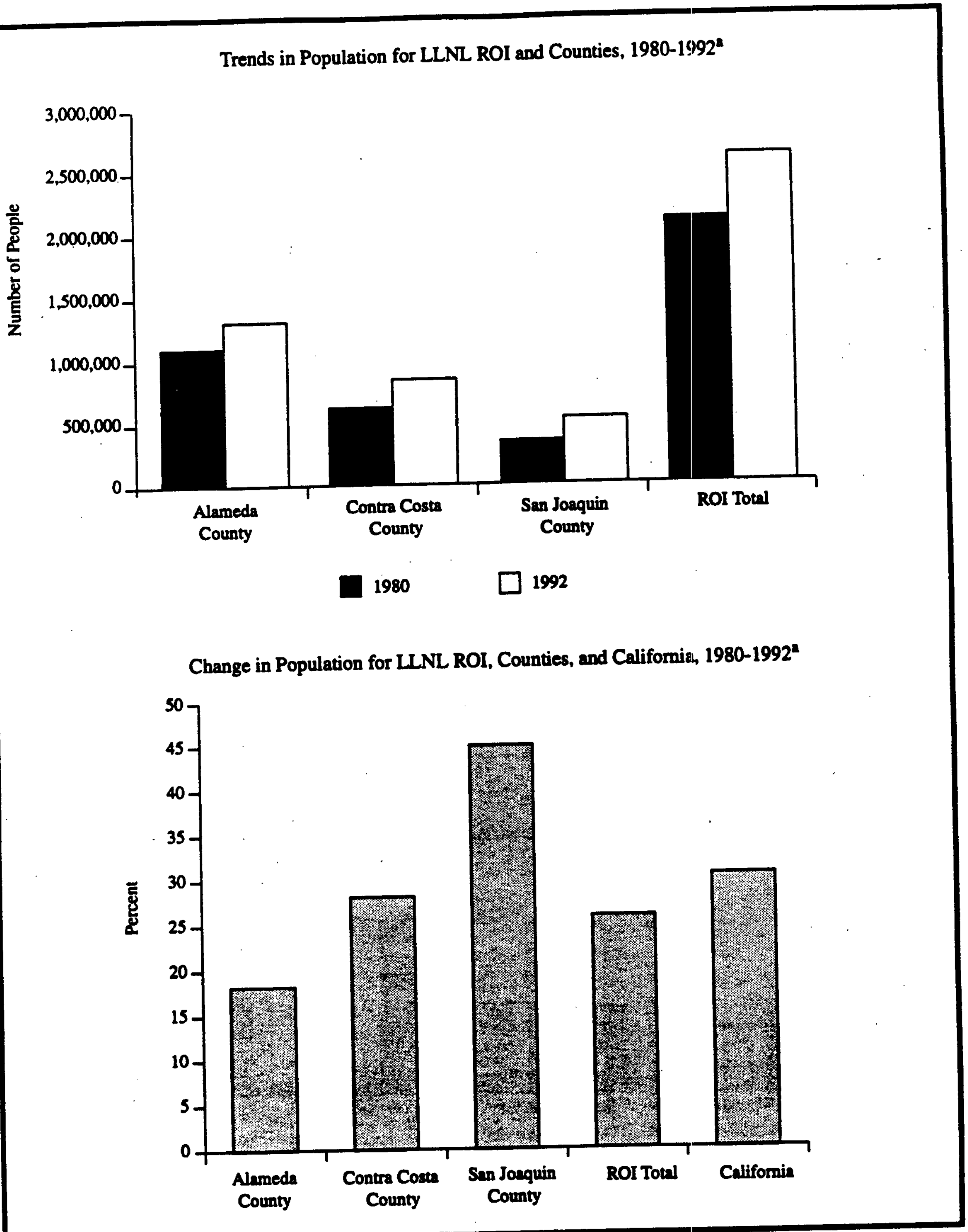
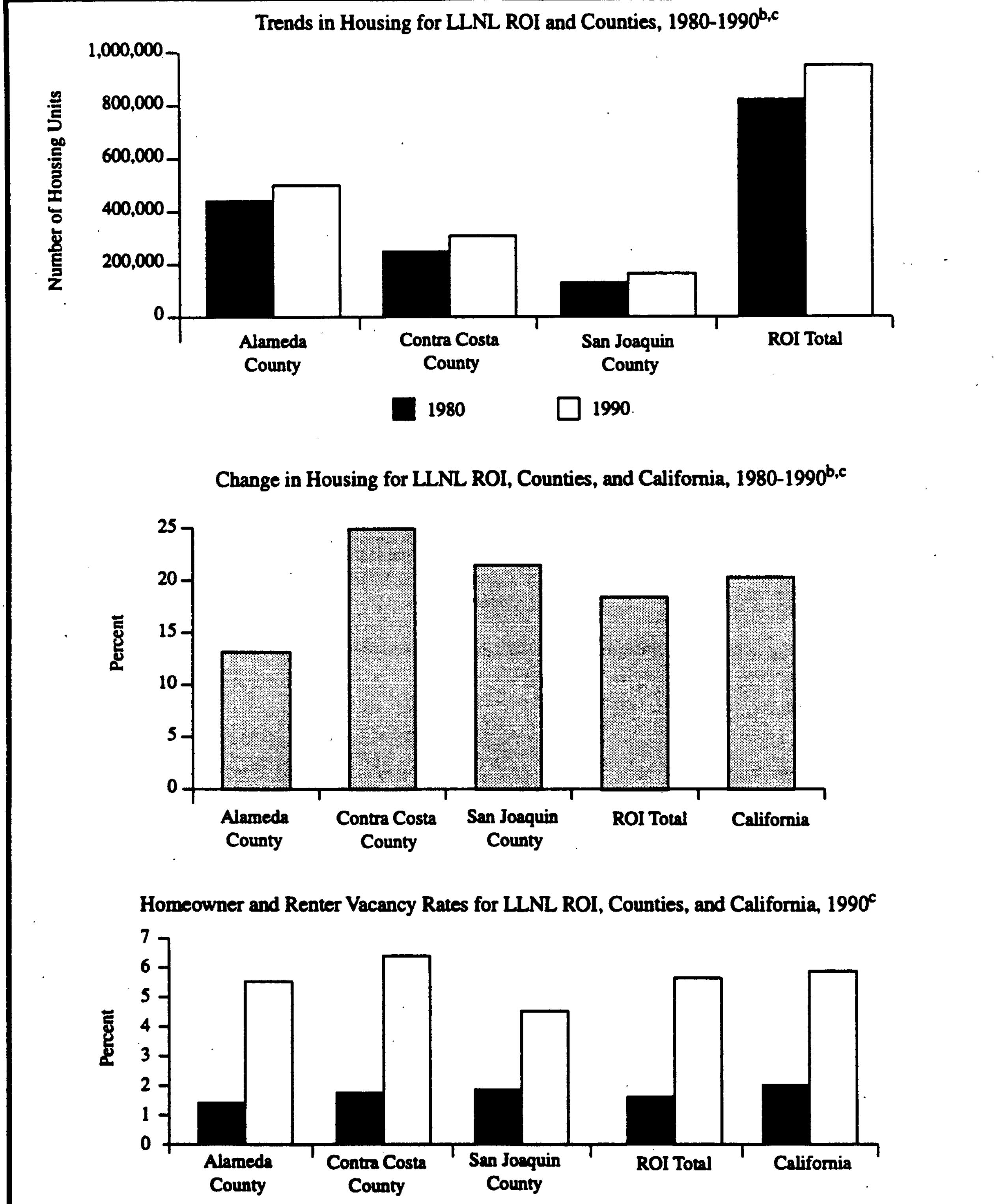


FIGURE 4.7.2.8–3.—***Population and Housing for the Lawrence Livermore National Laboratory Region of Influence*** **[Page 1 of 2].**



[a]Census 1994o.
[b]Census 1982y.
[c]Census 1991j.

FIGURE 4.7.2.8–3.—*Population and Housing for the Lawrence Livermore National Laboratory Region of Influence* [Page 2 of 2].

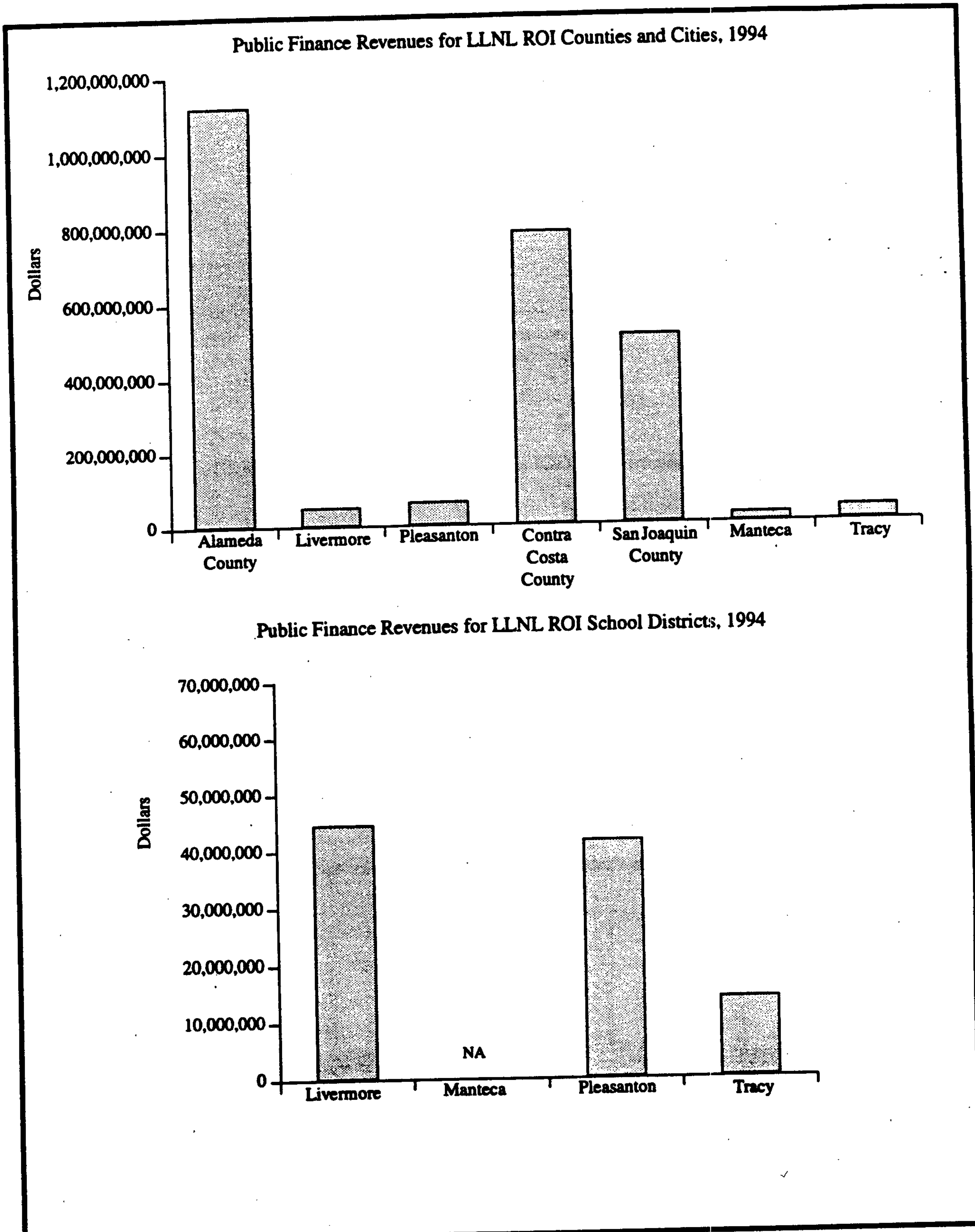
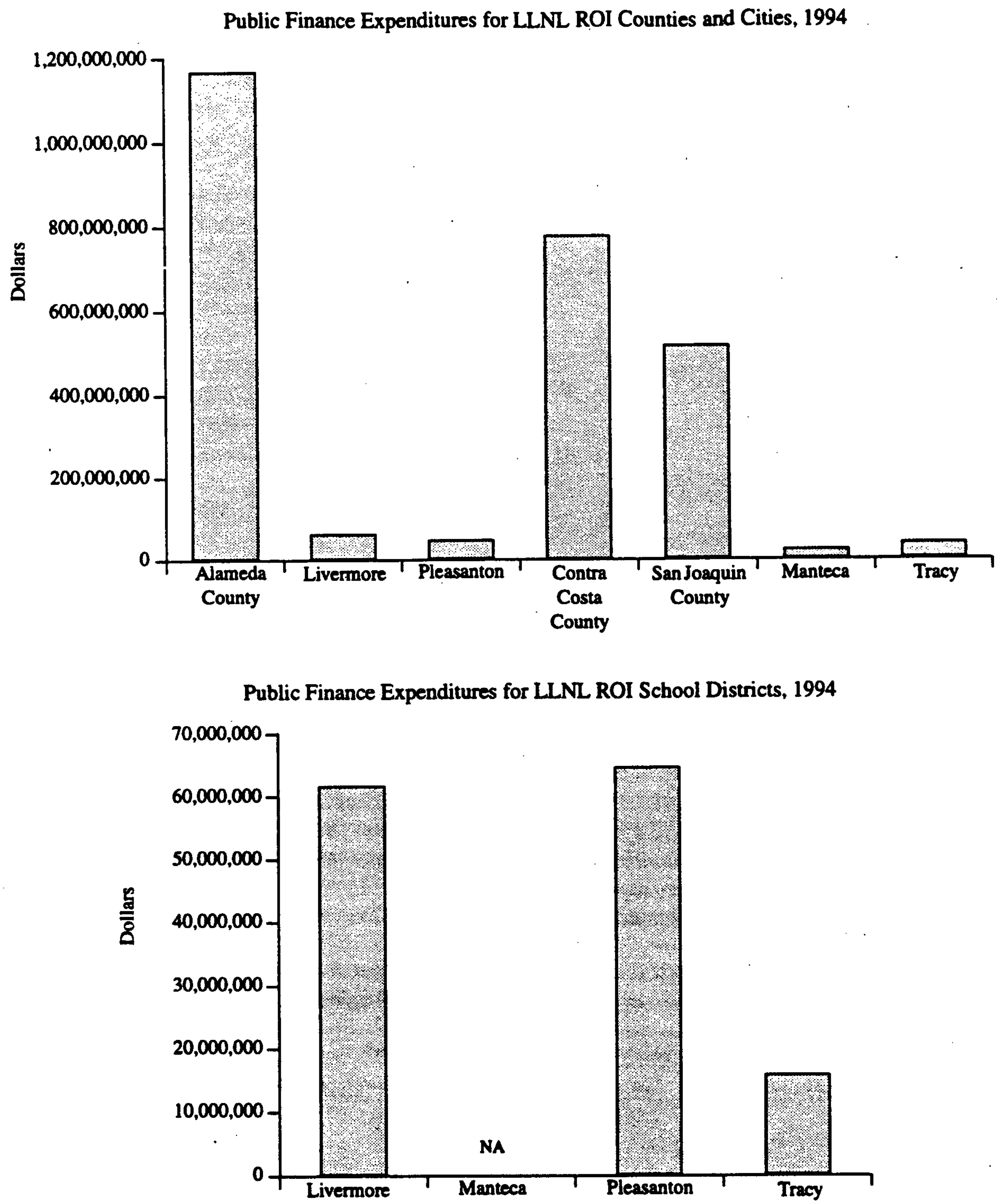


FIGURE 4.7.2.8–4.—*Local Government Public Finance for the Lawrence Livermore National Laboratory Region of Influence* [Page 1 of 2].



Note: NA - not available. 1993 and 1994 financial audit data for Alameda County is not available. Data presented is for 1992.
Source: LL City 1995a; LL County 1995a; LL School 1995b.

FIGURE 4.7.2.8–4.—*Local Government Public Finance for the Lawrence Livermore National Laboratory Region of Influence* [Page 2 of 2].

TABLE 4.7.2.9–1.—*Sources of Radiation Exposure to Individuals in the Vicinity, Unrelated to Lawrence Livermore National Laboratory Operations*

Source	Committed Effective Dose Equivalent (mrem/yr)
Natural Background Radiation[a]	
Cosmic and cosmogenic radiation	30
External terrestrial radiation	30
Internal terrestrial radiation	40
Radon in homes (inhaled)	200
Other Background Radiation[a,b]	
Diagnostic x rays and nuclear medicine	53
Weapons test fallout	<1
Air travel	1
Consumer and industrial products	10
Total	365

[a] LLNL 1994a. Value for radon is an average for the United States.
[b] NCRP 1987a.

Releases of radionuclides to the environment from LLNL operations provide another source of radiation exposure to individuals in the vicinity of LLNL. The radionuclides and quantities released from LLNL operations in 1994 are listed in the *Environmental Report 1994* (UCRL-50027-94). The doses to the public resulting from these releases are presented in table 4.7.2.9–2. These doses fall within regulatory limits (DOE Order 5400.5) and are small in comparison to background radiation. The releases listed in the 1994 report were used in the development of the reference environment's (No Action) radiological releases at LLNL in 2005.

Based on a dose-to-risk conversion factor of 500 cancer deaths per 1 million person-rem ($5x10^{-4}$ fatal cancers per person-rem) to the public (appendix E), the fatal cancer risk to the maximally exposed member of the public due to radiological releases from LLNL operations in 1994 is estimated to be $3.3x10^{-8}$. That is, the estimated probability of this person dying of cancer from radiation exposure associated with 1 year of LLNL operations is slightly greater than 3 chances in 100 million. (Note that it takes several years from the time of exposure to radiation for cancer to manifest itself.)

Based on the same conversion factor, $3.8x10^{-4}$, excess fatal cancers are projected in the population living within 80 km (50 mi) of LLNL from normal operation in 1994. To place this number into perspective, it can be compared with the number of fatal cancers expected in this population from all causes. The 1990 mortality rate associated with cancer for the entire U.S. population was 0.2 percent per year (Almanac 1993a:839). Based on this national rate, the number of fatal cancers from all causes expected during 1994 in the population living within 80 km (50 mi) of LLNL was 12,000. This number of expected fatal cancers is much higher than the

TABLE 4.7.2.9–2.—*Doses to the General Public from Normal Operation at Lawrence Livermore National Laboratory, 1994 (Committed Effective Dose Equivalent)*

Affected Environment	Atmospheric Releases		Liquid Releases		Total	
	Standard[a]	Actual	Standard	Actual	Standard[a]	Actual
Maximally exposed individual (mrem)	10	0.065	4	0.0	100	0.065
Population within 80 kilometers[b] (person-rem)	None	0.76	None	0.0	100	0.76
Average individual within 80 kilometers[c] (mrem)	None	$1.3x10^{-4}$	None	0.0	None	$1.3x10^{-4}$

[a] The standards for individuals are given in DOE Order 5400.5. As discussed in that order, the 10 mrem/yr limit from airborne emissions is required by the CAA, the 4 mrem/yr limit is required by the SDWA, and the total dose of 100 mrem/yr is the limit from all pathways combined. The 100 person-rem value for the population is given in proposed 10 CFR 834 (58 FR 16268).
[b] In 1994, this population was approximately 6 million.
[c] Obtained by dividing the population dose by the number of people living within 80 km (50 mi) of the site.
Source: LLNL 1994a.

estimated 3.8×10^{-4} fatal cancers that could result from LLNL operations in 1994.

Workers at LLNL receive the same dose as the general public from background radiation, but also receive an additional dose from working in the facilities.

Table 4.7.2.9–3 includes the average, maximum, and total occupational doses to LLNL workers from operations in 1994. These doses fall within radiological limits (10 CFR 835). Based on a dose-to-risk conversion factor of 400 fatal cancers per 1 million person-rem (4×10^{-4} fatal cancers per person-rem) among workers (appendix E), the number of excess fatal cancers to LLNL workers from operations in 1994 is estimated to be 0.0073.

A more detailed presentation of the radiation environment, including background exposures and radiological releases and doses, is presented in the *Lawrence Livermore National Laboratory Environment Report-1994* (UCRL-50027-94). The concentrations of radioactivity in various environmental media (e.g., air and water) and in animal tissue in the site region (onsite and offsite) are also presented in the same reference.

TABLE 4.7.2.9–3.—***Doses to the Onsite Worker from Normal Operation at Lawrence Livermore National Laboratory, 1994***

	Onsite Releases and Direct Radiation	
Affected Environment	**Standard**[a]	**Actual**[b]
Average worker (mrem)	None	2.1
Maximally exposed worker (mrem)	5,000	1,300
Total workers (person-rem)	None	18.3

[a] 10 CFR 835. DOE's goal is to maintain radiological exposure as low as reasonably achievable.

[b] LLNL 1994a. The number of badged workers in 1994 was approximately 8,700.

Chemical Environment. The background chemical environment important to human health consists of the atmosphere, which may contain hazardous chemicals that can be inhaled; drinking water, which may contain hazardous chemicals that can be ingested; and other environmental media with which people may come in contact (e.g., soil through direct contact or via the food pathway). The baseline data for assessing potential health impacts from the chemical environment are those presented in sections 4.7.2.3 and 4.7.2.4.

Adverse health impacts to the public can be minimized through administrative and design controls to decrease hazardous chemical releases to the environment and to achieve compliance with permit requirements. The effectiveness of these controls is verified through the use of monitoring information and inspection of mitigation measures. Health impacts to the public may occur during normal operation at LLNL via inhalation of air containing hazardous chemicals released to the atmosphere by LLNL operations. Risks to public health from ingestion of contaminated drinking water or direct exposure are also potential pathways.

Baseline air emission concentrations for hazardous air pollutants and their applicable standards are presented in section 4.7.2.3. These concentrations are estimates of the highest existing offsite concentrations and represent the highest concentrations to which members of the public could be exposed. These concentrations are compared with applicable guidelines and regulations. Information about estimating health impacts from hazardous chemicals is presented in appendix E.

Exposure pathways to LLNL workers during normal operation may include inhaling the workplace atmosphere, drinking LLNL potable water, and possible other contact with hazardous materials associated with work assignments. The potential for health impacts varies from facility to facility and from worker to worker, and available information is not sufficient to allow a meaningful estimation and summation of these impacts. However, workers are protected from hazards specific to the workplace through appropriate training, protective equipment, monitoring, and management controls. LLNL workers are also protected by adherence to OSHA and EPA occupational standards that limit atmospheric and drinking water concentrations of potentially hazardous chemicals. Appropriate monitoring, which reflects the frequency and amounts of chemicals utilized in the operation processes, ensures that these standards are not exceeded. Additionally, DOE requirements ensure that conditions in the workplace are as free as possible from recognized hazards that cause or are likely to cause illness or physical harm. Therefore, worker health conditions at LLNL are expected to be substantially better than required by standards.

Health Effects Studies. A study involving two groups of children and young adults under the age of 25 who were born in Livermore between 1960 and 1990 and lived in Livermore between 1960 and 1991 found no increased risk of leukemia or non-Hodgkins lymphoma. The study found a 2.4-fold increase in the risk of malignant melanoma in the children and young adults who lived in Livermore between 1960 and 1991 and a 6.4-fold increased risk of malignant melanoma for children born in Livermore between 1960 and 1991. No increased risk of any other type of cancer was found.

A joint study conducted by the California Department of Public Health and LLNL reported 19 cases of malignant melanoma between 1972 and 1977 among LLNL employees (Lancet 1981a: 712-716). No other cancers were increased among LLNL employees from 1969 to 1980 (WJM 1985a:214-218).

Hiatt and Fireman investigated the hypothesis that the increased incidence of malignant melanoma was due to a difference in medical care received by LLNL employees compared to non-LLNL employees of the same geographic area belonging to the same prepaid health plan (LLNL 1984c). The authors concluded that the sustained increase in melanoma incidence at LLNL is associated with an increased likelihood of being biopsied for pigmented skin lesions because the physicians caring for LLNL employees may be more aware of the potential malignancy of pigmented lesions than those caring for non-LLNL employees.

The most recent case-control study of malignant melanoma concluded that there was no association between occupational factors and the increased melanoma diagnosis among LLNL employees (LLNL 1994e). No clear explanation for the increased melanoma among LLNL workers has been provided. Increased awareness and enhanced surveillance are currently suspected. For a more detailed description of the studies and the findings, refer to appendix section E.4.7.

Accident History. Prior to 1960, there were no accidents at LLNL that had offsite impacts. Since 1960, there have been a number of accidents that have resulted in only negligible exposures to the public.

Emergency Preparedness. Each DOE site has established an emergency management program that would be activated in the event of an accident. This program has been developed and maintained to ensure adequate response for most accident conditions and to provide response efforts for accidents not specifically considered. The emergency management program incorporates activities associated with emergency planning, preparedness, and response. The LLNL Emergency Preparedness Plan is designed to minimize or mitigate the impact of any emergency upon the health and safety of employees and the public.

4.7.2.10 *Waste Management*

This section outlines the major environmental regulatory structure and waste management activities for the Livermore Site and Site 300. A more detailed discussion of the ongoing Livermore Site and Site 300 waste management operations and the regulatory setting is provided in appendix section H.2.6.

DOE is working with Federal and state regulatory authorities to address compliance and cleanup obligations arising from its past operation at the Livermore Site and Site 300, and is engaged in several activities to bring its operations into full regulatory compliance. These activities are set forth in negotiated agreements that contain schedules for compliance with applicable requirements and financial penalties for nonachievement of agreed-upon milestones. These agreements have been reviewed to assure the proposed actions are allowable under the terms of these agreements.

EPA included the Livermore Site on the NPL on July 21, 1987, because of groundwater contamination primarily by solvents containing VOC and fuel hydrocarbons. DOE, EPA, and the State of California entered into a Federal Facility Agreement to serve as the interagency agreement required under CERCLA and *Superfund Amendments and Reauthorization Act* (SARA), Section 120. This Federal Facility

Agreement applies to the Livermore Site only and establishes a procedural framework and schedule for conducting source investigations, continued sampling, monitoring, and remediation of groundwater at the site. The Federal Facility Agreement enhances interagency coordination and cooperation, minimizes duplication of analysis and documentation, expedites remedial actions with a minimum of administrative delays, and establishes a basis for a determination that DOE has completed the CERCLA, RCRA, and state requirements.

Site 300 was placed on the NPL in 1990 because VOCs were discovered in the regional aquifer underlying the site and because of the proximity of the contamination to private drinking water supplies. The EPA and Site 300 authorities agreed to combine RCRA and CERCLA restoration requirements under a single Federal Facility Agreement for Site 300. A Federal Facility Agreement covering cleanup activities at Site 300 was executed on June 29, 1992. This agreement addresses the presence of trichloroethylene (TCE) in soil, rock, and groundwater; HE compounds in the HE Process Area; and tritium in the Pit 7 complex and in the Building 850 Area.

Through its research activities at the Livermore Site and Site 300, LLNL manages five broad waste categories: TRU, low-level, mixed, hazardous, and nonhazardous wastes, some of which are classified. Because there is no TRU waste associated with any of the proposed activities at LLNL, there is no discussion in this PEIS of TRU waste generation and management at LLNL. A discussion of the waste management activities associated with each of these waste categories follows.

Low-Level Waste. In 1994, the Livermore Site generated approximately 181 m^3 (47,800 gal) of liquid and 307 m^3 (403 yd^3) of solid LLW (LLNL 1995i:1). Solid LLW at the Livermore Site consists of gloves, absorbent paper, plastics, glass, and other solid materials contaminated with low-level radioactive materials. Wastewater from retention tank systems that exceeds site radiological discharge limits or any special limits established for that tank, and cannot be treated for discharge or released to the sanitary sewer, is treated as LLW. Smaller quantities of contaminated liquids may be accumulated in various sizes and types of containers. Nonreleasable wastewater in generator retention tank systems is pumped into portable tanks for treatment at the Wastewater Treatment Tank Farm at the Building 514 Facility. At the Area 514 Waste Treatment Facility, containerized and bulk radioactive liquid wastes are transferred into one of the six 7,003 L (1,850 gal) treatment tanks to be treated chemically. These tanks are used to treat both radioactive and mixed waste liquids. Following treatment, a sample is gathered by hazardous waste management personnel and analyzed by a certified analytical laboratory for pH, metals, gross alpha and beta activity, tritium, and other possible contaminants, as necessary (depending on the waste's description). If the review indicates that the contents of a treatment tank are below established sewer discharge limits, the liquid is released to the sanitary sewer.

The precipitate wastes from tank farm chemical treatments are filtered in the Dorr-Oliver unit by creating a filter cake (coating a rotating drum with a slurry of diatomaceous earth), depositing the precipitate on the absorbent filter cake, capturing the filtrate in a tank, removing and packaging the contaminated cake, and then either discharging the liquid filtrate to the sanitary sewer or retreating it. The filter cake is then stabilized. Liquid and solid radioactive wastes are processed or stored at Building 514 and 612 complexes.

In 1994, Site 300 generated approximately 463 m^3 (606 yd^3) of solid LLW (LLNL 1995i:1). Site 300 generates solid LLW from the detonation of test assemblies on firing tables. The debris from the detonation is contaminated with depleted uranium and, in some instances, thorium or tritium. LLW is packaged in approved waste containers and transported for staging on site, pending shipment to the Livermore Site or shipment directly to NTS for disposal.

Mixed Low-Level Waste. In 1994, the Livermore Site generated approximately 51 m^3 (13,470 gal) of liquid and 20 m^3 (26 yd^3) of solid mixed LLW (LLNL 1995i:1). Some of the generated liquid mixed LLW is treated at the Area 514 Wastewater Treatment Tank Farm prior to discharge to the sanitary sewer so that hazardous constituents and radionuclides are removed, and this wastewater can be discharged within the allowable limits of the sewer discharge permit. The residual solids from this treatment process contain such hazardous constituents as coolants and solvents used in machining operations, toxic metals, decontamination solutions, and dyes. Mixed LLW is treated or stored at the Area 514 Wastewater Treatment Tank Farm and Building 612 complexes located in the southeast corner of the Livermore Site. Mixed wastes generated by Site 300 are currently stored and will continue to be stored at the Livermore Site until DOE-approved disposal options are available. These options are outlined in the LLNL Site Treatment Plan. In 1994, Site 300 generated approximately 8 m^3 (2,100 gal) of liquid and 0.37 m^3 (0.48 yd^3) of solid mixed LLW.

Hazardous Waste. The Livermore Site and Site 300 presently operate five hazardous waste management facilities: Area 514, Area 612, Building 693, and Building 233 container storage unit are at the Livermore Site. Building 883 is at Site 300. The Area 514 and Area 612 facilities contain treatment and storage units for hazardous and mixed wastes. The Building 693 facility is currently a container storage unit for hazardous waste and limited flammable mixed waste, pending analysis. The Building 233 container storage unit is currently used to store mixed, low-level, and TRU waste. Building 883 is used for hazardous wastes only.

In 1994, approximately 342 m^3 (90,350 gallons) of liquid and 237 m^3 (310 yd^3) of solid hazardous wastes were generated at the Livermore Site (LLNL 1995i:1). Waste Management Facility operations at the Livermore Site are subject to Federal, state, regional, and local environmental requirements. Hazardous waste operations at the Livermore Site include the safe and proper handling, treatment, packaging, storage, and shipment of all hazardous waste generated by the site. The Livermore Site hazardous waste management units operate under RCRA interim status with an approved Part A Permit that was submitted December 16, 1991. A revised Part A Permit has been submitted to the state, while the Part B application submitted on January 17, 1992, undergoes processing by the State of California. Hazardous wastes are generated by the numerous R&D activities conducted throughout the facilities. Storage areas for nonradioactive and radioactive (or mixed) wastes are located at the Area 612 Facility yard. Wastes that contain PCBs and other wastes regulated by the TSCA are stored in Building 625. The nonradiological hazardous waste consists of ignitable, reactive, corrosive, toxic, and biohazardous waste (such as very dilute carcinogens and small animal carcasses) generated in biomedical and environmental research. Liquid hazardous waste contained in carboys may be pumped into drums that are stored, pending offsite transportation. The solid chemical wastes are packaged in drums and temporarily stored. The waste is then packaged according to DOT regulations. A commercial waste handler transports the liquid and solid hazardous waste drums to RCRA-permitted treatment, storage, and disposal facilities.

Building 693 was constructed in 1987. The California Department of Toxic Substances Control approved operation of this chemical waste storage facility in early 1991 under interim status standards. Building 693 began operation in 1992 and is used to store containerized RCRA-, TSCA-, and California-only regulated waste and limited flammable mixed waste, pending safety analysis.

Liquid waste and wastewaters are accumulated in retention tanks, carboys, or drums at the respective source locations throughout the Livermore Site. There, the materials are sampled and analyzed, and the determined waste contaminant levels are compared to the Livermore Site and city of Livermore discharge limits. If the levels of contaminants are below the regulatory limits, the material is released to the sanitary sewer. Industrial wastewater that contains constituents at concentrations greater than allowed by the city of Livermore discharge limits is managed as hazardous waste.

In 1994, Site 300 generated 111 m^3 (29,320 gal) of liquid and 46 m^3 (60 yd^3) of solid hazardous wastes (LLNL 1995i:1). Hazardous waste generated at Site 300 can be broken down into three general categories: explosives, analytical chemicals, and industrial wastes. The generation of solid and liquid hazardous waste varies with the number and type of experiments being conducted at any given time at Site 300. HE wastes are treated at the Building 829 complex, an open burn facility used for thermal treatment of these wastes. This facility will be operated until a new explosives waste treatment facility is permitted and operational as stated in a 1993 compliance order between LLNL, DOE, and the State of California. Site 300 hazardous wastes are stored in Building 883, a RCRA-permitted storage facility, before transfer to the Livermore Site waste management facilities.

Generally, wastes are stored up to 1 year before shipment to the Livermore Site. Hazardous wastes are shipped through licensed commercial transporters to various offsite commercial RCRA-permitted treatment, storage, and disposal facilities.

The newly redesigned Decontamination and Waste Treatment Facility will replace and upgrade current waste management facilities presently used to process, treat, and store hazardous, radioactive, and mixed wastes. The Decontamination and Waste Treatment Facility would receive Livermore Site-generated medical, hazardous, LLW, and mixed LLW for consolidation, processing, treatment, and packaging before shipment and disposal offsite at commercial RCRA-permitted facilities.

The explosives waste storage facility project will convert five existing explosives storage magazines for the storage of explosives wastes. A new prefabricated metal building, to be located in a previously paved area, will be used for storing explosives-contaminated solid wastes (including packing material, discarded paper, and plastic labware) and ash from thermal treatment processes. Each of the five earth-covered magazines will be capable of storing specified weight limits of explosives, depending on the explosives waste types present.

Nonhazardous Waste. In 1994, the Livermore Site generated approximately 6,425 t (7,082 tons) of solid nonhazardous wastes (LLNL 1995i:1). Solid, nonhazardous wastes generated consisted of paper, plastics, glass, organic, and other wastes. The Livermore Site does not have onsite solid waste disposal facilities. Solid wastes are collected in dumpsters and other similar containers in such a manner as to assure that they do not contain hazardous or radioactive wastes and are transported to the Vasco Road Landfill for disposal.

In 1994, Site 300 generated approximately 315 m^3 (412 yd^3) of solid nonhazardous wastes (LLNL 1995i:1). The sources of solid, nonhazardous waste on Site 300 include office and laboratory refuse, construction debris, and landscape clippings. Solid, nonhazardous waste generated at Site 300 is transported to the Corral Hollow Sanitary Landfill, approximately 4 km (2.49 mi) east of Site 300 on Corral Hollow Road.

Medical wastes generated at the Livermore Site consist of biohazardous waste and sharps wastes. In 1994, approximately 2 m^3 (3 yd^3) of solid medical wastes were generated. Infectious wastes from the Biomedical Sciences Division are autoclaved in Building 365 to sterilize prior to disposal as sanitary waste, while sharps (e.g., needles, blades, and glass slides) waste is sent to an offsite commercial RCRA-permitted incinerator following sterilization.

Medical wastes at Site 300 are generated at the Medical Facility, Building 877. In 1994, approximately 2 m^3 (528 gal) of liquid and 2 m^3 (3 yd^3) of solid medical wastes were generated (LLNL 1995i:1). These wastes are managed in accordance with established LLNL procedures for handling medical wastes and are transported to the Livermore Site, where they are autoclaved at Building 365. The sterilized materials are then disposed of as sanitary waste.

For 1994, the Livermore Site generated approximately 456,000 m^3 (120,460,000 gal) of sanitary wastewater (LLNL 1995i:2). If sanitary wastewater generated by operations exceed permissible discharge limits and is treatable using permitted Livermore Site waste treatment units, the water is processed to meet the release criteria and then monitored as it is discharged to ensure that permissible discharge limits are not exceeded. These wastes enter the city of Livermore's sewer system and are then processed at the city of Livermore Water Reclamation Plant. The treated sanitary wastewater is piped to San Francisco Bay for discharge, except for a small volume that is used for summer irrigation of the municipal golf course adjacent to the Livermore Water Reclamation Plant. Sludge from the treatment plant is disposed of in offsite landfills.

When wastewater is discharged to the sewer system, it combines with sewage from SNL, Livermore. To protect the Livermore Water Reclamation Plant and to minimize any cleanup that might become necessary, the Livermore Site has an onsite sewage diversion and retention system that is capable of containing approximately 775,000 L (200,000 gal) of potentially contaminated sewage until it can be analyzed and appropriate handling methods implemented. If the liquids cannot be processed for discharge, they are packaged for treatment or disposal at an offsite facility. Treatment residues, or solids generated from the treatment process, are also packaged for treatment or disposal at an offsite facility.

In 1994, Site 300 generated approximately 4,420 m^3 (1,167,600 gal) of sanitary wastewater (LLNL 1995i:2). Sanitary wastewater generated within the General Services Area at Site 300 is discharged to an onsite sewer lagoon. Other more remotely located buildings on Site 300 are serviced by septic systems and leach fields. Industrial wastewaters are contained in retention tanks and analyzed, and their proper disposition determined. These wastewaters may be shipped to the Livermore Site for treatment, then discharged to the sanitary sewer system or shipped directly to an offsite treatment and disposal facility. The nonhazardous rinsewater from the HE machining, pressing, and formulation processes are disposed of by surface evaporation from two ponds.

4.7.3 Environmental Impacts

4.7.3.1 *Land Use*

No Action. Under No Action, DOE would continue current and planned activities at LLNL as described in section 3.2.7. No additional land-use impacts are anticipated at LLNL beyond the effects of existing and future activities that are independent of the proposed action.

Management Alternatives

Secondary and Case Fabrication. The secondary and case fabrication alternative at the Livermore Site would use existing facilities, equipment, and infrastructure to support production requirements for the secondary and case fabrication mission. Facilities for this proposed action would require approximately 21,739 m^2 (234,000 ft^2) of floor space, and all operations would be carried out within those facilities. Additional land would not be used to implement the new mission. The proposed secondary and case fabrication activities would be compatible and consistent with existing operations, and LLNL land-use plans and policies. No land-use impacts are expected.

High Explosives Fabrication. The HE fabrication alternative at the Livermore Site would use existing facilities and infrastructure to support the HE feedstock, main charge, and component procurement and fabrication activities. Additional land would not be used to implement the mission. The proposed HE fabrication activities would be compatible and consistent with existing operation and LLNL land-use plans and policies. Land-use impacts are not expected.

Nonnuclear Fabrication. Nonnuclear fabrication and assembly activities for nonnuclear components would be incorporated into existing buildings with mission modification. Modification activities would be limited to upgrades within existing facilities. Additional land would not be used to implement the mission. The proposed nonnuclear fabrication activities would be compatible and consistent with existing operations and LLNL land-use plans and policies. Impacts to land-use are not expected.

Sensitivity Analysis. LLNL would be able to accommodate the high and low case operation for all proposed management alternatives with the base case production facilities. No land-use impacts are expected.

Stewardship Alternatives

Proposed National Ignition Facility. The proposed site for NIF would occupy an estimated 8.1 ha (20 acres) of vacant undeveloped land in the northeast corner of the Livermore Site. The site acreage would account for 11 percent of the land currently designated as available for development inside the Livermore Site boundaries. The project would be located in an area where similar types of research and experimentation activities occur. The proposed NIF would be compatible and consistent with LLNL land-use plans and policies. No impacts to land-use are expected.

Proposed Contained Firing Facility. The proposed CFF would be a modification to the existing B801 Flash X-Ray (FXR) Facility located at Site 300. Approximately 1.2 ha (3 acres) of hillside land adjacent to the present B801 complex would be disturbed during construction of the proposed CFF. The proposed action would be compatible and consistent with existing operations at Site 300 and LLNL land-use plans and policies. Construction and operation of CFF would not result in land-use impacts.

Combined Program Impacts

Livermore Site. Of the four stockpile stewardship and management alternatives proposed for the Livermore Site, existing facilities would be used for three of the alternatives. Additional land would not be used to implement these three missions. The proposed NIF would require clearing 8.1 ha (20 acres) of land for buildings, walkways, and buffer space. An additional 2 ha (4.9 acres) would be temporarily required for a construction laydown area. The total land-use impact from placing all potential Program alternatives at the Livermore Site would be the use of 8.1 ha (20 acres) of undeveloped land for the new NIF mission.

Site 300. Combined Program impacts would be limited to land-use impacts from construction and operation of CFF, which are expected to be negligible.

Potential Mitigation Measures. Additional mitigation measures are not anticipated.

4.7.3.2 *Site Infrastructure*

This section discusses site infrastructure at LLNL for No Action and the modifications needed for actions due to construction and operation of new stockpile stewardship and management facilities. A comparison of site infrastructure and facilities resources needs for No Action and the proposed alternatives is presented in table 4.7.3.2–1.

No Action. This alternative continues the LLNL missions described in section 3.2.7. As shown in table 4.7.3.2–1, the site infrastructure would continue to adequately supply facility requirements. There would be a 12-percent increase in petrochemical (oil) use and a 13-percent increase in natural gas use over current site requirements.

Management Alternatives

Secondary and Case Fabrication. The site infrastructure would require facility improvements to implement this alternative. Table 4.7.3.2–1 shows the total site requirements and the changes over No Action for electricity and fuel to support the secondary and case fabrication mission. Impacts to site energy infrastructure include a 108-percent increase in liquid fuel use and a 4-percent increase in electrical energy and natural gas use over No Action requirements.

High Explosives Fabrication. The site infrastructure would require slight facility improvements to implement this alternative. The changes in LLNL site infrastructure requirements are shown in table 4.7.3.2–1. Impacts to site infrastructure include a 67-percent increase in liquid fuel use over No Action requirements. No other impacts to site infrastructure are expected. This analysis assumes the entire mission is relocated to LLNL. If it is shared with LANL, the impact would be appropriately less.

Nonnuclear Fabrication. As shown in table 4.7.3.2–1, the site infrastructure requirement changes would be small to implement this alternative. Impacts to site infrastructure are not expected.

Sensitivity Analysis. No change in site infrastructure impacts are expected for the high and low production cases for the nonnuclear and HE fabrication alternatives. For secondary and case fabrication, facility upgrades and utility improvements would be required to support the high production case. No changes are expected to meet the low case production scenario.

Stewardship Alternatives

Proposed National Ignition Facility. Table 4.7.3.2–1 shows the energy requirement to support the proposed NIF at LLNL. The LLNL site infrastructure would require slight facility improvements to implement this alternative. Impacts to site infrastructure include a 9-percent increase in electrical energy use, a 33-percent increase in peak electrical load, and a 4-percent increase in natural gas use over No Action requirements. The electric power pool has sufficient capacity margins to accommodate the proposed NIF.

Proposed Contained Firing Facility. As shown in table 4.7.3.2–1, the site infrastructure would require slight facility improvements to implement this alternative. Impacts to site infrastructure include slight increases in electrical energy and liquid fuel use over No Action requirements.

Combined Program Impacts. If all applicable alternatives were to be located at LLNL, the combined impacts would exceed current site resources. The largest impact would be a 179-percent increase in liquid fuel use. Electrical peak load would increase by 40 percent with an associated increase in electrical energy use of 14 percent. Consumption of natural gas would increase by about 8 percent.

Potential Mitigation Measures. No additional mitigation measures for proposed stockpile stewardship and management alternatives at LLNL are anticipated.

4.7.3.3 *Air Quality*

No Action. No Action air quality utilizes estimated air emissions data from operations at the Livermore Site and Site 300 in 2005 assuming continuation of current site missions to calculate pollutant concentrations at or beyond the Livermore Site and Site 300 boundaries. The emission rates for criteria and toxic/hazardous pollutants for No Action are presented in appendix table B.3.7–1. Tables 4.7.3.3–1 and 4.7.3.3–2 present the No Action

TABLE 4.7.3.2–1.—***Site Infrastructure Requirements and Changes for Stockpile Stewardship and Management Alternatives at Lawrence Livermore National Laboratory***

Alternative	Electrical: Energy (MWh/yr)	Electrical: Peak Load (MWe)	Fuel: Liquid (L/yr)	Fuel: Gas (m^3/yr)	Fuel: Coal (t/yr)
Current Resources (1994)	343,377	59.8	75,220	14,160,000	NA
No Action (2005)					
Total site requirement	352,050	60.3	79,022	15,970,000	NA
Change from current resources	8,673	0.5	3,802	1,810,000	NA
Nonnuclear Fabrication					
Total site requirement	352,158	60.4	79,022	15,998,900	NA
Change from No Action	108	0.1	0	28,900	NA
Secondary and Case Fabrication					
Total site requirement	367,050	62.3	164,222	16,536,000	NA
Change from No Action	15,000	2	85,200	566,000	NA
High Explosives Fabrication					
Total site requirement	356,350	61.3	132,122	15,970,000	NA
Change from No Action	4,300	1	53,100	0	NA
National Ignition Facility					
Total site requirement	382,050	80.3	79,722	16,580,000	NA
Change from No Action	30,000	20	700	610,000	NA
Contained Firing Facility					
Total site requirement	353,650	61.5	81,672	15,970,000	NA
Change from No Action	1,600	1.2	2,650	0	NA
Combined Program Impacts					
Total site requirement	403,058	84.6	220,672	17,174,900	NA
Change from No Action	51,008	24.3	141,650	1,204,900	NA

Note: NA - not applicable.

Source: LLNL 1995e; LLNL 1995f; LLNL 1995i:1; LLNL 1995i:2; LLNL 1995i:3; LLNL 1995j; appendix I; appendix J.

pollutant concentrations calculated from the 2005 emission rates for the Livermore Site and Site 300, respectively. In this table pollutant concentrations are compared with applicable Federal and state regulations and guidelines. Concentrations are expected to remain within these standards. Modeled estimates for the 1-hour nitrogen dioxide concentration at the Livermore Site, however, result in a concentration above the applicable standard.

Management Alternatives

Secondary and Case Fabrication. The secondary and case fabrication mission would generate criteria and toxic/hazardous emissions resulting from the operation of the plant boiler, component manufacturing, and chemical processes. Reasonably available control technology would be used to minimize pollutant emissions. This would include using HEPA filters to contain particulate emissions and providing liquid scrubbing prior to HEPA filtration to remove chemical vapors such as nitric acid. Emission rates for criteria and toxic/hazardous pollutants from secondary and case fabrication are presented in appendix table B.3.7–1. Table 4.7.3.3–1 presents the concentrations of criteria and toxic/hazardous pollutants resulting from No Action and those generated from operation of secondary and case fabrication.

TABLE 4.7.3.3–1.—*Estimated Concentrations of Pollutants from No Action and Stockpile Stewardship and Management Alternatives at the Livermore Site* [Page 1 of 2]

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines (μg/m³)	2005 No Action (μg/m³)	Secondary and Case Fabrication (μg/m³)	Nonnuclear Fabrication (μg/m³)	National Ignition Facility (μg/m³)	Combined Program Impacts (μg/m³)
Criteria Pollutant							
Carbon monoxide	8-hour	10,000[a]	55.79	65.70	55.79	60.05	69.96
	1-hour	23,000[b]	187.80	221.17	187.80	202.15	235.50
Lead	Calendar quarter	1.5[a]	<0.01	<0.01	<0.01	<0.01	<0.01
	30-day	1.5[b]	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrogen dioxide	Annual	100[a]	5.46	5.78	5.46	5.76	6.08
	1-hour	470[b]	1,082.64	1,146.03	1,082.64	1,142.36	1,205.75
Ozone	1-hour	180[b]	c	c	c	c	c
Particulate matter	Annual	30[b]	0.78	0.80	0.78	0.81	0.83
	24-hour	50[b]	15.32	15.65	15.32	15.85	16.18
Sulfur dioxide	Annual	80[a]	0.07	0.08	0.07	0.08	0.08
	24-hour	105[b]	1.42	1.49	1.42	1.52	1.59
	3-hour	1,300[a]	9.35	9.79	9.35	10.0	10.44
	1-hour	655[b]	14.35	15.01	14.35	15.35	16.01
Mandated by California							
Beryllium	30-day	0.01[d]	0.000089	0.000089	0.000089	0.000089	0.000089
Hydrogen sulfide	1-hour	42[b]	c	c	c	c	c
Sulfate	24-hour	25[b]	c	c	c	c	c
Vinyl chloride	24-hour	26[b]	c	c	c	c	c
Hazardous and Other Toxic Compounds							
Acetone	8-hour	e	8.11	8.11	9.01	8.11	9.01
Benzene	8-hour	e	0.99	0.99	0.99	0.99	0.99
2-Butoxyethanol	8-hour	e	1.52	1.52	1.52	1.52	1.52
Carbon tetrachloride	8-hour	e	2.03	2.03	2.03	2.03	2.03
Chlorine	8-hour	e	c	0.50	c	c	0.50
Chlorofluorocarbons	8-hour	e	86.28	86.28	86.28	86.28	86.28

TABLE 4.7.3.3–1.—*Estimated Concentrations of Pollutants from No Action and Stockpile Stewardship and Management Alternatives at the Livermore Site* [Page 2 of 2]

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines (μg/m³)	2005 No Action (μg/m³)	Secondary and Case Fabrication (μg/m³)	Nonnuclear Fabrication (μg/m³)	National Ignition Facility (μg/m³)	Combined Program Impacts (μg/m³)
Hazardous and Other Toxic Compounds (Continued)							
Chloroform	8-hour	e	1.87	1.87	1.87	1.87	1.87
Ethanol	8-hour	e	3.19	3.19	3.19	3.19	3.19
Formaldehyde	8-hour	e	0.53	0.53	0.53	0.53	0.53
Glycol ethers (other)	8-hour	e	0.03	0.03	0.03	0.03	0.03
Hexane	8-hour	e	0.59	0.59	0.59	0.59	0.59
Hydrogen chloride	8-hour	e	0.64	16.50	0.64	0.64	16.50
Hydrogen fluoride	8-hour	e	c	3.15	c	c	3.15
Isopropyl alcohol	8-hour	e	7.23	7.23	9.03	7.23	9.03
Methyl ethyl ketone	8-hour	e	3.35	3.35	3.43	3.35	3.43
Methylene chloride	8-hour	e	1.33	1.33	1.33	1.33	1.33
Methanol	8-hour	e	9.41	54.01	9.41	9.41	54.01
Naphthalene	8-hour	e	0.73	0.73	0.73	0.73	0.73
Nitric acid	8-hour	e	c	22.80	c	c	22.80
Styrene	8-hour	e	12.59	12.59	12.59	12.59	12.59
Sulfuric acid	8-hour	e	c	5.95	c	c	5.95
Tetrohydrofuran	8-hour	e	0.61	0.61	0.61	0.61	0.61
Toluene	8-hour	e	3.81	3.81	3.89	3.81	3.89
1,1,1-Trichloroethane	8-hour	e	9.73	9.73	9.73	9.73	9.73
Trichloroethylene	8-hour	e	1.74	1.74	1.74	1.74	1.74
Xylene	8-hour	e	2.20	2.20	2.20	2.20	2.20

[a] Federal standard.
[b] State standard or guideline.
[c] No monitoring data available, concentration assumed less than applicable standard/threshold value.
[d] San Francisco Bay Area Quality Management District ambient concentration guide.
[e] No standard.
Source: 40 CFR 50; CA EPA 1993a; LLNL 1995c; LLNL 1995f; LLNL 1995i:1; appendix I.

TABLE 4.7.3.3–2.—*Estimated Concentrations of Pollutants from No Action and Stockpile Stewardship and Management Alternatives at Site 300* [Page 1 of 2]

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines (μg/m³)	2005 No Action (μg/m³)	High Explosives Fabrication (μg/m³)	Contained Firing Facility[a] (μg/m³)	Combined Program Impacts (μg/m³)
Criteria Pollutant						
Carbon monoxide	8-hour	10,000[b]	4.96	5.26	-	5.26
	1-hour	23,000[c]	39.68	42.11	-	42.11
Lead	Calendar quarter	1.5[b]	<0.01	<0.01	-	<0.01
	30-day	1.5[c]	<0.01	<0.01	-	<0.01
Nitrogen dioxide	Annual	100[b]	0.28	0.29	-	0.29
	1-hour	470[c]	183.54	188.88	-	188.88
Ozone	1-hour	180[c]	d	d	-	d
Particulate matter	Annual	30[c]	0.03	0.03	-	0.03
	24-hour	50[c]	0.91	0.93	-	0.93
Sulfur dioxide	Annual	80[b]	<0.01	<0.01	-	<0.01
	24-hour	105[c]	0.09	0.10	-	0.10
	3-hour	1,300[b]	0.71	0.80	-	0.80
	1-hour	655[c]	2.12	2.41	-	2.41
Mandated by California						
Beryllium	30-day	0.01[e]	0.000049	0.000049	-	0.000049
Hydrogen sulfide	1-hour	42[c]	d	0.71	-	0.71
Sulfate	24-hour	25[c]	d	d	-	d
Vinyl chloride	24-hour	26[c]	d	d	-	d
Hazardous and Other Toxic Compounds						
Acetone	8-hour	f	0.12	0.12	-	0.12
Acetonitrile	8-hour	f	d	0.04	-	0.04
Ammonia	8-hour	f	d	0.01	-	0.01
Benzene	8-hour	f	<0.01	d	-	<0.01
Chlorofluorocarbons	8-hour	f	0.44	0.44	-	0.44
Chloroform	8-hour	f	<0.01	d	-	<0.01
1,2-Dichloroethane	8-hour	f	d	<0.01	-	<0.01

TABLE 4.7.3.3–2.—*Estimated Concentrations of Pollutants from No Action and Stockpile Stewardship and Management Alternatives at Site 300* [Page 2 of 2]

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines (μg/m³)	2005 No Action (μg/m³)	High Explosives Fabrication (μg/m³)	Contained Firing Facility[a] (μg/m³)	Combined Program Impacts (μg/m³)
Hazardous and Other Toxic Compounds (Continued)						
Ethanol	8-hour	[f]	<0.01	[d]	-	<0.01
Formaldehyde	8-hour	[f]	0.01	0.01	-	0.01
Gasoline vapors	8-hour	[f]	0.98	0.98	-	0.98
Glycol ethers (other)	8-hour	[f]	0.14	0.14	-	0.14
Hydrogen chloride	8-hour	[f]	0.16	0.28	-	0.28
Hydrogen fluoride	8-hour	[f]	[d]	0.24	-	0.24
Isopropyl alcohol	8-hour	[f]	<0.01	[d]	-	<0.01
Methyl ethyl ketone	8-hour	[f]	<0.01	0.02	-	0.02
Methylene chloride	8-hour	[f]	<0.01	[d]	-	<0.01
Toluene	8-hour	[f]	0.05	0.05	-	0.05
Trichloroethylene	8-hour	[f]	0.01	0.01	-	0.01
Xylene	8-hour	[f]	0.01	0.02	-	0.02

[a] CFF air emissions are addressed in appendix J.
[b] Federal standard.
[c] State standard or guideline.
[d] No monitoring data available, concentration assumed less than applicable standard/threshold value.
[e] San Francisco Bay Area Air Quality Management District ambient concentration guide.
[f] No standard.
Source: 40 CFR 50, CA EPA 1993a; LLNL 1995i:1; LLNL 1995j; appendix J.

The resulting concentrations of criteria and toxic/hazardous pollutants are expected to be within Federal and state regulations and guidelines. Modeled estimates for 1-hour nitrogen dioxide concentration at the Livermore Site, however, are above the applicable standard.

High Explosives Fabrication. Gaseous emissions of criteria and toxic/hazardous air pollutants would be generated from the HE fabrication mission. These emissions would result from open burn/open detonation of nonradioactive scrap HE and HE-contaminated waste, plant boiler operation, cleaning operations using solvents, and formulation and synthesis operations. Emission rates for criteria and toxic/hazardous pollutants from HE fabrication are presented in appendix table B.3.7–1. Table 4.7.3.3–2 presents the concentrations of criteria and toxic/hazardous pollutants resulting from No Action and those generated from operation of the HE mission. The resulting concentrations of criteria and toxic/hazardous pollutants are expected to be within Federal and state regulations and guidelines.

Nonnuclear Fabrication. The primary source of emissions would be fugitive emissions of numerous small amounts of solvents from nonnuclear component fabrication processes. These solvents include acetone, isopropyl alcohol, methyl ethyl ketone, and toluene. Table 4.7.3.3–1 presents the concentrations of toxic/hazardous pollutants resulting from No Action and nonnuclear fabrication. Emission rates of toxic/hazardous pollutants for annual operation of nonnuclear fabrication are presented in appendix table B.3.7–1. Concentrations of pollutants resulting from operation of nonnuclear fabrication added to No Action concentrations are expected to be within Federal and state regulations. Modeled estimates for the 1-hour concentration of nitrogen dioxide at the Livermore Site, however, are above the applicable standard.

Sensitivity Analysis. Impacts to air quality from either the low or high case scenario of the program alternatives at the Livermore Site and Site 300 would result in higher and lower concentrations of criteria and toxic/hazardous pollutants for the high and low case, respectively. The concentrations of pollutants for both cases are expected to be within applicable Federal and state regulations and guidelines. The 1-hour concentrations of nitrogen dioxide at the Livermore Site may result in a concentration above the applicable standard.

Stewardship Alternatives

Proposed National Ignition Facility. Operation of the proposed NIF would generate criteria and toxic/hazardous pollutants resulting from the combustion of boiler fuel for heating, operation of diesel generators, and solvent cleaning processes. The emissions consist of particulate matter, carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, and volatile organic compounds. Boiler fuel is assumed to be natural gas. Emission rates of criteria and toxic/hazardous pollutants for annual operation of the proposed NIF are presented in appendix table B.3.7–1. Table 4.7.3.3–1 presents the concentrations of criteria and toxic/hazardous pollutants resulting from No Action and those generated from operation of the proposed NIF. Concentrations of pollutants resulting from operation of the proposed NIF added to No Action concentrations are expected to be within Federal and state regulations. Modeled estimates for the 1-hour concentration of nitrogen dioxide at the Livermore Site, however, are above the applicable standard.

Proposed Contained Firing Facility. It is expected that emissions (such as particulate metal oxides and soot, acid gases, and VOCs) from the proposed CFF operations would be below regulatory limits because of the extensive air scrubbing, filtration, and absorption systems that would be operated in conjunction with the proposed CFF. Resulting emissions from the air control system should then be limited to those such as carbon dioxide, nitrogen, water, and, when tritium is used in the chamber, tritiated water as well as very minor amounts of activated air gas molecules (appendix J).

Combined Program Impacts. The combined impacts to air quality assuming that each of the proposed stockpile stewardship and management alternatives is located at the Livermore Site and Site 300 are small. Tables 4.7.3.3–1 and 4.7.3.3–2 present the Program total concentrations of criteria and toxic/hazardous pollutants derived by adding the contribution from each alternative at each site. The contribution to air pollutants was determined for each alternative independently from each of the other alternatives. Therefore, adding the respective contributions presents a conservative estimate of the combined impacts to air quality since the maximum pollutant concentration for each alternative would not occur at the same time or location at or beyond the site boundary.

Using this conservative estimate of the combined impacts to air quality at the Livermore Site and Site 300, the data indicate that the 1-hour concentration of nitrogen dioxide may result in a concentration above the applicable State of California ambient air quality standard at the Livermore Site. All other criteria and/or toxic/hazardous air pollutants are expected to be within applicable standards.

Potential Mitigation Measures. The reduction of emissions of nitrogen dioxide from the Livermore Site using reasonable available control technology would contribute to the reduction of concentrations of nitrogen dioxide at or beyond the site boundary.

4.7.3.4 *Water Resources*

Environmental impacts associated with the construction and operation of the proposed stockpile stewardship and management facilities at LLNL could affect surface and groundwater resources. The proposed sites for the facilities would be outside the 100-year floodplain. An assessment of the 500-year floodplain would be performed before construction began. A description of the functions to be transferred to LLNL and the facility locations selected to house these activities is presented in sections 3.3 and 3.4. Tables 4.7.3.4–1 and 4.7.3.4–2 present existing surface and groundwater resources and the potential changes to water resources at the Livermore Site and Site 300 resulting from the proposed alternatives. The total site water resource requirements for each alternative, including No Action, are displayed in this table.

Surface Water

No Action. At the Livermore Site, water would continue to be obtained from county and state suppliers described in section 4.7.2.4. No construction would occur under No Action; therefore, no additional construction water would be required or discharged. Current public water usage of 968 MLY (256 MGY) would decrease to 967 MLY (255 MGY) by 2005. Current wastewater discharges to the city of Livermore are expected to increase 56 MLY (14.8 MGY) by 2005.

At Site 300, current wastewater discharges of 4.8 MLY (1.3 MGY) are anticipated to decrease 0.4 MLY (0.1 MGY) by 2005. Adverse impacts to surface water or surface water quality at the Livermore Site or Site 300 are not expected under the No Action alternative.

Management Alternatives

Secondary and Case Fabrication. The estimated 3.0 MLY (0.79 MGY) of public water withdrawals during modifications of the secondary and case fabrication facilities at the Livermore Site would compose no more than a 0.3-percent increase over the projected water use of 967 MLY (255 MGY). The 461 MLY (122 MGY) of treated wastewater effluent would be released to the city of Livermore Water Reclamation Plant during construction; this would be approximately a 15-percent increase over current Livermore Site wastewater discharges of 400 MLY (106 MGY). All discharges would be monitored to comply with NPDES permit and other discharge requirements. To minimize soil erosion impacts, stormwater management and erosion control measures would be implemented. With appropriate controls, adverse impacts to surface water are not expected.

An additional 194 MLY (51.2 MGY) would be required to support three-shift surge operations of the secondary and case fabrication facilities. This is approximately a 20-percent increase over the projected amount of water use. Approximately 102 MLY (27 MGY) of treated wastewater would be released to the city of Livermore Water Reclamation Plant during operations, resulting in a 40-percent increase over projected Livermore Site wastewater discharges. All discharges would be to the city of Livermore sewer system and would be monitored to comply with NPDES permit and other discharge requirements. Adverse impacts to surface water are not expected.

Nonnuclear Fabrication. Public water use of 0.02 MLY (0.005 MGY) during modification of the nonnuclear fabrication facilities at the Livermore Site would comprise less than a 0.1-percent increase over the projected water use of 967 MLY (255 MGY).

TABLE 4.7.3.4–1.—*Potential Changes to Water Resources from Stockpile Stewardship and Management Alternatives at the Livermore Site*

Affected Resource Indicator	No Action Single-Shift Operation 2005	Secondary and Case Fabrication Three-Shift Operation	Nonnuclear Fabrication Three-Shift Operation	National Ignition Facility	Combined Program Impacts
Construction					
Water Availability and Use					
Water source	Municipal Supply	Municipal Supply	Municipal Supply	Municipal Supply	Municipal Supply
Total site water operation requirement[a] (MLY)	0[b]	970	967.02	970	970.02
Percent change from No Action water use (967 MLY)	NA	0.3	0.002	0.3	0.3
Water Quality					
Wastewater discharge to the city of Livermore[c] (MLY)	0[b]	461	456.1	459	464.1
Percent change from No Action wastewater discharges (456 MLY)	NA	1.1	0.02	.7	1.8
Operation					
Water Availability and Use					
Water source	Municipal Supply	Municipal Supply	Municipal Supply	Municipal Supply	Municipal Supply
Total site water operation requirement (MLY)	967	1,161	971	1,119	1,317
Percent change from No Action water use (967 MLY)	NA	20	0.4	16	36
Percent change from current use (968 MLY)	-0.1	20	0.4	16	36
Water Quality					
Wastewater discharge to the city of Livermore (MLY)	456	558	462	474	582
Percent change from No Action wastewater discharge (456 MLY)	NA	22	1.3	3.9	28
Percent change from current wastewater discharge (400 MLY)	14	40	16	17	46
Floodplain					
Actions in 100-year floodplain	NA	None	None	None	None
Actions in 500-year floodplain	NA	Uncertain	Uncertain	Uncertain	Uncertain

[a] Total water requirements for construction at the Livermore Site are based on a 3-year period for secondary and case fabrication, a 5-year period for nonnuclear fabrications, and a 5-year period for NIF.

[b] No construction water would be used or construction wastewater generated. Total site water use and wastewater discharged would be the same as No Action operation.

[c] NPDES permit is required for stormwater discharges.

Note: NA - not applicable; MLY - million liters per year.

Source: LLNL 1995e; LLNL 1995f; LLNL 1995i:1; appendix I.

TABLE 4.7.3.4–2.—*Potential Changes to Water Resources from Stockpile Stewardship and Management Alternatives at Site 300*

Affected Resource Indicator	No Action Single-Shift Operation 2005	High Explosives Fabrication Three-Shift Operation	Contained Firing Facility
Construction			
Water Availability and Use			
Water source	Ground	Ground	Ground
Total site water operation requirement[a] (MLY)	0[b]	91.2	91.9
Percent change from No Action water use (90 MLY)	0	1.3	2.1
Water Quality			
Wastewater discharge to leach fields and septic systems[c] (MLY)	0[b]	5.8	5.8
Percent change from No Action wastewater discharge (4.4 MLY)	NA	32	32
Percent of leach fields and septic systems capacity (12 MLY)	36.7	48	48
Operation			
Water Availability and Use			
Water source	Ground	Ground	Ground
Total site water operation requirement (MLY)	90	148	92.3
Percent change from No Action water use	NA	65	2.6
Water Quality			
Wastewater discharge to leach fields and septic systems[c] (MLY)	4.4	12.2	4.7
Percent change from No Action discharge to leach fields and septic systems (4.4 MLY)	NA	178	6.8
Percent change from current discharge (4.8 MLY)	-8.3	154	-2.1
Percent of leach fields and septic systems capacity (12 MLY)	36.7	102	39.2
Floodplain			
Actions in 100-year floodplain	NA	None	None
Actions in 500-year floodplain	NA	Uncertain	Uncertain

[a] Total water requirements for construction at Site 300 are based on a 1-year time period for HE fabrication and a 2-year time period for CFF.

[b] No construction water would be used or construction wastewater generated. Total site water use and wastewater discharged would be the same as No Action operation.

[c] NPDES permit is required for stormwater.

Note: NA - not applicable; MLY - million liters per year.

Source: LLNL 1995i:1; LLNL 1995j; appendix J.

Approximately 0.02 MLY (0.005 MGY) of treated wastewater effluent would be released to the city of Livermore Water Reclamation Plant during the modification phase. All discharges would be to the city of Livermore sewer system and monitored to comply with NPDES permits and other requirements.

An additional 3.8 MLY (1 MGY) of public water is needed for operating the nonnuclear fabrication facilities. The estimated 462 MLY (122 MGY) of treated wastewater released to the city of Livermore Water Reclamation Plant during operations would be a 1.2-percent increase over projected wastewater discharges. All discharges would be to the city of

Livermore sewer system and monitored to comply with NDPES permit and other discharge requirements. Adverse impacts to surface water are not expected.

High Explosives Fabrication. During construction and operations of these facilities at Site 300, surface, groundwater, public water supply (Hetch Hetchy Reservoir), or a combination of both, could be used to meet water requirements. If reservoir water is used, withdrawals of 91.2 MLY (24.1 MGY) during construction and modifications of the HE facilities would compose no more than 13 percent of the 693 MLY (183 MGY) capacity of the newly constructed tap line to the Hetch Hetchy Aqueduct. The 5.8 MLY (1.5 MGY) of treated wastewater effluent released to the General Service Area leach fields and septic systems during construction would be 48 percent of the wastewater leach fields and septic systems capacity of 12 MLY (3.2 MGY). All discharges would be monitored to comply with NPDES permit and other discharge requirements. To minimize soil erosion impacts to surface waters, stormwater management and erosion control measures would be implemented. Adverse impacts to surface waters are not expected.

An additional 12.2 MLY (3.2 MGY) of treated wastewater would be released to the General Service Area leach fields and septic systems during operations. The additional wastewater represents a 178-percent increase over current wastewater discharges and exceeds the capacity of the leach fields and septic systems by 2 percent. Additional leach fields or modifications to the septic systems would have to be planned to meet the projected discharges. All discharges would be monitored to comply with permit and other discharge requirements.

Stewardship Alternatives

Proposed National Ignition Facility. Constructing the proposed NIF at the Livermore Site would require approximately 3 MLY (0.79 MGY) of water over the 5-year construction period or a 0.3-percent increase in the projected water requirements of 967 MLY (255 MGY). NIF's construction would require a California General Construction Activity Stormwater Permit, which satisfies the requirements of both the NPDES and State of California stormwater regulations. Construction activities would be expected to have minor to negligible effects on water quality, assuming that a stormwater pollution prevention plan is prepared and implemented to minimize soil erosion, sedimentation, and contamination of stormwater. During construction, the additional 0.4 MLY (0.1 MGY) of wastewater generated would be handled by the existing city of Livermore sewer and treatment system. During operation, the proposed NIF would require approximately 152 MLY (40.2 MGY) of additional water, of which 17.9 MLY (4.7 MGY) would be used for domestic purposes. This amount is approximately 16 percent of the projected amount of the Livermore Site's water use. The proposed NIF operation would not exceed water and wastewater utility capacities.

Proposed Contained Firing Facility. Constructing the proposed CFF would require some excavation and terrain sloping. The direction and volume of existing runoff would not be altered by the proposed site work because all earth work would be accomplished within the same micro-drainage area below the division for adjacent watersheds. To minimize soil erosion impacts, stormwater management and erosion control measures would be implemented. Appendix J provides more detailed analyses of the proposed CFF.

Groundwater

No Action. Under No Action, the relatively small amount of groundwater used for irrigation and cooling tower makeup at the Livermore Site would remain the same. At Site 300, projected water use is expected to remain at the current 90 MLY (23.8 MGY) level. The two existing groundwater supply wells in the southeastern portion of the site are the sole source of this water; however, a tap line from the Hetch Hetchy Aqueduct has been constructed with a capacity of 693 MLY (183 MGY) and is expected to be in operation in the near future. It is not known at this time how much Site 300 will rely on this additional water source. No additional impacts to groundwater quality are anticipated since there are no direct discharges to groundwater.

Management Alternatives

Secondary and Case Fabrication. During modification activities and operation of the secondary and case fabrication facilities at the Livermore Site, water would be obtained from the public suppliers described in section 4.7.2.4. There are no plans for withdrawal from groundwater resources. All process, utility, and sanitary wastewater would be discharged to the city of Livermore sewer systems for treatment at the Livermore Water Reclamation Plant. No adverse impacts to groundwater or groundwater quality are expected.

Nonnuclear Fabrication. During modification activities and operation of the nonnuclear fabrication facilities at the Livermore Site, water would be obtained from the public suppliers described in section 4.7.2.4. There are no plans for withdrawal from groundwater resources. All process, utility, and sanitary wastewater would be discharged to the city of Livermore sewer system for treatment at the Livermore Water Reclamation Plant. No adverse impacts to groundwater or groundwater quality are expected.

High Explosives Fabrication. The groundwater used while constructing and modifying the HE facilities would be approximately equal to current groundwater withdrawals of 90 MLY (23.8 MGY) from Site 300. During construction, no wastewater would be discharged directly to the ground. Adverse impacts to groundwater or groundwater quality are not expected.

Operating the facilities would require an additional 58.2 MLY (15.4 MGY), an approximate 65-percent increase over the projected amount of groundwater withdrawn from the aquifer. As previously mentioned, water could also be obtained from the newly constructed tap line connecting Site 300 to the Hetch Hetchy Aqueduct. This new tap line has a supply capacity of 693 MLY (183 MGY). No wastewater would be discharged directly to groundwater. All discharges to the leach fields and septic systems would be monitored to comply with permit and other discharge requirements. Adverse impacts to groundwater or groundwater quality are not expected.

Sensitivity Analysis. Surface water or surface water quality would not be affected by either the low or high case production scenario for stockpile management alternatives at the Livermore Site and Site 300. Groundwater or groundwater quality is not expected to be impacted by the high or low case production scenario for stockpile management alternatives at the Livermore Site or Site 300.

Stewardship Alternatives

Proposed National Ignition Facility. During construction and operation of the proposed NIF facilities at the Livermore Site, water would be obtained from the public suppliers described in section 4.7.2.4. There would be no withdrawal from groundwater resources. All process, utility, and sanitary wastewater would be discharged to the city of Livermore sanitary sewer system for treatment at the Livermore Water Reclamation Plant. No adverse impacts to groundwater or groundwater quality are expected. Appendix I provides a more detailed analysis of the proposed NIF.

Proposed Contained Firing Facility. During construction and operation of the proposed CFF at Site 300, water would either be obtained from groundwater via the two onsite groundwater supply wells or from public water supply (Hetch Hetchy Aqueduct). An additional 1.9 MLY (0.5 MGY) would be required for construction activities and 2.3 MLY (0.60 MGY) for operation of the proposed CFF. These requirements compose less than a 3-percent increase from projected groundwater use. No adverse impacts to groundwater or groundwater quality are expected. Appendix J provides a more detailed analysis of the proposed CFF.

Combined Program Impacts. The combined Program impacts to water resources if each proposed alternative was implemented at the Livermore Site are shown in table 4.7.3.4–1. During construction approximately 973 MLY (257 MGY) of public supply water would be used. Approximately 1,317 MLY (348 MGY) of public supply water would be required for operation of the facilities; this represents a 36-percent increase from the projected water use. Wastewater discharges during construction and operation of the facilities would total 458 MLY (121 MGY) and 582 MLY (154 MGY), respectively. All wastewater would be discharged to the city of Livermore sewer systems. Adverse impacts to both surface water and groundwater quality are not anticipated.

Potential Mitigation Measures. Additional leach fields or modifications to the septic systems would have to be planned in order to meet the projected HE fabrication wastewater discharges. Reclaiming or recycling wastewater would reduce sanitary discharges and minimize the impact on the existing Site 300 sanitary treatment system.

4.7.3.5 *Geology and Soils*

The alternatives proposed for LLNL would have no adverse impact on geological resources described in section 4.7.2.5. Although a relatively high seismic risk exists at LLNL, this would be considered in the design of any new structures. The existing seismic risk does not preclude safe construction, modification, or operation of any proposed facilities. All new functions, with the exceptions of the proposed NIF and CFF, would be accommodated in existing structures. For the management alternatives, LLNL has sufficient warehousing space, parking space, and yard area to accommodate construction area requirements. Control measures would be used to minimize any soil erosion. Potential changes to geology and soils associated with the proposed alternatives at LLNL are discussed below.

No Action. Under No Action, DOE would continue current and planned activities at LLNL. Any impacts to geology and soils would be independent of and unaffected by the proposed action.

Management Alternatives

Secondary and Case Fabrication. Soil disturbance is not expected during modification of existing buildings for the secondary and case fabrication mission at the Livermore Site. Since facilities needed for the secondary and case fabrication mission already exist, only laydown areas for receiving and staging equipment and construction materials are needed. The Livermore Site has sufficient warehousing space and developed yard area to accommodate this requirement. Offices for construction engineering and management would be provided by plant engineering, or trailers would be located adjacent to facilities undergoing modification. Parking for construction workers is available onsite. Adverse soil impacts are not expected. The construction of a 167-m^2 (1,800-ft^2) steel-framed Butler-type building that is needed to provide covered space within the Superblock protected area would not affect geology or soils.

The potential for surface faulting at the Livermore Site is very low (LL DOE 1992c:4-84). Ground shaking is more likely. Based on the seismic history of the area, a high seismic risk exists but should not preclude safe modification and operation of the proposed facilities. Potential sources of future ground motion at LLNL include the major regional faults and the local faults: Greenville, Las Positas, Verona, Corral Hollow, Carnegie, and Williams (LL DOE 1992c:4-83,4-84). The location of the proposed facilities would be evaluated at the Livermore Site during project-specific studies so that these faults and any associated potential ground rupture would be considered in facilities design. All facilities would be designed for earthquake-generated ground acceleration in accordance with DOE O 420.1 and accompanying safety guides. Potential health impacts from accidents associated with geological hazards are discussed in 4.7.3.9.

High Explosives Fabrication. No significant upgrades to either the HE Applications Facility at the Livermore Site or to Site 300 are anticipated should LLNL receive the HE fabrication mission for the Complex. All production operations would be housed within existing buildings, with the exception of a 116-m^2 (1,250-ft^2) facility for conventional HE storage. Soil disturbances during construction of the new storage facility would be minimal with standard construction erosion control measures.

Based on the seismic history of the area, a high seismic risk exists but should not preclude safe modification and operation of the proposed facilities. Potential sources of future ground motion at Site 300 include the major regional faults and the local faults: Greenville, Las Positas, Corral Hollow, Carnegie, Black Butte, and Midway (LL DOE 1992c:4-87). The location of the proposed facilities would be evaluated at LLNL during project-specific studies so that these faults and any associated potential ground rupture would be considered in facilities design. Surface faulting at Site 300 in areas adjacent to the active Carnegie fault is possible (LL DOE 1992c:4-87). However, no HE facilities are located in these areas. The potential for seismically induced ground deformation at Buildings 826, 851, and 854, located on landslide deposits, is considered to be moderate to high (LL DOE 1992c:4-89). All facilities would be designed for earthquake-generated ground acceleration in accordance with DOE O 420.1 and accompanying safety guides.

Nonnuclear Fabrication. All production operations can be housed within existing buildings at the Livermore Site. Material and equipment laydown and parking areas exist, and no additional areas would be required. Adverse soil impacts are not expected. Seismic risks would be similar to the risks associated with the secondary and case fabrication mission.

Sensitivity Analysis. The high or low case operation scenario for the proposed stockpile management alternatives at LLNL would not affect geology or soils.

Stewardship Alternatives

Proposed National Ignition Facility. The construction and operation of the proposed NIF at the Livermore Site would not adversely affect geological resources. The proposed NIF would require the clearing of an estimated 8.1 ha (20 acres) of land for structures, walkways, building access, and buffer space. Soil impacts during construction would be short term and minor with appropriate standard construction erosion and sediment control measures. Net soil disturbance during operation would be less than for construction because areas temporarily used for material and equipment laydown would be restored. Seismic risks would be taken into account during construction and operation of NIF (see appendix I).

Proposed Contained Firing Facility. Construction of the proposed CFF at LLNL would result in minor soil impacts at Site 300 in the vicinity of the B801 complex. About 36,700 m^3 (48,000 yd^3) of soil surrounding the current facility would be excavated and removed to provide space for the new portion of the facility. Approximately 1.2 ha (3 acres) would be permanently disturbed immediately around the B801 complex as a result of necessary slope contouring and construction of the proposed CFF. Soils exposed by project construction, especially on the hillsides, are considered to be moderately vulnerable to erosion; their clay content provides slightly more resistance to erosion than does the high loam content of entisols, which dominate Site 300 soil types. Erosion, if it occurs, would be minor and short term. Erosion of the small hillsides surrounding the proposed project would not be expected beyond one growing season. Cut hillsides would be sloped and, where local geology allows, revegetated (using hydroseeding) to prevent erosion. The direction and volume of existing runoff would not be altered by the proposed site work because all earthwork would be accomplished within the same micro-drainage area below the division for adjacent watersheds. Dust suppression and stormwater pollution prevention (runoff) mitigation technologies would be applied to reduce these impacts (see appendix J).

Existing B801 site slopes are stable. Unconsolidated overburden is only a few feet thick in the area and bedrock dips at a shallow angle (about 5 degrees) to the northeast. However, a recently active landslide deposit has been observed east of the site within about 244 m (800 ft). This landslide is reported to have generated a mudflow that reached the vicinity of the B801 site during a 15-year period prior to 1983. This mudflow appears to have been mitigated by placement of an earthen fill between the flow and the B801 site. Appropriate slope stabilization measures would be taken in the design and construction of graded slopes (see appendix J).

A number of active faults are considered capable of causing strong ground motion at Site 300. The nearest of these faults to Site 300 is the Carnegie-Corral Hollow fault, which crosses the southwest portion of the site. No significant recorded earthquakes have occurred on any of the local faults. The effect of seismic activity at Site 300 is likely to be confined to ground shaking with no surface displacement. Raber and Carpenter have identified the principal seismic hazard at Site 300 as being the potential for strong ground shaking caused by an earthquake on the Greenville fault, located about 8 km (5 mi) west of Site 300 (see appendix J). Facilities would be designed for earthquake-generated ground acceleration in accordance with DOE O 420.1 and accompanying safety guides.

Potential Mitigation Measures. No mitigation measures for stockpile stewardship and management alternatives at LLNL are anticipated.

4.7.3.6 *Biotic Resources*

The following sections address impacts to terrestrial resources, wetlands, aquatic resources, and threatened and endangered species at LLNL. Construction and operation of the HE Fabrication Facility, proposed CFF, and proposed NIF would result in loss of terrestrial habitat and possible impacts to threatened and endangered species. Temporary impacts to wildlife due to noise and human presence during construction are also possible for most of these alternatives.

No Action. Under No Action, the stockpile stewardship missions described in section 3.2.7 would continue at LLNL. There would be no changes to current biotic resource conditions at the site as described in section 4.7.2.6.

Management Alternatives

Secondary and Case Fabrication. The secondary and case fabrication mission at the Livermore Site would require modification of some existing structures and construction of one Butler-style building. New construction would take place within an area of the Livermore Site that is already developed. Temporary construction laydown and parking would utilize existing warehousing and yard area. Wastewater would be discharged to the sanitary sewer system. Except for some temporary disturbance to wildlife during construction of the new building, no adverse impacts to site biotic resources are expected.

High Explosives Fabrication. Most operations associated with the HE fabrication mission at LLNL would be housed within existing buildings within the B827 Area of Site 300. However, an HE storage area would need to be developed. This facility would be located just southeast of the B827 Area. Impacts to biotic resources are not expected from modification activities conducted at existing buildings. The HE storage area would result in the disturbance of about 0.8 ha (2 acres) of grassland. Proper erosion and sediment control measures would reduce the potential for disturbance of habitat adjacent to the construction area. Construction and operation would result in some disturbance to wildlife living in adjacent areas due to noise and human presence. Impacts to wetlands and aquatic resources would not be expected due to the general lack of these resources in the area. The presence of threatened and endangered species in the area to be disturbed is unknown. Preactivity surveys would be required to determine the occurrence of any special status species including the San Joaquin kit fox *(Vulpes macrotis mutica)*, San Joaquin pocket mouse *(Perognathus inoratus)*, western burrowing owl, *(Athene cunicularia hypugea)*, California horned lizard *(Phrynosoma coronatum frontale)*, and American badger *(Taxidea taxus)*.

Nonnuclear Fabrication. Nonnuclear fabrication mission functions would be located in existing buildings at the Livermore Site. No new construction would be required and wastewater would be released through existing NPDES-permitted discharges. The relocation of the nonnuclear fabrication mission to the Livermore Site would not impact biotic resources.

Sensitivity Analysis. Implementation of either a low or high case workload for the stockpile management alternatives would not effect biological resources of LLNL with the exception of those already described for the proposed HE Fabrication Facility.

Stewardship Alternatives

Proposed National Ignition Facility

Terrestrial Resources. The proposed NIF would be sited on an 8.1-ha (20-acre) area of disturbed grassland located within the Livermore Site. Proper erosion and sediment control measures would reduce the potential for disturbance of habitat adjacent to the construction area. Animal species within the disturbed area would be either destroyed or displaced depending upon whether they were able to move from the area. Wildlife may also be disturbed by the increased level of human activity associated with the project.

Wetlands. The proposed NIF site does not contain, nor is it located near, wetlands. Construction and operation of the proposed NIF is not expected to adversely impact this resource. Proper erosion and sediment control measures would reduce the potential of impacting site wetlands.

Aquatic Resources. Because there are no aquatic resources on the proposed NIF site, this resource would not be disturbed by construction. Proper erosion and sediment control measures would reduce the potential of sediment-laden runoff from reaching site arroyos.

Threatened and Endangered Species. Adverse impacts to special status species would not be expected from construction or operation of the proposed NIF due to the lack of suitable habitat and the disturbed nature of the proposed site.

Proposed Contained Firing Facility

Terrestrial Resources. Construction of the proposed CFF would result in the disturbance of approximately 1.2 ha (3.0 acres) of hillside land adjacent to the present Site 300 B801 complex. While some of the area to be developed has been previously disturbed, some land adjacent to B801 would be impacted. Erosion and sediment control measures would reduce the potential for disturbance of habitat adjacent to the construction area. Animal species within the disturbed area would be either destroyed or displaced depending upon whether they were able to move from the area. Wildlife may also be disturbed by the increased level of human activity associated with the project.

Wetlands. Direct disturbance to wetlands from construction would not occur since there are no wetlands located on the site. However, a cattail wetland (resulting from cooling tower discharge), located about 60 m (197 ft) south-southwest of B801, could be affected by sediment runoff. Erosion and sediment control measures would be used to reduce the risk of indirect impacts to this wetland.

Aquatic Resources. There are no aquatic resources on or near the B801 area; therefore, aquatic resources would not be affected by construction or operation of the proposed CFF.

Threatened and Endangered Species. No known Federal- or state-listed endangered plant or animal species are present within the immediate vicinity of the B801 complex. The potential for impacts to the western burrowing owl and American badger from construction and operation of the proposed CFF are considered minimal. Western burrowing owl dens have become established during periods of road construction south of B801 and during long periods of outdoor explosives testing at the present B801 complex; thus, it is unlikely that construction and operation of the new facility would adversely affect this species. American badgers should not be affected due to the relatively small portion of the species' home range (less than 1 percent) that would be occupied by the project, the large amount of unrestricted land at Site 300, and the transient nature of American badgers. Preactivity surveys for special status species (i.e., San Joaquin kit fox, western burrowing owl, and American badger) would be conducted prior to the start of the project and, if found, appropriate mitigation measures would be implemented.

Potential Mitigation Measures. Minimization of the area to be disturbed, revegetation with native species, and implementation of a soil erosion and sediment control plan would help to lessen short- and long-term impacts to terrestrial species and habitats, as well as wetlands in the vicinity of the proposed CFF. Disturbance to wildlife living adjacent to facilities may be minimized by preventing workers from entering undisturbed areas. It may be necessary to survey the site for the nests of migratory birds prior to construction and to avoid clearing operations during the breeding season. If any threatened or endangered species occur on the site, specific mitigation measures would be developed in conjunction with the USFWS.

4.7.3.7 *Cultural and Paleontological Resources*

For the discussion of impacts, the term cultural resources includes prehistoric, historic, and Native American resources. Cultural and paleontological resources may be affected directly through ground disturbance, building modifications, visual intrusion of the project to the historic setting or environmental context of historic sites, visual and audio intrusions to Native American resources, reduced access to traditional use areas, and unauthorized artifact collecting and vandalism. Some cultural and paleontological resources may be affected by the proposed alternatives.

No Action. Under No Action, DOE would continue the existing and planned missions of the Livermore Site and Site 300. Any impacts to cultural or paleontological resources from these missions would be independent of and unaffected by the proposed action.

Management Alternatives

Secondary and Case Fabrication. The secondary and case fabrication mission at the Livermore Site would involve equipment movement, installation, building modification, and the construction of one 167 m^2 (1,800 ft^2) steel framed Butler-style building within the Superblock protected area. No cultural or paleontological resources are known to exist within the proposed area; however, some resources may be affected by the proposed alternative. NRHP-eligible resources would be identified through project-specific surveys, inventories, and evaluations, and any project-related effects would be addressed in tiered NEPA documentation.

High Explosives Fabrication. LLNL maintains most of the facilities necessary for HE fabrication within the B827 area of Site 300. An HE storage area would need to be developed. The proposed facility would be located to the southeast of the B827 area. About 0.8 ha (2 acres) would be disturbed during construction. Site 300 has been surveyed and does contain prehistoric and historic resources. Additional resources may exist in the acreage to be disturbed during construction. Some Native American and paleontological resources may also be affected. Project-specific evaluations and any project-related effects would be addressed in tiered NEPA documentation. No impacts to cultural or paleontological resources are expected. Sharing this mission with LANL would have no effects on cultural or paleontological resources at LLNL.

Nonnuclear Fabrication. The nonnuclear fabrication mission at LLNL would involve equipment movement, installation, and some modification to existing buildings. Some NRHP-eligible historic buildings may be affected under this alternative. NRHP-eligible resources would be identified through project-specific inventories and evaluations, and any project-related effects would be addressed in tiered NEPA documentation. No impacts are expected to prehistoric, Native American, or paleontological resources.

Sensitivity Analysis. The secondary and case, HE, and nonnuclear alternatives high and low case production scenarios would have the same impacts to cultural and paleontological resources as the base case production facilities.

Stewardship Alternatives

Proposed National Ignition Facility. The proposed alternative would require the construction of two buildings and the development of 8.1 ha (20 acres) of currently undeveloped land at the Livermore Site. No prehistoric or historic resources exist on the proposed location for NIF at the Livermore Site. Six to 13 m (2 to 4 ft) of fill cover the proposed location, which is underlain by soils deposited approximately 15,000 years ago. These soils predate the earliest documented human settlement in the area, and it is unlikely that these soils contain prehistoric materials. Paleontological remains have not been recovered from the soils. Consultation is in progress with Native American groups to identify any important cultural resources on the Livermore Site (appendix I).

Proposed Contained Firing Facility. Under this alternative, 36,701 m^3 (48,000 yd^3) of soils surrounding the existing B801 facility at Site 300 would be excavated. A surface survey conducted in 1981 recorded one prehistoric site 394 m (1,300 ft) from the proposed project area. Additional NRHP-eligible prehistoric and historic sites may exist in the area. Should culturally significant materials be encountered during construction, work would stop until the discovery could be evaluated by a qualified archaeologist. Some paleontological resources with moderate research potential exist within Site 300 and may be affected by the proposed action. Consultation is in progress with Native American groups to identify any important cultural resources on Site 300 (appendix J).

Potential Mitigation Measures. If NRHP-eligible resources cannot be avoided through project design or siting, and would result in adverse impacts, then a Memorandum of Agreement would need to be negotiated between DOE, the California SHPO, and the Advisory Council on Historic Preservation. The Memorandum of Agreement would formalize mitigation measures agreed to by these consulting parties. Mitigation measures could include describing and implementing intensive inventory and evaluation studies, data recovery plans, site treatments, and monitoring programs. The appropriate level of data recovery for mitigation would be determined through consultation with the California SHPO and the Advisory Council on Historic Preservation, in accordance with Section 106 of the *National Historic Preservation Act*. Mitigation measures for specific NRHP-eligible sites would be identified during tiered NEPA documentation.

If Native American resources cannot be avoided through project design or siting, then acceptable mitigation measures to reduce project effects on them would be determined in consultation with the affected Native American groups. In accordance with the *Native American Graves Protection and Repatriation Act* and the *American Indian Religious Freedom Act*, such mitigations may include, but would not be limited to, appropriately relocating human remains, planting vegetation screens to reduce visual or noise intrusion, increasing access to traditional use areas during operations, or transplanting or harvesting important Native American plant resources.

Because scientifically important buried paleontological materials could be affected, paleontological monitoring of construction activities and data recovery of fossil remains would be appropriate mitigation measures.

4.7.3.8 *Socioeconomics*

No Action. Under No Action, the existing stewardship R&D missions would remain operational at LLNL. No new employment or in-migration of workers would be required. Projected regional economy and employment levels, population and housing changes, and public finance characteristics are presented in appendix D.

Regional Economy and Employment. Total employment in the regional economic area is projected to increase by about 2 percent annually between 1996 and 2000, and reach approximately 4,621,900 in 2000. Long-range projections show employment growth continuing at this rate until 2020 when annual growth falls to less than 1 percent. Total employment is projected to number 6,555,300 in 2030. No Action employment at LLNL is projected to reach 8,189 by 2005. Unemployment in the regional economic area was 7.6 percent in 1994 and is expected to remain near that level into the near future. Per capita income is projected to increase from approximately $27,215 to $41,570 between 1996 and 2030.

Population and Housing. Annual ROI county and city population and housing growth is projected to average about 2 percent from 1995 to 2000, but then slow to 1 percent between 2000 and 2030. The ROI population is projected to increase from 2,841,200 in 1995 to 4,421,000 in 2030. The total number of housing units is projected to increase from 1,074,200 to 1,671,600 during the same period.

Public Finance. Between 2000 and 2005, all ROI county, city, and school district total revenues are projected to increase at an annual average of less than 1.8 percent. Total expenditures are projected to increase at an annual average of less than 1.4 percent during the same period. These rates of increase should continue until 2030.

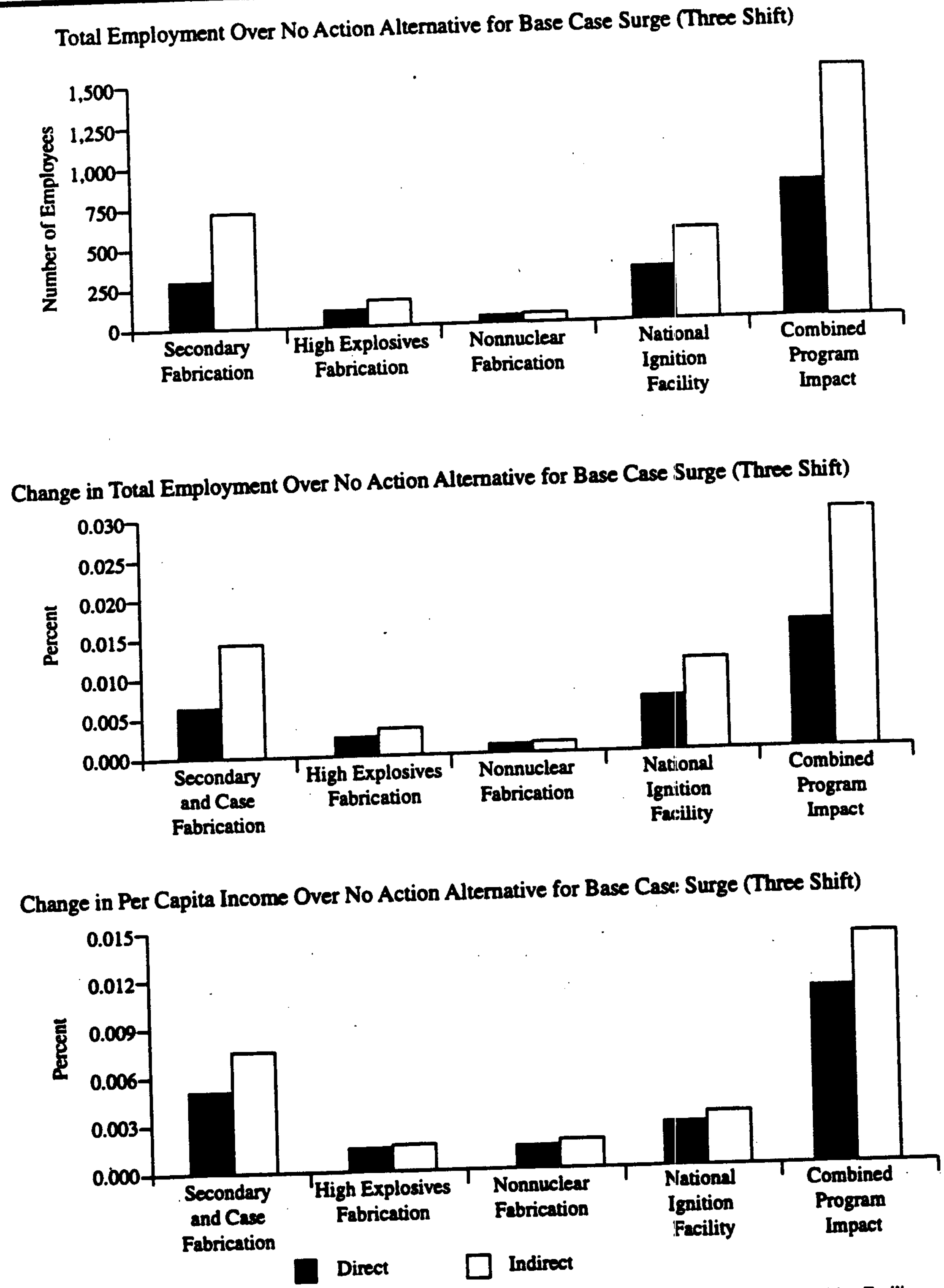
Management Alternatives

Secondary and Case Fabrication

Regional Economy and Employment. During peak construction, the modification and renovation of these facilities would employ 130 workers during 2000, the peak year of construction, and generate an additional 194 indirect jobs in the regional economy. Total employment in the regional economic area would increase by less than 1 percent from the No Action projections. There would be no perceptible change in either the regional economic area per capita income or the unemployment rate.

Although operation of the facility would require a larger and more permanent workforce than construction, resulting increases to the regional economic area's employment and income would still be less than 1 percent. During operation of the facility, the creation of 290 direct jobs at LLNL would generate 722 indirect jobs in other industries in the region. Because so few jobs are generated relative to the large regional economic area, the unemployment rate would remain unchanged from the No Action level of 7.6 percent. See figure 4.7.3.8–1.

Population and Housing. Sufficient available labor within the region eliminates the need for any in-migrant workers to fill direct or indirect jobs created as a result of this alternative; therefore, housing and population would remain the same as under the No Action alternative.



Note: No Action projections are baseline for comparing proposed alternatives; base case surge does not apply to National Ignition Facility operation.

Source: Socio 1996b.

FIGURE 4.7.3.8–1.—*Employment and Income Changes Resulting from Stewardship and Management Alternatives in the Lawrence Livermore National Laboratory Regional Economic Area, 2005.*

Public Finance. Construction and operation of the Secondary and Case Fabrication Facility would not require in-migrating workers. Therefore, changes to local finances compared to No Action projections would be attributed to income increases and would be negligible.

High Explosives Fabrication. The HE fabrication alternative would involve the transfer of HE fabrication functions from Pantex to LLNL. A variation of this alternative would divide the HE mission between LANL and LLNL. This latter option would require a smaller workforce at each of the receiving sites than if the entire mission were transferred to one laboratory. The regional economy would still benefit, but on a smaller scale than described below.

Regional Economy and Employment. During peak construction a total of 47 jobs (19 direct and 28 indirect) would be generated in the region. Total employment in the regional economic area would increase by less than 1 percent. There would be no perceptible change in either the regional economic area per capita income or unemployment rate.

Although operation of the facility would have a greater impact on the regional economic area's employment and income because of a larger required workforce, the resulting increases would still constitute a less than 1 percent increase from the No Action alternative. Operations would generate a total of approximately 255 jobs (100 direct and 155 indirect) in the region, too small a number to affect the unemployment rate in such a large urban regional economic area. See figure 4.7.3.8–1.

Population and Housing. Because all direct and indirect jobs created as a result of transferring the HE fabrication mission to LLNL would be filled by the available labor force within the regional economic area, housing and population would remain the same as in the No Action alternative.

Public Finance. Construction and operation of the HE Fabrication Facility would not require in-migrating workers. Therefore, changes to local finances compared to No Action projections would be due to income increases and would be negligible.

Nonnuclear Fabrication

Regional Economy and Employment. During peak modification activities a total of 15 jobs (6 direct and 9 indirect) would be generated. Changes in the regional economic area's employment would be less than 1 percent. There would be no perceptible change in either the regional economic area per capita income or the unemployment rate.

Although operations would have a greater impact on the regional economic area's employment, because of the larger workforce, the resulting increases in both employment and income would still be less than 1 percent. Operation of the facility would generate a total of about 131 jobs (60 direct and 71 indirect) in the region, too small a number to affect unemployment in such a large urban regional economic area. This is shown in figure 4.7.3.8–1.

Population and Housing. Projections indicate that available labor within the regional economic area would be sufficient to fill all direct and indirect jobs created by both modification and operation of the facility. Therefore, housing demand and population growth would remain unchanged from No Action projections.

Public Finance. Construction and operation of the Nonnuclear Fabrication Facility would not require in-migrating workers. Therefore, changes to local finances compared to No Action projections would be due to income increases and would be negligible.

Sensitivity Analysis. Construction employment requirements for the low case secondary and case fabrication mission at LLNL are the same as for the base case surge discussed above. Therefore, the socioeconomic impacts on the region from the construction would also be the same. Construction to meet the high case production scenario would require 10 additional workers. However, the socioeconomic effects on the region would remain essentially unchanged from the base case surge level. Employment requirements for operation under the low case production scenario would be less than for the base case surge. Accordingly, the economic benefits would also be smaller than projected for the base case surge level.

High case operation of the Secondary and Case Fabrication Facility would require more workers than base case surge operation. However, the expected changes to the total regional economic area employment would still be less than 1 percent. Some of these additional workers would have to in-migrate to the regional economic area to fill specific employment requirements. Population would increase slightly, as would housing demand. However, these population increases would also be less than 1 percent and would be readily accommodated by projected vacancies within the housing stock.

Construction employment requirements for the high or low case HE fabrication and nonnuclear fabrication missions at LLNL are the same as for the base case surge level discussed above. Therefore, the socioeconomic impacts on the region from construction would also be the same.

During full operation, employment requirements for the base case surge of these alternatives would equal or exceed employment needs for the high and low cases. The region would still benefit economically from the high or low case, but on a smaller scale than from the base case surge due to a smaller workforce.

Stewardship Alternatives

Proposed National Ignition Facility. The following is a summary of the socioeconomic effects of construction of the proposed NIF at LLNL. See appendix I for a more detailed, project-specific discussion.

Regional Economic Impacts. Construction of the proposed NIF would require 470 construction workers during the peak year of construction and would generate an additional 2,400 indirect jobs in the regional economic area. Employment for operation would begin phasing in as the construction phase neared completion. Operation of the facility would require 330 direct workers and would generate an additional 560 indirect jobs in the regional economic area. Construction and operation of the proposed NIF would have only minimal affects on the regional economy and employment. During both phases there would be no perceptible change in the unemployment rate attributable to the proposed project, and changes to per capita income would be less than 1 percent.

Population and Housing. Both construction and operation of the facility would require workers and their families to in-migrate to the ROI. Population increases would total about 1,600 during construction and 350 during operation. This in-migration would cause a slight increase in the housing demand during both periods. However, the demand for additional housing during construction would absorb less than 2 percent of the projected vacant housing stock in the ROI. The increase in demand during operations would be much smaller and have no effect in the housing market.

Public Finance. Both revenues and expenditures would increase as a result of the construction and operation of the proposed NIF. Increases due to construction would peak in 1998 and then decline as construction nears completion in 2002. Increases due to operation of the facility would peak in 2003 and continue through the duration of NIF operation.

Proposed Contained Firing Facility. There are no identified effects over No Action to the socioeconomics of the LLNL regional economic area as a result of the modification activities or operation of CFF.

Combined Program Impacts. If the secondary and case fabrication, HE fabrication, nonnuclear fabrication, and NIF missions were all located at LLNL, the resulting benefits to the regional economy would be greater than from any one mission. However, the changes in regional total employment and per capita income would still be less than 1 percent. This is shown in figure 4.7.3.8–1. There would be sufficient labor available in the projected labor force to fill any employment requirements, and population and housing would remain as projected in the No Action alternative.

Potential Mitigation Measures. Adding any new missions to LLNL would create new jobs and generally benefit the local economy through increased earnings in the ROI. Because the effects on population and housing markets are so slight relative to the size of the region, and are generally perceived to be beneficial, no mitigation measures would be necessary.

4.7.3.9 *Radiation and Hazardous Chemical Environment*

This section describes the radiological and hazardous chemical releases and their associated impacts, which could result from No Action and the proposed alternatives at LLNL. Within this section, impacts resulting from the base case scenario are quantitatively discussed, and a sensitivity analysis of the high and low case scenarios is qualitatively discussed.

Summaries of the prevailing radiological impacts to the public and to workers associated with normal operation at LLNL are presented in tables 4.7.3.9–1 through 4.7.3.9–4. Radiological accident impacts are presented in figure 4.7.3.9–1 and in tables 4.7.3.9–5 through 4.7.3.9–9. The impact assessment methodology is described in section 4.1.9 and further supplementary methodological information is presented in appendixes E and F.

Normal Operation. There would be no radiological releases during the construction or modification of any facilities to support the Stockpile Stewardship and Management Program. However, limited hazardous chemical releases (e.g., small spills of diesel fuel and from equipment refueling) may occur because of construction activities for the base case scenario and may increase slightly for the high case scenario. The concentration of these releases is expected to be well within the regulated exposure limits and would not result in any adverse health effects.

Water from processes containing hazardous chemicals is not discharged directly into surface water or groundwater that serves as potable water. Process water that may contain hazardous chemicals is treated before discharge. Furthermore, discharges of wastewater through NPDES-permitted outfalls, which can be attributed to the activities associated with normal operation and operation of the stockpile stewardship and management alternatives at LLNL are expected to be below NPDES limits. Water quality would not be adversely affected. Thus, the primary pathway considered for the public and the onsite worker is the air pathway.

For normal operation at LLNL, all possible hazardous chemicals were examined for further analysis based on their toxicity, concentration, and frequency of use. The HI is a summation of the HQ for all chemicals. The HQ is the value used as an assessment of noncancer toxic effects of chemicals (e.g., kidney or liver dysfunction). It is independent of cancer risk, which is calculated only for those chemicals identified as carcinogens. The HI was calculated for the No Action chemicals and all alternative chemicals, proposed to be added (the increment) at the site, to yield cumulative levels for the site. An HI of ≤1.0 indicates that all noncancer exposure values meet OSHA standards; if the cancer risk is ≤ $1x10^{-6}$ (the default value, not a regulatory standard), no further analysis is indicated. A cancer risk of $1x10^{-6}$ is considered acceptable by EPA (40 CFR 300.430) because this incidence of cancers cannot be distinguished from the cancer risk for an individual member of the population. Information pertaining to OSHA-regulated exposure limits and toxicity profiles for all hazardous chemicals described in this PEIS may be found in the *Chemical Health Effect Technical Reference* (TTI 1996b).

No Action

Radiological Impacts. Radiological impacts to the public resulting from the No Action alternative are presented in tables 4.7.3.9–1 and 4.7.3.9–2 for the Livermore Site and Site 300, respectively. These impacts are representative of the aggregated total which is estimated to exist from all future baseline operational contributions. Total impacts are provided to compare to applicable regulations governing total site operations. To place doses to the public from the No Action alternative into perspective, comparisons are made to natural background radiation. As shown in tables 4.7.3.9–1 and 4.7.3.9–2, the total dose to the maximally exposed member of the public from annual total site operations is within radiological limits and would be 0.065 mrem for the No Action alternative at the Livermore Site and 0.080 mrem at Site 300. The annual population dose within 80 km (50 mi) in 2030 would be 0.76 person-rem at the Livermore Site and 0.17 person-rem at Site 300.

Total site doses to onsite workers from normal operation for the No Action alternative are presented in table 4.7.3.9–3 for the Livermore Site and table 4.7.3.9–4 for Site 300. The estimated annual dose to the entire facility workforce for this alternative would be 18 person-rem at the Livermore Site and 0.42 person-rem at Site 300.

TABLE 4.7.3.9–1.—*Potential Radiological Impacts to the Public Resulting from Normal Operation of Stockpile Stewardship and Management Alternatives at the Livermore Site*

Affected Environment	No Action Total Site	Secondary and Case Fabrication Three-Shift Operation Total Site[b]	National Ignition Facility Total Site[b]	Combined Program Impacts[a] Total Site[b]
Maximally Exposed Individual (Public)				
Atmospheric Release				
Dose[c] (mrem/yr)	0.065	1.3	0.17	1.4
Percent of natural background[d]	0.021	0.42	0.058	0.44
25-year fatal cancer risk	8.1×10^{-7}	1.6×10^{-5}	2.1×10^{-6}	1.7×10^{-5}
Liquid Release				
Dose[c] (mrem/yr)	0	0	0	0
Percent of natural background[d]	0	0	0	0
25-year fatal cancer risk	0	0	0	0
Atmospheric and Liquid Releases				
Dose[c] (mrem/yr)	0.065	1.3	0.17	1.4
Percent of natural background[d]	0.021	0.42	0.058	0.44
25-year fatal cancer risk	8.1×10^{-7}	1.6×10^{-5}	2.1×10^{-6}	1.7×10^{-5}
Population Within 80 Kilometers				
Atmospheric and Liquid Releases in 2030				
Dose (person-rem)	0.76	1.6	0.96	1.8
Percent of natural background[d]	3.3×10^{-5}	6.9×10^{-5}	4.2×10^{-5}	7.7×10^{-5}
25-year fatal cancers	9.4×10^{-3}	0.020	0.012	0.023

[a] Conservative assumption poses existence of maximally exposed individual at multiple locations simultaneously.
[b] Includes impacts from No Action.
[c] The applicable radiological limits for an individual member of the public from total site operations are 10 mrem/yr from the air pathways, 4 mrem/yr from the drinking water pathway, and 100 mrem/yr from all pathways combined (DOE Order 5400.5).
[d] Natural background radiation levels to average individual is 300 mrem/yr; to the population within 80 km (50 mi) in 2030 it is 2,353,000 person-rem.
Source: LLNL 1994a; LLNL 1995c; appendix I.

Based on the radiological impacts associated with normal operation under the No Action alternative, all resulting doses are within radiological limits and would be well below levels of natural background radiation. The associated risks of adverse health effects to the public and to workers would be small.

Hazardous Chemical Impacts. Hazardous chemical impacts to the public resulting from normal operation under No Action at LLNL are presented below. Analyses to support the values presented in this section are provided in appendix table E.3.4–20. This PEIS does not purport to provide the level of detail needed to go beyond a conservative screening process for hazardous chemicals. As such, the analysis in this PEIS for the No Action alternative should not be relied upon as a basis for judging the sites as having a hazardous chemical health concern. The model used to calculate HI and cancer risk in this PEIS only establishes a baseline for comparison of alternatives among sites. The baseline is then used to determine the extent by which each alternative adds or subtracts from the No Action HI and cancer risk to the public at each site.

The HI for the maximally exposed member of the public at LLNL resulting from normal operation under the No Action alternative would be 1.34, and the cancer risk would be 4.55×10^{-7}. The HI for the onsite worker would be 2.39, and the cancer risk would be 4.53×10^{-6}.

The HIs for the public (1.34) and the onsite worker narrowly exceed the cumulative HQ screening level of 1.0 (the HI) as a result of the total emissions of over 100 of 130 hazardous chemicals listed in appendix table E.3.4–20 under the No Action alternative. Individual OSHA standards for specific effects were not necessarily exceeded. However, if reanalyzed according to organ/tissue specific effects (i.e.,

TABLE 4.7.3.9–2.—*Potential Radiological Impacts to the Public Resulting from Normal Operation of Stockpile Stewardship Alternatives at Site 300*

Affected Environment	No Action Total Site	Contained Firing Facility Total Site[b]	Combined Program Impacts[a] Total Site[b]
Maximally Exposed Individual (Public)			
Atmospheric Release			
Dose[c] (mrem/yr)	0.080	0.12	0.12
Percent of natural background[d]	0.026	0.039	0.039
25-year fatal cancer risk	9.9×10^{-7}	1.5×10^{-6}	1.5×10^{-6}
Liquid Release			
Dose[c] (mrem/yr)	0	0	0
Percent of natural background[d]	0	0	0
25-year fatal cancer risk	0	0	0
Atmospheric and Liquid Releases			
Dose[c] (mrem/yr)	0.080	0.12	0.12
Percent of natural background[d]	0.026	0.039	0.039
25-year fatal cancer risk	9.9×10^{-7}	1.5×10^{-6}	1.5×10^{-6}
Population Within 80 Kilometers			
Atmospheric and Liquid Releases in 2030			
Dose (person-rem)	0.17	0.49	0.49
Percent of natural background[d]	7.4×10^{-6}	2.1×10^{-5}	2.1×10^{-5}
25-year fatal cancers	2.1×10^{-3}	6.1×10^{-3}	6.1×10^{-3}

[a] Conservative assumption poses existence of maximally exposed individual at multiple locales simultaneously.
[b] Includes impacts from No Action.
[c] The applicable radiological limits for an individual member of the public from total site operations are 10 mrem/yr from the air pathways, 4 mrem/yr from the drinking water pathway, and 100 mrem/yr from all pathways combined (DOE Order 5400.5).
[d] Natural background radiation levels: to average individual is 300 mrem/yr; to the population within 80 km (50 mi) in 2030 it is 2,353,000 person-rem.
Source: LLNL 1994a; appendix J.

after second stage analysis), it is very likely that the HIs would prove acceptable. The cancer risks for the onsite worker (4.53×10^{-6}) narrowly exceed the EPA default value as a result of the emissions of 1,1-dichloroethylene, 1,4-dioxane, arsenic, benzene, cadmium, carbon tetrachloride, chloroform, chromium VI, epichlorohydrin, folpet, methylene chloride, nickel, and trichloroethylene.

Management Alternatives

Secondary and Case Fabrication

Radiological Impacts. Radiological impacts to the public resulting from the secondary and case fabrication alternative are presented in table 4.7.3.9–1. These impacts are representative of the aggregate total which is estimated to exist from all future baseline operational Livermore Site contributions and from three-shift base case operations for secondary and case fabrication at the site. Total impacts are provided to compare to applicable regulations governing total site operations. To place doses to the public from this alternative into perspective, comparisons are made to natural background radiation. As shown in table 4.7.3.9–1, the total dose to the maximally exposed member of the public from annual total site operations is within radiological limits and would be 1.3 mrem for this alternative. The annual population dose within 80 km (50 mi) in 2030

TABLE 4.7.3.9–3.—***Potential Radiological Impacts to Workers Resulting from Normal Operation of Stockpile Stewardship and Management Alternatives at the Livermore Site***

Affected Environment	No Action	Secondary and Case Fabrication Three-Shift Operation	National Ignition Facility	Combined Program Impacts
Involved Workforce[a]				
Average worker dose[b] (mrem/yr)	NA	2.2	30	NA
25-year fatal cancer risk	NA	2.2×10^{-5}	3.0×10^{-4}	NA
Total dose (person-rem/yr)	NA	0.55	8.0	8.6
Noninvolved Workforce[c]				
Average worker dose[b] (mrem/yr)	2.1	2.1	2.1	2.1
25-year fatal cancer risk	2.1×10^{-5}	2.1×10^{-5}	2.1×10^{-5}	2.1×10^{-5}
Total dose (person-rem/yr)	18	18	18	18
Total Site Workforce[d]				
Dose (person-rem/yr)	18	19	26	27
25-year fatal cancers	0.18	0.19	0.26	0.27

[a] The involved worker is a worker associated with operation of the secondary and case fabrication or NIF. The dose presented for the involved workforce is only that incremental dose received from the secondary and case fabrication mission or NIF. The total dose received by the involved workforce would be higher than that received by the noninvolved workforce from these operations. The estimated number of involved workers is 250 for secondary and case fabrication and 267 for NIF.

[b] The radiological limit for an individual worker is 5,000 mrem/yr (10 CFR 835).

[c] The noninvolved worker is an onsite worker onsite but not associated with operation of the secondary and case fabrication or NIF facilities. The estimated number of noninvolved workers at the Livermore Site is 8,200 for secondary and case fabrication, and for NIF.

[d] The total site workforce is the sum of the number of involved and noninvolved workers. The estimated number of badged workers in the total site workforce at the Livermore Site is 8,200 for No Action, 8,467 for NIF, and 8,450 for secondary and case fabrication.

Note: NA - not applicable.

Source: DOE 1993n:7; LLNL 1995c; appendix I.

TABLE 4.7.3.9–4.—***Potential Radiological Impacts to Workers Resulting from Normal Operation of Stockpile Stewardship Alternatives at Site 300***

Affected Environment	No Action	Contained Firing Facility	Combined Program Impacts
Involved Workforce[a]			
Average worker dose[b] (mrem/yr)	NA	<250	NA
25-year fatal cancer risk	NA	$<2.5 \times 10^{-3}$	NA
Total dose (person-rem/yr)	NA	<0.75	<0.75
Noninvolved Workforce[c]			
Average worker dose[b] (mrem/yr)	2.1	<5.2	NA
25-year fatal cancer risk	2.1×10^{-5}	$<5.2 \times 10^{-5}$	NA
Total dose (person-rem/yr)	0.42	<1.0	<1.5
Total Site Workforce[d]			
Dose (person-rem/yr)	0.42	<1.8	<2.3
25-year fatal cancers	4.2×10^{-3}	<0.018	<0.023

[a] The involved worker is a worker associated with operation of CFF. The estimated number of involved workers is three for the proposed CFF.

[b] The radiological limit for an individual worker is 5,000 mrem/yr (10 CFR 835). The average worker is assumed to receive the same dose at Site 300 as at the Livermore Site complex.

[c] The noninvolved worker is an onsite worker not associated with operation of CFF. The estimated number of noninvolved workers at Site 300 is 200.

[d] The total site workforce is the sum of the number of involved and noninvolved workers. The estimated number of badged workers in the total site workforce at Site 300 is 203.

Note: NA - not applicable.

Source: DOE 1993n:7; appendix J.

would be 1.6 person-rem. Total site doses to onsite workers from normal operation for the secondary and case fabrication mission are presented in table 4.7.3.9–3. The average annual dose to involved workers for this alternative would be 2.2 mrem. The dose to the entire facility workforce (involved workforce) would be 0.55 person-rem. As stated in the methodology section 4.1.9, all worker doses were referenced from the Radiation Exposures for DOE and DOE Contractor Employees 1992 Database which reports doses for similar types of operations. The presented noninvolved worker impacts were not modeled due to the unavailability of certain site-specific information. There may also be small risks to construction workers who are involved with tasks that are in close proximity to potentially contaminated areas.

Hazardous Chemical Impacts. Hazardous chemical impacts for the public and for the onsite worker resulting from normal operation of the secondary and case fabrication alternative at the Livermore Site are presented below. The HI and cancer risk would remain constant over 25 years of operation provided exposures remain the same. Analyses to support the values presented in this section are provided in appendix table E.3.4–21.

The incremental HI for the maximally exposed member of the public would be 8.97×10^{-3}, and the incremental cancer risk would be zero as a result of the secondary and case fabrication mission at the Livermore Site. The incremental HI for the onsite worker would be 6.16×10^{-3}, and the incremental cancer risk would be zero as a result of the secondary and case fabrication mission.

Total site operations and the incremental effects of the secondary and case fabrication mission would result in the HIs for the public (1.35) and the onsite worker (2.40) narrowly exceeding the cumulative HQ screening level of 1.0 (the HI), but not necessarily exceeding the individual OSHA standards for specific effects. The cancer risks for the public (3.80×10^{-7}) are within the EPA default value of concern of 1×10^{-6}. The cancer risks to the onsite worker (4.53×10^{-6}) narrowly exceed the EPA default value.

The HI for the public and the onsite worker exceeds the cumulative HQ screening level of 1.0 (the HI) as a result of the total emissions of over 100 of 130 hazardous chemicals due to No Action total site operations at LLNL. The individual OSHA standards for specific effects were not necessarily exceeded. However, if reanalyzed according to organ/tissue specific effects (i.e., after second stage analysis), it is very likely that the HIs would prove acceptable. The cancer risks for the onsite worker exceed the EPA default value as a result of the No Action emissions of 1,1-dichloroethylene; 1,4-dioxane; arsenic; benzene; cadmium; carbon tetrachloride; chloroform; chromium VI; epichlorohydrin; folpet; methylene chloride; nickel; and trichloroethylene.

High Explosives Fabrication

Radiological Impacts. There are no radiological impacts associated with this alternative.

Hazardous Chemical Impacts. Hazardous chemical impacts for the public and for the onsite worker resulting from normal operation of the HE fabrication alternative at LLNL are presented below. The HI and cancer risk would remain constant over 25 years of operation provided exposures remain the same. Analyses to support the values presented in this section are provided in appendix table E.3.4–22.

The incremental HI for the maximally exposed member of the public would be 1.42×10^{-3}, and the incremental cancer risk would be 8.47×10^{-10} as a result of the HE fabrication mission at LLNL. The incremental HI for the onsite worker would be 5.62×10^{-4}, and the incremental cancer risk would be 8.43×10^{-9} as a result of the HE fabrication mission.

Total site operations and the incremental effect of the HE fabrication mission would result in the HIs for the public (1.34) and the onsite worker (2.39) narrowly exceeding the cumulative HQ screening level of 1.0 (the HI), but not necessarily exceeding the individual OSHA standards for specific effects. The cancer risk for the public is within the EPA default value of 1×10^{-6}. The cancer risk to the onsite worker (1.79×10^{-6}) narrowly exceeds the EPA default value.

The HI for the public and the onsite worker exceeds the cumulative HQ screening level of 1.0 (the HI) as a result of the total emissions of over 100 of 130 hazardous chemicals due to No Action total site operations at LLNL. Individual OSHA standards for specific effects were not necessarily exceeded. However, if reanalyzed according to organ/tissue specific effects (i.e., after second stage analysis), it is very likely that the HIs would prove acceptable. The cancer risk for the onsite worker exceeds the EPA default value as a result of the No Action emissions of 1,1-dichloroethylene; 1,4-dioxane; arsenic; benzene; cadmium; carbon tetrachloride; chloroform; chromium VI; epichlorohydrin; folpet; methylene chloride; nickel; and trichloroethylene.

Sharing of the HE fabrication mission with LANL would be expected to reduce emissions of hazardous chemicals by up to 50 percent. Therefore, HI and cancer risk impacts may be reduced up to 50 percent, and the cancer risk could drop to approximately 1×10^{-6}.

Nonnuclear Fabrication

Radiological Impacts. There are no radiological impacts associated with this alternative.

Hazardous Chemical Impacts. Hazardous chemical impacts for the public and for the onsite worker resulting from the normal operation of the nonnuclear fabrication alternative at the Livermore Site are presented below. The HI and cancer risk would remain constant over 25 years of operation provided exposures remain the same. Analyses to support the values presented in this section are provided in appendix table E.3.4–23.

The incremental HI for the maximally exposed member of the public would be 4.94×10^{-5}, and the incremental cancer risk is zero as a result of the nonnuclear fabrication alternative at the Livermore Site. The incremental HI for the onsite worker would be 1.20×10^{-6}, and the incremental cancer risk would be zero as a result of the nonnuclear fabrication mission.

Total site operations and the incremental effects of the nonnuclear fabrication mission would result in the HIs for the public (1.34) and the onsite worker (2.39) narrowly exceeding the cumulative HQ screening level of 1.0 (the HI), but not necessarily exceeding individual OSHA standards for specific effects. The cancer risk for the public (4.55×10^{-7}) is within the EPA default value of 1×10^{-6}. The cancer risk for the onsite worker (4.53×10^{-6}) narrowly exceeds the EPA default value.

The HIs for the public and the onsite worker exceed the cumulative HQ screening level of 1.0 (the HI) as a result of the total emissions of over 100 of 130 hazardous chemicals due to No Action and total site operations at the Livermore Site. However, if reanalyzed according to organ/tissue specific effects (i.e., after second stage analysis), it is very likely that the HIs would prove acceptable. The cancer risk to the onsite worker exceeds the EPA default value as a result of the No Action emissions of 1,1-dichloroethylene; 1,4-dioxane; arsenic; benzene; cadmium; carbon tetrachloride; chloroform; chromium VI; epichlorohydrin; folpet; methylene chloride; nickel; and trichloroethylene.

Sensitivity Analysis. Radiological impacts may be subject to certain degrees of variance resulting from either high or low case operations for secondary and case fabrication. For the high case scenario, total impacts to both the public and worker would be similar to the three-shift base case operations. For the low case scenario, impacts to the public and site workforce would be expected to fall within the increment (range) projected between the No Action and the secondary and case fabrication alternatives (less than 1.2 mrem/year to the maximally exposed individual, less than 0.84 person-rem/year to the population, and less than 1 person-rem/year to the total site workforce).

Based on the radiological impacts associated with normal operation of this alternative, all resulting doses would be within radiological limits and are well below levels of natural background radiation. The associated risks of adverse health effects to the public and to workers would be small.

Operations under the low case scenario for secondary and case, HE, and nonnuclear fabrication are not expected to appreciably affect hazardous chemical emissions at LLNL and, therefore, would not adversely affect the HI impacts and cancer risks for the public and the onsite worker.

Operations under the high case scenario for secondary and case fabrication may result in up to a two- to four-fold increase in the emission of hazardous chemicals at LLNL. Chemical emissions under the high case scenario may substantially increase the HI impact to the public and raise the HI for the onsite worker above the cumulative HQ screening level of 1.0 (the HI), but not necessarily the individual OSHA standards for specific effects. Cancer risks for the public are below the EPA default value, but operations under the high case scenario may increase cancer risks above the EPA default value. Since cancer risks for the onsite worker already exceed the EPA default value, operations under the high case scenario would further contribute to the adverse cancer risk impacts.

Operations under the high case scenario for HE fabrication may result in up to a two-fold increase in the emission of hazardous chemicals at LLNL. Chemical emissions under the high case scenario may increase the HI impact for the public and raise the HI for the onsite worker above the cumulative HQ screening level of 1.0 (the HI), but not necessarily the individual OSHA standards for specific effects. Cancer risks for the public are below the EPA default value, but operations under the high case scenario may increase cancer risks above the EPA default value. Since cancer risks for the onsite worker already exceed the EPA default value, operations under the high case scenario would further contribute to the adverse cancer risk impacts.

Operations under the high case scenario for nonnuclear fabrication may result in up to a 2.5-fold increase in the emissions of hazardous chemicals at LLNL. Chemical emissions under the high case scenario would further adversely affect the HI impact for the public and raise the HI for the onsite worker above the cumulative HQ screening level of 1.0 (the HI), but not necessarily the individual OSHA standards for specific effects. The HI might still be acceptable upon reanalysis according to organ/tissue specific effects. Cancer risks for the public are below the EPA default value, but operations under the high case scenario may adversely affect cancer risks. Since cancer risks for the onsite worker already exceed the EPA default value, operations under the high case scenario would contribute to the adverse cancer risk impacts.

Stewardship Alternatives

Proposed National Ignition Facility

Radiological Impacts. Radiological impacts to the public resulting from normal operation of the proposed NIF for the enhanced option scenario are presented in table 4.7.3.9–1. These impacts are representative of the aggregate total which is estimated to exist from all future baseline operational Livermore Site contributions and from enhanced option operations of the proposed NIF at the site. Total impacts are provided to compare to applicable regulations governing total site operations. To place doses to the public from this alternative into perspective, comparisons are made to natural background radiation. As shown in table 4.7.3.9–1, the total dose to the maximally exposed member of the public from annual total site operations is within radiological limits and would be 0.17 mrem for this alternative. The annual population dose within 80 km (50 mi) in 2030 would be 0.96 person-rem.

Total site doses to onsite workers from normal operation for the proposed NIF are presented in table 4.7.3.9–3. The average annual dose to involved workers for this alternative would be 30 mrem. The dose to the entire facility workforce (involved workforce) would be 8.0 person-rem. The presented noninvolved worker impacts were not modeled due to the unavailability of certain site-specific information. There may also be small risks to construction workers who are involved with tasks that are in close proximity to potentially contaminated areas.

Based on the radiological impacts associated with normal operation of this alternative, all resulting doses would be within radiological limits and are well below levels of natural background radiation. The associated risks of adverse health effects to the public and to workers would be small.

Hazardous Chemical Impacts. No hazardous chemical impacts are expected from the operation of the proposed NIF (see appendix I). Therefore, the HI and cancer risks for the public and the onsite worker were not calculated nor assessed.

Proposed Contained Firing Facility

Radiological Impacts. Radiological impacts to the public resulting from normal operation of the proposed CFF alternative are presented in table 4.7.3.9–2. These impacts are representative of the aggregate total which is estimated to exist from all future baseline operational Site 300 contributions and from operations for the proposed CFF at the site. Total impacts are provided to compare to applicable regulations governing total site operations. To place doses to the public from this alternative into perspective, comparisons are made to natural background radiation. As shown in table 4.7.3.9–2, the total dose to the maximally exposed member of the public from annual total site operations is within radiological limits and would be 0.12 mrem for this alternative. The annual population dose within 80 km (50 mi) in 2030 would be 0.49 person-rem.

Total site doses to onsite workers from normal operation of the proposed CFF are presented in table 4.7.3.9–4. The average annual dose to involved workers for this alternative would be less than 250 mrem. The dose to the entire facility workforce (involved workforce) would be less than 0.75 person-rem. The presented noninvolved worker impacts were modeled for this alternative due to the availability of certain site-specific information. There may also be small risks to construction workers who are involved with tasks that are in close proximity to potentially contaminated areas.

Based on the radiological impacts associated with normal operation of this alternative, all resulting doses would be within radiological limits and are well below levels of natural background radiation. The associated risks of adverse health effects to the public and to workers would be small.

Hazardous Chemical Impacts. No hazardous chemical impacts are expected from the proposed CFF (see appendix J). Therefore, the HI and cancer risks for the public and the onsite worker were not calculated nor assessed.

Combined Program Impacts. Radiological impacts to the public and to workers from the simultaneous operation of all Livermore Site (and all Site 300) proposed alternatives, respectively, would result in very small increases over the No Action or the largest contributing individual alternative. All Program totals would be within radiological limits and are well below levels of natural background radiation. The associated risks of adverse health effects to the public and to workers would be small.

Combined Program impacts due to hazardous chemical emissions with operation of the No Action alternative and the incremental emissions incurred by the management alternatives (secondary and case fabrication, HE fabrication, and nonnuclear fabrication) result in a combined HI for the public of (1.13) and a cancer risk of (4.55x10^{-7}). The combined HI for the onsite worker is (2.40), and the combined cancer risk is (4.53x10^{-6}).

The combined Program HI for the public narrowly exceeds the acceptable health level; the HI for the onsite worker increases slightly, but remains narrowly within the acceptable health level. Cancer risks to the public would not increase above the acceptable level of regulatory concern. Cancer risks to the onsite worker would not increase, but would remain narrowly above the EPA default value.

Potential Mitigation Measures. Radioactive airborne emissions to the general population and onsite exposures to workers could be reduced by implementing the latest technology for process and design improvements. For example, to reduce public exposure from emissions, improved building and work area control methods could be used to remove radioactivity from the releases to the environment. Similarly, the use of remote, automated, and robotic production methods are examples of techniques that are being developed which would reduce worker exposure (see section 3.5).

Mitigation measures, such as substituting less toxic solvents and chemicals or modification processes, are proposed to reduce or eliminate the emissions of all hazardous chemicals due to operations under the No Action alternative. Particular attention would be given to 1,1-dichloroethylene, 1,4-dioxane, arsenic, benzene, cadmium, carbon tetrachloride, chloroform, chromium VI, epichlorohydrin, folpet, methylene chloride, nickel, and trichloroethylene.

Facility Accidents. The proposed actions have the potential for accidents that may impact the health and safety of workers and the public. The potential for and associated consequences of reasonably foreseeable accidents that have been evaluated are summarized in this section and are described in more detail in appendix F. The methodology used in the assessment is described in section 4.1.9. A list of documents reviewed for applicable accident data is provided in table F.1.1–1. The potential impacts from accidents, ranging from high-consequence/low-probability to low-consequence/high-probability events, have been evaluated in terms of potential cancer fatalities that may result for noninvolved workers and the public. The risk of cancer fatalities has also been evaluated to provide an overall measure of accident impacts and is calculated by multiplying the accident annual frequency (or probability) of occurrence by the consequences (number of cancer fatalities). Figure 4.7.3.9–1 shows the risk of latent cancer fatalities in the population within 80 km (50 mi) that may result from accidents for the alternatives. Specifically, the curve in the figure shows the probability (vertical axis) that the number of cancer fatalities in the offsite population within 80 km (50 mi) (horizontal axis) will be exceeded. The curve does show the probability of the accident.

In addition to the potential impacts to noninvolved workers and the offsite population, there are potential impacts to involved workers who would be located in the facilities associated with the proposed action. Quantitative statements of these impacts cannot be made until design details are developed further, at which time the number and location of facility workers protective and mitigating features can be estimated to support detailed accident impact analyses. However, depending on the type of accident, facility workers in close proximity to the point of the accident could receive high levels of exposure to radiation with potentially fatal impacts.

No Action. Under the No Action alternative, stewardship would continue to be performed at LLNL with no changes to facilities and operations. Under existing conditions, potential accidents and their consequences have been addressed in facility safety documentation according to requirements in DOE orders.

Management Alternatives

Secondary and Case Fabrication. A set of potential accidents have been postulated for the secondary and case fabrication alternative for which there may be releases of radioactive materials or other hazardous effects that may impact onsite workers and the offsite population. The potential accidents analyzed are described in appendix F. The probability distribution showing the range of probable cancer fatalities that may result for the composite set of accidents identified in appendix F is shown in figure 4.7.3.9–1. For example, the probability of a secondary and case fabrication accident causing more than one cancer fatality is approximately 10^{-6} per year. The curve reflects the probability of the accidents occurring. The impacts for the composite set of accidents and their consequences are shown in table 4.7.3.9–5. If an accident were to occur, there would be an estimated 0.063 cancer fatalities in the population within 80 km (50 mi) of the site. A noninvolved worker located 247 m (810 ft) (site boundary) from the accident would have an increased likelihood of cancer fatality of 1.5×10^{-4}. A maximally exposed individual located at the site boundary would have an increased likelihood of cancer fatality of 1.8×10^{-4}. The risks for the combined EBA and BEBA composite set of accidents, reflecting both the probability of the accident occurring and the consequences, are also shown in table 4.7.3.9–5. For the same worker, maximally exposed individual and population, the risks are 8.9×10^{-9}, 1.1×10^{-8}, and 3.8×10^{-6} cancer fatalities per year, respectively. Table 4.7.3.9–5 shows the impacts for EBAs and BEBAs only. There is also a potential for chemical accidents as shown in table 4.7.3.9–6.

High Explosives Fabrication. A set of potential accidents have been postulated for the HE fabrication alternative for which there may be hazardous effects that could impact onsite workers and the offsite population. The potential accidents analyzed are described in appendix F. The chemical impacts of the accidents are shown in table 4.7.3.9–7. The threshold limit value-time weighted average (TLV-TWA) limits represent a time-weighted average limit to a worker for a 40-hour work week. Exposures exceeding these limits could result in a suite of symptoms including liver damage, cyanosis, sore throat, muscular pain, kidney damage, and anemia. Note that the toxic exposures considered here are of a much shorter duration, on the order of minutes.

In addition to the chemical accident impacts, the potential for physical effects from a catastrophic explosion of the entire contents of a process-related

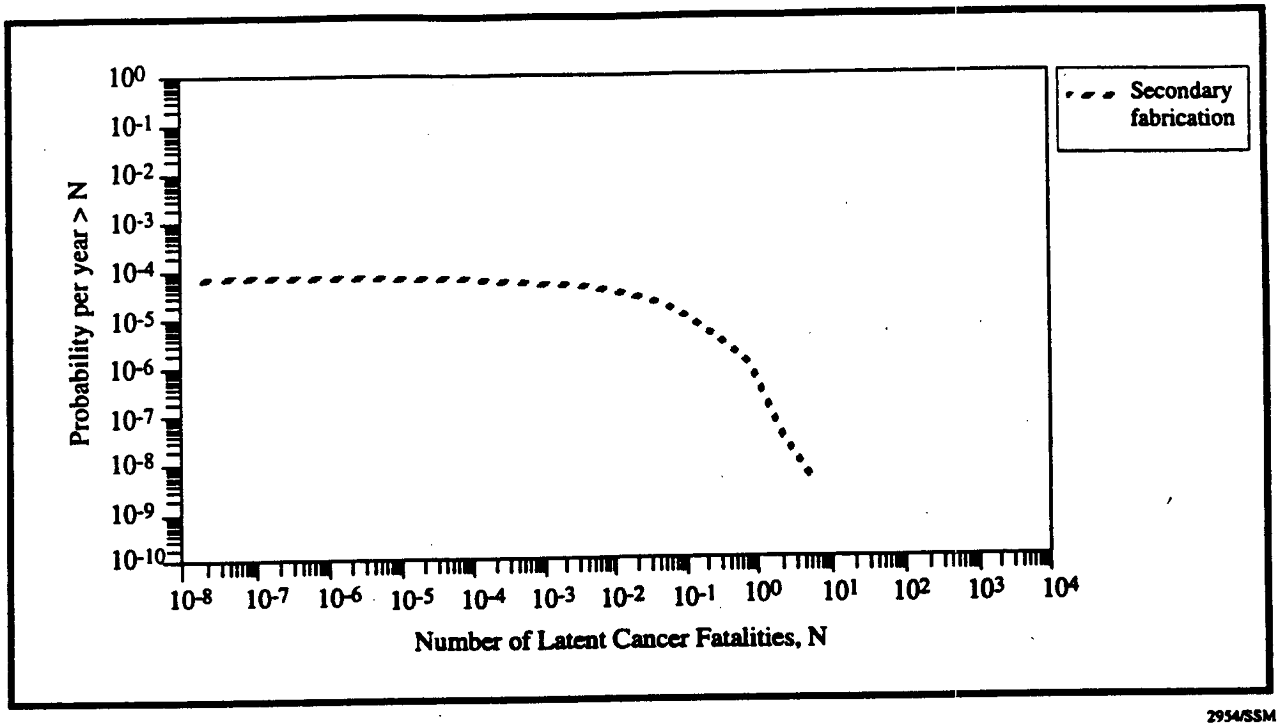


FIGURE 4.7.3.9–1.—*Combined Evaluation Basis Accidents and Beyond Evaluation Basis Accidents—Cancer Fatalities Complementary Cumulative Distribution Functions for Stockpile Management Alternatives at Lawrence Livermore National Laboratory.*

TABLE 4.7.3.9–5.—*Impacts of Accidents for Secondary and Case Fabrication at Lawrence Livermore National Laboratory*

	Secondary and Case Fabrication		
Parameter	**EBA**	**BEBA**	**EBA and BEBA Combined**
Composite Accident Frequency (Per Year)	$6.0x10^{-5}$	$5.0x10^{-7}$	0.052
Consequences			
Noninvolved Worker			
Cancer fatality[a]	$1.4x10^{-4}$	$1.4x10^{-3}$	$1.5x10^{-4}$
Risk (cancer fatality per year)	$8.2x10^{-9}$	$6.8x10^{-10}$	$8.9x10^{-9}$
Maximally Exposed Individual			
Cancer fatality[a]	$1.7x10^{-4}$	$1.7x10^{-3}$	$1.8x10^{-4}$
Risk (cancer fatality per year)	$1.0x10^{-8}$	$8.5x10^{-10}$	$1.1x10^{-8}$
Population Within 80 Kilometers [b]			
Cancer fatality[c]	0.06	0.6	0.063
Risk (cancer fatalities per year)	$3.5x10^{-6}$	$2.9x10^{-7}$	$3.8x10^{-6}$

[a] Probability (increased likelihood) of cancer fatality to hypothetical member of the public located at the site boundary or to a noninvolved worker if the accident occurred as a result of exposure to the indicated dose.

[b] For the offsite population of 7,843,061, the average probability of cancer fatality/risk of cancer fatality (per year) for the combined EBA and BEBA is $8.0 x10^{-9}/4.8x10^{-13}$ for the listed alternative.

[c] Number of cancer fatalities in the population out to 80 km (50 mi) as a result of exposure to the indicated dose if the accident occurs.

Note: All values are mean values; BEBA - beyond evaluation basis accidents; EBA - evaluation basis accidents.

Source: Results shown are derived from model accident analyses.

TABLE 4.7.3.9–6.—*Impacts of Chemical Accidents for Secondary and Case Fabrication at Lawrence Livermore National Laboratory*

Accident Description	Accident Frequency (Per Year)	IDLH	TLV-STEL	TLV-TWA	Concentration to: Noninvolved Worker (mg/m^3)	Concentration to: Individual at Site Boundary (mg/m^3)	Potential Impacts of Exceeding: IDLH Limits[a]	Potential Impacts of Exceeding: TLV Limits[a]
Fire and Release of Lithium Oxide	10^{-6} to 10^{-4}				>670	670	Irreversible health effects	Burns to the eyes, skin, mouth and esophagus; muscular twitches; mental confusion; and blurred vision
Concentration[a] (mg/m^3)		55	–	0.025				
Distances[a] (m)		87 to 2,000		46 to >9x10^4				
Area (m^2)		3.0x10^5		>5.8x10^8				
Population[b]		570		>600,000				
Hydrogen Fluoride Release	10^{-6} to 10^{-4}				>220	220	Irreversible health effects	Irritation or burning to skin, eyes, nose and throat; pulmonary edema; and bronchitis
Concentration[a] (mg/m^3)		36	5	2.5				
Distances[b] (m)		720	2,500	3,900				
Area (m^2)		4.6x10^4	4.8x10^5	1.1x10^6				
Population[c]		59	1,000	2,800				
Hydrogen Cyanide Release	10^{-6} to 10^{-4}				>140	140	Irreversible health effects	Nausea, vomiting, gasping for breath, weakness, and at high levels, asphyxiation and death
Concentration[a] (mg/m^3)		56	5	–				
Distances[b] (m)		420	1,800					
Area (m^2)		1.6x10^4	2.6x10^5					
Population[c]		11	460					

[a] From facility (downwind); exceedance begins at facility, 0 meters, unless indicated otherwise.
[b] Offsite individuals exposed to concentration exceeding limit.
Note: IDLH - immediately dangerous to life or health; TLV - threshold limit value; STEL - short-term exposure limit; TWA - time-weighted average.
Source: Derived from accident analyses (see appendix F).

TABLE 4.7.3.9–7.—*Accident Impacts for High Explosives Fabrication at Lawrence Livermore National Laboratory*

Accident Description	Accident Frequency (Per Year)	TLV-TWA	Concentration to: Noninvolved Worker (mg/m^3)	Concentration to: Individual at Site Boundary (mg/m^3)	Impacts of Exceeding: TLV/TWA Limits[a]
Fire and Release of Chemical TATB	0.01 to 10^{-4}		>54	54	Liver damage, cyanosis, sore throat, muscular pain, kidney damage, and anemia
Concentration[a] (mg/m^3)		1.5			
Distances[b] (m)		2,200			
Area (m^2)		$3.8x10^5$			
Population[c]		740			
Fire and Release of Chemical TNT	0.01 to 10^{-4}		>54	54	Liver damage, cyanosis, sore throat, muscular pain, kidney damage, and anemia
Concentration[a] (mg/m^3)		0.5			
Distances[b] (m)		4,500			
Area (m^2)		$1.4x10^6$			
Population[c]		3,800			
Explosion and Elevated Release of Chemical TATB	10^{-4} to 10^{-6}		6.4	6.7[d]	Liver damage, cyanosis, sore throat, muscular pain, kidney damage, and anemia
Concentration[a] (mg/m^3)		1.5			
Distances[b] (m)		180 to 3,500			
Area (m^2)		$1.1x10^6$			
Population[c]		2,700			
Explosion and Elevated Release of Chemical TNT	10^{-4} to 10^{-6}		2.4	2.5[d]	Liver damage, cyanosis, sore throat, muscular pain, kidney damage, and anemia
Concentration[a] (mg/m^3)		0.5			
Distances[b] (m)		170 to 3,700			
Area (m^2)		$1.2x10^6$			
Population[c]		3,100			

[a] NIOSH 1990a.
[b] From facility (downwind); exceedance begins at facility, 0 meters, unless indicated otherwise.
[c] Offsite individual exposed to concentration exceeding limit.
[d] Individual at 560 meters from boundary (individual at boundary is exposed to concentrations of roughly 3 times lower).
Note: TLV - threshold limit value; TWA - time-weighted average; TATB - triaminotrinitrobenzene; TNT - trinitrotoluene.
Source: Derived from accident analyses (see appendix F).

building, which would have a probability of occurrence less than the explosion considered above (i.e., less than 1.0×10^{-6} per year), was also considered. The quantity of HE detonated could range up to 18 t (19.8 tons); the blast pressure could result in death (up to 40 m [131 ft]), lung damage (80 m [262 ft]), thoracic injury (130 m [427 ft]), and eardrum rupture (160 m [525 ft]) depending on an individual's distance from the accident. Injuries could also result from glass breakage and building debris

Nonnuclear Fabrication. The impacts of potential accidents associated with nonnuclear fabrication activities at LLNL were previously addressed in *Nonnuclear Consolidation Environmental Assessment* (DOE/EA-0792, June 1993) where it was determined that the then current accident profile would not change as a result of the relocation of nonnuclear fabrication functions to LLNL. The present proposed action to transfer the nonnuclear fabrication mission to LLNL is not expected to change the accident profile that presently exists at the site.

Stewardship Alternatives

Proposed National Ignition Facility. Studies of potential accidents associated with the proposed NIF have been performed. A bounding accident was postulated based on a preliminary hazard analysis. The bounding accident assumes a severe earthquake of 1 g horizontal ground acceleration occurring during a maximum-credible-yield fusion experiment. Beamlines leaking into the target chamber and building structures other than the target area building would fail during the postulated earthquake. The collapsed beamlines and building structures would provide a pathway for acute atmospheric releases of tritium in the tritium processing system, activated gases in the air, and activated material in the target chamber.

The frequency of this severe earthquake is estimated at 1×10^{-4} per year. The joint frequency of the severe earthquake during the maximum-credible-yield fusion experiment would be less than 2×10^{-8} per year. The radiological impacts of the accident, presented in table 4.7.3.9–8, were estimated using the GENII computer code.

Proposed Contained Firing Facility. Studies of potential accidents associated with the proposed CFF have been performed. The reasonably foreseeable accident scenarios that could produce the greatest potential impacts are the following:

TABLE 4.7.3.9–8.—***Consequences and Risk of the Bounding Proposed National Ignition Facility Accident at the Livermore Site***

Health Impact	Conceptual Designs	Enhanced Baseline Option
Workers Onsite		
Dose (person-rem)	29	49
Fatal cancers	0	0
Risk (cancer fatalities per year)	2×10^{-10}	4×10^{-10}
Maximally Exposed Individual		
Dose (person-rem)	0.1	0.2
Fatal cancers	5×10^{-5}	8×10^{-5}
Risk (cancer fatality per year)	1×10^{-13}	2×10^{-13}
Population Within 80 Kilometers		
Dose (person-rem)	260	440
Fatal cancers	1.3×10^{-1}	0
Risk (cancer fatalities per year)	3×10^{-9}	4×10^{-9}

Source: Appendix I.

- Scenario 1: Accidental detonation of a test of a 60-kg (132-lb) charge of explosives at the B801 firing table. (Applicable to the No Action alternative.)

- Scenario 2: Accidental detonation of a 60-kg (132-lb) test that could contain up to 20 mg (200 curies) of tritium with dispersal through an unsecured blast door during final preparation. No neutron generation potential would exist because blast doors would be closed before any accident scenario that would involve neutron generation (misfire). (Applicable to either B801 or B851 alternatives.)

One beyond design basis accident configuration is considered as follows:

- Scenario 3: Same test configuration as Scenario 2, but the planned detonation takes place yielding the potential for neutron generation: accidental rupture of the CFF Firing Chamber occurs. (Applicable to either B801 or B851 alternatives.)

The impacts to involved workers for each accident scenario would probably be fatal injuries from blast effects due to peak overpressure and debris, but there would be no injury offsite to members of the public. No damage to current buildings offsite or in other areas of Site 300 would be expected. Projected radiation effects for the three scenarios are shown in table 4.7.3.9–9.

4.7.3.10 *Waste Management*

This section summarizes the impacts on waste management at the Livermore Site and Site 300 under No Action and for each of the stockpile stewardship and management alternatives. There is no spent nuclear fuel, HLW, or TRU waste associated with secondary and case fabrication, HE fabrication, nonnuclear fabrication, the proposed CFF, or the proposed NIF; therefore, there is no further discussion of these wastes at LLNL. Table 4.7.3.10–1 lists the projected waste generation rates and treatment, storage, and disposal capacities under No Action for the Livermore Site. Table 4.7.3.10–2 lists the projected waste generation rates and treatment, storage, and disposal capacities under No Action for Site 300. Projections for No Action were derived from 1994 environmental data, with the appropriate adjustments made for those changing operational requirements where the volume of wastes generated is identifiable. The projection does not include wastes from future, as yet uncharacterized, environmental restoration activities.

Table 4.7.3.10–3 provides the total estimated operational waste volumes projected to be generated at LLNL as a result of the secondary and case fabrication, nonnuclear fabrication, and the proposed NIF alternatives. Table 4.7.3.10–4 provides the total estimated operational waste volumes projected to be generated at Site 300 as a result of the HE fabrication and proposed CFF alternatives. The net increase or decrease over No Action is provided in the table in parentheses. The waste volumes generated from the various alternatives and the resultant waste effluent used in the impact analysis can be found in table 3.4.4.4–3 for secondary and case fabrication, table 3.4.2.4–3 for nonnuclear fabrication, table 3.4.5.4–3 for HE fabrication, table 3.3.2.2–3 for NIF, and table 3.3.1.2–3 for CFF. Facilities that would support the Stockpile Stewardship and Management Program would treat and package all waste generated into forms that would enable long-term storage and/or disposal in accordance with the *Atomic Energy Act*, RCRA, and other applicable statutes as outlined in appendix section H.1.2.

No Action. Under No Action, TRU, low-level, mixed, hazardous, and nonhazardous wastes would continue to be generated at LLNL from the missions outlined in section 3.2.7. LLNL would continue to treat, store, and dispose of its legacy and newly generated wastes in current and planned facilities.

Liquid LLW would be neutralized and solidified and the treated wastewater discharged to the city of

TABLE 4.7.3.9–9.—***Accident Radiation-Related Impacts for the Proposed Contained Firing Facility at Site 300***

Health Impacts	Scenario 1	Scenario 2	Scenario 3
Involved Worker at 30 Meters			
Dose (rem)	0.0	0.026	0.031
Cancer fatality	0.0	$1x10^{-5}$	$1.2x10^{-5}$
Risk (cancer fatality per year)	[a]	[a]	[a]
Noninvolved Worker at 50 Meters			
Dose (rem)	0.0	0.015	0.015
Cancer fatality	0.0	$6x10^{-6}$	$6x10^{-6}$
Risk (cancer fatality per year)	[a]	[a]	[a]
Offsite Member of Public at 1,340 Meters			
Dose (rem)	0.0	$1.1x10^{-4}$	$1.1x10^{-4}$
Cancer fatalities	0.0	$5.5x10^{-8}$	$5.5x10^{-8}$
Risk (cancer fatalities per year)	[a]	[a]	[a]

[a] Data not available.
Source: Appendix J.

TABLE 4.7.3.10–1.—*Projected Waste Management Under No Action at the Livermore Site* [Page 1 of 2]

Category	Annual Generation (m^3)	Treatment Method	Treatment Capacity (m^3/yr)	Storage Method	Storage Capacity (m^3)	Disposal Method	Disposal Capacity (m^3)
Low-Level							
Liquid	181	Neutralization, filtration, solidification, precipitation, oxidation, flocculation, and blending	34.1 Treatment episode	Hazardous waste management division facilities	627	Treated wastewater discharged to city of Livermore sanitary sewer if within approved limits	None
Solid	307	Shredding, drum crushing, and compaction	NA	Hazardous waste management division facilities	2,297	Shipped to NTS	NA
Mixed Low-Level							
Liquid	51	Neutralization, filtration, solidification, precipitation, oxidation, flocculation, and blending	8,750	Hazardous waste management division facilities	627	Treated wastewater discharged to city of Livermore sanitary sewer if within approved limits	NA
Solid	20	Shredding, drum crushing, and compaction	11,800	Hazardous waste management division facilities	2,297	None	None
Hazardous							
Liquid	342	Shipped to offsite RCRA-permitted TSD facilities, except silver recovery	97	Hazardous waste management division facilities	769	Shipped to offsite RCRA-permitted facilities	NA
Solid	237	Same as above	NA	Hazardous waste management division facilities	98	Shipped to offsite RCRA-permitted facilities	NA

TABLE 4.7.3.10–1.—*Projected Waste Management Under No Action at the Livermore Site* [Page 2 of 2]

Category	Annual Generation (m^3)	Treatment Method	Treatment Capacity (m^3/yr)	Storage Method	Storage Capacity (m^3)	Disposal Method	Disposal Capacity (m^3)
Nonhazardous (Sanitary)							
Liquid	456,000	None	NA	Retention tanks	829 (spill control capacity) (828,662 L)	Discharged to city of Livermore sanitary sewer system	NA
Solid	4,280[a]	None	NA	Hazardous waste management division facilities	NA	Offsite landfill	NA
Nonhazardous (Other)							
Liquid	0	None	NA	Hazardous waste management division facilities	41	Autoclaved and disposed as sanitary waste	NA
Solid	2	None	NA	Hazardous waste management division facilities	41	Autoclaved and disposed as sanitary waste	NA

[a] Reported as 7,082 U.S. short tons. For analysis, 1,500 kg/m^3 was assumed.
Note: NA - not applicable.
Source: LLNL 1995i:1.

TABLE 4.7.3.10–2.—*Projected Waste Management Under No Action at Site 300*

Category	Annual Generation (m^3)	Treatment Method	Treatment Capacity (m^3/yr)	Storage Method	Storage Capacity (m^3)	Disposal Method	Disposal Capacity (m^3)
Low-Level							
Liquid	0	None	NA	NA	NA	NA	NA
Solid	463	None	NA	NA	NA	Shipped to NTS	NA
Mixed Low-Level							
Liquid	0	None	None	Shipped to the Livermore Site	NA	None	None
Solid	0	None	None	Shipped to the Livermore Site	NA	None	None
Hazardous							
Liquid	117	None	NA	Building 883, a RCRA-permitted storage facility	12.46	Shipped to the Livermore Site or offsite RCRA-permitted facilities	NA
Solid	45	Open burning[a]	91 kg/ episode	Building 883, a RCRA-permitted storage facility	12.46	Shipped to the Livermore Site or offsite RCRA-permitted facilities	NA
Nonhazardous (Sanitary)							
Liquid	4,420	NA	NA	NA	NA	Onsite evaporation pond, septic systems, and leach fields	NA
Solid	315	NA	NA	NA	NA	Offsite sanitary landfill	NA
Nonhazardous (Other)							
Liquid	2	Sent to LLNL for autoclaving	NA	NA	NA	Autoclaved infectious waste disposed as sanitary waste; autoclaved sharps waste is sent to a commercial incinerator	NA
Solid	2	Sent to LLNL for autoclaving	NA	NA	NA	Autoclaved infectious waste disposed as sanitary waste; autoclaved sharps waste is sent to a commercial incinerator	None

[a] HE wastes only. Up to a total of 340 kg (750 lb) of HE pieces, parts, and powders or 340 kg (750 lb) of sludge from HE-contaminated rinsewaters settling tanks or 907 kg (2,000 lb) of HE-contaminated materials such as kimwipes.

Note: NA - not applicable.

Source: LLNL 1995i:1; LLNL 1996i:2.

TABLE 4.7.3.10–3.—*Estimated Annual Generated Waste Volumes for Stockpile Stewardship and Management Alternatives at the Livermore Site*

Category	No Action[a] (m^3)	Secondary and Case Fabrication[b] (m^3)	Nonnuclear Fabrication[c] (m^3)	National Ignition Facility[d] (m^3)	Combined Program Impacts (m^3)
Low-Level					
Liquid	181	286 (+105)	181 (0)	182 (+0.6)	287 (+106)
Solid	307	677 (+370)	307 (0)	310 (+3)	680 (+373)
Mixed Low-Level					
Liquid	51	601 (+550)	51 (0)	53 (+2)	603 (+552)
Solid	20	32 (+12)	20 (0)	20 (+0.3)	32 (+12)
Hazardous					
Liquid	342	882 (+540)	349 (+7)	344 (+2)	892 (+550)
Solid	237	255 (+18)	237 (0)	245 (+8)	263 (+26)
Nonhazardous (Sanitary)					
Liquid	456,000	558,000 (+102,000)	462,000 (+5,770)	474,000 (+17,900)	582,000 (+126,000)
Solid	4,280	8,600 (+4,320)	4,410 (+127)	10,300 (+6,000)	14,700 (+10,400)
Nonhazardous (Other)					
Liquid	0	0 (0)	0 (0)	0 (0)	0 (0)
Solid	2[e]	3,200[f] (+3,200)	2[e] (0)	2[e] (0)	3,200[f] (+3,200)

[a] No Action volumes are from table 4.7.3.10–1.
[b] Volumes for secondary and case fabrication are from table 3.4.4.4–3 and are based on surge operations (three shifts).
[c] Volumes for nonnuclear fabrication are from table 3.4.2.4–3 are based on surge operations (three shifts).
[d] Volumes for NIF are from table 3.3.2.2–3 and are based on the Conceptual Design.
[e] Medical wastes.
[f] Includes recyclable and medical wastes.
Note: Waste generation volumes were rounded to three significant figures. Waste effluent volumes are found in sections 3.3 and 3.4.

TABLE 4.7.3.10–4.—*Estimated Generated Waste Volumes for Stockpile Stewardship and Management Alternatives at Site 300*

Category	No Action[a] (m^3)	High Explosives Fabrication[b] (m^3)	Contained Firing Facility[c] (m^3)	Combined Program Impacts (m^3)
Low-Level				
Liquid	0	0 (+0)	0 (+0)	0 (+0)
Solid	463	463 minimal	447 (-16)	447 (-16)
Mixed Low-Level				
Liquid	0	0 (+0)	0 (+0)	0 (+0)
Solid	0	0 (+0)	10 (+10)	10 (+10)
Hazardous				
Liquid	117	120 (+3)	123 (+6)	126 (+9)
Solid	315	369 (+54)	311 (-4)	365 (+50)
Nonhazardous (Sanitary)				
Liquid	4,420	11,700 (+7,270)	4,700 (+284)	12,000 (+7,550)
Solid	315	384 (+69)	328 (+13)	397 (+82)
Nonhazardous (Other)				
Liquid	2[d]	570 (+568)	2[d] (+0)	570 (+568)
Solid	2[d]	38 (+36)	2[d] (+0)	38 (+36)

[a] No Action volumes are from table 4.7.3.10–2 and are based on 50 tests per year at the current B801 Complex.

[b] Volumes for HE fabrication are from table 3.4.5.4–3 and are based on surge operations (three shifts).

[c] Volumes for CFF are from table 3.3.1.2–3 and are based on 100 tests per year. Wastes generated from the B801 Complex, appendix table J.5.2.2–1, were subtracted since this facility would not operate if CFF was constructed.

[d] Medical waste.

Note: Waste generation volumes were rounded to three significant figures. Waste effluent volumes are found in sections 3.3 and 3.4.

Livermore sanitary sewer. Solid LLW would be compacted, packaged, and stored for shipment to NTS. Hazardous waste would be packaged and shipped offsite to RCRA-permitted treatment, storage, and disposal facilities. Liquid mixed waste would undergo neutralization/pH adjustment, oxidation/reduction, precipitation, chelation/flocculation, and filtration in the Area 514 Wastewater Treatment Tank Farm, Area 514 Wastewater Filtration Unit, and Building 513 Solidification Unit. Both liquid and solid mixed waste would be treated and disposed of according to the LLNL Site Treatment Plan, which was developed pursuant to the *Federal Facility Compliance Act* of 1992. The resulting waste would then be stored in a RCRA-permitted facility in DOT-approved containers until it is shipped to an offsite DOE disposal facility. Some of this waste would be placed in interim storage until new technologies for treatment and disposal are identified and evaluated. Liquid nonhazardous sanitary wastes would be pretreated and discharged to the city of Livermore sanitary sewer system. Solid nonhazardous sanitary waste would be disposed of in a permitted offsite sanitary landfill sized to handle projected future waste volumes.

Under No Action, low-level, mixed, hazardous, and nonhazardous wastes would continue to be generated at Site 300 from the missions outlined in section 3.2.7. Site 300, in conjunction with LLNL, would continue to treat, store, and dispose of its legacy and newly generated wastes in current and planned facilities.

LLNL does not anticipate the future generation of mixed waste at Site 300. If mixed waste is generated at Site 300, the mixed waste would be limited to storage periods of 90 days or less. The mixed waste would then be taken either to LLNL for treatment and/or long-term storage or sent to commercial facilities for treatment and/or disposal. Site 300 LLW, including the gravel from firing table operations, would be packaged in approved waste containers and transported to Building 804 for staging, pending shipment to LLNL or shipment directly to NTS for disposal. Site 300 would hold hazardous waste before it is transferred to the Area 612 facility at LLNL for treatment, storage, and disposal or send it directly offsite to RCRA-permitted treatment, storage, and disposal facilities. Sanitary wastewater generated within the General Services Area at Site 300 would be discharged to an onsite sewer lagoon. Other more remotely located buildings on Site 300 would be serviced by septic systems and leach fields. Site 300 industrial wastewaters would be contained in retention tanks and analyzed to determine their proper disposition. These wastewaters could be shipped to LLNL for treatment and discharged to the sanitary sewer system or shipped directly to an offsite treatment and disposal facility. Solid waste generated at Site 300 would be transported to a permitted offsite sanitary landfill.

Management Alternatives

Livermore Site

Secondary and Case Fabrication. The Secondary and Case Fabrication Facility would not generate any TRU waste. Following treatment and volume reduction, 304 m^3 (398 yd^3) of solid LLW would be packaged in approved waste containers for staging, pending shipment directly to NTS for disposal. With no onsite LLW disposal capability, LLNL would require approximately 18 additional LLW shipments per year to NTS. Assuming a land usage factor of 6,000 m^3/ha (3,180 yd^3/acres), 0.05 ha/yr (0.13 acres/yr) of LLW disposal area at NTS would be required.

The LLNL Site Treatment Plan for mixed waste was developed pursuant to the *Federal Facility Compliance Act*. The mixed waste streams identified at LLNL have been combined into 10 treatability groups, each with a preferred treatment option. The type of mixed wastes generated by secondary and case fabrication would fit into one of the established 10 treatability groups and would not require the creation of new treatability groups or new preferred treatment options. The 550 m^3 (145,000 gal) annual generation of liquid mixed wastes and 12 m^3 (16 yd^3) annual generation of solid mixed wastes may impact the available storage capacity of the main areas for future mixed waste storage in RCRA-permitted hazardous waste management units. Existing and planned mixed waste treatment at LLNL would be adequate to handle the increased volume. Additional staging capacity for 540 m^3 (143,000 gal) of liquid and 18 m^3 (24 yd^3) of solid hazardous wastes while awaiting shipment to offsite RCRA-permitted treatment and disposal facilities may be needed. Minimal impacts would result from the 102,000 m^3 (26.9 million gal) of liquid nonhazardous sanitary waste, which would be collected and routed to the sanitary and industrial waste treatment plant prior to discharge to the city of Livermore sanitary sewer system. Minimum impacts would result from the 4,320 m^3 (5,650 yd^3) of solid nonhazardous sanitary waste that would be disposed of in offsite industrial and sanitary landfills.

Nonnuclear Fabrication. The Nonnuclear Fabrication Facility would not generate any TRU waste, LLW, or mixed LLW. The generation of 7 m^3 (1,950 gal) of liquid hazardous wastes would have a small impact on LLNL's waste management infrastructure. The toluene/methanol waste stream would be recycled by distillation. The distillation bottoms (0.2 m^3 [0.26 yd^3]) would be shipped offsite to a RCRA-permitted disposal facility as solid hazardous waste. The remaining 3 m^3 (905 gal) of liquid hazardous waste would be staged in the onsite hazardous waste accumulation area and shipped to offsite RCRA-permitted treatment, storage, and disposal facilities. Minimal impacts would result from the 5,770 m^3 (1,530,000 gal) of liquid sanitary waste that would be collected and routed to the sanitary and industrial waste treatment plant. Minimal impacts would result from the 64 m^3 (83 yd^3) of solid nonhazardous sanitary waste that would be disposed of in offsite industrial and sanitary landfills after volume reduction.

Site 300

High Explosives Fabrication. The HE Fabrication Facility at Site 300 would not generate any TRU or mixed LLW. Minimal to zero quantities of LLW would be generated. If generated, these wastes would be packaged in approved waste containers and transported to Building 804 for staging, pending shipment to LLNL, or they would be shipped directly to NTS for disposal. Minimal impacts would result from the 3 m^3 (920 gal) of liquid hazardous waste and 54 m^3 (70 yd^3) of solid hazardous waste, which could be staged in the onsite hazardous waste accumulation area up to 1year before being shipped to LLNL or to offsite commercial RCRA-permitted treatment, storage, and disposal facilities. Existing infrastructure should be able to handle the 7,270 m^3 (1,920,000 gal) of liquid sanitary waste. Minimal impacts would result from the 55 m^3 (72 yd^3) of solid nonhazardous sanitary waste that would be disposed of in offsite industrial and sanitary landfills.

Sensitivity Analysis. The waste volumes generated from the secondary and case, nonnuclear, and HE fabrication facilities required to support a larger stockpile level (high case) operating on a single-shift basis are bounded by the base case under surge operations. There would be no additional waste management impacts associated with these fabrication facilities that would support a high case stockpile operating at a single shift. The volumes generated from these fabrication facilities required to support a low case stockpile would be reduced by a factor of at least three.

Stewardship Alternatives

Livermore Site

Proposed National Ignition Facility. The proposed NIF would not generate any TRU waste. The 0.7 m^3 (185 gal) of liquid LLW could be batch treated in the Area 514 Wastewater Treatment Tank Farm with minimal impact. The 3 m^3 (4 yd^3) of solid LLW would be packaged in approved waste containers and staged, pending shipment directly to NTS for disposal. Assuming a land usage factor of 6,000 m^3/ha (3,180 yd^3/acres), less than 0.0005 ha/yr (0.001 acres/yr) of LLW disposal area at NTS would be required.

The LLNL Site Treatment Plan for mixed waste was developed pursuant to the *Federal Facility Compliance Act*. The mixed waste streams identified at LLNL have been combined into 10 treatability groups, each with a preferred treatment option. The type of mixed wastes generated by NIF would fit into one of the established 10 treatability groups and would not require the creation of new treatability groups or new preferred treatment options. The annual generation of 2 m^3 (528 gal) of liquid and 0.3 m^3 (0.4 yd^3) of solid mixed wastes would have a negligible impact on the available storage capacity of the main areas for future mixed waste storage in RCRA-permitted hazardous waste management units. Minimal impacts would result from the 2 m^3 (528 gal) of liquid hazardous waste and 8 m^3 (10 yd^3) of solid hazardous waste, which would be staged in the onsite hazardous waste accumulation area and shipped to offsite commercial RCRA-permitted treatment, storage, and disposal facilities. Additional sanitary wastewater treatment capacity may be required to accommodate the 17,900 m^3 (4.72 million gal) of liquid nonhazardous sanitary waste that would be routed to sanitary wastewater treatment facilities prior to discharge to existing municipal sanitary wastewater systems. Minimal impacts would result from the 6,050 m^3 (7,910 yd^3) of solid nonhazardous sanitary waste that would be disposed of in offsite industrial and sanitary landfills after volume reduction.

Site 300

Proposed Contained Firing Facility. The proposed CFF would not generate any TRU waste. CFF would reduce the annual generation of solid LLW from the No Action alternative by 16 m^3 (21 yd^3). The 90 m^3 (117 yd^3) of solid LLW from CFF would be packaged in approved waste containers and staged, pending shipment directly to NTS for disposal. Six LLW shipments per year to NTS and 0.016 ha/yr (0.04 acres/yr) of LLW disposal area at NTS would be required.

The LLNL Site Treatment Plan for mixed waste was developed to comply with the *Federal Facility Compliance Act*. The mixed waste streams identified at LLNL have been combined into 10 treatability groups, each with a preferred treatment option. The type of mixed wastes generated by CFF would fit into one of the established 10 treatability groups and would not require the creation of new treatability groups or new preferred treatment options. The 10 m^3 (14 yd^3) annual generation of solid mixed waste would have a negligible impact on the available storage capacity of the main areas for future mixed waste storage in RCRA-permitted hazardous waste management units.

CFF would reduce the generation of solid hazardous wastes by 4 m^3 (5 yd^3) from the No Action alternative. The 6-m^3 (1,560-gal) increase in the generation of liquid hazardous wastes would have a minimal impact. Hazardous wastes would be stored in the onsite hazardous waste accumulation area and shipped to offsite commercial RCRA-permitted treatment, storage, and disposal facilities. The additional 284 m^3 (75,000 gal) of liquid sanitary wastes would have a negligible impact on the existing sanitary wastewater system. Negligible impacts would also result from the 13 m^3 (17 yd^3) of additional solid sanitary wastes.

Combined Program Impacts

Livermore Site. If all the stockpile stewardship and management alternatives listed in table 4.7.3.10–3 were located at the Livermore Site, the impacts from LLW, mixed LLW, and hazardous wastes would be similar to those discussed for the secondary and case fabrication alternative. The 126,000 m^3 (33.2 million gal) of liquid sanitary wastes would not be expected to impact the sanitary wastewater treatment system, as adequate capacity exists to handle this increase. After volume reduction, approximately 10,400 m^3 (13,600 yd^3) of solid sanitary waste would require disposal. This increase could require the construction of a new sanitary landfill sooner than currently planned.

Site 300. If all the stockpile stewardship and management alternatives listed in table 4.7.3.10–4 were located at Site 300, the impacts from LLW, and mixed LLW would be identical to those identified for the CFF alternative. The impacts from hazardous and nonhazardous wastes would be similar to the HE fabrication alternative.

Potential Mitigation Measures. Waste quantities or waste forms could undergo additional reductions by utilizing emerging technologies, thereby further reducing or mitigating waste and waste management impacts. Pollution prevention and waste minimization would be considered in determining the final actions of the Stockpile Stewardship and Management Program at the Livermore Site and Site 300.

4.7.3.11 *Environmental Justice*

As discussed in section 4.14, any impacts to surrounding communities would most likely result from toxic or hazardous air pollutants and radiological emissions. Section 4.7.3.9, which describes public and occupational health impacts from normal operation, shows that potential chemical air emissions and releases narrowly exceed the generally accepted threshold of regulatory concern. This information is based on the conservative programmatic assumptions and modeling detailed in appendix E. Any adverse human health or environmental impacts that may occur would affect people living within communities located near LLNL. The analysis of the demographic data presented in appendix D for the communities surrounding LLNL indicates that if there were any adverse health impacts to these communities, they would not appear to disproportionately affect minority or low-income populations.

4.8 Sandia National Laboratories

SNL is headquartered in Albuquerque, NM, and maintains facilities in other locations. The facilities discussed in this document refer only to the Albuquerque location, which is adjacent to the city of Albuquerque as shown in figure 4.8–1. The site shown in figure 4.8–2 is approximately 10.5 km (6.5 mi) east of downtown Albuquerque. SNL consists of 1,150 ha (2,842 acres) on Kirtland Air Force Base. An additional 6,072 ha (15,003 acres) are provided to DOE through ingrant land from Kirtland Air Force Base, the State of New Mexico, and the Isleta Pueblo to conduct operations.

4.8.1 Description of Alternatives

There are no facilities at SNL that would be phased out as a result of any of the proposed alternatives discussed in the PEIS.

No Action. SNL would continue to perform the missions described in section 3.2.8.

Stockpile Management Alternatives. The majority of the nonnuclear fabrication mission could be located at SNL. A portion of the nonnuclear fabrication mission would also be shared with LANL and possibly LLNL.

Stockpile Stewardship Alternatives. The proposed NIF could be located at SNL.

4.8.2 Affected Environment

The following sections describe the affected environment at SNL for land resources, air quality, water resources, geology and soils, biotic resources, cultural and paleontological resources, and socioeconomics. In addition, the infrastructure, radiation and hazardous chemical environment, and waste management conditions, at SNL are described.

4.8.2.1 *Land Resources*

SNL is located approximately 10.5 km (6.5 mi) east of downtown Albuquerque, NM (figure 4.8–1). Generalized land uses at SNL and in the vicinity are shown in figure 4.8.2.1–1. There are no prime farmlands on SNL. The affected environment consists of two technical areas at the northern end of the site, designated Technical Area I and Technical Area II (figure 4.8–2).

Technical Area I is the most intensively developed of the SNL technical areas, containing administrative and support facilities; project engineering, research, and component development activities; neutron generator production; and special laboratories and shops.

The Kirtland Air Force Base cantonment, the most heavily developed area on the base, is adjacent to Technical Area I. U.S. Air Force-accompanied base housing is located west and north of Technical Area I. Various Kirtland Air Force Base facilities and operations, including flight operations, are located west of Technical Area I. U.S. Air Force flight operations are collocated with the civilian commercial aircraft operations of Albuquerque International Airport. The runway and taxiways are owned and managed by the city of Albuquerque (SN USAF 1990a:3.6-1). The airport Accident Potential Zone 1 extends east beyond the runway clear zone to the edge of the Technical Area I boundary, with Accident Potential Zone 2 extending across Technical Area I. Flight operations of the airport are regulated by the Federal Aviation Administration, which does not use Accident Potential Zones.

The U.S. Air Force granted an exemption for the development of an all new Air Installation Compatible Use Zone study at Kirtland Air Force Base. The base, however, monitors all development in its vicinity to ensure compatibility with base flying missions. The U.S. Air Force Air Installation Compatible Use Zone Land Use Guidelines do not recommend uses within Zone 1 and Zone 2 that are highly labor intensive; that involve explosive, fire, toxic, corrosive, or other hazardous characteristics; or that occupy high-density offices.

Except for vacant land on both sides of Tijeras Canyon east of Technical Area I and some unmanned utility facilities, the land north of SNL is part of the urbanized city of Albuquerque. The urban land use consists of a mixture of residential, commercial, industrial, institutional, and various supporting public uses. The closest residence to the Kirtland Air Force Base boundary is approximately 6 m (20 ft) to the north. An industrial park is currently being developed immediately east of the Eubank Gate and

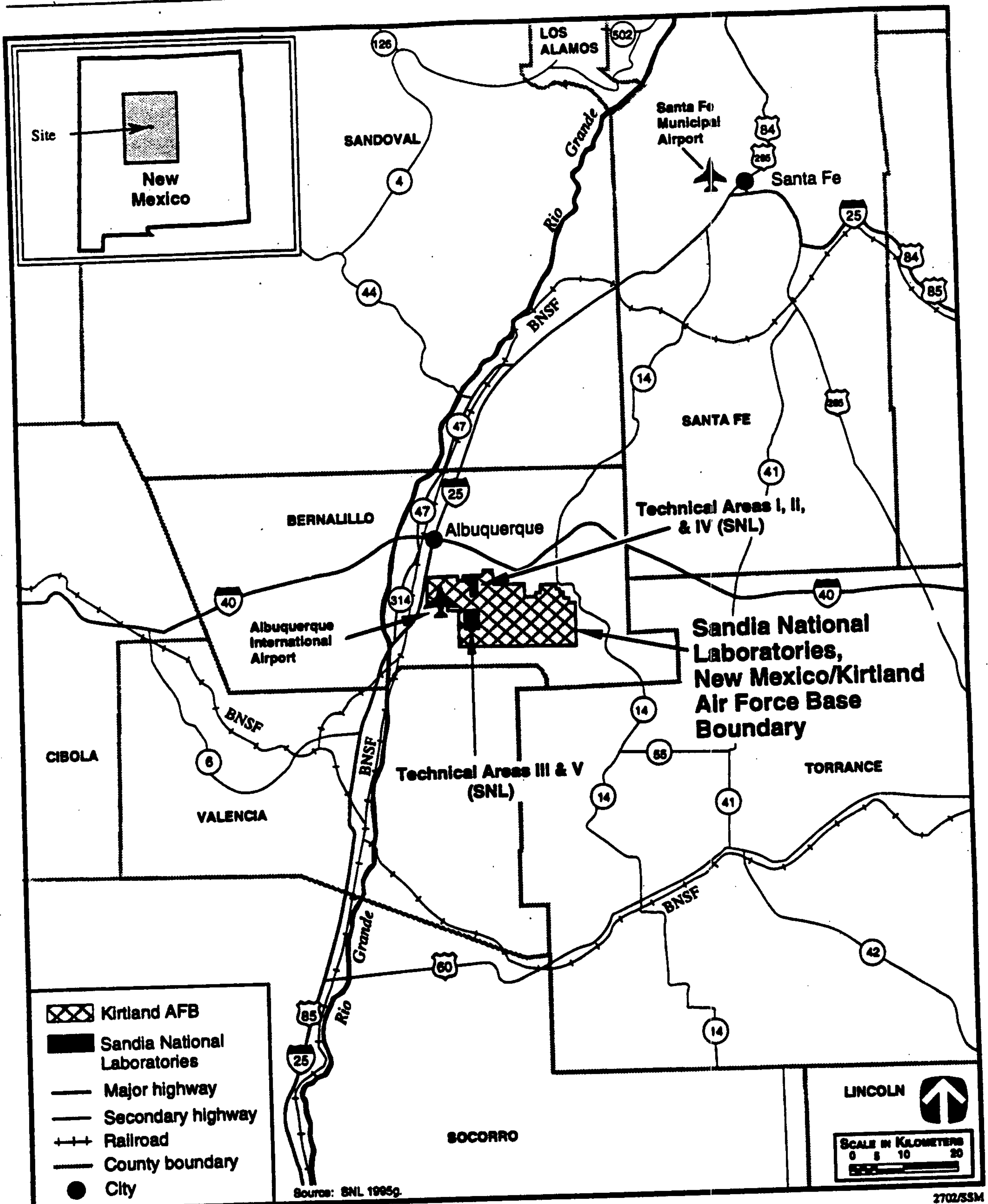


FIGURE 4.8–1. *Sandia National Laboratories, New Mexico, and Region.*

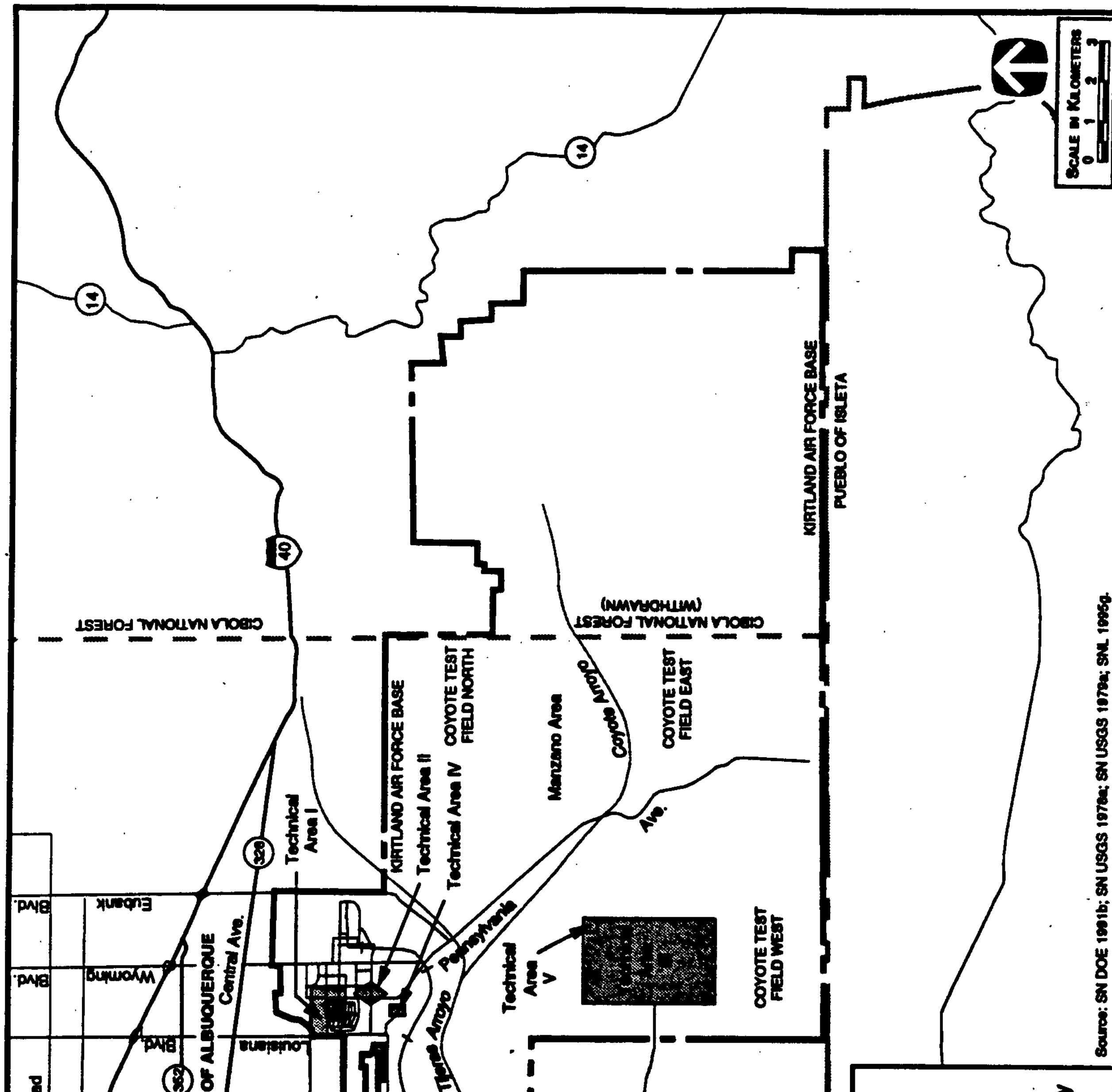


FIGURE 4.8–2.—*Location of Technical Areas I through V at Sandia National Laboratories, New Mexico.*

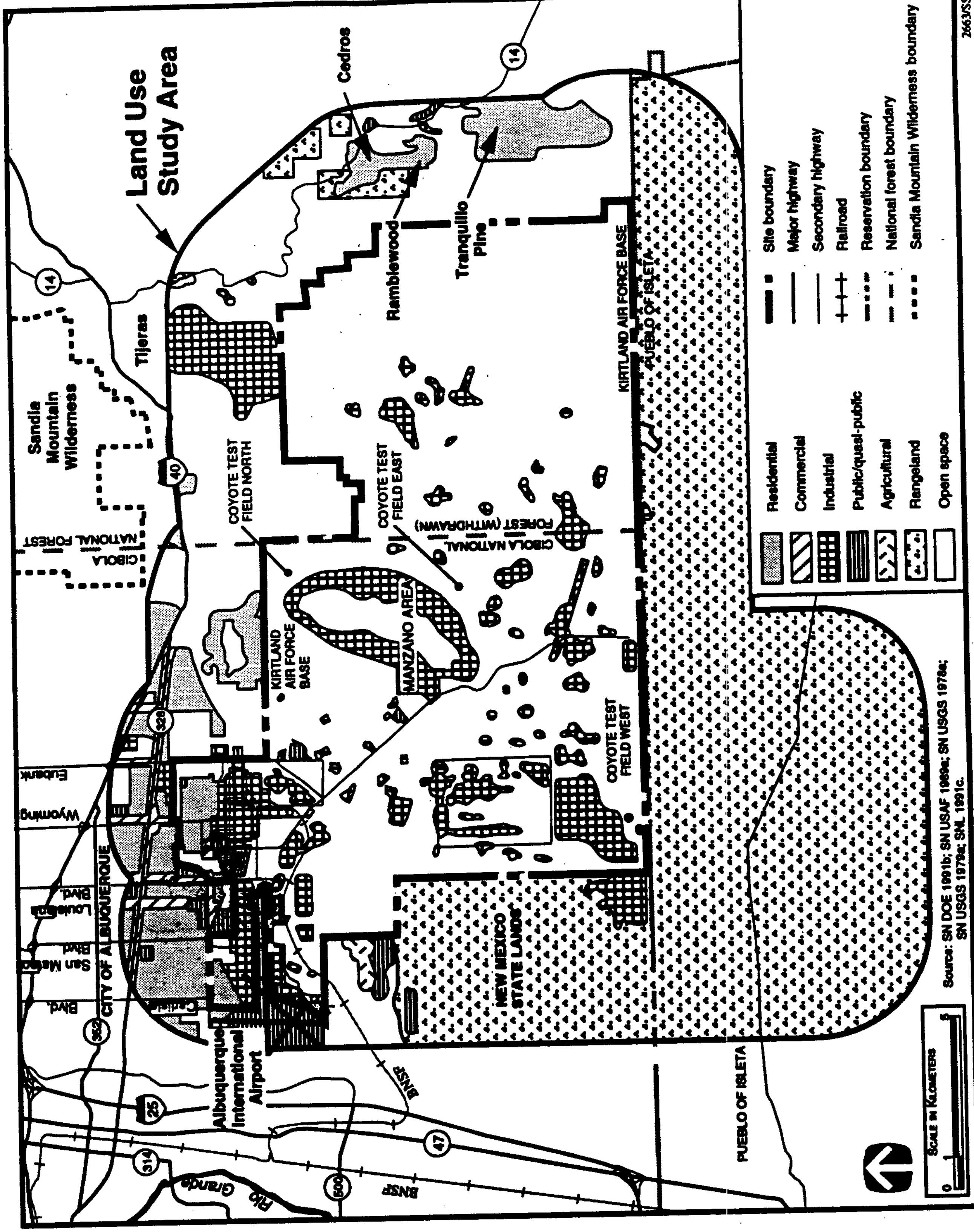


FIGURE 4.8.2.1-1.—*Generalized Land Use at Sandia National Laboratories, New Mexico, and Vicinity.*

Technical Area I. Commercial uses are primarily concentrated north of the site along Central Avenue and Gibson Boulevard (SN USAF 1990a:3.6-4–3.6-6). SNL does not contain any public recreation facilities.

4.8.2.2 *Site Infrastructure*

The site infrastructure characteristics that exist to support the current SNL missions described in section 3.2.8 are summarized in table 4.8.2.2–1.

TABLE 4.8.2.2–1.—*Baseline Characteristics for Sandia National Laboratories*

Characteristics	Current Value
Land	
Area (ha)	1,150
Roads (km)	40
Railroads (km)	8
Electrical	
Energy consumption (MWh/yr)	186,944
Peak load (MWe)	32
Fuel	
Natural gas (m^3/yr)	15,773,761
Liquid (L/yr)	1,301,598
Coal (t/yr)	0
Steam	
Generation (kg/hr)	29,287
Water	
Usage (MLY)	1,387[a]

[a] Value based on 1990 data.
Source: SNL 1995b:1.

4.8.2.3 *Air Quality*

The following section describes existing air quality including a review of the meteorology and climatology in the vicinity of SNL. More detailed discussions of the air quality methodologies, input data, and atmospheric dispersion characteristics are presented in appendix section B.3.8.

Meteorology and Climatology. The climate at SNL and in the surrounding region is characteristic of a semiarid steppe. The annual average temperature in the area is 13.4 °C (56.2 °F); temperatures vary from an average daily minimum of -5.7 °C (21.7 °F) in January to an average daily maximum of 33.6 °C (92.5 °F) in July. The average annual precipitation is 22.6 cm (8.88 in). The annual average wind speed is 4.0 m/s (9.0 mph) (NOAA 1994c:3).

Ambient Air Quality. SNL is located within the Albuquerque-Mid Rio Grande New Mexico Intrastate AQCR 152. Portions of the AQCR are designated nonattainment for carbon monoxide and total suspended particulates (40 CFR 81.332). The NAAQS and the State of New Mexico ambient air quality standards are given in appendix table B.3.1–1.

The principal sources of criteria air pollutants at SNL are the steam plant and the emergency diesel generator plant (SNL 1994a:5-19,5-20). Other emissions include fugitive particulate emissions from waste-burial activities, other process emissions, vehicular emissions, and temporary emissions from various construction activities. Hazardous/toxic air pollutant emissions at SNL occur from laboratories and miscellaneous operations and consist primarily of hydrogen chloride, methyl chloroform, toluene, and xylene. The emission inventories are included in appendix table B.3.8–1.

Ambient air quality conditions at SNL are shown in table 4.8.2.3–1. Ambient air quality concentrations at SNL are in compliance with applicable guidelines and regulations.

4.8.2.4 *Water Resources*

This section describes the surface and groundwater resources at SNL.

Surface Water. SNL is located within Kirtland Air Force Base on the Albuquerque East Mesa. The mesa slopes gently southwest to the Rio Grande, the primary drainage channel for the area. The Rio Grande is located 10 km (6 mi) west of Kirtland Air Force Base and flows north to south. No perennial streams flow through the SNL area. The major surface water feature at SNL is the Arroyo Seco, an intermittent stream that enters the site on the eastern boundary and exits on the northwestern corner. The channel is dry at least 6 months out of the year. Two other primary surface channels at SNL are Tijeras Arroyo and the smaller Arroyo del Coyote (figure 4.8–2). The Arroyo del Coyote joins the Tijeras Arroyo to discharge into the Rio Grande approximately 8 km (5 mi) from the western edge of Kirtland

TABLE 4.8.2.3–1.—*Comparison of Baseline Ambient Air Concentrations with Most Stringent Applicable Regulations and Guidelines at Sandia National Laboratories, 1994* [Page 1 of 2]

Pollutant	Averaging Time	Most Stringent Regulation or Guideline (μg/m³)	Baseline Concentration (μg/m³)
Criteria Pollutant			
Carbon monoxide	Annual	4,600[a]	1,603
	8-hour	10,000[b]	4,924
	1-hour	15,000[a]	10,307
Lead	Calendar quarter	1.5[b]	0.0667
	30-day	3[a]	c
Nitrogen dioxide	Annual	94[d]	30
	24-hour	117[a]	77
Ozone	1-hour	235[b]	188
Particulate matter	Annual	50[b]	15.92
	24-hour	150[b]	66
Sulfur dioxide	Annual	11[a]	0.8
	24-hour	92[a]	5.2
	3-hour	1,300[b]	21.7
Mandated by New Mexico and Albuquerque-Bernalillo County			
Arsenic, copper, and zinc	30-day	10[a]	0.067
Beryllium	30-day	0.01[a]	c
Hydrocarbon (non-methane)	3-hour	100[a]	c
Hydrogen sulfide	1-hour	4[a]	c
Photochemical oxidants	1-hour	20[a]	c
Total reduced sulfur	1-hour	4[a]	c
Total suspended particulates	Annual	60[d]	15.92
	30-day	90[d]	<66
	7-day	110[d]	<66
	24-hour	150[d]	66
Hazardous and Other Toxic Compounds			
Acetone	8-hour	e	0.25
Benzene	8-hour	e	< 0.01
Carbon tetrachloride	8-hour	300[d]	< 0.01
Hydrogen chloride	8-hour	e	3.27
Isopropyl alcohol	8-hour	9,800[d]	0.11
Methanol	8-hour	e	0.11
Methyl chloroform	8-hour	e	0.71
Methylene chloride	8-hour	e	0.04

TABLE 4.8.2.3–1.—***Comparison of Baseline Ambient Air Concentrations with Most Stringent Applicable Regulations and Guidelines at Sandia National Laboratories, 1994*** **[Page 2 of 2]**

Pollutant	Averaging Time	Most Stringent Regulation or Guideline (μg/m³)	Baseline Concentration (μg/m³)
Hazardous and Other Toxic Compounds (Continued)			
Toluene	8-hour	[e]	0.55
Trichloroethylene	8-hour	[e]	0.10
Trichlorotrifluoroethane	8-hour	[e]	0.15
Xylene	8-hour	[e]	0.59

[a] State and city/county standard.
[b] Federal standard.
[c] No monitoring data available, baseline concentrations assumed less than applicable standard.
[d] State standard.
[e] No standard.
Source: 40 CFR 50; NM EIB 1995a; NM EIB 1996a; SNL 1995b:1.

Air Force Base. Both arroyos flow intermittently during spring snowmelt or following thunderstorms. Springs in the eastern mountains provide a perennial flow in the upper reaches of Tijeras Arroyo. Most of this flow evaporates or percolates into the soil before reaching Kirtland Air Force Base.

Tijeras Arroyo separates Technical Areas I, II, and IV from Technical Areas III, V, and the Coyote Test Field. Stormwater runoff is drained from the SNL Technical Areas by a combination of overland flow, natural channels, open drainage ditches, culverts, and storm sewers.

High peak flows of short duration characterize floods in the area. High-intensity summer thunderstorms produce the greatest flows, but flooding is not considered a high probability at SNL. The proposed stockpile stewardship and management activities would be located outside the 100- and 500-year floodplain zones (SNL 1995g:1-7).

SNL contains over 24 km (15 mi) of sewer lines interconnected with those of Kirtland Air Force Base. In 1994, SNL had two categorical pretreatment operations and four general wastewater streams discharging to the city of Albuquerque wastewater treatment plant. Discharges by SNL are regulated by the city of Albuquerque Public Works Department, Liquid Waste Division, under the authority of the city's Sewer Use and Wastewater Control Ordinance. The city's ordinance is approved by EPA in accordance with the *Clean Water Act* (CWA), as amended (SNL 1995g:6-1). Total flow from SNL is estimated to be 757 MLY (200 MGY).

To comply with EPA regulations, the city of Albuquerque has implemented an industrial wastewater pretreatment program. This program requires SNL to obtain permits for wastewater discharges to the city's wastewater treatment plant. These permits specify the required quality of discharges and the frequency of reporting the results of the monitoring (SNL 1995g:6-1). In 1994, SNL did not meet permit limits on four different occasions. Noncompliances were for excursions of lead, nickel, pH, oil, and grease (SNL 1995g:6-5).

SNL has one active permitted discharge plan from the state to discharge stormwater from oil storage tank areas and building basements to two surface impoundments (lagoons) permitted under the New Mexico Water Quality Control Commission Regulations as implemented by the New Mexico Environmental Improvement Board.

Surface Water Quality. As a part of the annual surface water monitoring program, samples are obtained from stations upstream and downstream of SNL in the Rio Grande and from Coyote Springs. The upstream station on the Rio Grande is at Corrales Bridge, and the downstream station is at the Isleta Indian Reservation, considerably downstream of the influent point of Tijeras Arroyo. Stormwater flowing into Tijeras Arroyo is the only significant surface water flow into the Rio Grande from the site. Stormwater monitoring is conducted twice a year at SNL. Rio Grande water samples are analyzed for gross alpha, gross beta, total uranium, and tritium. Results from the 1994 annual monitoring are presented in table 4.8.2.4–1. Concentrations of radionuclides in surface waters in 1994 did not exceed applicable standards. No nonradiological monitoring is conducted in Tijeras Arroyo or in the Rio Grande.

Groundwater. SNL lies within the north-south trending Albuquerque basin. The principal aquifer of the Albuquerque basin is the Valley Fill aquifer. The Valley Fill consists of unconsolidated and semiconsolidated sands, gravels, silts, and clays that vary in thickness from a few meters adjacent to the mountain ranges to over 6,400 m (21,000 ft) at a point 8 km (5 mi) southwest of the Kirtland Air Force Base airfield. The Valley Fill aquifer is considered a Class IIa aquifer, having a current source of drinking water and waters having other beneficial uses.

The regional water table is separated by a fault complex that divides the area into a deep region on the west side of the complex and a shallower region on the east side. The depth to groundwater ranges from 15 m to 30 m (49 ft to 98 ft) on the east side of the fault complex and from 116 m (380 ft) to 153 m (500 ft) on the west side (SNL 1995g:1-5). Based on available data, the apparent direction of groundwater flow west of the fault complex is generally to the north and northwest. The direction of groundwater flow east of the fault complex typically is west toward the fault system.

Sources of recharge to the aquifer include precipitation, snowmelt along the margins of the basin, underflow from adjacent areas such as the Hagen Basin, and seepage from streams, canal drains, surface reservoirs, and applied crop irrigation water.

Groundwater Quality. Groundwater monitoring at SNL has been conducted since 1985. Overall, the groundwater in this region has been classified as a calcium bicarbonate chemical type with a pH ranging from 6.08 to 8.84 and an alkalinity range of 0.40 to 49 mg/L. The east side wells are characterized by lower pH than the west side wells. Currently, no monitoring wells are in the proposed project area. The closest well, located approximately 0.4 km (0.25 mi) southeast of the area, had an August 1990 depth-to-water reading of 152 m (499 ft).

The chemical waste landfill has been identified as a source of groundwater contamination. In 1994, concentrations of nickel and chromium were found above the water quality criteria established by the New Mexico Water Quality Regulations in the groundwater at the chemical waste landfill. No Target Analyte Metals or radionuclides were detected above background levels in groundwater samples collected in 1994. The groundwater contamination areas are not located near buildings that house proposed DP activities.

TABLE 4.8.2.4–1.—*Surface Water Quality Monitoring of the Rio Grande at Sandia National Laboratories, 1994*

Parameter	Unit of Measure	Water Quality Criteria[a]	Water Body Concentration Range[b]
Alpha (gross)	pCi/L	15[c]	2-3
Beta (gross)	pCi/L	50[d]	3-7
Tritium	pCi/L	80,000[e]	20-100
Uranium, total	μg/L	NA	1.6-2.6

[a] For comparison only.
[b] Samples were collected from station 11 located on the Rio Grande at the Isleta Pueblo down gradient of SNL. Samples are collected biannually: in May and August.
[c] National Primary Drinking Water Regulations (40 CFR 141).
[d] Proposed National Primary Drinking Water Regulations, Radionuclides (56 FR 33050).
[e] DOE's Derived Concentration Guides for water (DOE Order 5400.5). Values are based on a committed effective dose equivalent of 100 mrem per year; however, because the drinking water maximum contaminant level is based on 4 mrem per year, the number listed is 4 percent of the Derived Concentration Guides.

Note: NA - not applicable.
Source: SNL 1995g.

Groundwater Availability, Use, and Rights. SNL uses approximately 1,387 MLY (366 MGY) of water. Thirty percent of the water used at SNL is purchased from the city of Albuquerque, and the rest is pumped from Kirtland Air Force Base wells.

The city of Albuquerque has annual consumptive water rights of 27,300 MLY (7,210 MGY). The city receives a 50-percent return flow credit for sanitary wastewater discharged to the Rio Grande. In addition, the city of Albuquerque also has 56,800 MLY (15,000 MGY) consumptive water rights to the San Juan/Chama Diversion.

Kirtland Air Force Base has groundwater rights of 7,900 MLY (2,090 MGY). It also has the option of purchasing 10 percent of its water from the city of Albuquerque. Currently, it is operating at a 50-percent capacity.

Groundwater rights in New Mexico are traditionally associated with the appropriation doctrine. In this system, all water is declared to be public and subject to appropriation on the basis "first in time, first in right" principle (VDL 1990a:725). Control of well use is regulated by permits.

4.8.2.5 *Geology and Soils*

Geology. SNL lies on a sequence of sedimentary, igneous, and Precambrian basement rocks. The northern and western sections rest on Miocene to Quaternary gravels, sands, silts, and clays deposited in the basin formed by uplift of the mountains to the east. The eastern portion of SNL is primarily underlain by Precambrian rocks.

SNL is located in seismic Zone 2 (figure A.1–1). The eastern portion of SNL is cut by the Tijeras, Hubble Springs, Sandia, and Manzano faults. The facility is situated in a region of high seismic activity but low magnitude and intensity (SN ERDA 1977a:82). Available records indicate that more than 1,100 earthquakes have occurred during the past 127 years. Intensities have been as high as a modified Mercalli intensity of VII. However, during the past century, only three earthquakes have caused damage at Albuquerque, which is located approximately 10.5 km (6.5 mi) from SNL.

Possible geological concerns include potential ground shaking and rupturing associated with regional seismic activity and the faults intersecting on the site. Statistical studies indicate that a non-damaging earthquake of modified Mercalli intensity less than III may be expected every 2 years, with a damaging event every 100 years. The potential for damage from volcanic activity is small (DOE 1995cc:4-112).

Soils. SNL is located on soils of the Bluepoint-Kokan, Madurez-Wink, Tijeras-Embudo, Kolob-Rock outcrop, and the Seis-Orthids associations (SN USDA 1977a:31,32,41,42). The Bluepoint-Kokan soils are excessively drained, sandy, and gravelly. The Madurez-Wink soils are well-drained and loamy. The Tijeras-Embudo soils are well-drained, loamy, and gravelly. The Kolob-Rock outcrop association in the eastern portion of SNL includes deep, moderately to very steep, well-drained, loamy, and stony soils, and basalt, sandstone, and limestone rock outcrops. The Seis-Orthids association includes shallow to moderately deep soils on level to very steep slopes that are well-drained, very cobbly, stony and very stony, and loamy.

The hazard of blowing soils on the terraces and pediments is severe. Future water erosion hazards are moderate on the alluvial fans, foothills, and highlands. No soils are classified prime farmland at SNL. The soils at SNL are acceptable for standard construction techniques.

4.8.2.6 *Biotic Resources*

The following section describes biotic resources at SNL including terrestrial resources, wetlands, aquatic resources, and threatened and endangered species. A list of threatened and endangered species that may be found on or in the vicinity of SNL is presented in appendix C.

Terrestrial Resources. SNL is located at the juncture of four major North American physiographic and biotic provinces: the Great Basin, the Rocky Mountains, the Great Plains, and the Chihuahuan Desert. The biotic communities of the area exhibit influences from each of these provinces, with the Great Basin influence generally dominating.

SNL occupies about 1,150 ha (2,842 acres) within the larger Kirtland Air Force Base which totals 21,319 ha (52,700 acres). Approximately 39 percent of SNL-controlled land is developed. Vegetation of the area can be classified into four major plant communities: pinyon pine-juniper, grassland, riparian woodland, and riparian scrubland. The pinyon pine-juniper and grassland communities dominate the area, while the riparian woodland and riparian scrubland are limited to the surface drainage courses of canyons and arroyos, respectively (SNL 1992c:5-1). In total, 379 species have been identified that exist or could exist within the area (SNL 1990a:27-37).

At least 10 amphibian, 46 reptile, 124 bird, and 68 mammal species exist, or could exist, in the area of SNL (SNL 1990a:14,16,17,19-22,24-26). Common species include the short-horned lizard *(Phrynosoma douglassi)*, prairie rattlesnake *(Crotalus viridis viridis)*, mourning dove *(Zenaida macroura)*, horned lark *(Eremophila alpestris)*, black-tailed jackrabbit *(Lepus californicus)*, and black-tailed prairie dog *(Cynomys ludovicianus)*. A number of game animals are found on SNL; however, hunting is not permitted. Raptors, such as the Cooper's hawk *(Accipiter cooperii)* and golden eagle *(Aquila chrysaetos)*, and carnivores, such as the coyote *(Canis latrans)* and bobcat *(Lynx rufus)*, are ecologically important groups on the site. A variety of migratory birds has been found at SNL. Migratory birds and their nests and eggs are protected by the *Migratory Bird Treaty Act*. Eagles are similarly protected by the *Bald and Golden Eagle Protection Act*.

Wetlands. National Wetland Inventory maps of SNL have not been prepared nor have site wetlands been delineated. Springs exist at Lurance Canyon, Sol se Mate, and the outlet of Coyote Canyon. Sole se Mate Spring has a small area of permanent water below it that supports wetland plants such as cattails *(Typha spp.)* and rushes *(Juncus spp.)*. A swampy area exists at Coyote Springs that supports wetland vegetation (SN ERDA 1977a: 94-95). These springs can be considered an important source of water for wildlife.

Aquatic Resources. Potential aquatic resources found on SNL include Arroyo del Coyote and Tijeras Arroyo (located in the west and central portions of the site, respectively). The Rio Grande River is located about 10 km (6.2 mi) west of the site. There are no continuously flowing streams on the site. Site arroyos flow intermittently during heavy thundershowers (SNL 1994a:1-7). The arroyos do not support any permanent fish population.

Threatened and Endangered Species. The 18 Federal- and state-listed threatened, endangered, and other special status species that could be found on or in the vicinity of SNL are listed in appendix table C–6. No Federal-listed threatened or endangered species are known to exist on SNL. However, potential breeding habitat exists on SNL for the Mexican spotted owl *(Strix occidentalis lucida)*, southwestern willow flycatcher *(Empidonax traillii extimus)*, and the Federal-candidate mountain plover *(Charadrius montanus)*. The only special status species known to exist onsite is the state-threatened gray vireo *(Vireo vicinior)* (SNL 1992c:5-10,5-11). No critical habitat, as defined in the *Endangered Species Act* (50 CFR 17.11 and 17.12), exists on SNL.

4.8.2.7 *Cultural and Paleontological Resources*

Prehistoric Resources. The prehistoric chronology for the SNL area consists of three broad time periods: Paleo-Indian (10,000 to 5,500 B.C.), Archaic (5,500 B.C. to A.D. 1), and Anasazi (A.D. 1 to 1600) (SN NPS 1988a:132). All DOE-owned properties under SNL control have been surveyed or assessed for cultural resources (SNL 1993c:1-6). All five Technical Areas have been intensively surveyed; no prehistoric sites were recorded. However, because techniques and procedures varied greatly between projects in these areas, most surveys prior to 1985 are not considered adequate, and buried sites or archaeological remains may exist. Prehistoric site types may include pueblos, pithouse villages, rockshelters, hunting blinds, agricultural terraces, quarries, lithic and ceramic scatters, and hearths. Similar sites have been found at nearby locations. A systematic walkover survey was completed at the proposed site locations and no cultural resources were identified.

Historic Resources. Historic resources identified in the vicinity of SNL are associated with early mining, ranching and sheepherding activities, commercial ventures, or transportation routes. All five DOE Technical Areas have been intensively inventoried for resources; two historic sites were recorded. These sites were small historic trash scatters and are not eligible for the NRHP. Twenty-three historic resources have been recorded on DOE-owned or -controlled lands outside of the five Technical Areas, and about 65 percent are considered eligible or potentially eligible for the NRHP.

SNL was established in 1945 as the Z Division of the Los Alamos Scientific Laboratory. Technical Area I originally consisted of temporary World War II structures and wooden framed buildings; more permanent buildings were constructed in 1948. Construction in Technical Area II was initiated in 1948, including two buildings (Buildings 904 and 907) used to assemble the first hydrogen bomb. Test facilities were developed in Technical Area III from 1954 through 1960 (SNL 1993c:2-12,2-13). Numerous buildings and structures in Technical Areas I, II, and III were built between 1945 and 1960; most are associated with the AEC, and, as such, may be considered NRHP eligible. Buildings in Technical Areas III, IV, and V may also qualify for eligibility for the NRHP when they are 50 years old. The New Mexico SHPO has requested that buildings in these areas be evaluated at that time. Buildings 904 and 907 may be considered potentially NRHP eligible because of their association with the assembly of the first hydrogen bomb.

Native American Resources. Native Americans with concerns in this area include the Sandia Pueblo, north of Albuquerque, and the Isleta Pueblo, south of Kirtland Air Force Base (SNL 1993c:1-9). Native American resources on SNL/DOE-controlled lands may consist of prehistoric sites with ceremonial features such as kivas, village shrines, petroglyphs, or burials; all of these site types or features would be of concern to local groups. Consultation with the Isleta and Sandia Pueblos has been initiated by DOE for this project, and no Native American cultural resources have been identified within SNL, including the proposed NIF location.

Paleontological Resources. The geology at SNL consists of sedimentary and volcanic rocks. Uppermost is a sequence of gravel, sand, silt, clay, and caliche. Underneath are sedimentary rocks, and, beneath them, Precambrian rocks. Some fossils have been discovered near SNL. These fossils include vertebrate remains 5 to 8 km (3 to 5 mi) west-northwest of Technical Area III, and an ankle bone from an extinct Pleistocene camel and two teeth from a horse on the south side of Tijeras Arroyo. A fossilized horse skull and some hare teeth were recovered near the mouth of Tijeras Arroyo. These fossils may have been transported to their site of discovery. However, it is possible fossils are present at SNL beneath the alluvial fan deposits from the Sandia Mountains.

4.8.2.8 *Socioeconomics*

Socioeconomic characteristics addressed at SNL include employment and local economy, population and housing, and public finance. Statistics for employment and local economy are based on the regional economic area that encompasses nine counties around SNL located in Arizona and New Mexico. Statistics for population and housing, and public finance are presented for the ROI, a three-county area in which 97 percent of all SNL employees (7,341 persons in 1993) reside: Bernalillo County (88.0 percent), Valencia County (4.5 percent), and Sandoval County (4.5 percent) in New Mexico (appendix table D.1–7). Figure 4.8.2.8–1 presents a map of the counties and selected cities composing the SNL regional economic area and ROI. Supporting data is presented in appendix D.

Regional Economy Characteristics. Selected employment and regional economy statistics for the SNL regional economic area are summarized in figure 4.8.2.8–2. The civilian labor force in the regional economic area increased from 279,186 in 1980 to 344,309 in 1990. This is an increase of 23 percent (annual average increase of 2.3 percent). The 1994 unemployment rate in the regional economic area was 5.7, which was less than 1 percent lower than the rates in Arizona and New Mexico. The region's per capita income of $17,003 in 1993 was approximately 4 percent greater than New Mexico's per capita income of $16,346 and 6 percent lower than Arizona's per capita income of $18,085.

In 1993, as shown in figure 4.8.2.8–2, the percentage of total employment involving the private sector activity of retail trade in the regional economic area (18 percent) was comparable to the economies of Arizona and New Mexico. Service activities in the region (31 percent of the total employment) were also comparable to Arizona and New Mexico. Manufacturing was similar in both the regional economic area (7 percent) and New Mexico, but represented a 2-percent larger share of total employment in Arizona.

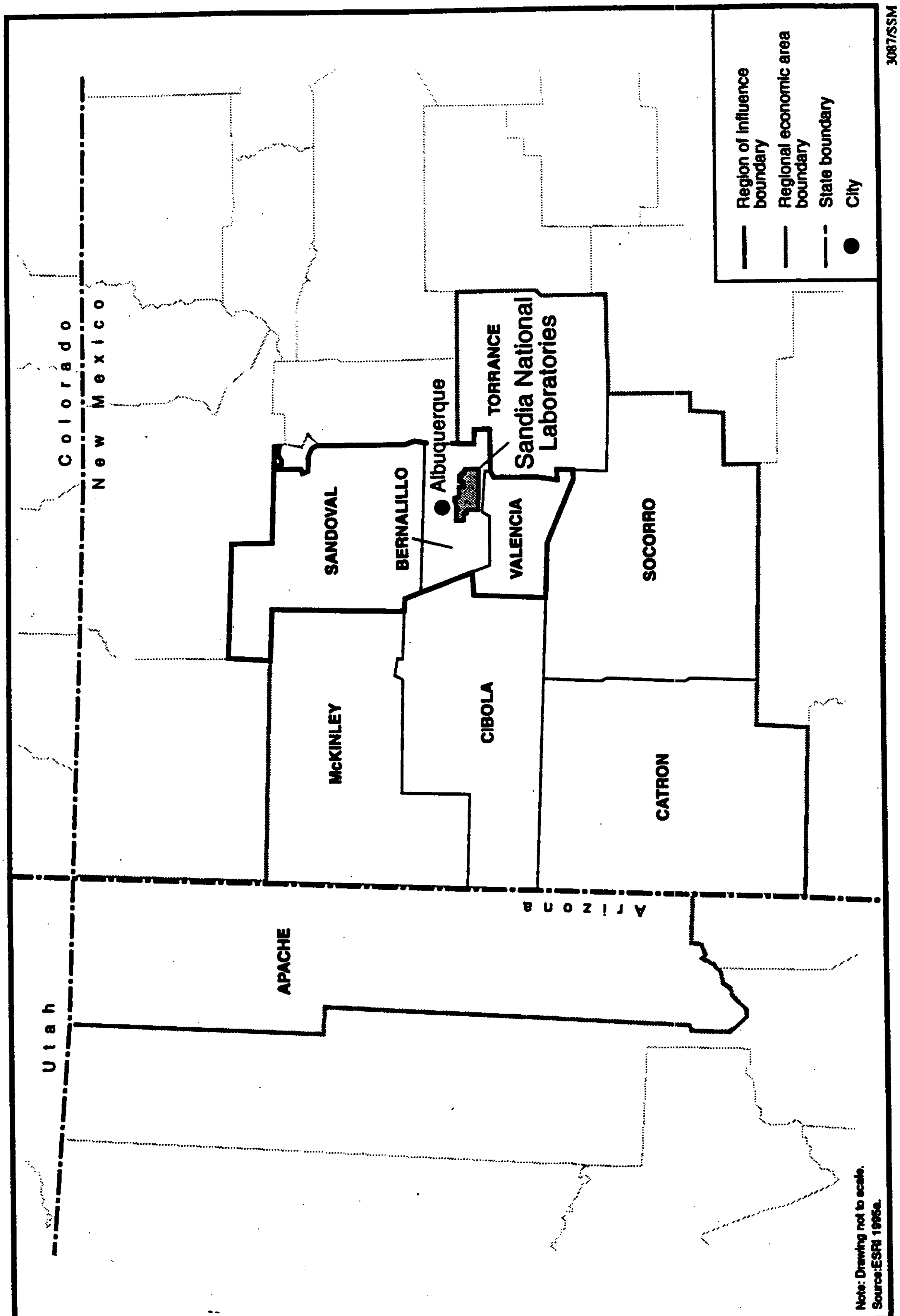
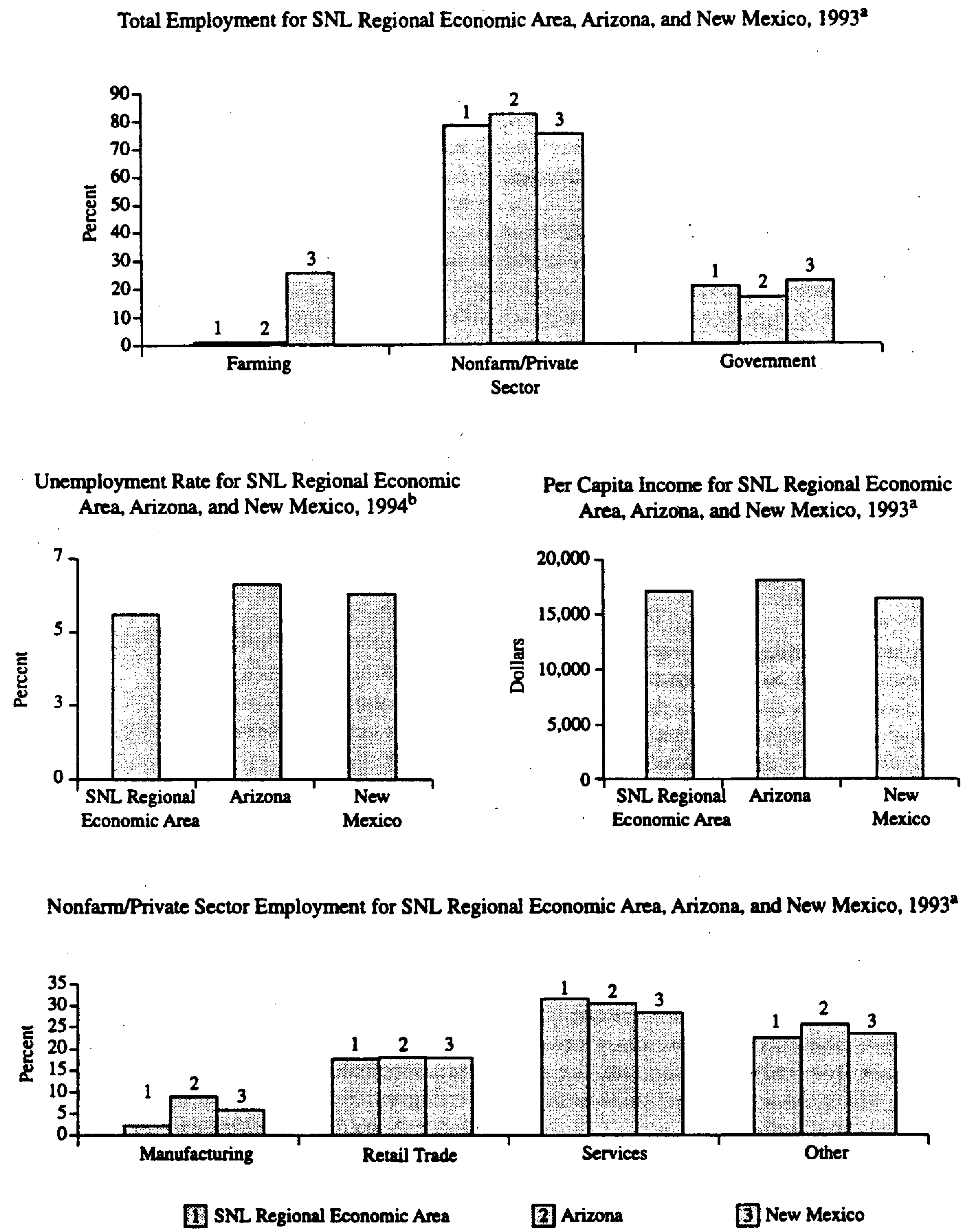


FIGURE 4.8.2.8–1.—*Regional Economic Area and Region of Influence for Sandia National Laboratories.*



[a]DOC 1995a.
[b]DOL 1995a.

FIGURE 4.8.2.8–2.—*Economy for the Sandia National Laboratories Regional Economic Area, Arizona, and New Mexico.*

Population and Housing. Between 1980 and 1992, the ROI population grew from 515,614 to 616,346. This is an increase of 19.5 percent (annual average increase of 1.6 percent). Within the ROI, Sandoval County experienced the largest increase at 97.7 percent, while Valencia County's population decreased by 21.0 percent. This decrease was due to the formation of Cibola County that was created entirely from the western portion of Valencia County shortly after the 1980 census. If the 1992 Cibola County population was added to Valencia's, the result would be an 18-percent increase from 1980 to 1992.

Between 1980 and 1990, housing units increased from 196,765 to 241,683. This is a 22.8-percent increase (annual average increase of 2.3 percent), which is similar to the percent increase for New Mexico. The total number of housing units estimated for 1992 is 244,900. The 1990 homeowner vacancy rate in the ROI was 1.8 percent. The rental vacancy rate for the ROI counties was 10.2 percent. Population and housing trends are summarized in figure 4.8.2.8–3.

Public Finance. Financial characteristics of the local jurisdictions in the SNL ROI that are most likely to be affected by the proposed action are presented in this section. The data reflect total revenues and expenditures of each jurisdiction's general fund, special revenue funds, and, as applicable, debt service, capital project, and expendable trust funds. School district boundaries may or may not coincide with county or city boundaries, but the districts are presented under the county where they primarily provide services. Major revenue and expenditure fund categories for counties, cities, and school districts are presented in appendix tables D.2.3–12 and D.2.3–13. Figure 4.8.2.8–4 summarizes 1994 local governments' revenues and expenditures. Fund balances, which are dollars carried over from previous years, are not included in figure 4.8.2.8–4. All jurisdictions assessed had positive fund balances.

4.8.2.9 *Radiation and Hazardous Chemical Environment*

The following section provides a description of the radiation and hazardous chemical environment at SNL. Also included are discussions of health effects studies, emergency preparedness considerations, and a brief accident history.

Radiation Environment. Major sources of background radiation exposure to individuals in the vicinity of SNL are shown in table 4.8.2.9–1. All annual doses to individuals from background radiation are expected to remain constant over time. The incremental total dose to the population would result only from changes in the size of the population. Background radiation doses are unrelated to SNL operations.

TABLE 4.8.2.9–1.—*Sources of Radiation Exposure to Individuals in the Vicinity, Unrelated to Sandia National Laboratories Operations*

Source	Committed Effective Dose Equivalent (mrem/yr)
Natural Background Radiation	
Cosmic and external terrestrial radiation[a]	95
Internal terrestrial radiation[b]	39
Radon in homes (inhaled)[b]	200
Other Background Radiation[b]	
Diagnostic x rays and nuclear medicine	53
Weapons test fallout	<1
Air travel	1
Consumer and industrial products	10
Total	399

[a] SNL 1994a.
[b] NCRP 1987a.

Releases of radionuclides to the environment from SNL operations provide another source of radiation exposure to people in the vicinity. The radionuclides and quantities released from operations in 1993 are listed in the *1993 Site Environmental Report Sandia National Laboratories, Albuquerque, New Mexico* (SAND94-1293). The doses to the public resulting from these releases are given in table 4.8.2.9–2. These doses fall within radiological limits (DOE Order 5400.5) and are small in comparison to background radiation. The releases listed in the 1993 report were used in the development of the reference

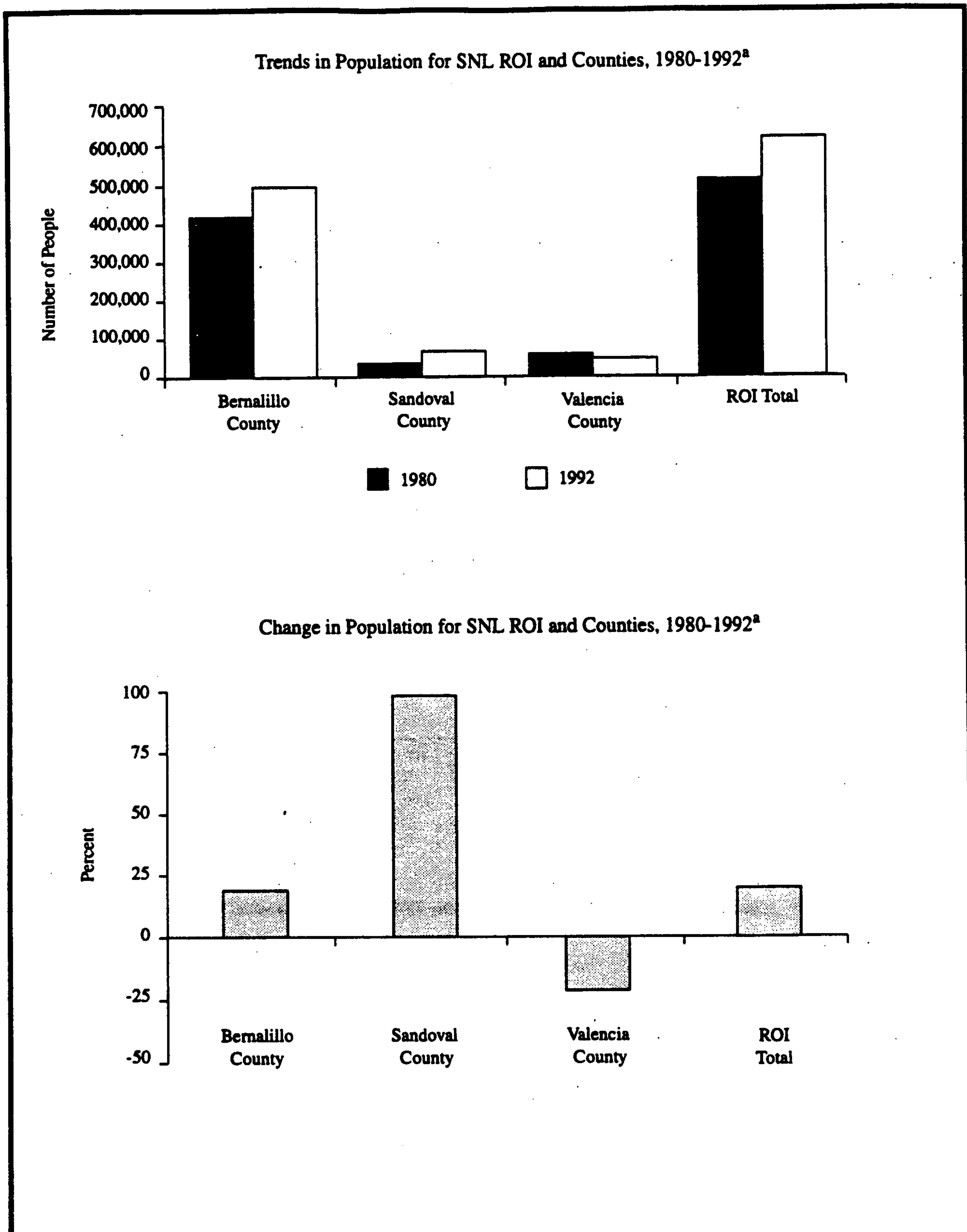
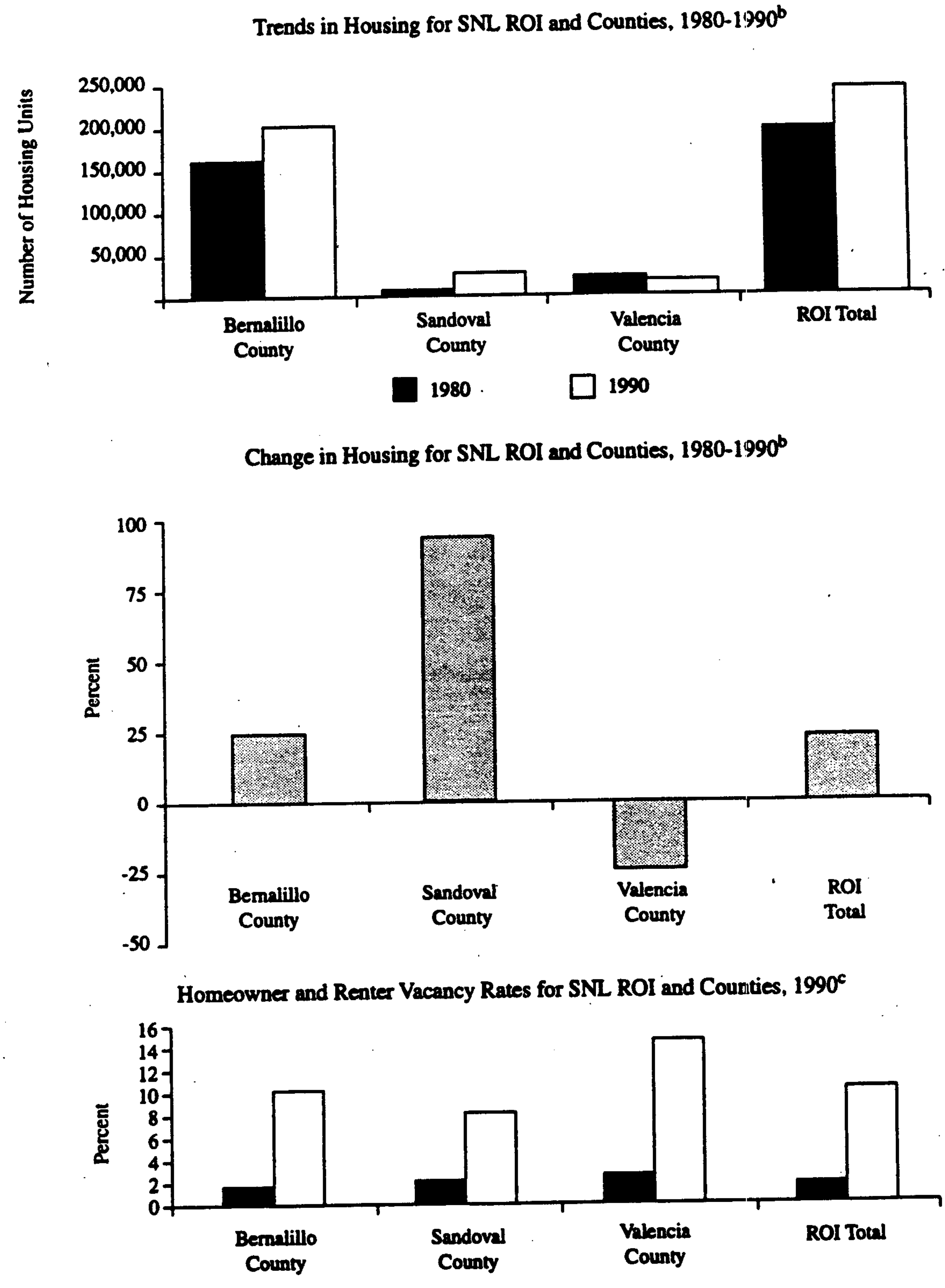
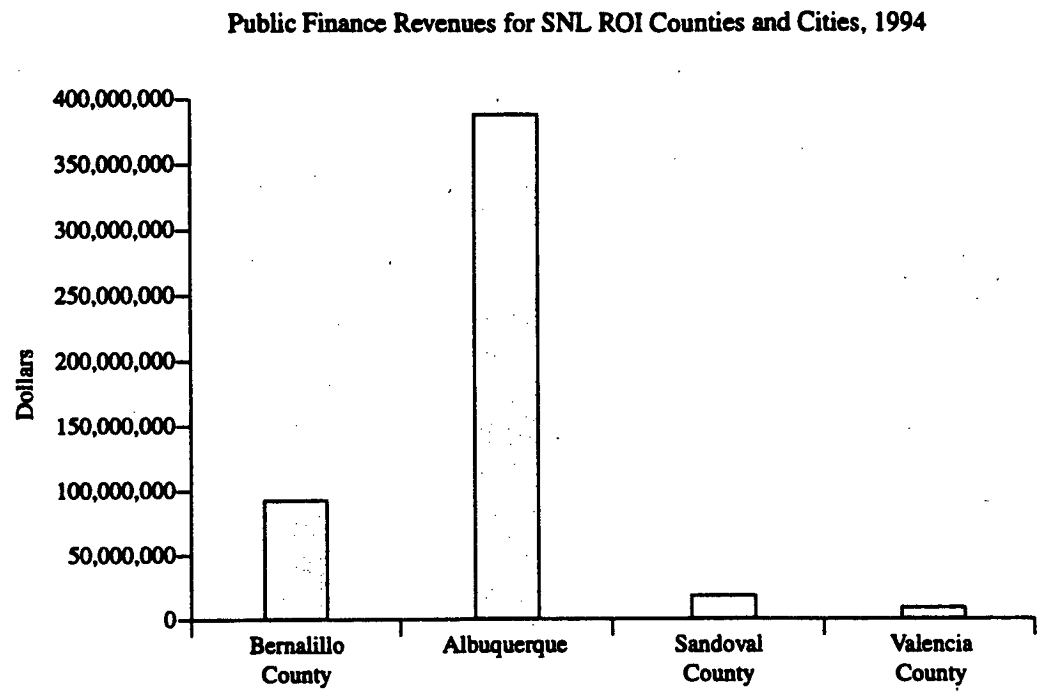


FIGURE 4.8.2.8–3.—*Population and Housing for the Sandia National Laboratories Region of Influence* [Page 1 of 2].



[a]Census 1983g; Census 1993m.
[b]Census 1982o; Census 1991h.
[c]Census 1991h.

FIGURE 4.8.2.8–3.—*Population and Housing for the Sandia National Laboratories Region of Influence* [Page 2 of 2].



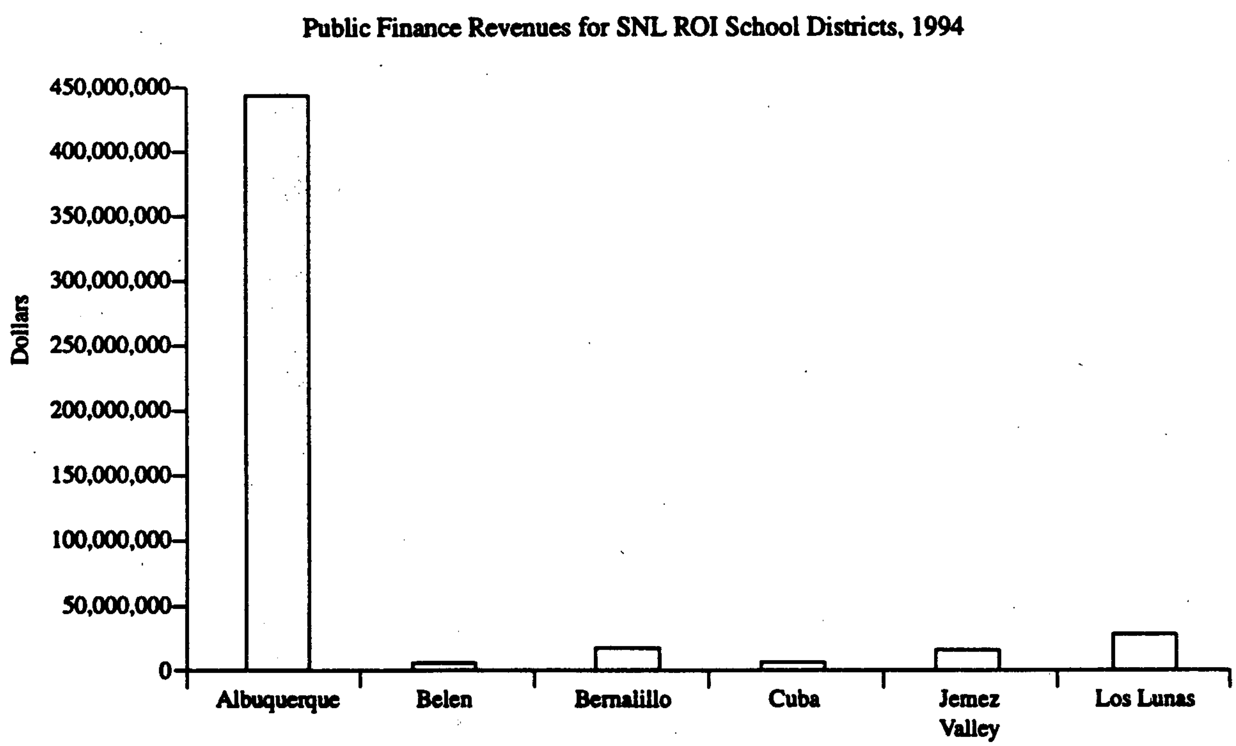
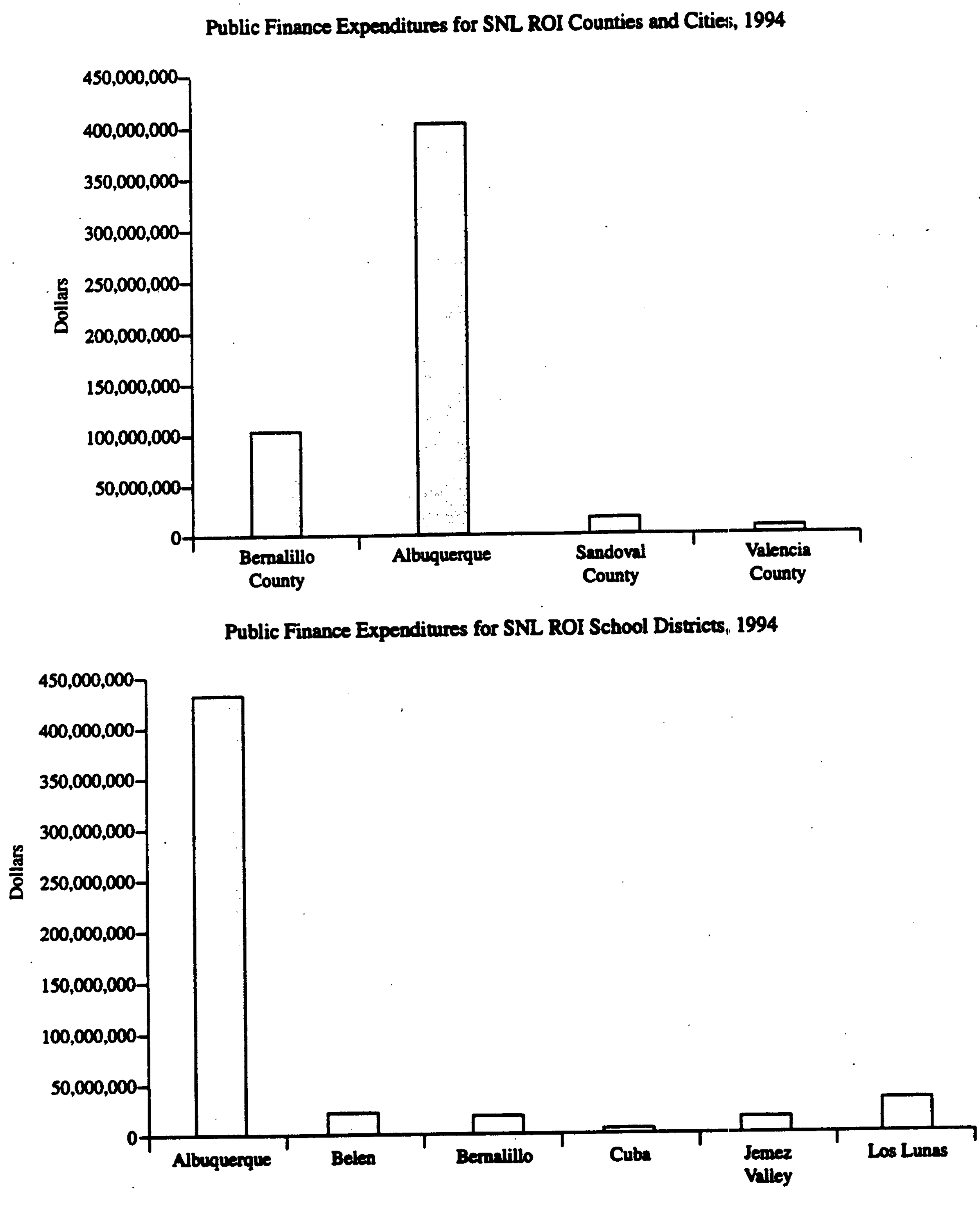


FIGURE 4.8.2.8–4.—*Local Government Public Finance for the Sandia National Laboratories Region of Influence* [Page 1 of 2].



Source: SN City 1995a; SN County 1995a; SN School 1995b.

FIGURE 4.8.2.8–4.—***Local Government Public Finance for the Sandia National Laboratories Region of Influence*** **[Page 2 of 2].**

TABLE 4.8.2.9–2.—*Doses to the General Public from Normal Operation at Sandia National Laboratories, 1993 (Committed Effective Dose Equivalent)*

	Atmospheric Releases		Liquid Releases		Total	
Affected Environment	Standard[a]	Actual	Standard[a]	Actual	Standard[a]	Actual
Maximally exposed individual (mrem)	10	$1.6x10^{-3}$	4	0.0	100	$1.6x10^{-3}$
Population within 80 kilometers[b] (person-rem)	None	0.027	None	0.0	100	0.027
Average individual within 80 kilometers[c] (mrem)	None	$4.7x10^{-5}$	None	0.0	None	$4.7x10^{-5}$

[a] The standards for individuals are given in DOE Order 5400.5. As discussed in that order, the 10 mrem/yr limit from airborne emissions is required by the CAA, the 4 mrem/yr limit is required by the SDWA, and the total dose of 100 mrem/yr is the limit from all pathways combined. The 100 person-rem value for the population is given in proposed 10 CFR 834 (58 FR 16268).

[b] In 1993, this population was approximately 578,000.

[c] Obtained by dividing the population dose by the number of people living within 80 km (50 mi) of the site.

Source: SNL 1994a.

environment (No Action) radiological releases at SNL in 2005 (section 4.8.3.9).

Based on a dose-to-risk conversion factor of 500 cancer deaths per 1 million person-rem ($5x10^{-4}$ fatal cancer per person-rem) to the public (appendix E), the fatal cancer risk to the maximally exposed member of the public due to radiological releases from SNL operations in 1993 was estimated to be approximately $8.0x10^{-10}$. That is, the estimated probability of this person dying of cancer at some point in the future from radiation exposure associated with 1 year of operations is less than 1 in 1 billion. (Note that it takes several to many years from the time of exposure to radiation for a cancer to manifest itself.)

Based on the same conversion factor, $1.4x10^{-5}$ excess fatal cancers are projected in the population living within 80 km (50 mi) of SNL from normal operation in 1993. To place this number into perspective, it can be compared with the number of fatal cancers expected in this population from all causes. The 1990 mortality rate associated with cancer for the U.S. population was 0.2 percent per year (Almanac 1993a:839). Based on this mortality rate, the number of fatal cancers from all causes expected to occur during 1993 in the population living within 80 km (50 mi) of SNL is 1,156. This number of expected fatal cancers is much higher than the estimated $1.4x10^{-5}$ fatal cancers that could result from SNL operations in 1993.

Workers at SNL receive the same dose as the general public from background radiation, but also receive an additional dose from working in the facilities. Table 4.8.2.9–3 includes the average, maximum, and total occupational doses to workers from operations in 1992. These doses fall within radiological limits (10 CFR 835). Based on a dose-to-risk conversion factor of 400 fatal cancers per 1 million person-rem ($4x10^{-4}$ fatal cancers per person-rem) among workers (appendix E), the number of excess fatal cancers to SNL workers from operations in 1992 is estimated to be $4.4x10^{-3}$.

TABLE 4.8.2.9–3.—*Doses to the Onsite Worker from Normal Operation at Sandia National Laboratories, 1992*

	Onsite Releases and Direct Radiation	
Affected Environment	Standard[a]	Actual[b]
Average worker (mrem)	None	3.2
Maximally exposed worker (mrem)	5,000	1,000
Total workers (person-rem)	None	11

[a] 10 CFR 835. DOE's goal is to maintain radiological exposure as low as reasonably achievable.

[b] DOE 1993n:7. The number of badged workers in 1992 was approximately 3,420.

A more detailed presentation of the radiation environment, including background exposures and radiological releases and doses, is presented in *1993 Site Environmental Report Sandia National Laboratories, Albuquerque, New Mexico* (SAND 94-1293). In addition, the concentrations of radioactivity in various environmental media (e.g., air, water, and soil) in the onsite and offsite regions are presented in the same reference.

Chemical Environment. The background chemical environment important to human health consists of the atmosphere, which may contain hazardous chemicals that can be inhaled; drinking water, which may contain hazardous chemicals that can be ingested; and other environmental media with which people may come in contact (e.g., surface waters during swimming and soil through direct contact or via the food pathway). The baseline data for assessing potential health impacts from the chemical environment are those presented in sections 4.8.2.3 and 4.8.2.4.

Adverse health impacts to the public can be minimized through administrative and design controls that decrease hazardous chemical releases to the environment and achieve compliance with permit requirements (e.g., air emissions and NPDES permit requirements). The effectiveness of these controls is verified through the use of monitoring information and inspection of mitigation measures. Health impacts to the public may occur during normal operation at SNL via inhalation of air containing hazardous chemicals released to the atmosphere by operations. Risks to public health from ingestion of contaminated drinking water or by direct exposure are also potential pathways.

Baseline air emission concentrations for hazardous air pollutants and their applicable standards are presented in section 4.8.2.3. These concentrations are estimates of the highest existing offsite concentrations and represent the highest concentrations to which members of the public could be exposed. All annual concentrations are compared with applicable guidelines and regulations. Information about estimating health impacts from hazardous chemicals is presented in appendix E.

Exposure pathways to SNL workers during normal operation may include inhaling the workplace atmosphere, drinking SNL potable water, and possible other contact with hazardous materials associated with particular work assignments. The potential for health impacts varies from facility to facility and from worker to worker, and available information is not sufficient to allow a meaningful estimation and summation of these impacts. However, workers are protected from hazards specific to the workplace through appropriate training, protective equipment, monitoring, and management controls. SNL workers are also protected by adherence to OSHA and EPA occupational standards that limit workplace atmospheric and drinking water concentrations of potentially hazardous chemicals. Appropriate monitoring, which reflects the frequency and amount of chemicals utilized in the operation processes, ensures that these standards are not exceeded. Additionally, DOE requirements ensure that conditions in the workplace are as free as possible from recognized hazards that cause or are likely to cause illness or physical harm. Therefore, worker health conditions at SNL are expected to be substantially better than required by the standards.

Health Effects Studies. There are no known epidemiological studies that have been conducted which examine the impact of SNL on the health of the surrounding communities.

Broadwell and others reported on 25 workers currently or formerly involved in the manufacture of hybrid microcircuits (AJIM 1995a:677-698). Clinical narratives and retrospective exposure assessments in the study group suggested chronic low-level exposure to solvents, with intermittent acute excursions. Solvent exposures linked to a clinical syndrome were intermittent, and symptoms were reversible after cessation of what were reported as "high-level" exposures. Several exposed workers showed clinical evidence of an acquired toxic encephalopathy supporting an association between long-term solvent exposure and depressed mood, with increased somatic symptoms. Attention to engineering controls, chemical fume hood ventilation, work practices, safety training, and personal protective gear was markedly improved when the lab was moved in the fall of 1990. For a more detailed description of the studies and the findings, refer to appendix section E.4.8.

Accident History. A review of the recent SNL annual environmental and accident reports indicates that there have been no significant adverse impacts to workers, the public, or the environment. This review was performed to provide an indication of the site's accident history. The period of review, from 1986 to 1990, was a time during which plant operations were much higher than in previous years and also higher than what is anticipated for the future.

Emergency Preparedness. Each DOE site has established an emergency management program that would be activated in the event of an accident. This program has been developed and maintained to ensure adequate response to accident conditions and to provide response efforts for accidents not specifically considered. The emergency management program incorporates activities associated with planning, preparedness, and response.

4.8.2.10 *Waste Management*

This section outlines the major environmental regulatory structure and ongoing waste management activities for the Albuquerque location of SNL. A more detailed discussion of the ongoing waste management operation is provided in appendix section H.2.7.

DOE is working with Federal and state regulatory authorities to address compliance and cleanup obligations arising from its past operations at SNL. DOE is also engaged in several activities to bring its operations into full regulatory compliance. These activities are set forth in negotiated agreements that contain schedules for achieving compliance with these applicable requirements and financial penalties for nonachievement of agreed upon milestones. These agreements have been reviewed to assure the proposed actions are allowable under the terms of these agreements.

SNL is not on the NPL for sites requiring environmental restoration in accordance with CERCLA and *Superfund Amendments and Reauthorization Act* (SARA). The assessment of environmental contamination at SNL began formally in 1984, when DOE started to identify, assess, and remediate potentially hazardous waste sites in response to CERCLA. This program identified 117 sites with potential contamination. A similar investigation was conducted by EPA in 1987. These programs ultimately defined a working inventory of potential "solid waste management units." Current investigations are intended to determine the nature and extent of hazardous and radioactive contamination and to restore any sites where such materials pose a threat to human health or the environment. It is assumed that remediation at all sites will be completed by 2011.

SNL has a Waste Minimization and Pollution Awareness Plan to document projections for present and future waste generation rates. This program tracks the amount of waste generated at the site and encourages the use of waste reduction methods. In the future, it will assess opportunities for preventing pollution from priority waste streams, increasing recycling efforts, and ensuring the procurement of recycled products.

SNL manages a small quantity of spent nuclear fuel and five broad waste categories: TRU, low-level, mixed, hazardous, and nonhazardous. Because there is no spent nuclear fuel or TRU waste associated with any of the proposed activities at SNL, there is no discussion in this PEIS of spent nuclear fuel or TRU waste generation and management at SNL. A discussion of the waste management operations associated with low-level, mixed, hazardous, and nonhazardous wastes follows.

Low-Level Waste. In 1994, SNL generated approximately 0.9 m^3 (241 gal) of liquid and 53 m^3 (70 yd^3) of solid LLW (SNL 1995f:7). SNL generates LLW in both technical and remote test areas as a result of R&D activities. Most of the LLW consists of contaminated equipment and combustible decontamination materials and cleanup debris. All generated LLW is temporarily stored at generator sites or aboveground in transportation containers at the Technical Area III disposal site. All LLW packages are currently onsite pending approval of transport by commercial carriers to NTS for disposal.

Mixed Low-Level Waste. In 1994, SNL generated approximately 0.007 m^3 (2 gal) of liquid and 1.9 m^3 (2.5 yd^3) of solid mixed LLW (SNL 1995f:7). Mixed waste includes radioactively contaminated oils and solvents and radioactively contaminated or activated lead, or other heavy metals. Other mixed waste may be generated as a result of weapons tests. The 557-m^2 (666-yd^2) Radioactive and Mixed Waste Management Facility will have a centralized packaging and storage function for LLW and mixed waste. Mixed waste will be stored at the facility until accepted for disposal at NTS once it is permitted.

Processing at the Radioactive and Mixed Waste Management Facility will include activities required to comply with the waste acceptance criteria and Federal regulations. Pursuant to the *Federal Facility Compliance Act,* SNL developed a site treatment plan for mixed wastes at SNL. The site treatment plan is intended to bring SNL into compliance with Land Disposal Restrictions storage prohibitions under the *New Mexico Hazardous Waste Act* and RCRA. On March 31, 1995, DOE submitted its proposed site treatment plan to the New Mexico Environment Department for review, public comment, and approval. On October 6, 1995, a Compliance Order was issued by the State of New Mexico requiring SNL to comply with the site treatment plan for the treatment of mixed wastes at SNL. The Compliance Plan Volume of the site treatment plan provides overall schedules for achieving compliance with the land disposal restrictions storage and treatment requirements, a schedule for the submittal of applications for permits, construction of treatment facilities, technology development, offsite transportation for treatment, and the treatment of mixed wastes in full compliance with the *New Mexico Hazardous Waste Act* and RCRA. An annual update to the site treatment plan is required.

Hazardous Waste. In 1994, SNL generated approximately 342 m^3 (90,530 gal) of liquid, and 81.9 t (90.3 tons) of RCRA-regulated and 647 t (713 tons) of state-regulated solid hazardous wastes (SNL 1995f:7). Hazardous/toxic chemical waste is generated at SNL by the numerous R&D activities conducted throughout the facilities. The Hazardous Waste Management Facility can store 265 m^3 (70,000 gal) of liquid and solid hazardous wastes at one time. There are no active onsite disposal facilities for hazardous/toxic wastes at SNL. All RCRA-regulated wastes are packaged, manifested, and shipped offsite by DOT-registered transporters for disposal at RCRA-permitted treatment, storage, and disposal facilities.

Nonhazardous Waste. For 1994, SNL generated approximately 75,700 m^3 (19,998,000 gal) of liquid sanitary and industrial wastewater (SNL 1995b:1). SNL contains over 24 km (15 mi) of sewer lines interconnected with those of Kirtland Air Force Base. Pretreated industrial wastewater effluent and sanitary sewage are discharged to the city of Albuquerque sewer system in compliance with NPDES permit discharge limits. In 1994, SNL generated approximately 13,600 t (14,990 tons) of solid sanitary waste (SNL 1995f:7). Solid sanitary waste is collected and taken to the Albuquerque sanitary landfill on a regular basis.

4.8.3 Environmental Impacts

4.8.3.1 *Land Resources*

No Action. Under No Action, DOE would continue current and planned activities at SNL as described in section 3.2.8. No additional land-use impacts are anticipated at SNL beyond the effects of existing and future activities which are independent of the proposed action.

Management Alternatives

Nonnuclear Fabrication. The Nonnuclear Fabrication Facility at SNL would require no additional land acquisition. Modification of existing facilities and new construction at Technical Area I would be required to accommodate the new proposed activities. The new facilities at SNL would provide approximately 58,060 m^2 (625,000 ft^2) of work space and would be located within an undeveloped 9-ha (22-acre) area. The land to be developed represents approximately 6 percent of the land currently identified as available for development at SNL, but it is only a small portion of the land available for future development within SNL. An additional 5,110 m^2 (55,000 ft^2) of support facility space would be located in existing buildings. The proposed nonnuclear fabrication activities would be compatible and consistent with current operations in the area and SNL land-use plans and policies. Impacts to land use or land use plans are not expected.

Sensitivity Analysis. SNL would be able to accommodate all operations and support functions for nonnuclear fabrication with modification of existing facilities. Modification of existing facilities to support base case production would be sufficient to maintain capacity for both the high and low production cases.

Stewardship Alternatives

Proposed National Ignition Facility. Impacts to land use at and around SNL from the proposed NIF project would be limited to the clearing of land, minor and temporary disruptions to contiguous land parcels south of the proposed site from construction activities, and a slight increase in vehicular traffic. The proposed site for NIF would occupy a large parcel of flat, vacant land on the southern end of Technical Area II between East Ordinance Road and "R" Boulevard, and a small plot of land for temporary construction staging on the northern edge of Technical Area IV just south of "R" Boulevard. The proposed NIF project would require the clearing of an estimated 11 ha (28 acres) of land for buildings, walkways, building access and buffer space. Such acreage would account for approximately 7 percent of the land currently identified as available for development at SNL, but it represents only a small portion of the land available for future development within SNL. The project would be located in an area dedicated to similar land uses. No impacts to land use or land-use plans and policies at SNL, in Bernalillo County, the city of Albuquerque, or nearby communities would be expected.

Potential Mitigation Measures. No mitigation measures are anticipated.

4.8.3.2 *Site Infrastructure*

The SNL site infrastructure resources are capable of accommodating any of the alternatives for which it is a candidate with only moderate changes in the existing electrical and fuel resources. Table 4.8.3.2–1 presents a comparison of the annual operating infrastructure resource requirements for the alternatives of No Action, nonnuclear fabrication, and the proposed NIF. The No Action alternative would continue SNL's current mission objectives in the existing facilities without modification as described in section 3.2.8. Under the No Action alternative, the required site infrastructure resources would be unchanged relative to current resource consumption.

Management Alternatives

Nonnuclear Fabrication. SNL is being considered for the alternative of nonnuclear fabrication. Under this alternative, the majority of the ongoing nonnuclear production activities at KCP would be reconfigured and transferred to SNL, with a small portion going to LANL and possibly LLNL.

The nonnuclear fabrication alternative at SNL would result in a new stand-alone production site with four new production facilities, an office structure, and a central utilities building surrounded by a security fence. In addition, some existing buildings would

TABLE 4.8.3.2–1.—***Site Infrastructure Requirements and Changes for Stockpile Stewardship and Management Alternatives at Sandia National Laboratories***

Alternative	Electrical		Fuel		
	Energy (MWh/yr)	Peak Load (MWe)	Liquid (L/yr)	Natural Gas (m^3/yr)	Coal (t/yr)
Current Resources (1994)	186,944	32	1,301,598	15,773,761	NA
No Action (2005)					
Total site requirements	186,944	32	1,301,598	15,773,761	NA
Change from current resources	0	0	0	0	NA
Nonnuclear Fabrication					
Total site requirement	226,644	38.2	1,301,598	19,043,761	NA
Change from No Action	39,700	6.2	0	3,270,000	NA
National Ignition Facility					
Total site requirement	228,944	42	1,304,398	16,583,761	NA
Change from No Action	42,000	20	2,800	810,000	NA
Combined Program Impacts					
Total site requirement	268,644	58.2	1,304,398	19,853,761	NA
Change from No Action	81,700	26.2	2,800	4,080,000	NA

Note: NA - not applicable.
Source: SNL 1995b:1; SNL 1995b:4; SNL 1995b:5; SNL 1995e; appendix I.

require minor modifications to accept some functions associated with this action. The nonnuclear fabrication mission at SNL would increase electrical energy usage and fuel (natural gas) consumption by approximately 20 percent relative to the No Action alternative.

SNL's electrical power distribution is by underground 15 kV (nominal) feeder loops. Dual feeders, each capable of carrying the entire load, would be run in new ductbanks and manholes to new double-ended unit substations in a new central plant on the site. The required power for the nonnuclear mission is greater than is usually available from the existing site loops and would most likely require a separate, dedicated, feeder loop from the utility substation. Natural gas is supplied by Kirtland Air Force Base and would be distributed, as required, to the nonnuclear fabrication facilities from the existing underground gas main.

The effect of not including reservoirs in the nonnuclear fabrication mission would not result in any significant reduction in the site infrastructure-related impacts at SNL since this activity only involves final reservoir assembly; primarily welding, along with final inspection, testing, packaging, and shipping. The only machining to be performed would be post-weld dressing. Final certification would include volume measurement and proof testing.

Sensitivity Analysis. The site infrastructure requirements given in table 4.8.3.2–1 reflect facility operating conditions for the production of a base case, multiple-shift, stockpile size. For the reduced stockpile size associated with the low case scenario, there would be a small (10-percent) reduction in the required floorspace and operating personnel. Transition to a high case stockpile size would result in about a 30- to 50-percent increase in these requirements. These deviations in the stockpile size would result in comparable changes in site infrastructure resource requirements.

Stewardship Alternatives

Proposed National Ignition Facility. The proposed NIF alternative at SNL would result in the construction of six new buildings and ancillary facilities (i.e., access roads, parking facilities, and utility extensions). Infrastructure requirements would not exceed any utility resources available at SNL. The NIF mission would increase SNL's electrical energy consumption by approximately 22 percent, whereas the increase in fuel usage would be less than 1 percent relative to the No Action alternative.

Potential Mitigation Measures. No mitigation measures are anticipated.

4.8.3.3 *Air Quality*

No Action. No Action air quality utilizes estimated air emissions data from operations at SNL in 2005 assuming continuation of current site missions to calculate pollutant concentrations at or beyond the SNL site boundary. The emission rates for criteria and toxic/hazardous pollutants for No Action are presented in table B.3.8–1. Table 4.8.3.3–1 presents the No Action pollutant concentrations calculated from the 2005 emission rates. In this table, pollutant concentrations are compared with applicable Federal and state regulations and guidelines. Concentrations are expected to remain within these standards.

Management Alternatives

Nonnuclear Fabrication. No new air pollutant waste streams will be generated by the nonnuclear fabrication mission at SNL. Emissions from the additional nonnuclear fabrication missions at SNL will include exhausts from vehicles and small quantities of aromatic hydrocarbon solvents, alcohols, and related chemistry. Process gases will be vented, but these consist only of naturally occurring atmospheric gases and vapors (i.e., nitrogen, argon, carbon dioxide, helium, hydrogen, and water) and are not considered to be pollutants. Table 4.8.3.3–1 presents the concentrations of criteria and toxic/hazardous pollutants resulting from No Action and nonnuclear fabrication. Concentrations of pollutants resulting from operation of nonnuclear fabrication added to No Action concentrations are expected to be within Federal and state regulations.

Sensitivity Analysis. Impacts to air quality from either the low or high case scenario of the nonnuclear fabrication alternative would result in the same concentrations of criteria and toxic/hazardous pollutants for the high and low case. The concentrations of pollutants for both cases are expected to be within applicable Federal and state regulations and guidelines.

Stewardship Alternatives

Proposed National Ignition Facility. Operation of the proposed NIF would generate criteria and toxic/hazardous pollutants resulting from the combustion of boiler fuel for heating, operation of diesel generators,

TABLE 4.8.3.3–1.—*Estimated Concentrations of Pollutants from No Action and Stockpile Stewardship and Management Alternatives at Sandia National Laboratories* **[Page 1 of 2]**

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines (μg/m³)	2005 No Action (μg/m³)	Nonnuclear Fabrication (μg/m³)	National Ignition Facility (μg/m³)
Criteria Pollutant					
Carbon monoxide	Annual	4,600[a]	1,603	1,603	1,603
	8-hour	10,000[b]	4,924	4,924	4,925
	1-hour	15,000[a]	10,307	10,307	10,311
Lead	Calendar quarter	1.5[b]	0.0667	0.0667	0.0667
	30-day	3[a]	c	c	c
Nitrogen dioxide	Annual	94[d]	30	30	30.12
	24-hour	117[a]	77	77	78.29
Ozone	1-hour	235[b]	188	188	188
Particulate matter	Annual	50[b]	15.92	15.92	15.93
	24-hour	150[b]	66	66	66.12
Sulfur dioxide	Annual	11[a]	0.8	0.8	0.8
	24-hour	92[a]	5.2	5.2	5.22
	3-hour	1,300[b]	21.7	21.7	21.79

TABLE 4.8.3.3–1.—*Estimated Concentrations of Pollutants from No Action and Stockpile Stewardship and Management Alternatives at Sandia National Laboratories* [Page 2 of 2]

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines (μg/m³)	2005 No Action (μg/m³)	Nonnuclear Fabrication (μg/m³)	National Ignition Facility (μg/m³)
Mandated by New Mexico and Albuquerque-Bernalillo County					
Arsenic, copper, and zinc	30-day	10[a]	0.067	0.067	0.067
Hydrocarbons (nonmethane)	3-hour	100[a]	c	c	c
Hydrogen sulfide	1-hour	4[a]	c	c	c
Photochemical oxidants	1-hour	20[a]	c	c	c
Total reduced sulfur	1-hour	4[a]	c	c	c
Total suspended particulates	Annual	60[d]	15.92	15.92	15.92
	30-day	90[d]	<66	<66	<66
	7-day	110[d]	<66	<66	<66
	24-hour	150[d]	66	66	66
Hazardous and Other Toxic Compounds					
Acetone	8-hour	e	0.25	0.25	0.25
Benzene	8-hour	e	<0.01	<0.01	<0.01
Carbon tetrachloride	8-hour	300[d]	<0.01	<0.01	<0.01
Hydrogen chloride	8-hour	e	3.27	3.27	3.27
Isopropyl alcohol	8-hour	9,800[d]	0.11	0.11	0.11
Methanol	8-hour	e	0.11	0.11	0.11
Methyl chloroform	8-hour	e	0.71	0.71	0.71
Methylene chloride	8-hour	e	0.04	0.04	0.04
Toluene	8-hour	e	0.55	0.55	0.55
Trichloroethylene	8-hour	e	0.10	0.10	0.10
Trichlorotrifluoroethane	8-hour	e	0.15	0.15	0.15
Xylene	8-hour	e	0.59	0.59	0.59

[a] State and city/county standard.
[b] Federal standard.
[c] No monitoring data available; concentration assumed less than applicable standard.
[d] State standard or guideline.
[e] No standard.
Source: 40 CFR 50; NM EIB 1995a; NM EIB 1996a; SNL 1995b:1; SNL 1995e; appendix I.

and solvent cleaning processes. The emissions consist of PM_{10}, carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, and VOCs. Boiler fuel is assumed to be natural gas. Emission rates of criteria and toxic/hazardous pollutants for annual operation of the proposed NIF are presented in table B.3.8–1. Table 4.8.3.3–1 presents the concentrations of criteria and toxic/hazardous pollutants resulting from No Action and those generated from operation of the proposed NIF. Concentrations of pollutants resulting from operation of the proposed NIF added to No Action concentrations are expected to be within Federal and state regulations.

Potential Mitigation Measures. No mitigation measures are anticipated for the nonnuclear fabrication and the proposed NIF at SNL.

4.8.3.4 *Water Resources*

Environmental impacts associated with the construction and operation of the potential stockpile stewardship and management facilities at SNL could affect surface and groundwater resources. All water required for construction or operation would be supplied from local groundwater resources at Kirtland Air Force Base. The proposed sites for the facilities would be outside the 100- and 500-year floodplains. A description of the proposed functions to be transferred to SNL is presented in sections 3.3 and 3.4. Table 4.8.3.4–1 presents existing surface and groundwater resources and the potential changes to water resources at SNL resulting from the proposed alternatives. The total site water resource requirement for each alternative including No Action are displayed in this table.

Surface Water

No Action. Under No Action, no impacts to surface water resources are anticipated because there are no surface water withdrawals or demands. No construction would occur under No Action; therefore, no additional construction water would be used or discharged. Current operation wastewater discharges of 757 MLY (200 MGY) are expected to remain the same in 2005. Treated wastewater effluent would be monitored to comply with the city of Albuquerque's Sewer Use and Wastewater Control Ordinance. No impacts to surface or surface water quality are expected.

Management Alternatives

Nonnuclear Fabrication. No surface water would be used for construction and modification activities or operation. An additional 6.5 MLY (1.7 MGY) of wastewater would be generated by the construction and modification activities of the nonnuclear fabrication facilities. This wastewater increase represents less than 1 percent over the projected sanitary wastewater generation rate. During operation an additional 291 MLY (76.9 MGY) of wastewater would be generated. This wastewater discharge represents a 38.5-percent increase over projected sanitary wastewater generation. A stormwater pollution prevention plan would be prepared and implemented to minimize soil erosion, sedimentation, and contamination of stormwater. During construction and operation, all wastewater would be collected, treated, and discharged to the city of Albuquerque sewer systems. Treated wastewater would be monitored to meet or exceed standards of the city of Albuquerque's Sewer Use and Wastewater Control Ordinance. There would be no new wastewater streams added or special waste handling capability required. There would be no impacts to surface water quality because all wastewater would be discharged to the city of Albuquerque's sewer systems. There would be no change in stormwater runoff due to this alternative. Adverse impacts to surface water are not expected. Nonnuclear fabrication facilities would be located in portions of Technical Areas I and II that are determined to be above the 500-year floodplain.

Stewardship Alternatives

Proposed National Ignition Facility. Construction of the proposed NIF would be expected to have minor to negligible effects on water quality. A stormwater pollution prevention plan would be prepared and implemented to minimize soil erosion, sedimentation, and contamination of stormwater. During operation of NIF, wastewater discharge would be expected to increase by about 18 MLY (4.8 MGY). Wastewater discharges would have to meet all Kirtland Air Force Base and the city of Albuquerque discharge requirements. Appropriate measures would be taken to

TABLE 4.8.3.4–1.—*Potential Changes to Water Resources from Stockpile Stewardship and Management Alternatives at Sandia National Laboratories*

Affected Resource Indicator	No Action Single-Shift Operation 2005	Nonnuclear Fabrication Three-Shift Operation	National Ignition Facility
Construction			
Water Availability and Use			
Water source	Ground	Ground	Ground
Total site water operation requirement[a] (MLY)	0[b]	1,391	1,392.9
Percent change from No Action water use (1,390 MLY)	NA	0.05	0.2
Water Quality			
Wastewater discharge to the city of Albuquerque[c] (MLY)	0[b]	763.2	757.4
Percent change from No Action wastewater discharges to the city of Albuquerque (757 MLY)	NA	0.86	0.05
Operation			
Water Availability and Use			
Water source	Ground	Ground	Ground
Total site operations water requirement (MLY)	1,390	2,283	1,542
Percent change from No Action water use (1390 MLY)	NA	64	11
Percent change from current use (970 MLY)	43	135	59
Water Quality			
Wastewater discharge to the city of Albuquerque (MLY)	757	1,048	775
Percent change from No Action wastewater discharge to the city of Albuquerque (757 MLY)	0	38.5	2
Percent change from current wastewater discharge (757 MLY)	0	38.5	2
Floodplain			
Actions in 100-year floodplain	NA	None	None
Actions in 500-year floodplain	NA	None	None

[a] Total water requirements for construction at SNL are based on a 3-year period for nonnuclear fabrication and a 5-year period for NIF.

[b] No construction water would be used or construction wastewater generated. Total site water use and wastewater discharged would be the same as No Action operation.

[c] All discharges to natural drainages require NPDES permits.

Note: NA - not applicable; MLY - million liters per year.

Source: SNL 1995b:1; SNL 1995e; appendix I.

comply with stormwater discharge regulations associated with construction activities under the CWA.

Groundwater

No Action. Under No Action, baseline conditions and operations, described in section 4.8.2.4, would continue at SNL, and the current groundwater amount of 970 MLY (256 MGY) would increase to 1,390 MLY (367 MGY) by 2005. Groundwater would continue to be withdrawn from local groundwater sources, but no additional impacts to groundwater quality are anticipated because there are no direct discharges to groundwater.

Management Alternatives

Nonnuclear Fabrication. Water requirements for the modification, construction, and operation of the nonnuclear fabrication facilities would be supplied from local groundwater sources at Kirtland Air Force Base. During the modification and construction phase, approximately 0.7 MLY (0.18 MGY) of groundwater would be required. This amount is less than 0.1 percent of the projected SNL groundwater withdrawal of 1,390 MLY (367 MGY) from the Kirtland Air Force Base wells. It is anticipated that an additional 893 MLY (236 MGY) of water would be required to operate the facilities. This amount is an increase of approximately 64-percent over No Action water requirements, but only comprises 29 percent of the Kirtland Air Force Base groundwater rights of 7,900 MLY (2,090 MGY). Adverse impacts to groundwater are not expected.

Groundwater Quality. No process wastes would be discharged directly to the groundwater and all wastewater discharges would be monitored to comply with NPDES permit and other applicable discharge requirements. Given normal safeguards and precautions, no adverse impacts to groundwater quality are expected.

Sensitivity Analysis. All effluent is discharged to the city of Albuquerque; therefore, both the high and low case production scenario for nonnuclear fabrication would have no impacts to surface water quality. Groundwater or groundwater quality would not be affected by the high or low case stockpile requirement for nonnuclear fabrication at SNL.

Stewardship Alternatives

Proposed National Ignition Facility. During construction of the proposed NIF, approximately 3 MLY (0.8 MGY) of additional groundwater would be required. Approximately 152 MLY (40.2 MGY) of additional groundwater would be required during operation of NIF, increasing the water use at SNL by 11 percent over No Action.

Groundwater Quality. No process wastes would be discharged directly to the groundwater, and all wastewater discharges would be monitored to comply with NPDES permit and other applicable discharge requirements. Given normal safeguards and precautions, no adverse impacts to groundwater quality are expected.

Potential Mitigation Measures. No mitigation measures for the stockpile stewardship and management alternatives at SNL are anticipated.

4.8.3.5 *Geology and Soils*

The proposed alternatives for SNL would have no adverse impact on geological resources described in section 4.8.2.5. Although a moderate seismic risk exists for new facilities, this would be considered in the design of the structures. The existing seismic risk does not preclude safe construction and operation of the proposed project facilities. Control measures would be used to minimize any soil erosion. Impacts would depend on the extent of land disturbing activities and the amount of soil disturbed. Potential changes to geology and soils associated with the proposed alternatives at SNL are discussed below.

No Action. Under No Action, DOE would continue current and planned activities at SNL. Any impacts to geology and soils would be independent of and unaffected by the proposed action.

Management Alternatives

Nonnuclear Fabrication. Construction activities would not affect geologic conditions. Designs of the new 58,060 m^2 (625,000 ft^2) facility would ensure that it would not be adversely affected by geologic conditions. The properties and conditions of the soils in the proposed project area place no limitations on the construction or safe operation of project facilities.

The area of land disturbance for nonnuclear fabrication at SNL is approximately 9 ha (22 acres). Part of the construction required for the new Nonnuclear Fabrication Facility includes parking spaces in the form of ground-level, uncovered, paved lots. SNL's practice is to use parking lots as construction staging areas for both material and office trailers and to pave the lots as one of the last construction activities. Further, the new buildings are proposed to be slab-on-grade for the first level, and the proposed construction site is relatively flat and unobstructed, which would minimize the amount of land required for cut-and-fill operations during construction. For modification and renovation of existing buildings, staging activities would use the same operations and staging areas that were used during previous renovations.

Disturbance could occur at building, parking, and construction laydown areas, leading to a possible temporary increase in erosion as a result of stormwater runoff and wind action. Soil losses would depend on frequency of storms; wind velocities; size and location of the facilities with respect to drainage and wind patterns; slopes, shape, and area of the tracts of ground disturbed; and whether the soil is bare, particularly during the construction period. Appropriate erosion and sediment control measures would be used to minimize any soil loss.

Net soil disturbance during operations would be less than for construction, because areas temporarily used for laydown would be paved. Although erosion from stormwater runoff and wind action could occur occasionally during operation, it is anticipated to be minimal.

There are no known active faults that cross the area of the proposed facilities. The Tijeras and Sandia faults, located in the eastern portion of SNL, are regarded as the most probable sources for seismic activity in the vicinity of the proposed facilities. The location of active faults and the associated potential ground rupture would be considered in the design of facilities. All facilities would be designed for earthquake-generated ground acceleration in accordance with DOE O 420.1, and accompanying safety guides. Major seismic activity and associated mass movement and subsidence are unlikely to occur during the construction or operational phases, because seismic activity in the region is generally of low intensity and magnitude (see section 4.8.2.5). Hazards resulting from the return of volcanism are unlikely (see section 4.8.2.5). Potential health impacts from accidents associated with geological hazards are discussed in section 4.8.3.9.

Sensitivity Analysis. The high or low case operation scenario would not affect geology and soils.

Stewardship Alternatives

Proposed National Ignition Facility. The construction and operation of the proposed NIF at SNL would not adversely affect geological resources. NIF would require the clearing of an estimated 11 ha (28 acres) of land for buildings, walkways, building access, and buffer space (see appendix I). Soil impacts during construction would be short term and minor with appropriate standard construction erosion and sediment control measures. Net soil disturbance during operation would be less than for construction because areas temporarily used for laydown would be restored. Seismic risks would be taken into account during construction and operation of NIF.

Potential Mitigation Measures. No mitigation measures for the stockpile stewardship and management alternatives at SNL are anticipated.

4.8.3.6 *Biotic Resources*

The following section addresses impacts to terrestrial resources, wetlands, aquatic resources, and threatened and endangered species. Construction and operation of nonnuclear fabrication mission facilities and the proposed NIF would result in a loss of terrestrial habitat. Nonnuclear fabrication mission facilities may also impact special status species.

No Action. Under No Action, the selected nonnuclear fabrication and stewardship R&D missions described in section 3.2.8 would continue at SNL. This would result in no changes to current biotic resource conditions at the site as described in section 4.8.2.6.

Management Alternatives

Nonnuclear Fabrication

Terrestrial Resources. While the nonnuclear fabrication mission at SNL would use some space in existing buildings, approximately 9 ha (22 acres) would be required for construction of new facilities. The area to be developed is located just east of Technical Area I and is characterized as grassland. Grassland is a common plant community type in the area. Animal species within the disturbed area would be either destroyed or displaced depending upon whether they were able to move from the area. For example, many reptiles and small mammals, as well as nests and young birds, would likely be destroyed, while larger mammals and birds would be able to leave the area. Wildlife may also be disturbed by the increased level of human activity associated with the project.

Wetlands. There are no wetlands on or near the proposed site for the location of the nonnuclear fabrication mission at SNL. Wetlands would not be affected by construction or operation of new nonnuclear fabrication facilities.

Aquatic Resources. There is no natural aquatic habitat on or near the proposed site for the location of the nonnuclear fabrication mission at SNL. Aquatic resources would not be affected by construction or operation of new nonnuclear fabrication facilities.

Threatened and Endangered Species. There would be no Federal-listed threatened or endangered species affected by construction and operation of new nonnuclear fabrication facilities at SNL. Considering that grassland habitat is the prevalent plant community type in the site area, the Federal-candidate mountain plover (*Charadrius montanus*) could potentially exist onsite. This bird species could lose possible nesting and foraging habitat as a result of site development. Preactivity surveys would need to be conducted prior to construction in order to determine if any special status species are present on or near the site.

Sensitivity Analysis. While implementation of a low case workload would not alter impacts to biological resources, the high case workload would result in a slight increase in the disturbed grassland area.

Stewardship Alternatives

Proposed National Ignition Facility

Terrestrial Resources. The proposed NIF would be located within a disturbed grassland area of Technical Area II. Construction of new facilities would require 11 ha (28 acres). Proper erosion and sediment control measures would reduce the potential for disturbance of habitat adjacent to the construction area. Animal species within the disturbed area would be either destroyed or displaced, depending upon whether they were able to move from the area. For example, many reptiles and small mammals, as well as nests and young birds, would likely be destroyed, while larger mammals and birds would be able to leave the area. Wildlife may also be disturbed by the increased level of human activity associated with the project.

Wetlands. The proposed NIF site does not contain, nor is it located near, wetlands. The construction and operation of the proposed NIF is not expected to adversely impact this resource.

Aquatic Resources. The proposed NIF site does not contain, nor is it located near, aquatic resources. The construction and operation of the proposed NIF is not expected to adversely impact this resource.

Threatened and Endangered Species. Adverse impacts to special status species are not expected from the construction or operation of the proposed NIF at SNL due to the lack of suitable habitat and the disturbed nature of the proposed site. A site survey may be required to determine the presence of any special status species.

Potential Mitigation Measures. Minimization of the area to be disturbed, revegetation with native species, and implementation of a soil erosion and sediment control plan would help to lessen short- and long-term impacts to terrestrial species and habitats. Disturbance to wildlife living in areas adjacent to management and stewardship facilities may be minimized by preventing workers from entering undisturbed areas. It may be necessary to survey the site for the nests of migratory birds prior to construction and to avoid clearing operations during the breeding season. If any threatened or endangered species occur on the site, specific mitigation measures would be developed in conjunction with the USFWS.

4.8.3.7 *Cultural and Paleontological Resources*

For the discussion of impacts, the term cultural resources includes prehistoric, historic, and Native American resources. Cultural and paleontological resources may be affected directly through ground disturbance, building modifications, visual intrusion of the project to the historic setting, or environmental context of historic sites, visual and noise intrusions to Native American resources, reduced access to traditional use areas, and unauthorized artifact collecting and vandalism. Some NRHP-eligible historic sites may be affected by the proposed action. All of the undisturbed DOE-owned properties at SNL were surveyed for cultural resources between 1989 and 1991. No significant resources were found. However, it is possible that buried archaeological remains are present and that some of the SNL facilities may be NRHP eligible based on their historical or architectural significance (SNL 1993c:1-6). The SNL Sitewide Hydrogeologic Characterization project reports that no important paleontological remains have been recovered from deposits on SNL (apendix I).

No Action. Under No Action, DOE would continue existing and planned missions at SNL as described in section 3.2.8. Any impacts to cultural or paleontological resources would be independent of and unaffected by the proposed action.

Management Alternatives

Nonnuclear Fabrication. This alternative would involve renovation and modification of existing facilities at SNL and the construction of a new stand alone production facility. New construction would be located on available undeveloped land directly east of Technical Area I. Although no NRHP-eligible resources were identified during a pedestrian survey of the proposed nonnuclear fabrication area, the potential for subsurface prehistoric and historic resources exists. In 1989, the Quivira Research Center identified two prehistoric lithic and ceramic scatters in a Kirtland Air Force Base management area adjacent to the proposed project area. Both of these sites are on the southern bank of the Tijeras Arroyo. It is also possible that some of the buildings involved may be NRHP eligible. NRHP-eligible resources would be identified during project-specific surveys and evaluations. Some important Native American and paleontological resources may be affected by the proposed alternative. Any project related effects would be addressed in tiered NEPA documentation.

Sensitivity Analysis. The high and low case scenarios have the same impacts to cultural and paleontological resources. The base case production facilities for the nonnuclear fabrication mission operation would accommodate the high and low case production scenarios.

Stewardship Alternatives

Proposed National Ignition Facility. If the proposed NIF were to be located at SNL, it would require the construction of six buildings on a currently undeveloped tract of 11 ha (28 acres) in Technical Area II. Pedestrian surveys indicate that no prehistoric or historic sites or standing structures exist within the proposed NIF location. The Isleta Pueblo has not identified any important Native American resources nor have important paleontological remains been recovered from deposits in the proposed NIF location. No impacts to cultural or paleontological resources are anticipated from construction and operation of the proposed NIF.

Potential Mitigation Measures. If project design or siting would result in adverse effects to NRHP-eligible sites, then a Memorandum of Agreement would need to be negotiated among DOE, the New Mexico SHPO, and the Advisory Council on Historic Preservation. The Memorandum of Agreement would formalize mitigation measures agreed to by these consulting parties. Mitigation measures could include describing and implementing intensive inventory and evaluation studies, data recovery plans, site treatments, and monitoring programs. The appropriate level of data recovery for mitigation would be determined through consultation with the New Mexico SHPO and the Advisory Council on Historic Preservation, in accordance with Section 106 of the *National Historic Preservation Act*. Mitigation measures for specific NRHP-eligible sites would be identified during tiered NEPA documentation.

If Native American resources cannot be avoided through project design or siting, then acceptable mitigation measures to reduce project effects on them would be determined in consultation with the affected Native American groups. In accordance with the *Native American Graves Protection and Repatriation Act* and the *American Indian Religious Freedom Act*, such mitigations may include, but would not be limited to, appropriately relocating human remains, planting vegetation screens to reduce visual or noise intrusion, increasing access to traditional use areas during operation, or transplanting or harvesting important Native American plant resources.

Because scientifically important buried paleontological materials could be affected, paleontological monitoring of construction activities and data recovery of fossil remains would be appropriate mitigation measures.

4.8.3.8 *Socioeconomics*

No Action. Under No Action, the existing missions at SNL, as described in section 3.2.8, would continue. No new employment or in-migration of workers would be required. Projections of regional economy and employment rates, population and housing statistics, and public finance characteristics are presented in appendix D.

Regional Economy and Employment. Total employment in the regional economic area is projected to increase by less than 2 percent annually between 1995 and 2000, reaching approximately 420,900 in the latter year. Long-range projections show employment growth averaging slightly above 1 percent annually between 2001 and 2020, and then slowing to less than 1 percent between 2021 and 2030 when total employment reaches 563,880. Site employment for SNL is expected to be 7,341 in 2005. The unemployment rate in the regional economic area was 5.7 percent in 1994 and is expected to remain at this level into the near future. Per capita income is projected to increase from approximately $17,676 in 1995 to $25,867 in 2030.

Population and Housing. Annual ROI county and city population and housing increases are projected to average about 2 percent between 1996 and 2005. Annual increases between 2006 and 2030 are expected to average approximately 1 percent. Population in the ROI is estimated to increase from 653,100 in 1995 to 955,600 in 2030. The total number of housing units in the ROI is projected to increase from 267,700 to 391,800 during the same period.

Public Finance. Between 2000 and 2005, all ROI county, city, and school district total revenues are projected to increase at an annual average of less than 1.6 percent. Total expenditures are projected to increase at an annual average of less than 1.5 percent during the same period. These rates of increase should continue until 2030.

Management Alternatives

Nonnuclear Fabrication

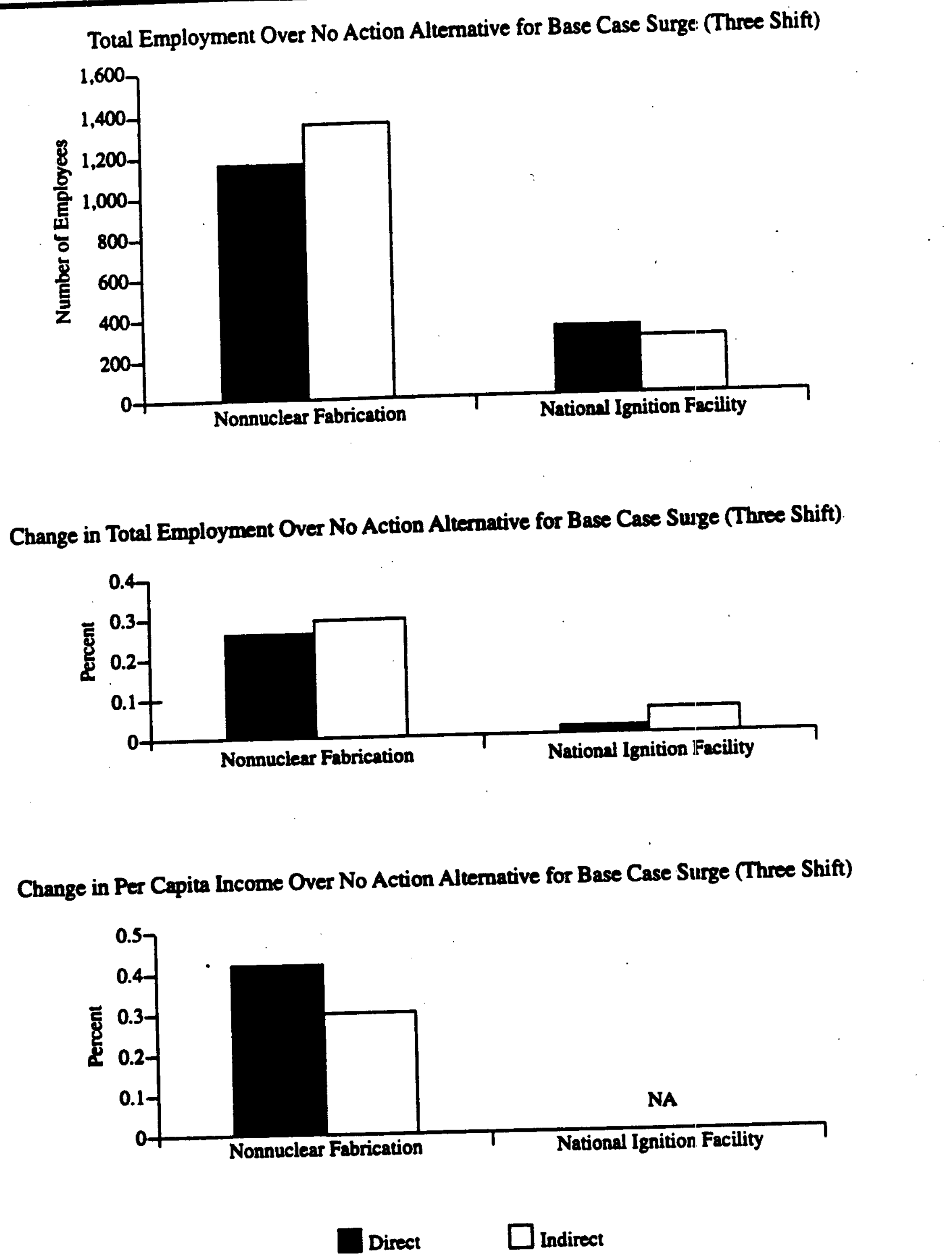
Regional Economy and Employment. Construction-related activities for the Nonnuclear Fabrication Facility would require 379 direct workers during the peak construction year, and would generate 421 indirect jobs in the regional economic area. As a result of the construction and modification activities, total employment in the SNL regional economic area would increase by less than 1 percent. Regional unemployment would fall from the No Action estimate of 5.7 percent to approximately 5.5 percent. Per capita income in the SNL regional economic area would increase very slightly over No Action projections as a result of constructing the facility.

Facility operation-related employment at SNL would begin phasing in as the construction phase neared completion. Operation of the facility in the base case surge mode would require 1,160 direct jobs, and would generate 1,350 additional indirect jobs in the regional economic area. As a result of the operation of the Nonnuclear Fabrication Facility, total employment in the SNL regional economic area would increase by less than 1 percent. Regional unemployment would fall from the 5.7 percent No Action estimate to approximately 5.2 percent. Per capita income for the SNL regional economic area would increase by less than 1 percent over No Action projections. Changes in employment and per capita income resulting from the operation of the Nonnuclear Fabrication Facility are shown in figure 4.8.3.8–1.

Population and Housing. Population in the SNL ROI during peak construction would not increase over No Action projections. Enough workers would be available in the regional economic area and ROI to fill all of the direct and indirect jobs generated by the construction of the facility.

There are not enough available workers to fill all of the direct operation jobs. Approximately 145 workers would in-migrate to fill new positions at the Nonnuclear Fabrication Facility. Changes in the ROI population over No Action during full operation at SNL are shown in figure 4.8.3.8–2. Vacant housing would be sufficient to house in-migrating workers and their families.

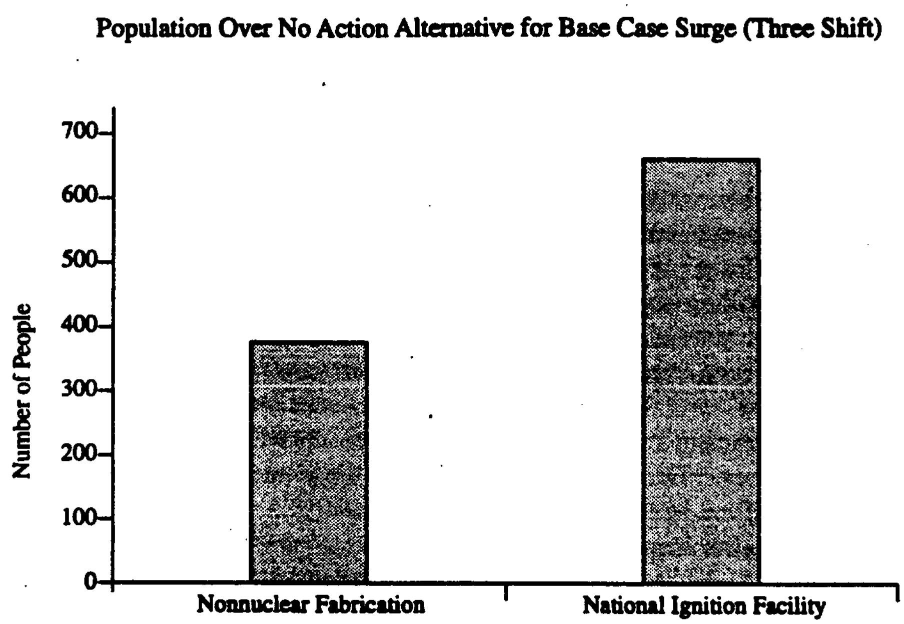
Public Finance. Construction of the Nonnuclear Fabrication Facility would not require in-migrating workers. Therefore, changes to local finances compared to No Action projections would be attributed to income increases and would be negligible.



Note: No Action projections are baseline for comparing proposed alternatives; base case surge does not apply to NIF operation; NA - not applicable.

Source: Socio 1996b.

FIGURE 4.8.3.8–1.—***Employment and Income Changes Resulting from Stewardship and Management Alternatives in the Sandia National Laboratories Regional Economic Area, 2005.***



Note: No Action projections are baseline for comparing proposed alternatives; base case surge does not apply to NIF operation.
Source: Socio 1996b.

FIGURE 4.8.3.8–2.—*Population Changes Resulting from Stewardship and Management Alternatives in the Sandia National Laboratories Region of Influence, 2005.*

Changes in revenues and expenditures compared to No Action projections due to operation of the Nonnuclear Fabrication Facility with reservoirs at SNL are shown in figure 4.8.3.8–3. In 2005, the percent increase in total ROI revenues and expenditures over No Action projections would be negligible (less than 0.1 percent).

Nonnuclear Fabrication Without Reservoirs

The option of terminating the reservoir production mission at SNL would result in 56 fewer direct operations jobs. There would be less in-migration than in the nonnuclear fabrication with reservoirs alternative. This would result in slightly smaller increases in regional economy, population and housing, and public finance than occurred in the nonnuclear fabrication with reservoirs base case surge alternative.

Sensitivity Analysis. There would be no change in the number of construction workers required to complete the Nonnuclear Fabrication Facility for either the high or low case. Operation of the facility at the high case level, would require the same number of workers and would have the same socioeconomic effects as the base case surge level. For the low case, worker requirements would decrease, causing slightly lower increases in regional economy, population and housing, and public finance than occurred in the base case surge level. These changes would be negligible.

Stewardship Alternatives

Proposed National Ignition Facility. The following is a summary of the socioeconomic effects of construction of the proposed NIF at SNL. See appendix I for a more detailed, project-specific discussion.

Regional Economy and Employment. Construction of the proposed NIF would require 280 construction workers during the peak year of construction, and would generate approximately 1,490 additional indirect jobs in the regional economic area. Employment for operation would begin phasing in as the construction phase neared completion. Operation of the facility would require 330 direct workers, and would generate 340 additional indirect jobs in the regional economic area. Construction and operation of NIF would have only minimal effects on the regional economy and employment.

Population and Housing. Both construction and operation of the facility would require workers and their families to in-migrate to the ROI. This in-migration would cause a slight increase in the population of the ROI. Vacant housing in the ROI is sufficient to handle these increases.

Public Finance. Both revenues and expenditures would increase as a result of the construction and operation of the proposed NIF. Increases due to construction would peak in 1998 and then decline as construction neared completion in 2002. Increases due to operation of the facility would peak in 2003 and continue through the duration of NIF operation.

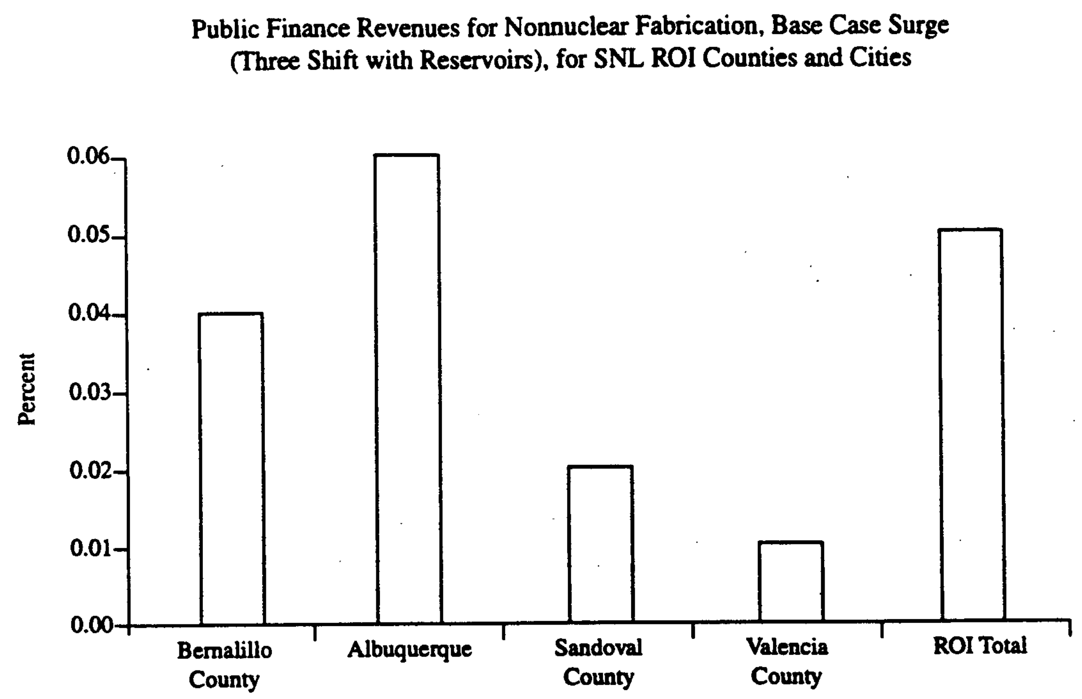
Potential Mitigation Measures. No mitigation measures are anticipated.

4.8.3.9 *Radiation and Hazardous Chemical Environment*

This section describes the radiological and hazardous chemical releases and their associated impacts, which could result from No Action and the proposed alternatives at SNL. Within this section, impacts resulting from the base case scenario are quantitatively discussed, and a sensitivity analysis of the high and low case scenarios is qualitatively discussed.

Summaries of the prevailing radiological impacts at SNL to the public and to workers associated with normal operation are presented in tables 4.8.3.9–1 and 4.8.3.9–2, respectively. Accident impacts are given in table 4.8.3.9–3. The impact assessment methodology is described in section 4.1.9, and further supplementary methodological information is presented in appendixes E and F.

Normal Operation. There would be no radiological releases during the construction or modification of any facilities to support the Stockpile Stewardship and Management Program. However, limited hazardous chemical releases (e.g., small spills of diesel fuel from equipment refueling) may occur due to construction activities for the base case scenario and may increase slightly for the high case scenario. The concentration of these releases is expected to be well within the regulated exposure limits and would not result in any adverse health effects.



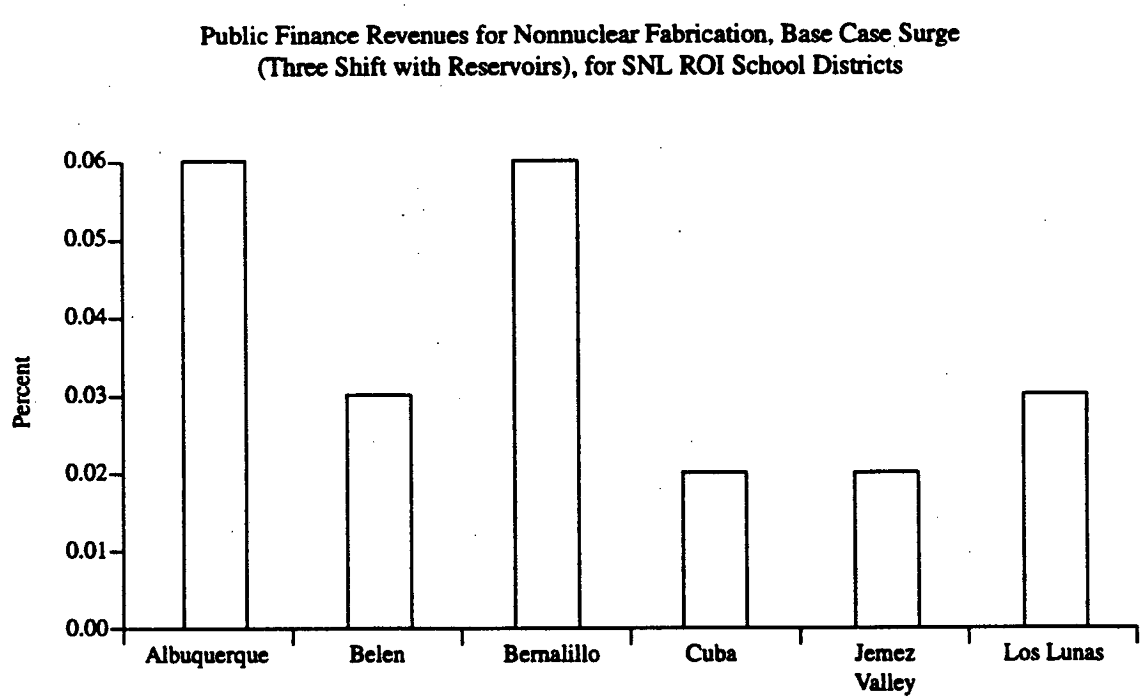
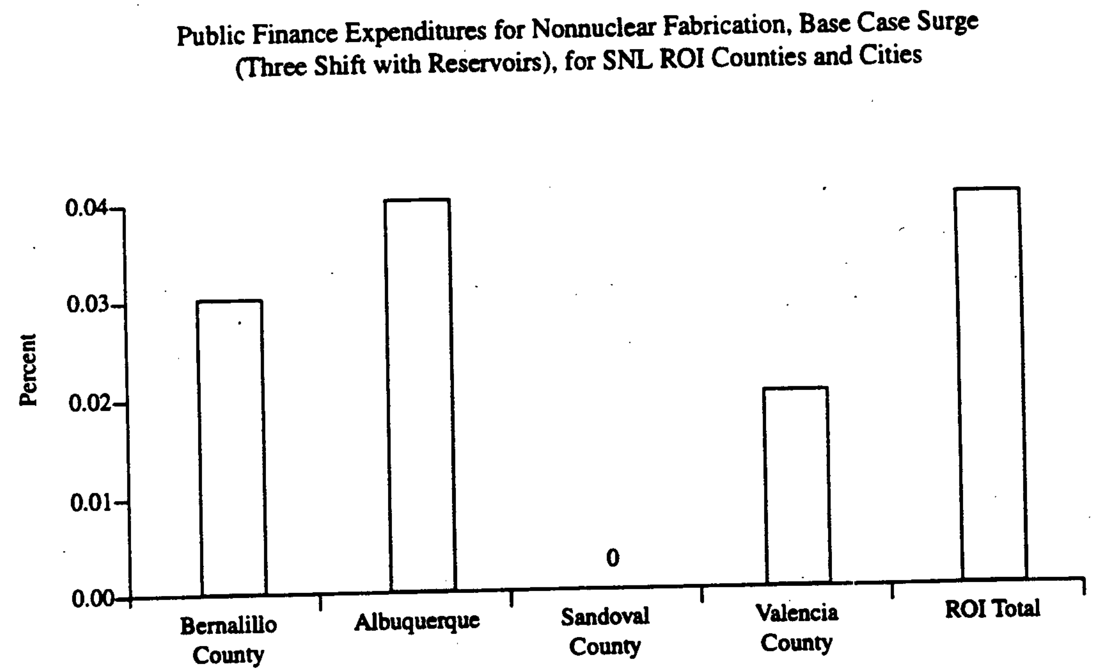
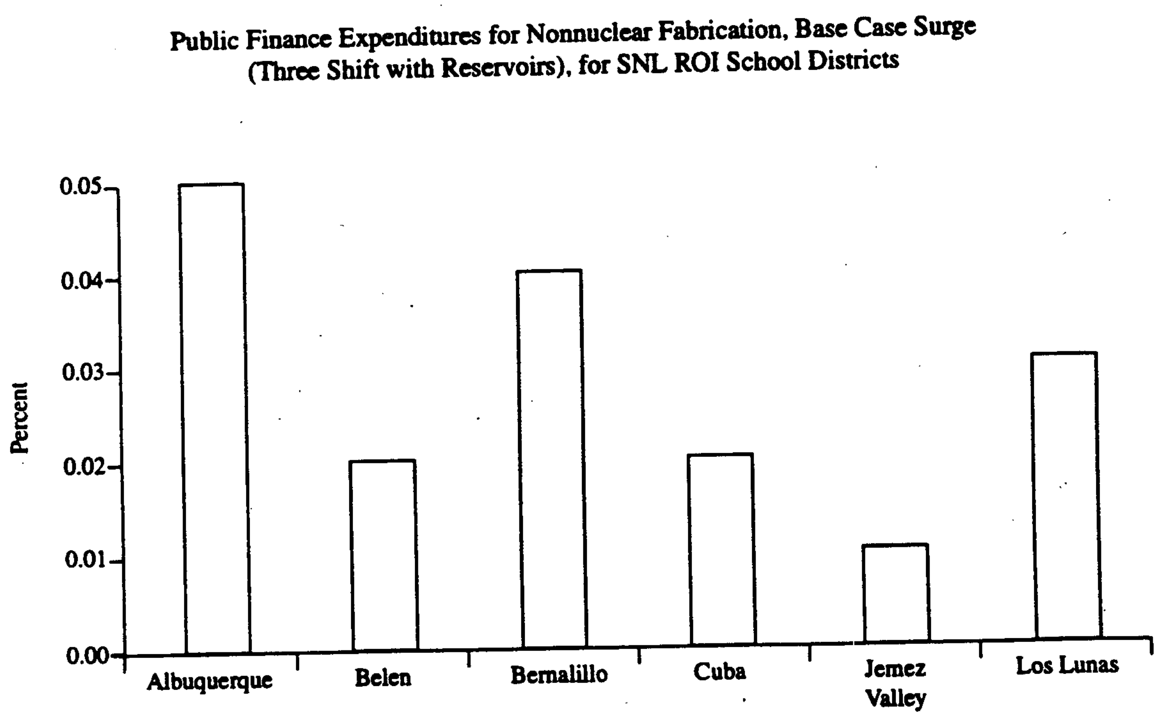


FIGURE 4.8.3.8–3.—*Percent Change from No Action Alternative in County, City, and School District Total Revenues and Expenditures in the Sandia National Laboratories Region of Influence with Nonnuclear Fabrication, 2005* [Page 1 of 2].





Source: Socio 1996b.

FIGURE 4.8.3.8–3.—*Percent Change from No Action Alternative in County, City, and School District Total Revenues and Expenditures in the Sandia National Laboratories Region of Influence with Nonnuclear Fabrication, Base Case Surge, 2005* [Page 2 of 2].

Water from processes containing hazardous chemicals is not discharged directly into surface water or groundwater that serves as potable water. Process water that may contain hazardous chemicals is treated before discharge to the city of Albuquerque sewer system. Furthermore, state-permitted discharges of stormwater to surface impoundment (lagoons) which can be attributed to the activities associated with normal operation and operation of the stockpile stewardship and management alternatives at SNL are expected to be below New Mexico Water Quality Control Commission Regulations limits. Water quality would not be adversely affected. Thus, the primary pathway considered for the public and the onsite worker is the air pathway.

For normal operation at SNL, all possible hazardous chemicals were examined for further analysis based on their toxicity, concentration, and frequency of use. The HI is a summation of the HQ for all chemicals. The HQ is the value used as an assessment of noncancer toxic effects of chemicals (e.g., kidney or liver dysfunction). It is independent of cancer risk, which is calculated only for those chemicals identified as carcinogens. The HI was calculated for the No Action chemicals and all alternative chemicals proposed to be added (the increment) at the site to yield cumulative levels for the site. An HI of ≤1.0 indicates that all noncancer exposure values meet OSHA standards; if the cancer risk is $\leq 1\times10^{-6}$ (the default value, not a regulatory standard), no further analysis is indicated. A cancer risk of $\leq 1\times10^{-6}$ is considered acceptable by EPA (40 CFR 300.430) because this incidence of cancers cannot be distinguished from the cancer risk for an individual member of the population. Information pertaining to OSHA-regulated exposure limits and toxicity profiles for all hazardous chemicals described in this PEIS may be found in the *Chemical Health Effects Technical Reference* (TTI 1996b).

No Action

Radiological Impacts. Radiological impacts to the public resulting from the No Action alternative are presented in table 4.8.3.9–1. These impacts are representative of the aggregated total which is estimated to exist from all future baseline operational contributions. Total impacts are provided to compare with applicable regulations governing total site operations. To place doses to the public from the No Action alternative into perspective, comparisons are made to natural background radiation. As shown in table 4.8.3.9–1, the total dose to the maximally exposed member of the public from annual total site operations is within radiological limits and would be 1.6×10^{-3} mrem for the No Action alternative. The annual population dose within 80 km (50 mi) in 2030 would be 0.027 person-rem.

Total site doses to onsite workers from normal operation for the No Action alternative are presented in table 4.8.3.9–2. The estimated average annual dose to the entire facility workforce for this alternative would be 11 person-rem. The presented noninvolved worker values were not modeled due to the unavailability of certain site-specific information.

Based on the radiological impacts associated with normal operation under the No Action alternative, all resulting doses would be within radiological limits and are well below levels of natural background radiation. The associated risks of adverse health effects to the public and to workers would be small.

Hazardous Chemical Impacts. Hazardous chemical impacts to the public and onsite workers resulting from normal operation under No Action at SNL are presented below. Analyses used to support the values presented in this section are provided in appendix table E.3.4–26. This PEIS does not purport to provide the level of detail needed to go beyond a conservative screening process for hazardous chemicals. As such, the analysis in this PEIS for the No Action alternative should not be relied upon as a basis for judging the sites as having a hazardous health concern. The model used to calculate HI and cancer risk in this PEIS only establishes a baseline for comparison of alternatives among sites. The baseline is then used to determine the extent to which each alternative adds or subtracts from the No Action HI and cancer risk to the public at each site.

The HI for the maximally exposed member of the public at SNL resulting from normal operation under the No Action alternative would be 2.31×10^{-3} and the cancer risk would be zero. The HI for the onsite worker would be 1.04×10^{-5} and the cancer risk would be zero.

The HIs for the public and for the onsite worker are within the acceptable health levels. The cancer risks to the public and the onsite worker are within the EPA default value of 1×10^{-6}.

TABLE 4.8.3.9–1.—*Potential Radiological Impacts to the Public Resulting from Normal Operation of Stockpile Stewardship Alternatives at Sandia National Laboratories*

Affected Environment	No Action Total Site	National Ignition Facility Total Site[a]
Maximally Exposed Individual (Public)		
Atmospheric Release		
Dose[b] (mrem/yr)	1.6×10^{-3}	5.6×10^{-3}
Percent of natural background[c]	4.8×10^{-4}	1.7×10^{-3}
25-year fatal cancer risk	2.0×10^{-8}	7.1×10^{-8}
Liquid Release		
Dose[b] (mrem/yr)	0	0
Percent of natural background[c]	0	0
25-year fatal cancer risk	0	0
Atmospheric and Liquid Releases		
Dose[b] (mrem/yr)	1.6×10^{-3}	5.6×10^{-3}
Percent of natural background[c]	4.8×10^{-4}	1.7×10^{-3}
25-year fatal cancer risk	2.0×10^{-8}	7.1×10^{-8}
Population Within 80 Kilometers		
Atmospheric and Liquid Releases in 2030		
Dose (person-rem)	0.027	0.23
Percent of natural background[c]	1.0×10^{-5}	8.9×10^{-5}
25-year fatal cancers	3.3×10^{-4}	2.8×10^{-3}

[a] Includes impacts from No Action.
[b] The applicable radiological limits for an individual member of the public from total site operations are 10 mrem/yr from the air pathways, 4 mrem/yr from the drinking water pathway, and 100 mrem/yr from all pathways combined (DOE Order 5400.5).
[c] Natural background radiation levels to an average individual are 334 mrem/yr and to the population within 80 km (50 mi) in 2030 are 259,500 person-rem.
Source: SNL 1994a; appendix I.

Management Alternatives

Nonnuclear Fabrication

Radiological Impacts. There are no radiological impacts associated with this alternative.

Hazardous Chemical Impacts. Hazardous chemical impacts for the public and for the onsite worker resulting from normal operation due to the nonnuclear fabrication mission at SNL are presented below. The HI and cancer risk would remain constant over 25 years of operation, provided exposures remain the same. Analyses to support the values presented in this section are provided in appendix table E.3.4–27.

The incremental HI for the maximally exposed member of the public would be 1.02×10^{-4} and the incremental cancer risk would be 1.65×10^{-7} as a result of the nonnuclear fabrication mission at SNL. The incremental HI for the onsite worker would be 1.60×10^{-4} and the incremental cancer risk would be 1.10×10^{-5} as a result of the nonnuclear fabrication alternative.

Total site operations of the nonnuclear fabrication mission would result in HIs for the public (2.41×10^{-3}) and the onsite worker (1.70×10^{-4}) that are within acceptable health levels. The cancer risks for the public (1.65×10^{-7}) are within the default value. The cancer risks to the onsite worker (1.10×10^{-5}) somewhat exceed the default value of 1×10^{-6} due to emissions of trichloroethylene under the nonnuclear fabrication mission at SNL.

It is likely that emissions of hazardous chemicals would not increase, and may slightly decrease, as a result of implementing the option of not including

TABLE 4.8.3.9–2.—*Potential Radiological Impacts to Workers Resulting from Normal Operation of Stockpile Stewardship Alternatives at Sandia National Laboratories*

Affected Environment	No Action	National Ignition Facility
Involved Workforce[a]		
Average worker dose[b] (mrem/yr)	NA	30
25-year fatal cancer risk	NA	3.0×10^{-4}
Total dose (person-rem/yr)	NA	8.0
Noninvolved Workforce[c]		
Average worker dose[b] (mrem/yr)	3.2	3.2
25-year fatal cancer risk	3.2×10^{-5}	3.2×10^{-5}
Total dose (person-rem/yr)	11	11
Total Site Workforce[d]		
Dose (person-rem/yr)	11	19
25-year fatal cancers	0.11	0.19

[a] The involved worker is a worker associated with operation of NIF. The estimated number of involved workers is 267 for NIF.
[b] The radiological limit for an individual worker is 5,000 mrem/yr (10 CFR 835).
[c] The noninvolved worker is an onsite worker not associated with operation of NIF. The estimated number of noninvolved workers is 3,400 for NIF.
[d] The total site workforce is the sum of the number of involved and noninvolved workers. The estimated number of workers in the total site workforce is 3,400 for No Action and 3,667 for NIF.
Note: NA - not applicable.
Source: DOE 1993n:7; appendix I.

reservoirs in the nonnuclear fabrication alternative at SNL. Therefore, no effects on the existing HI and cancer risk impacts for the public and onsite workers are expected.

Sensitivity Analysis. Operations under the low case scenario for nonnuclear fabrication are expected to reduce hazardous chemical emissions by up to 50 percent at SNL and, therefore, would likely reduce the HIs and cancer risks for the public and the onsite worker.

Operations under the high case scenario for nonnuclear fabrication may result in up to a 4-fold increase in the emissions of hazardous chemicals at SNL. The HI for the public and the onsite worker should remain within the cumulative HQ screening level of 1.0 (the HI). Cancer risks for the public are well within the default value of 1×10^{-6} and would not exceed this level under the high case scenario. Since cancer risk impacts for the onsite workers already exceed the EPA default value, operations under the high case scenario would further contribute to the adverse cancer risk impacts.

Stewardship Alternatives

Proposed National Ignition Facility

Radiological Impacts. Radiological impacts to the public resulting from normal operation of the proposed NIF for the enhanced option scenario are presented in table 4.8.3.9–1. These impacts are representative of the aggregate total which is estimated to exist from all future baseline operational SNL contributions and from enhanced option operations of the proposed NIF at the site. Total impacts are provided to compare with applicable regulations governing total site operations. To place doses to the public from this alternative into perspective, comparisons are made to natural background radiation. As shown in table 4.8.3.9–1, the total dose to the maximally exposed member of the public from annual total site operations is within radiological limits and would be 5.6×10^{-3} mrem for this alternative. The annual population dose within 80 km (50 mi) in 2030 would be 0.23 person-rem.

Total site doses to onsite workers from normal operation of the proposed NIF are presented in table

4.8.3.9–2. The average annual dose to involved workers for this alternative would be 30 mrem. The dose to the entire facility workforce (involved workforce) would be 8.0 person-rem. The presented total dose to noninvolved workers was not modeled due to the unavailability of certain site-specific information.

Based on the radiological impacts associated with normal operation of this alternative, all resulting doses would be within radiological limits and are well below levels of natural background radiation. The associated risks of adverse health effects to the public and to workers would be small.

Hazardous Chemical Impacts. No hazardous chemical impacts are expected from operation of the proposed NIF (see appendix I). Therefore, the HI and cancer risk to the public and the onsite worker were not calculated nor assessed.

Potential Mitigation Measures. Mitigation measures such as substituting less toxic solvents and chemicals or modifying processes are proposed to reduce or eliminate the emissions of trichloroethylene due to site operations. Radioactive airborne emissions to the general population and onsite exposures to workers could be reduced by implementing the latest technology for process and design improvements. For example, to reduce public exposure from emissions, improved building and work area control methods could be used to remove radioactivity from the releases to the environment. Similarly, the use of remote, automated, and robotic production methods are examples of techniques that are being developed that would reduce worker exposure (see section 3.5).

Facility Accidents. The proposed actions have the potential for accidents that may impact the health and safety of workers and the public. The potential for and associated consequences of reasonably foreseeable accidents that have been assessed are summarized in this section.

No Action. Under the No Action alternative, nonnuclear fabrication and stewardship R&D would continue to be performed at SNL with no changes to facilities and operations. Under existing conditions, potential accidents and their consequences have been addressed in facility safety documentation according to requirements in DOE orders. In addition, there are other facilities at SNL besides those for nonnuclear fa brication and stewardship R&D. The potential for accidents at these other facilities has been similarly addressed and documented.

Management Alternatives. This section provides accident information on the nonnuclear fabrication alternative for SNL.

Nonnuclear Fabrication. The impacts of potential accidents associated with nonnuclear fabrication activities at SNL were previously addressed in *Nonnuclear Consolidation Environmental Assessment* (DOE/EA-0792, June 1993) where it was determined that the then current accident profile would not change as a result of the relocation of nonnuclear fabrication functions to SNL. The present proposed action to transfer the nonnuclear fabrication mission to SNL is not expected to change the accident profile that presently exists at the site.

Stewardship Alternatives

Proposed National Ignition Facility. Studies of potential accidents associated with the proposed NIF have been performed. A bounding accident was postulated based on a preliminary hazard analysis. The bounding accident assumes a severe earthquake of 1 G horizontal ground acceleration occurring during a maximum-credible-yield fusion experiment. Beamlines streaking into the target chamber and building structures other than the target area building would fail during the postulated earthquake. The collapsed beamlines and building structures would provide a pathway for acute atmospheric releases of tritium from the tritium processing system, activated gases in the air, and activated material in the target chamber.

The frequency of this severe earthquake is estimated at $1x10^{-4}$ per year. The joint frequency of the severe earthquake during the maximum-credible-yield fusion experiment would be less than $2x10^{-8}$ per year. The radiological impacts of the accident, presented in table 4.8.3.9–3, were estimated using the GENII computer code.

TABLE 4.8.3.9–3.—***Consequences and Risk of the Bounding Proposed National Ignition Facility Accident at Sandia National Laboratories***

Parameter	Conceptual Design	Enhanced Baseline Option
Workers Onsite		
Dose (person-rem)	20	33
Fatal cancers	0	0
Risk (cancer fatalities per year)	2×10^{-10}	3×10^{-10}
Maximally Exposed Individual		
Dose (rem)	0.07	0.1
Fatal cancers probability	4×10^{-5}	8×10^{-5}
Risk (cancer fatality per year)	7×10^{-13}	1×10^{-12}
Population Within 80 Kilometers		
Dose (person-rem)	1,100	1,800
Fatal cancers probability	0	1
Risk (cancer fatalities per year)	1×10^{-8}	2×10^{-8}

Source: Appendix I.

4.8.3.10 *Waste Management*

This section summarizes the impacts on waste management at the Albuquerque location of SNL under No Action and for each of the proposed alternatives. There is no spent nuclear fuel, HLW, or TRU waste associated with nonnuclear fabrication or the proposed NIF; therefore, there is no further discussion of these wastes at SNL. Table 4.8.3.10–1 lists the projected waste generation rates and treatment, storage, and disposal capacities under No Action. Projections for No Action were derived from 1994 environmental data, with the appropriate adjustments made for those changing operational requirements where the volume of wastes generated are identifiable. The projection does not include wastes from future, yet uncharacterized, environmental restoration activities.

Table 4.8.3.10–2 provides the total estimated operational waste volumes projected to be generated at SNL as a result of the nonnuclear fabrication alternative and the NIF alternative. The net increase over No Action is shown in the table in parentheses. The waste volumes generated from the alternatives and the resultant waste effluent used in the impact analysis can be found in table 3.4.2.5–3 for nonnuclear fabrication and table 3.3.2.2–3 for NIF. Facilities that would support the Stockpile Stewardship and Management Program would treat and package all waste generated into forms that would enable long-term storage and/or disposal in accordance with the *Atomic Energy Act,* RCRA, and other applicable statutes as outlined in appendix section H.1.2.

No Action. Under No Action, TRU, low-level, mixed, hazardous, and nonhazardous wastes would continue to be generated at SNL from the missions described in section 3.2.8. SNL would continue to treat, store, and dispose of its legacy and newly generated wastes in current and planned facilities. Liquid LLW would be neutralized and solidified. Solid LLW would be compacted, packaged, and stored at the Technical Area III storage site for shipment to NTS. Both liquid and solid mixed waste would be treated in the Technical Area III Radioactive and Mixed Waste Management Facility and disposed of according to the SNL Site Treatment Plan which was developed pursuant to the *Federal Facility Compliance Act* of 1992. The resulting waste would be stored in a RCRA-permitted facility in DOT-approved containers until shipped to an offsite DOE disposal facility. Some of this waste would be placed in interim storage until new technologies for treatment and disposal are identified and evaluated. Hazardous waste would be packaged and shipped offsite to RCRA-permitted treatment storage and disposal facilities. Liquid sanitary waste would continue to be sent to the City of Albuquerque Municipal Sanitary Sewer System. Solid nonhazardous sanitary waste would be disposed of at the Albuquerque Sanitary Landfill.

Management Alternatives

Nonnuclear Fabrication. The Nonnuclear Fabrication Facility at SNL would not generate any TRU waste, LLW, or mixed LLW. Minimal impacts would result from the 15 m^3 (3,840 gal) of liquid hazardous waste and 17 m^3 (22 yd^3) of solid hazardous waste, which would be packaged and stored onsite in RCRA-permitted facilities prior to shipment offsite to commercial RCRA-permitted treatment, storage, and disposal facilities. The estimated 291,000 m^3 (77,000,000 gal) of sanitary waste would be

TABLE 4.8.3.10–1.—*Projected Waste Management Under No Action at Sandia National Laboratories*
[Page 1 of 2]

Category	Annual Generation (m^3)	Treatment Method	Treatment Capacity (m^3/yr)	Storage Method	Storage Capacity (m^3)	Disposal Method	Disposal Capacity (m^3)
Low-Level							
Liquid	1	Neutralization and solidification	Included in mixed low-level	Staged at generator sites or in containers at Technical Area III aboveground storage site and other facilities	Included in mixed low-level	NA	NA
Solid	53	Compaction	Included in mixed low-level	Staged at generator sites or in containers at Technical Area III aboveground storage site and other facilities	Included in mixed low-level	None - pending offsite shipment to NTS	NA
Mixed Low-Level							
Liquid	<0.01	Neutralization and solidification; specific preferred treatment option for each treatability group as per Site Treatment Plan for Mixed Waste	Data not available at this time	Technical Area III	Included in solid	NA	NA
Solid	2	Compaction; specific preferred treatment option for each treatability group as per Site Treatment Plan for Mixed Waste	Data not available at this time	Staged at generator sites or in containers at Technical Area III aboveground storage site and other facilities	3,080	Offsite commercial facilities; some waste streams have no disposal options identified	NA

TABLE 4.8.3.10–1.—*Projected Waste Management Under No Action at Sandia National Laboratories*
[Page 2 of 2]

Category	Annual Generation (m^3)	Treatment Method	Treatment Capacity (m^3/yr)	Storage Method	Storage Capacity (m^3)	Disposal Method	Disposal Capacity (m^3)
Hazardous							
Liquid	342	Neutralization or thermal treatment (open burn)	Data for neutralization not available at this time	RCRA-permitted Hazardous Waste Management Facility	Included in solid	Shipped to offsite RCRA-permitted facilities	NA
Solid	486[a]	Thermal treatment	9.1 kg/campaign	RCRA-permitted Hazardous Waste Management Facility	Data not available at this time	Shipped to offsite RCRA-permitted facilities	NA
Nonhazardous (Sanitary)							
Liquid	75,700	Offsite/Kirtland Air Force Base	NA	None	NA	Offsite-NPDES outfall to municipal facilities	NA
Solid	9,070	Segregation and recycling	NA	None	NA	Offsite sanitary landfill	NA
Nonhazardous (Other)							
Liquid	Included in sanitary	Included in sanitary	NA	None	NA	Included in sanitary	NA
Solid	Included in sanitary	Included in sanitary	NA	None	NA	Onsite classified waste landfill for classified waste; offsite for other nonhazardous wastes	NA

[a] Includes RCRA-regulated, state-regulated, and TSCA-regulated wastes.
Note: NA - not applicable.
Source: SNL 1995d.

TABLE 4.8.3.10–2.—*Estimated Annual Generated Waste Volumes for Stockpile Stewardship and Management Alternatives at Sandia National Laboratories*

Category	No Action[a] (m^3)	Nonnuclear Fabrication[b] (m^3)	National Ignition Facility[c] (m^3)	Combined Program Impacts (m^3)
Low-Level				
Liquid	1	1 (+0)	2 (+0.6)	2 (+0.6)
Solid	53	53 (+0)	56 (+3)	56 (+3)
Mixed Low-Level				
Liquid	<0.01	<0.01 (+0)	2 (+2)	2 (+2)
Solid	2	2 (+0)	2 (+0.3)	2 (+0.3)
Hazardous				
Liquid	342	357 (+15)	344 (+2)	359 (+17)
Solid	486	503 (+17)	494 (+8)	511 (+25)
Nonhazardous (Sanitary)				
Liquid	75,700	367,000 (+291,000)	93,600 (+17,900)	385,000 (+309,000)
Solid	9,070	16,900 (+7,880)	15,100 (+6,000)	22,900 (+13,900)
Nonhazardous (Other)				
Liquid	Included in sanitary	Included in sanitary	Included in sanitary	Included in sanitary
Solid	Included in sanitary	Included in sanitary	Included in sanitary	Included in sanitary

[a] No Action volumes are from table 4.8.3.10–1.
[b] Volumes for nonnuclear fabrication are from table 3.4.2.5–3 and are based on surge operations (three shifts).
[c] Volumes for NIF are from table 3.3.2.2–3 and are based on the conceptual design.
Note: Waste generation volumes were rounded to three significant figures. Waste effluent volumes are found in sections 3.3 and 3.4.

conveyed to the City of Albuquerque Municipal Sanitary Sewer System. Additional treatment in accordance with site practice and discharge permits may be required. Following volume reduction, 3,940 m^3 (5,150 yd^3) per year of solid nonhazardous waste would be disposed of at the Albuquerque Sanitary Landfill. Minimal impacts to the remaining capacity of the landfill are expected.

Sensitivity Analysis. The waste volumes generated from the Nonnuclear Fabrication Facility required to support a larger stockpile level (high case) operating on a single-shift basis are bounded by the base case under surge operations. Thus, there are no additional waste management impacts associated with the Nonnuclear Fabrication Facility that would support a high case stockpile operating at a single shift. The volumes generated from the Nonnuclear Fabrication Facility required to support a low case stockpile would be reduced by a factor of at least three.

Stewardship Alternatives

Proposed National Ignition Facility. The proposed NIF would not generate any TRU waste. The 0.6 m^3 (159 gal) of liquid LLW would require treatment prior to disposal. Liquid LLW is currently stored at the point of generation. Treatability studies are being conducted prior to applying for a RCRA permit for treating and storing liquid LLW and mixed waste. The 3 m^3 (4 yd^3) of solid LLW would be packaged in approved waste containers and staged in the Technical Area III storage site pending shipment directly to NTS for management. Assuming a land usage factor of 6,000 m^3/ha (3,180 yd^3/acres), less than 0.0005 ha/yr (0.0001 acres/yr) of LLW disposal area would be required.

The SNL Site Treatment Plan for Mixed Waste was developed to comply with the *Federal Facility Compliance Act.* The mixed waste streams identified at SNL have been combined into 16 treatability groups, each with a preferred treatment option. The type of mixed wastes generated by NIF would fit into one of the established 16 treatability groups and would not require the creation of new treatability groups or new preferred treatment options. The annual generation of 2 m^3 (528 gal) of liquid mixed wastes and the annual generation of 0.3 m^3 (0.4 yd^3) of solid mixed waste would have a negligible impact on the available storage capacity of the main areas for future mixed waste storage: the seven Manzano bunkers, the Radioactive and Mixed Waste Management Facility, and Building 6596.

Minimal impacts would result from the 2 m^3 (608 gal) of liquid hazardous waste and 8 m^3 (10 yd^3) of solid hazardous waste, which would be staged in the onsite hazardous waste accumulation area and shipped to offsite commercial RCRA-permitted treatment, storage, and disposal facilities. There are no adverse impacts expected from the annual volume of 17,900 m^3 (4.72 million gal) of liquid nonhazardous sanitary waste discharged to the City of Albuquerque Municipal Sanitary Sewer System. Additional treatment in accordance with site practice and discharge permits may be required. Minimal impacts to the Albuquerque Sanitary Landfill would result from the 6,050 m^3 (7,910 yd^3) of solid nonhazardous waste.

Combined Program Impacts. If all the stockpile stewardship and management alternatives listed in table 4.8.3.10–2 were located at SNL, the impacts from low-level and mixed LLW would be identical to those discussed for NIF. Minimal impacts would result from the program total of 17 m^3 (4,450 gal) of liquid and 25 m^3 (33 yd^3) of solid hazardous wastes. Adequate facilities exist to package and stage these wastes in onsite RCRA-permitted facilities prior to shipment offsite to commercial RCRA-permitted treatment and disposal facilities. There are no adverse impacts expected from the program total of 309,000 m^3 (81.7 million gal) annual volume liquid sanitary wastes discharged to the City of Albuquerque Sanitary Sewer System. Additional treatment in accordance with site practice and discharge permits may be required. After volume reduction, approximately 9,990 m^3 (13,100 yd^3) of solid sanitary waste would require disposal at the Albuquerque Sanitary Landfill. Minimal impacts to the landfill are expected.

Potential Mitigation Measures. Waste quantities or waste forms could undergo additional reductions by utilizing emerging technologies, thereby further reducing or mitigating impacts. Pollution prevention and waste minimization would be considered in determining the final actions of the Stockpile Stewardship and Management Program at SNL. Utilization of existing and planned treatment and storage facilities would be maximized to further reduce impacts.

4.8.3.11 *Environmental Justice*

As discussed in section 4.14, any impacts to surrounding communities would most likely result from toxic or hazardous air pollutants and radiological emissions. Section 4.8.3.9, which describes public and occupational health impacts from normal operation, shows that potential chemical air emissions and releases are not within the generally accepted threshold of regulatory concern. This information is based on the conservative programmatic assumptions and modeling detailed in appendix E. Any adverse human health or environmental impacts that might occur would affect people living within communities located near SNL. The analysis of the demographic data presented in appendix D for the communities surrounding SNL indicates that if there were any adverse health impacts to these communities, they would not appear to disproportionately affect minority or low-income populations.

4.9 Nevada Test Site

NTS was established in 1950 and currently occupies approximately 351,000 ha (867,000 acres) located 105 km (65 mi) northwest of Las Vegas, NV. The site has conducted underground testing of nuclear weapons and evaluation of the effects of nuclear weapons on military communications systems, electronics, satellites, sensors, and other materials. In October 1992, underground nuclear testing was halted, yet the site maintains the capability to resume testing if authorized by the President. Section 3.2.9 provides a description of all DOE missions and support facilities at NTS. The location of NTS within the state of Nevada is illustrated in figure 4.9–1, and the principal facilities at NTS are shown in figure 4.9–2.

4.9.1 Description of Alternatives

There are no facilities at NTS that would be phased out as a result of any of the proposed alternatives discussed in this PEIS.

No Action. NTS would continue to perform the mission described in section 3.2.9.

Stockpile Management Alternatives. The A/D mission, including the nonintrusive modification pit reuse mission (hereafter referred to as A/D), and the option of storage of strategic reserves of plutonium and uranium could be located at NTS.

Stockpile Stewardship Alternatives. NIF could be located at NTS (at the main site or at NLVF).

4.9.2 Affected Environment

The following sections describe the affected environment at NTS and NLVF for land resources, air quality, water resources, geology and soils, biotic resources, cultural and paleontological resources, and socioeconomics. In addition, the infrastructure, radiation and hazardous chemical environment, and waste management conditions are described.

4.9.2.1 *Land Resources*

Land Use. NTS occupies approximately 351,000 ha (867,000 acres) in southern Nye County in southern Nevada, with the southwestern boundary located approximately 16 km (10 mi) from California. The town of Indian Springs and the Indian Springs Air Force Auxiliary Field, in northeast Clark County, NV, are 39 km (24.2 mi) southeast of the closest NTS boundary. All of the land within NTS is owned by the Federal Government and is administered, managed, and controlled by DOE. NTS is also entirely bordered by Federal land: the land to the west, north, and east consists of the Nellis Air Force Range; the land to the south is administered by the Bureau of Land Management.

Generalized land uses at NTS and its vicinity are shown in figure 4.9.2.1–1. NTS is divided into 3 major regions consisting of 26 areas. The northern region of NTS is the underground nuclear weapons test area. Nuclear test ranges are located at Yucca Flats, Pahute Mesa, Rainier Mesa, and Buckboard Mesa. The southwest region of NTS (Area 25) provides support for nonweapons and nonnuclear weapons programs, such as the proposed HLW repository at the Yucca Mountain Project Site. Area 25 also provides support for short-term activities such as the nuclear weapons accident exercises conducted by the Nuclear Emergency Search Team. The southeastern region is the nonnuclear test area and primary administrative and support area of NTS.

Land areas not used for missions or other purposes have been designated in the *Nevada Site Development Plan* as reserve areas, available for future development (NT DOE 1994d:7-8). Approximately 4,050 ha (10,000 acres) of reserve areas are present within Areas 5 and 6, which are located in Frenchman and Yucca Flats. Figure 4.9.2.1–2 identifies the primary facilities, A/D area, and testing areas at NTS.

The Device Assembly Facility, undergoing final construction, is designed to conduct all nuclear assembly operations at NTS in support of the Nuclear Weapons

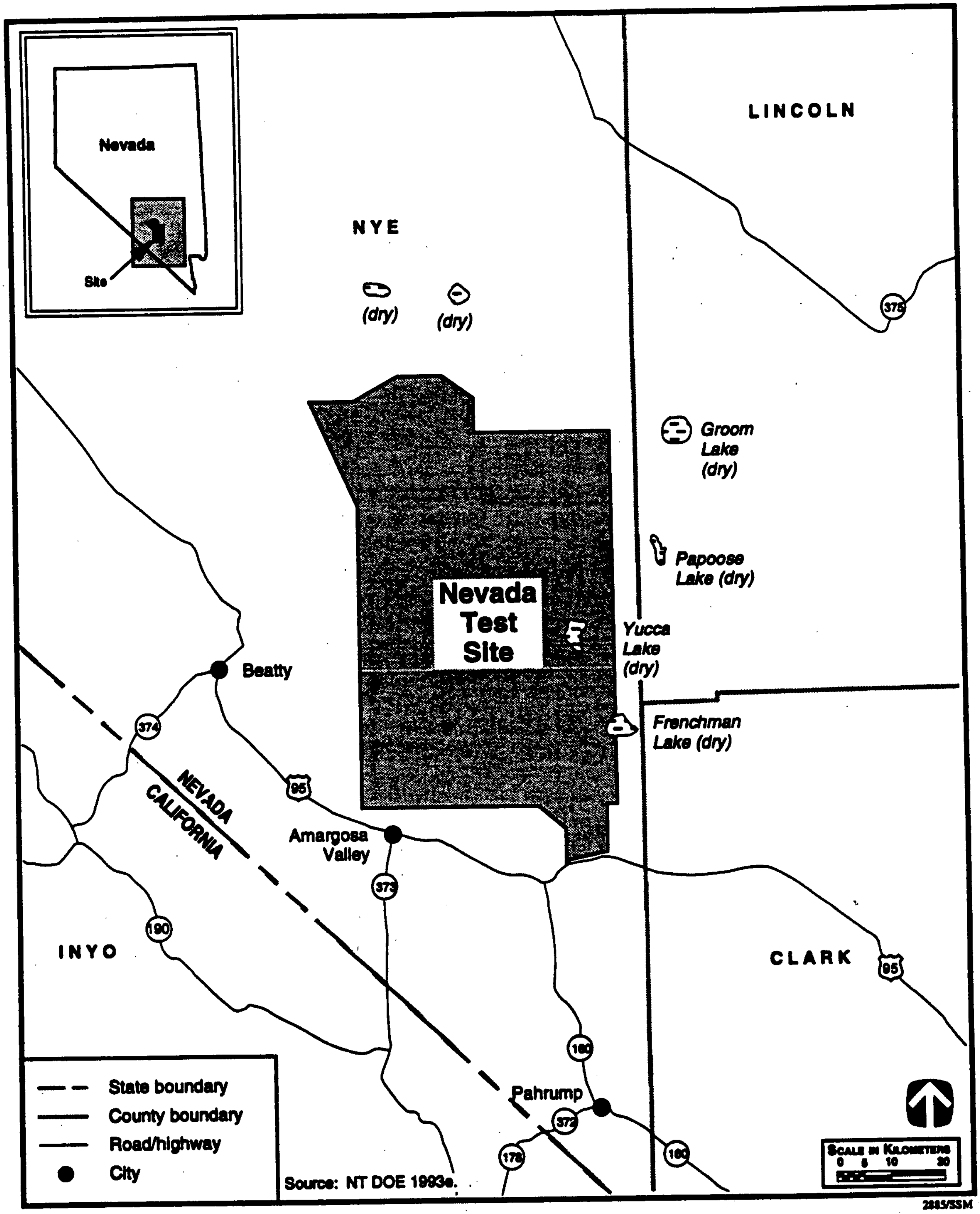


FIGURE 4.9–1.—*Nevada Test Site, Nevada, and Region.*

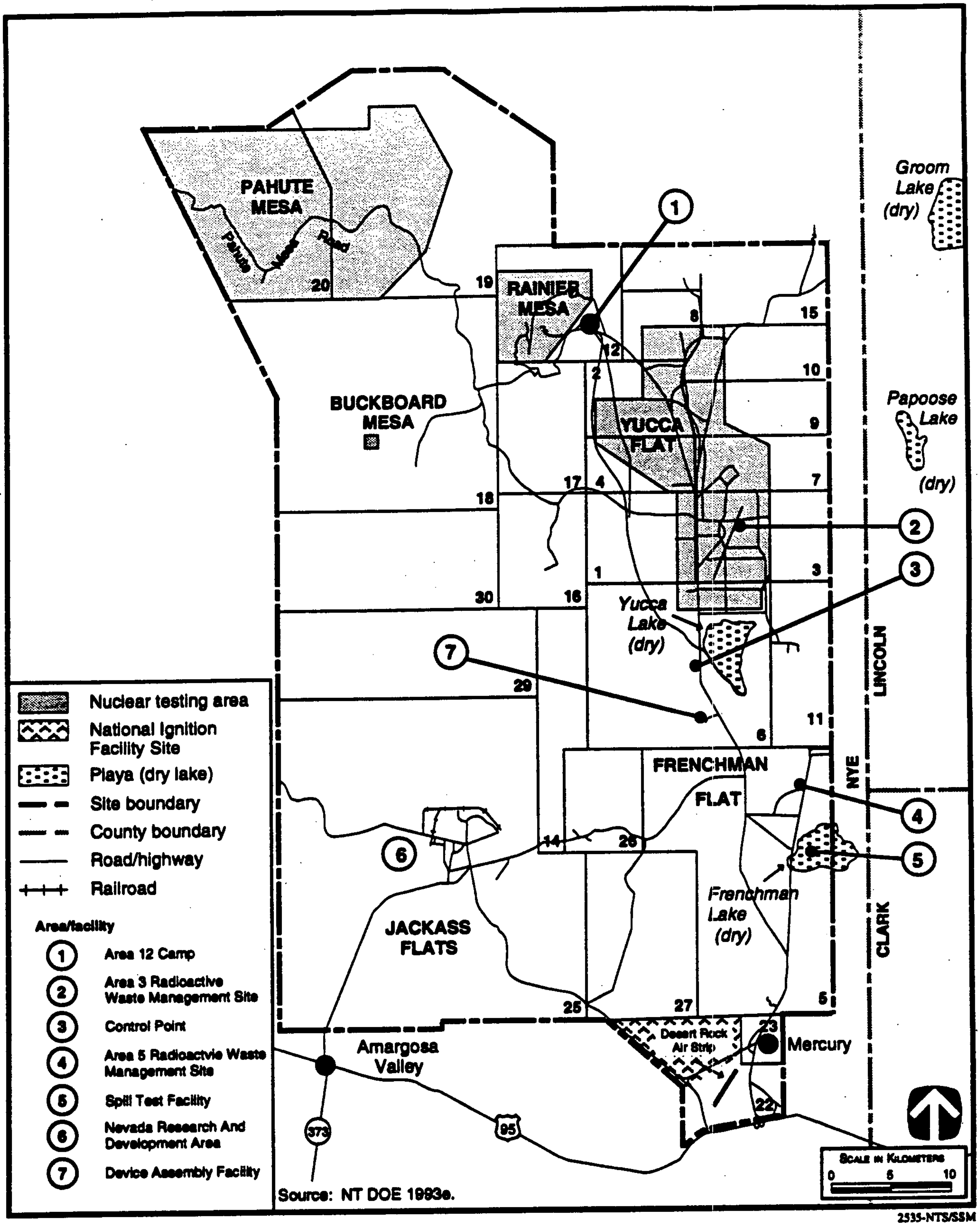


Figure 4.9–2.—*Principal Facilities and Testing Areas at Nevada Test Site.*

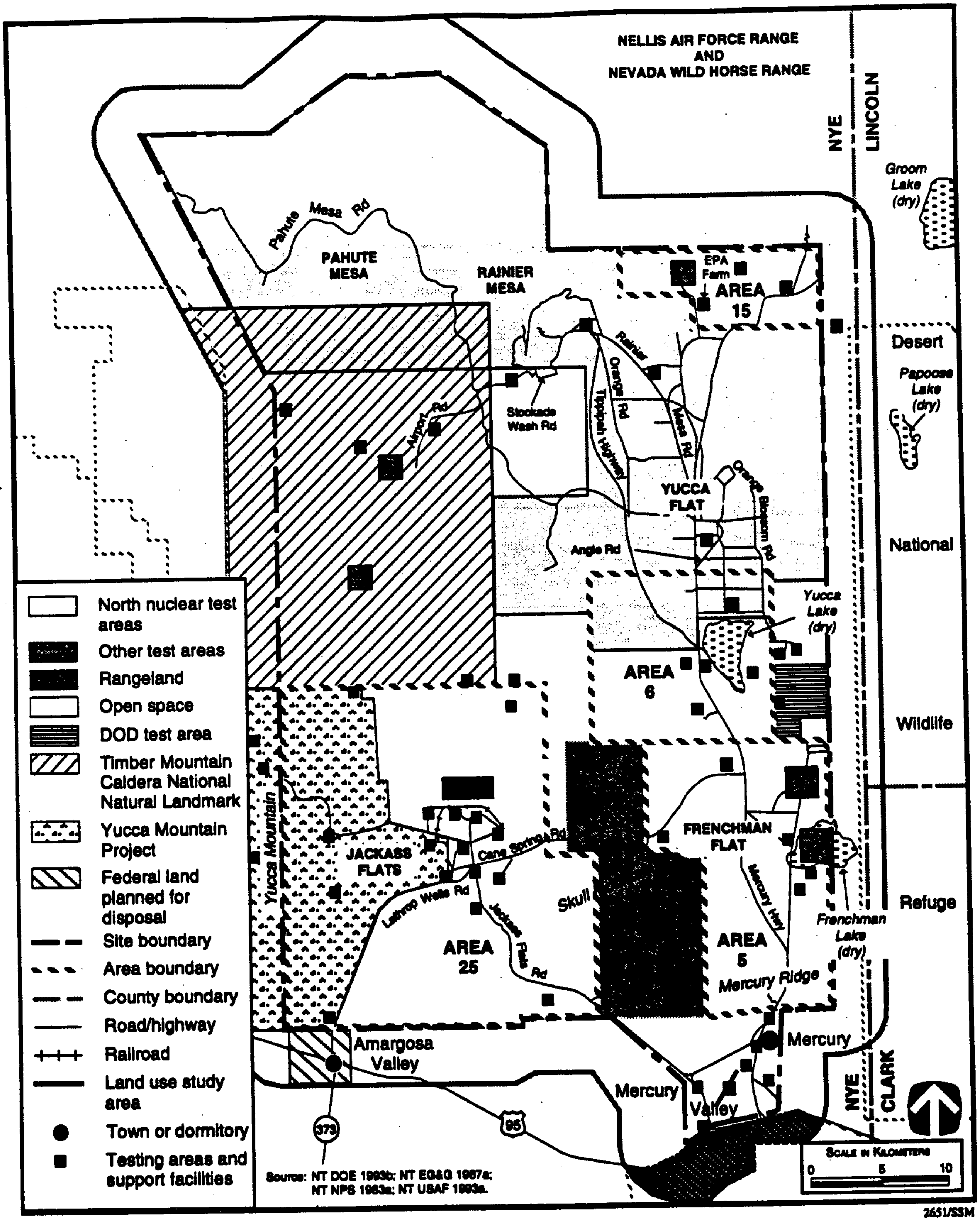


Figure 4.9.2.1–1.—*Generalized Land Use at Nevada Test Site and Vicinity.*

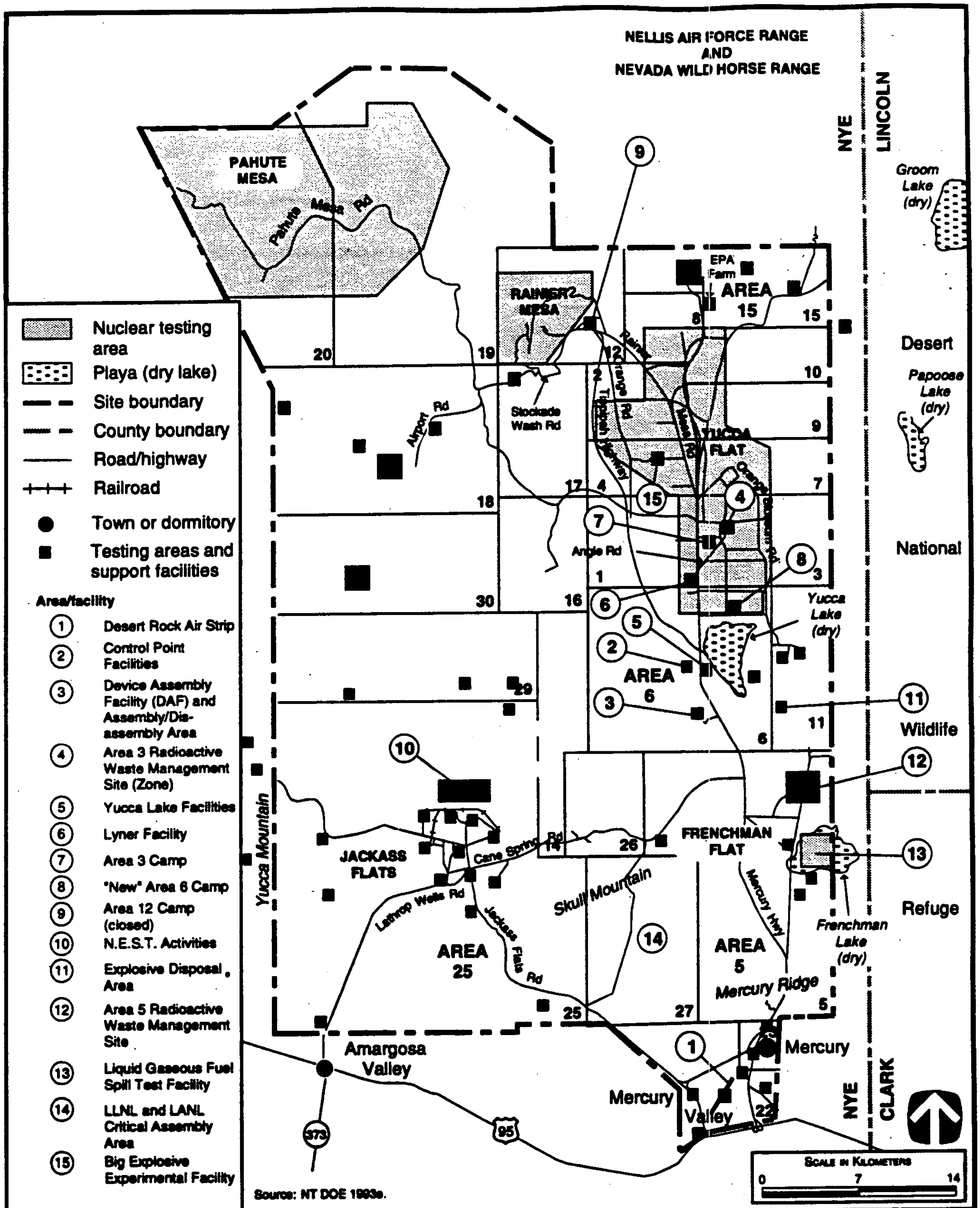


FIGURE 4.9.2.1–2.—*Primary Facilities, Assembly/Disassembly Area, and Testing Areas at Nevada Test Site.*

Test Program. Other nearby facilities include the DOD test area, explosives disposal area, radioactive waste management site, and the Spill Test Facility.

In 1992, DOE designated the entire NTS as a National Environmental Research Park. The park is used by the national scientific community as an outdoor laboratory for research on the effects of human activities on the desert ecosystem. There is no prime farmland present on NTS. Offsite agricultural activity occurs on the south side of U.S. Route 95, consisting of a cattle allotment granted by the Bureau of Land Management.

The Timber Mountain Caldera National Natural Landmark is located approximately 11 km (6.8 mi) north-northwest of the Device Assembly Facility, separated by mountains to the west. A wilderness study area located within the Desert National Wildlife Refuge, which has been recommended for inclusion in the National Wilderness System, is approximately 12 km (7.5 mi) to the east. This part of the refuge is also a part of the Nellis Air Force Range; it is jointly managed by the U.S. Air Force and USFWS. Public entry to this portion of the refuge is generally prohibited by the Air Force. The closest offsite residence to the NTS boundary is approximately 2 km (1.2 mi) south, at the unincorporated town of Amargosa Valley.

North Las Vegas Facility

Land Use. NLVF occupies 32 ha (80 acres) in the city of North Las Vegas, NV, as shown in figure 4.9.2.1–3. NLVF is zoned for general industrial use and is bordered on the north, south, and east by general industrial zoning. The western border of the site is adjacent to Commerce Street, which separates the property from fully developed, single-family residential-zoned property (figure 4.9.2.1–4).

NLVF is divided into three distinct areas: the A, B, and C Complexes. Complex A covers 8 ha (20 acres) and houses support for the LLNL nuclear test program. Complex B covers 8 ha (20 acres) just south of Complex A and houses support for the LANL test program. Complex C, located west of A and B Complexes, covers 15.5 ha (38.3 acres) and houses a computer center and administrative and engineering support functions (appendix I).

4.9.2.2 *Site Infrastructure*

As shown in figure 4.9.2.1–1, activities at NTS are concentrated in facilities in several general areas. Section 3.2.9 describes the current NTS missions. To support these missions an infrastructure exists as shown in table 4.9.2.2–1.

TABLE 4.9.2.2–1.—***Baseline Characteristics for Nevada Test Site***

Characteristics	Current Value
Land	
Area (ha)	351,000
Roads (km)	640
Railroads (km)	0
Electrical	
Energy consumption (MWh/yr)	121,460
Peak load (MWe)	27.4
Fuel	
Natural gas (m^3/yr)	0
Liquid (L/yr)	5,716,000
Coal (t/yr)	0

Source: NTS 1993a:4; NTS 1995a:1; NTS 1995a:2.

4.9.2.3 *Air Quality*

The following section describes the existing air quality at NTS and NLVF and includes a review of meteorology and climatology in the vicinity. More detailed discussions of air quality methodologies, input data, and atmospheric dispersion characteristics are presented in appendix section B.3.9 and appendix I.

Meteorology and Climatology. The climate at NTS and in the surrounding region is characterized by limited precipitation, low humidity, and large diurnal temperature ranges. The lower elevations are characterized by hot summers and mild winters, which are typical of other Great Basin desert areas. As elevation increases, precipitation amounts increase and temperatures decrease (NT DOE 1986b:3-46).

The annual average temperature is 19.5 °C (67.1°F); the average daily minimum temperature is 0.9 °C (33.6°F) in January; and the average daily maximum temperature is 41.1 °C (105.9°F) in July. The average annual precipitation at NTS is 10.5 cm (4.13 in) (NOAA 1994d:3). Prevailing winds at NTS vary

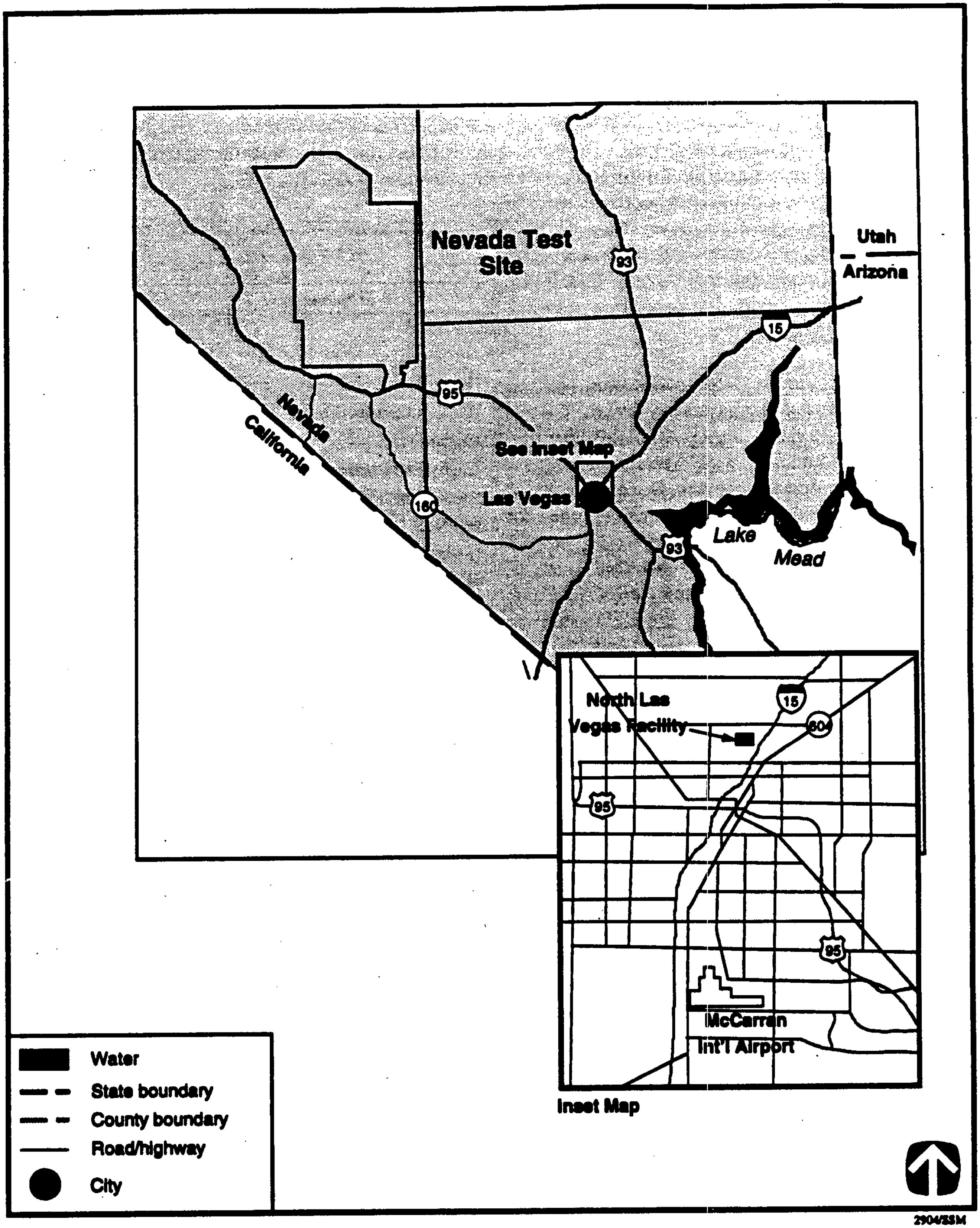


FIGURE 4.9.2.1–3.—*Regional Location of the North Las Vegas Facility.*

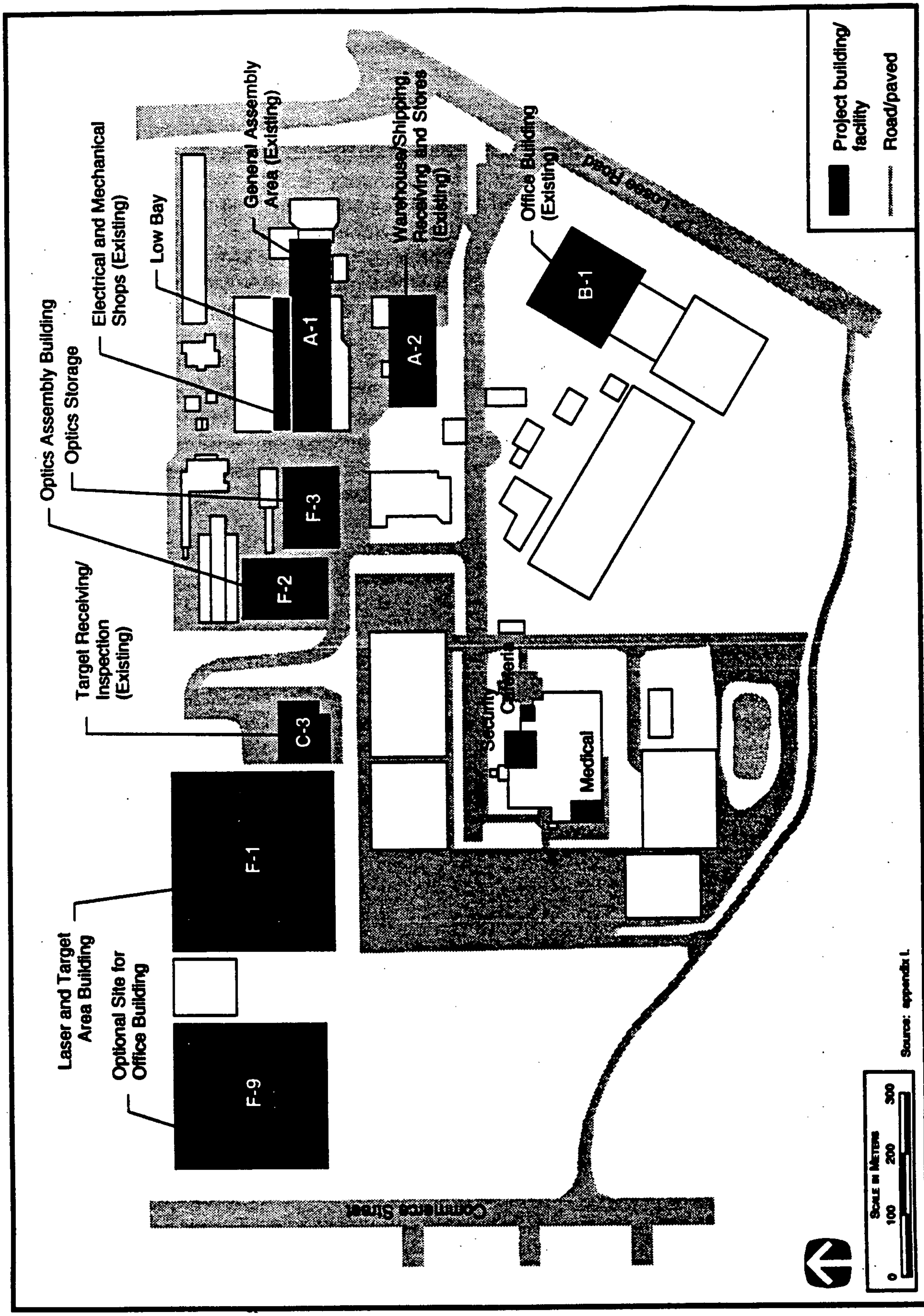


FIGURE 4.9.2.1–4.—*North Las Vegas Facility.*

by location. The annual average wind speed is 4.2 m/s (9.3 mph).

Ambient Air Quality. NTS is located within the Nevada AQCR 147. The region is designated as an attainment or unclassified area (40 CFR 81.329) with respect to the NAAQS. Applicable NAAQS and Nevada State ambient air quality standards are presented in appendix table B.3.1–1.

Two Prevention of Significant Deterioration Class I areas in the vicinity of NTS are Grand Canyon National Park, approximately 193 km (120 mi) to the southeast, and Sequoia National Park, California, approximately 169 km (105 mi) to the west-southwest of the site. Since the promulgation of Prevention of Significant Deterioration regulations (40 CFR 52.21) in 1977, no permits have been required for any emissions source at NTS.

The primary emission sources of criteria air pollutants at NTS include particulates from construction and other surface disturbances, fugitive dust from unpaved roads, various pollutants from fuel burning equipment, incineration, open burning, and volatile organics from fuel storage facilities. A summary of emission estimates for sources at NTS is presented in appendix table B.3.9–1.

Table 4.9.2.3–1 shows the site baseline ambient air concentrations for criteria pollutants and other pollutants of concern at NTS. No hazardous air pollutant or other toxic compound sources are indicated. Baseline concentrations are in compliance with applicable guidelines and regulations. Elevated levels of ozone or particulate matter may occur occasionally because of pollutants transported into the area by wind or because of local sources of fugitive particulates (NT DOE 1983a:30). Concentrations of other criteria pollutants (sulfur dioxide, nitrogen dioxide, carbon monoxide, and lead) are low because there are no large emission sources nearby. The nearest significant emission source for criteria pollutants is the Las Vegas area, which is about 105 km (65 mi) southeast of NTS.

North Las Vegas Facility

Meteorology and Climatology. The climate at NLVF and the surrounding region has four well-defined

TABLE 4.9.2.3–1.—*Comparison of Baseline Ambient Air Concentrations with Most Stringent Applicable Regulations and Guidelines at Nevada Test Site, 1990 to 1992*

Pollutant	Averaging Time	Most Stringent Regulation or Guideline ($\mu g/m^3$)	Baseline Concentration ($\mu g/m^3$)
Criteria Pollutant			
Carbon monoxide	8-hour	10,000[a]	2,290
	1-hour	40,000[a]	2,748
Lead	Calendar quarter	1.5[a]	[b]
Nitrogen dioxide	Annual	100[a]	[b]
Ozone	1-hour	235[a]	[b]
Particulate matter[c]	Annual	50[a]	9.4
	24-hour	150[a]	106
Sulfur dioxide	Annual	80[a]	8.4
	24-hour	365[a]	94.6
	3-hour	1,300[a]	725
Mandated by Nevada			
Hydrogen sulfide	1-hour	112[d]	[b]

[a] Federal and state standard.
[b] No monitoring data available; baseline concentration assumed less than applicable standard.
[c] It is assumed that particulate matter data are TSP data.
[d] State standard.
Source: 40 CFR 50; NT REECO 1990a; NV DCNR 1995a.

seasons. Summers display desert conditions, with maximum temperatures usually in the 38 °C (100 °F) range. Winter daytime temperatures average near 15.5 °C (60 °F). Rainy days average less than one in June to three per month in the winter. The annual average temperature at NLVF is 19.1 °C (66.3 °F); average daily temperatures range from 6.9°C (44.5 °F) in January to 32.1 °C (89.8 °F) in July. The average annual precipitation is 106 millimeters (4.19 in). The prevailing winds are from the southwest at an annual average wind speed of 4.2 m/s (9.3 mph) (GRI 1992a). Additional information related to meteorology and climatology at NLVF is presented in appendix I.

Ambient Air Quality. NLVF is located within the Las Vegas Intrastate AQCR 13, which only includes Clark County. Portions of Clark County, including the NLVF site, are in nonattainment with the NAAQS for carbon monoxide, particulate matter, and TSPs (40 CFR 81.329). The Clark County Health District is responsible for air pollution control and attainment of air quality standards in Clark County. Applicable NAAQS and Clark County ambient air quality standards are presented in table 4.9.2.3–2. In addition to NAAQS for criteria pollutants, NLVF is subject to ambient air quality standards adopted by the Clark County Health District.

The Clark County Health District operates a network of ambient air monitoring stations in Clark County. The county monitor closest to NLVF is at the McDaniel Post Office at 1414 East Lake Mead Drive, approximately 1.9 km (1.2 mi) east of the proposed NIF location. Data for this and other monitors near NLVF are provided in appendix I. Table 4.9.2.3–2 presents the 1994 baseline ambient air concentrations for criteria pollutants and other pollutants at NLVF. As the table shows, all of the baseline concentrations are in compliance with the NAAQS.

4.9.2.4 *Water Resources*

This section describes the surface and groundwater resources at NTS and NLVF.

TABLE 4.9.2.3–2.—*Comparison of Baseline Ambient Air Concentrations with Most Stringent Applicable Regulations and Guidelines at North Las Vegas Facility, 1994*

Pollutant	Averaging Time	Most Stringent Regulation or Guideline (μg/m³)	Baseline Concentration[a] (μg/m³)
Criteria Pollutant			
Carbon monoxide	8-hour	10,000[b]	8,635
	1-hour	40,000[b]	13,456
Lead	Calendar quarter	1.5[b]	[c]
Nitrogen dioxide	Annual	100[b]	53
Ozone	1-hour	235[b]	192
Particulate matter	Annual	50[b]	47
	24-hour	150[b]	117
Sulfur dioxide	Annual	60[d]	[c]
	24-hour	260[d]	[c]
	3-hour	1,300[b]	[c]
Mandated by Nevada			
Hydrogen sulfide	1-hour	112[e]	[c]

[a] For short-term standards, baseline concentration is highest second highest concentration for year.
[b] Federal standard (40 CFR 50).
[c] No monitoring data available; baseline concentration assumed less than applicable standard.
[d] County standard.
[e] State standard.
Source: ANL 1995b; NT County 1993a; NT County 1995c:1.

Surface Water. Surface water is not used at NTS. There are no perennial streams on NTS. The most noticeable natural hydrologic features are the playas (lake beds) that collect stormwater runoff. Runoff in the eastern half of the site ultimately collects in the playas of Yucca Flat and Frenchman Flat. In the northeastern portion, the runoff drains outside the test site and onto the Nellis Air Force Range Complex. In the western half and southernmost part, runoff is carried offsite towards the Amargosa Desert. Figure 4.9.2.4–1 shows the locations of the playas and flats. A few natural springs can be found at NTS.

Because there are no continuously flowing surface waters, there are no studies to assess 500-year floodplain boundaries. Two 100-year flood analyses have been conducted. These analyses show no runoff from a 100-year storm adversely affecting the proposed project areas. However, the proposed project areas are in a region where flash flooding occurs due to locally isolated intense convection storms. These floods normally last less than 6 hours.

Surface Water Quality. There are no NPDES permits for the site because there are no wastewater discharges to onsite or offsite surface waters. However, the state has issued sewage discharge permits for sewage lagoons and ponds for NTS facilities. Because there are no surface waters at or near the proposed project areas, and because there will be no withdrawal or discharge to natural surface waters at NTS, the assessment of surface water quality is not applicable.

Surface Water Rights and Permits. Surface water rights are not an issue because NTS facilities do not withdraw surface water for use, nor do they discharge effluents directly to natural surface waters.

Groundwater. NTS is located within three groundwater subbasins of the Death Valley Groundwater Basin (NT DOE 1994b:9-2). Groundwater beneath the eastern portion of NTS is located in the Ash Meadows Subbasin; the western portion is located in the Alkali Flat Furnace Creek Ranch Subbasin; and a small part of the northwestern corner is located in the Oasis Valley Subbasin (figure 4.9.2.4–1). The proposed project area is situated over the Ash Meadows Subbasin. Three primary aquifers are present within the Ash Meadows Subbasin: the Lower Carbonate (the deepest), the Volcanic, and the Valley-Fill (the shallowest) (NT DOE 1994b:2-13). Other aquifers are present to a limited extent under the area, but their water bearing potential has not been thoroughly investigated. Limited aquifers may occur in other volcanic units, including lava flows and bedded tuffs.

The Lower Carbonate is the regional aquifer and comprises carbonate rocks of Middle Cambrian through Devonian age. The saturated thickness ranges from 100 to over 1,000 m (328 to over 3,280 ft). This aquifer drains in a south-southwest direction, under Yucca and Frenchman Flat, toward Ash Meadows (NT USGS 1975a:C1). The Volcanic and Valley-Fill aquifers range in thickness from zero to about 610 m (2,000 ft) and are confined to their respective drainage basin (such as Frenchman and Yucca Flats) (NT DOE 1992d).

Depth to groundwater at NTS ranges from 160 m (515 ft) beneath Frenchman Flat to over 700 m (2,300 ft) at Pahute Mesa. There are, however, areas of perched water that lie at considerably shallower depths.

Estimates of the perennial yield of the NTS aquifers (i.e., the total amount that can be removed on an annual basis without depleting the groundwater reservoir) include 57,000 MLY (15,058 MGY) (NT USGS 1988a) and 38,000 MLY (10,039 MGY) (NT DOE 1992b:41-43). Groundwater recharge occurs from infiltration of precipitation in the northern and eastern mountain ranges and from underflow from upgradient areas. Natural discharge from the aquifers primarily occurs from evaporation and transpiration in the Amargosa Valley (including Ash Meadows) and Death Valley areas (figure 4.9.2.4–1).

Groundwater pumping at Ash Meadows was curtailed by order of the U.S. Supreme Court to protect the endangered pupfish *Cyprinodon* by maintaining water levels at Devils Hole. Devils Hole is a water-filled cavern near Ash Meadows, approximately 48 km (29.8 mi) southwest of NTS (latitude 36°25'40", longitude 116°18'13"). Studies show that historical pumping on NTS at rates that exceed current rates was probably unrelated to observed declines at Devils Hole (NT LVVWD 1994a). Springs at Ash Meadows nearby contain a large concentration of rare, endangered, and threatened indigenous species which depend upon adequate spring

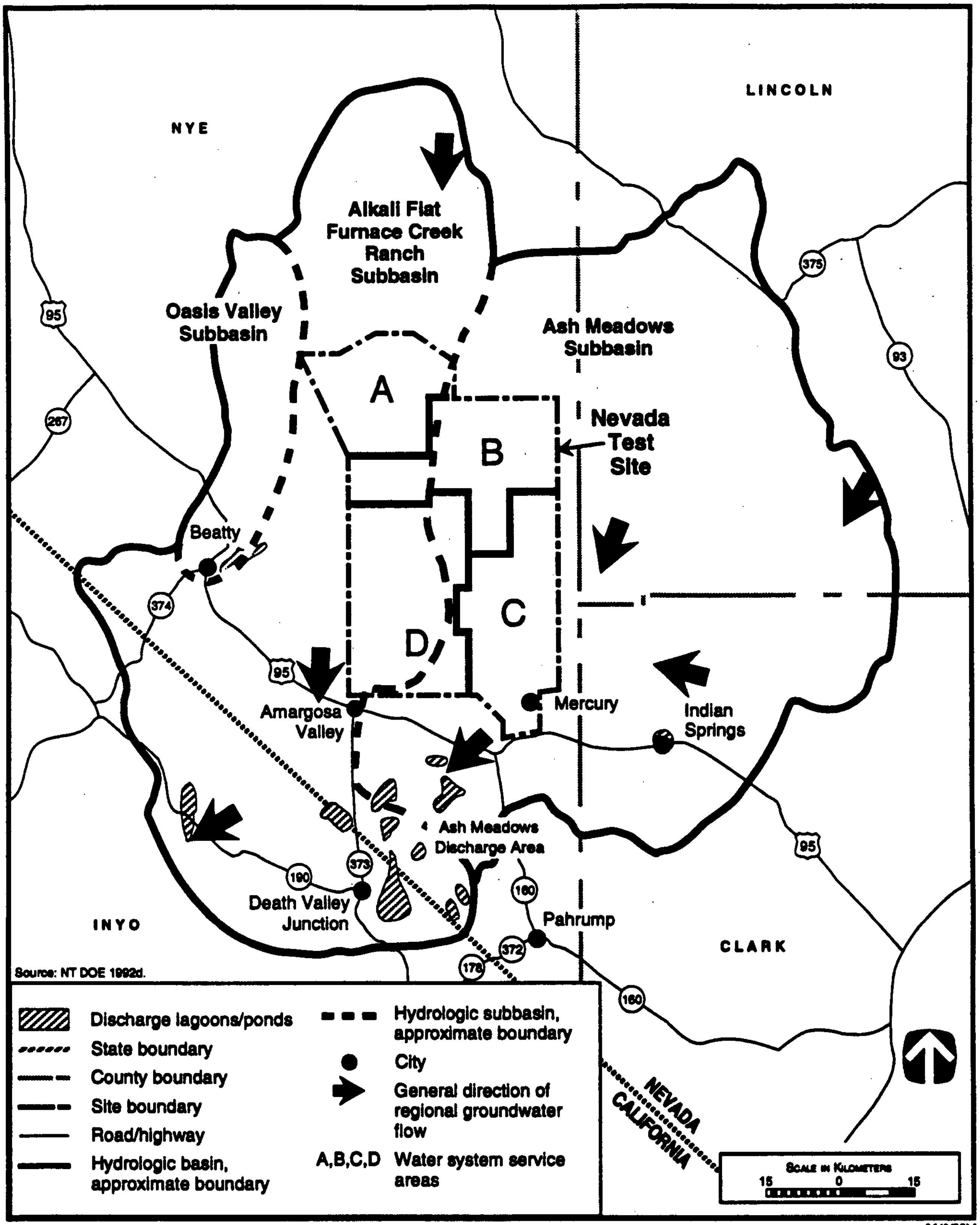


FIGURE 4.9.2.4–1.—*Groundwater Hydrologic Units at Nevada Test Site and Vicinity.*

flow for their survival. Substantially increased pumping at NTS is unlikely to lower spring levels but might reduce spring discharge rates (NTS 1995a:1).

Groundwater Quality. Currently, aquifers beneath NTS have not been classified by EPA. However, during an independent study (NT DOE 1989a:ii-v) the aquifers beneath NTS were classified as Class IIa and Class IIb (groundwater currently used for drinking water). In 1972, the Nevada Operations Office instituted a long-term hydrological monitoring program to be operated by EPA under an Interagency Agreement. Groundwater is monitored at and in the vicinity of NTS to detect any radioactivity that may be related to previous nuclear testing activities. Only wells drilled previously for water supply or exploratory purposes are being used in the existing monitoring program. In compliance with the SDWA and a State of Nevada Drinking Water Supply System Permit, drinking water wells and industrial use distribution systems are sampled and analyzed on a monthly basis. Groundwater samples collected are analyzed for a standard suite of parameters and constituents, including radioactive materials, nonradioactive materials, and other field parameters (pH and total dissolved solids).

Groundwater at portions of NTS has been affected by nuclear testing activities conducted during the last 43 years. Approximately 20 percent of the total underground nuclear tests have been conducted below the water table or have been close enough that effects have extended below it. Table 4.9.2.4–1 shows the 1993 groundwater quality in the vicinity of the proposed project site. In general, tritium is the only radionuclide that appears at significant levels in sampled groundwater. Samples collected in 1993 show tritium concentrations ranging from 120 pCi/L

TABLE 4.9.2.4–1.—*Groundwater Quality Monitoring at Nevada Test Site, 1993*

Parameter	Unit of Measure	Water Quality Criteria and Standards[a]	Potable Water Distribution System High	Potable Water Distribution System Low
Radiological				
Alpha (gross)	pCi/L	15[b]	11	0.62
Beta (gross)	pCi/L	50[c]	13	3.2
Tritium	pCi/L	80,000[d]	120	0.93
Nonradiological				
Alkalinity	mg/L	NA	270	64
Arsenic	mg/L	0.05[b]	0.012	<0.003
Barium	mg/L	2.0[b]	0.15	0.00
Chromium	mg/L	0.1[b]	<0.005[e]	<0.005[e]
Lead	mg/L	0.015[b]	<0.005[e]	<0.005[e]
Nitrate	mg/L	10[b]	6.8	1.2
pH	pH units	6.5-8.5[f]	8.66	7.70
Sodium	mg/L	NA	103	30
Total dissolved solids	mg/L	500[f]	639	283

[a] For comparison only.
[b] National Primary DrinkingWater Regulations (40 CFR 141).
[c] Proposed National Primary Drinking Water Regulations; Radionuclides (56 FR 33050).
[d] DOE's Derived Concentration Guides for water (DOE Order 5400.5). Values are based on a committed effective dose equivalent of 100 mrem per year; however, because the drinking water maximum contaminant level is based on 4 mrem per year, the number listed is 4 percent of the Derived Concentration Guides.
[e] Below laboratory detection limit.
[f] National Secondary Drinking Water Regulations (40 CFR 143).
Note: NA - not applicable.
Source: NT DOE 1994b.

in a nonpotable supply well located in the northwestern part of NTS to 0.93 pCi/L in a potable supply well located in the southeastern part of NTS. It is speculated that the Lower and Upper Carbonate aquifers would most likely be the aquifers in which tritium might migrate to offsite areas.

Groundwater Availability, Use, and Rights. Groundwater is the only local source of industrial and drinking water supplies in the NTS area. Numerous production wells are located on NTS and distributed among various areas of the site. Figure 4.9.2.4–1 shows how the NTS water system has been divided into four water service areas (A, B, C, and D) based on the location of the water supply system and support facilities. Water usage on NTS is largely for potable, construction, and dust control purposes. Water supply wells at NTS draw water from the Lower and Upper Carbonate, the Volcanic, and the Valley Fill aquifers. The total water usage in 1994 was 2,400 MLY (634 MGY), of which 1,300 MLY (343 MGY) were withdrawn from the Ash Meadows Subbasin, and 1,100 MLY (290 MGY) were withdrawn from the Alkali Flat Furnace Creek Ranch Subbasin (figure 4.9.2.4–1). The pumping capacity for all the water supply wells at NTS is estimated at 14,800 MLY (3,910 MGY).

The State of Nevada strictly controls all surface and groundwater withdrawals. The Appropriation Doctrine governs the acquisition and use of water rights. NTS has been withdrawn from public use and thus possesses an unquantified water right sufficient to meet the purposes of NTS land withdrawal, subject to water rights that existed at the time land for NTS was withdrawn.

<u>North Las Vegas Facility</u>

NLVF is located in the Las Vegas Valley, which is a desert between sharp, rugged mountain ranges on a gently sloping alluvial fan piedmont. At the lowest point of the alluvial fan is the Las Vegas Wash, which drains an area of 2,280 km^2 (880 mi^2) toward Lake Mead. Stormwater from NLVF is discharged into local flood control systems (appendix I).

The water supply for NLVF is provided by the city of North Las Vegas. Current water usage by NLVF is about 69 MLY (18.2 MGY) (appendix I). Industrial wastewater and sanitary sewage from NLVF are discharged into the city of North Las Vegas sewer system, which is connected to the city of Las Vegas treatment plant. The treated wastewater is discharged into Lake Mead under an NPDES permit issued by the Nevada Division of Environmental Protection (appendix I). NLVF discharges an average of 55 MLY (14.5 MGY) of wastewater. Wastewater quality has historically met the permit requirement established by the city to protect the treatment processes and ultimately the water quality of Lake Mead (appendix I).

4.9.2.5 *Geology and Soils*

Geology. NTS is located in the southern part of the Great Basin section of the Basin and Range Province in an intermediate position between the high, topographically closed basins in central Nevada and the low, connected basins of the Amargosa Desert-Death Valley region to the southwest. NTS consists of three flats (Yucca, Jackass, and Frenchman) surrounded by mountains (NT DOE 1988a:3-116). The general geology of the test site comprises three major rock units: complexly folded and faulted sedimentary rocks of Paleozoic age overlain at many places by volcanic tuffs and lavas of Tertiary age, which in the valleys are covered by an alluvium of late Tertiary and Quaternary age that was derived from erosion of the nearby hills of Tertiary and Paleozoic rocks (NT ERDA 1977a:2-40).

The general region has been tectonically active in the near past and has numerous faults (figure 4.9.2.5–1). NTS lies in an area of moderate historic seismicity on the southern margin of the Southern Nevada East-West Seismic Belt in seismic Zones 2 and 3 (figure A.1–1). Since about 1848, more than 4,000 earthquakes have been recorded within a 241-km (150-mi) radius of NTS. Most of these earthquakes were minor events with Richter magnitudes of less than 5.5. The largest event on record, which took place 161 km (100 mi) west in Owens Valley, CA, had an estimated magnitude of 8.3. In 1992, an earthquake of 5.6 magnitude occurred in the southwest corner of the site under Little Skull Mountain. The maximum acceleration from this earthquake was approximately 0.21 G (G is the acceleration due to gravity) at Amargosa Valley (DOE 1995i:4-117).

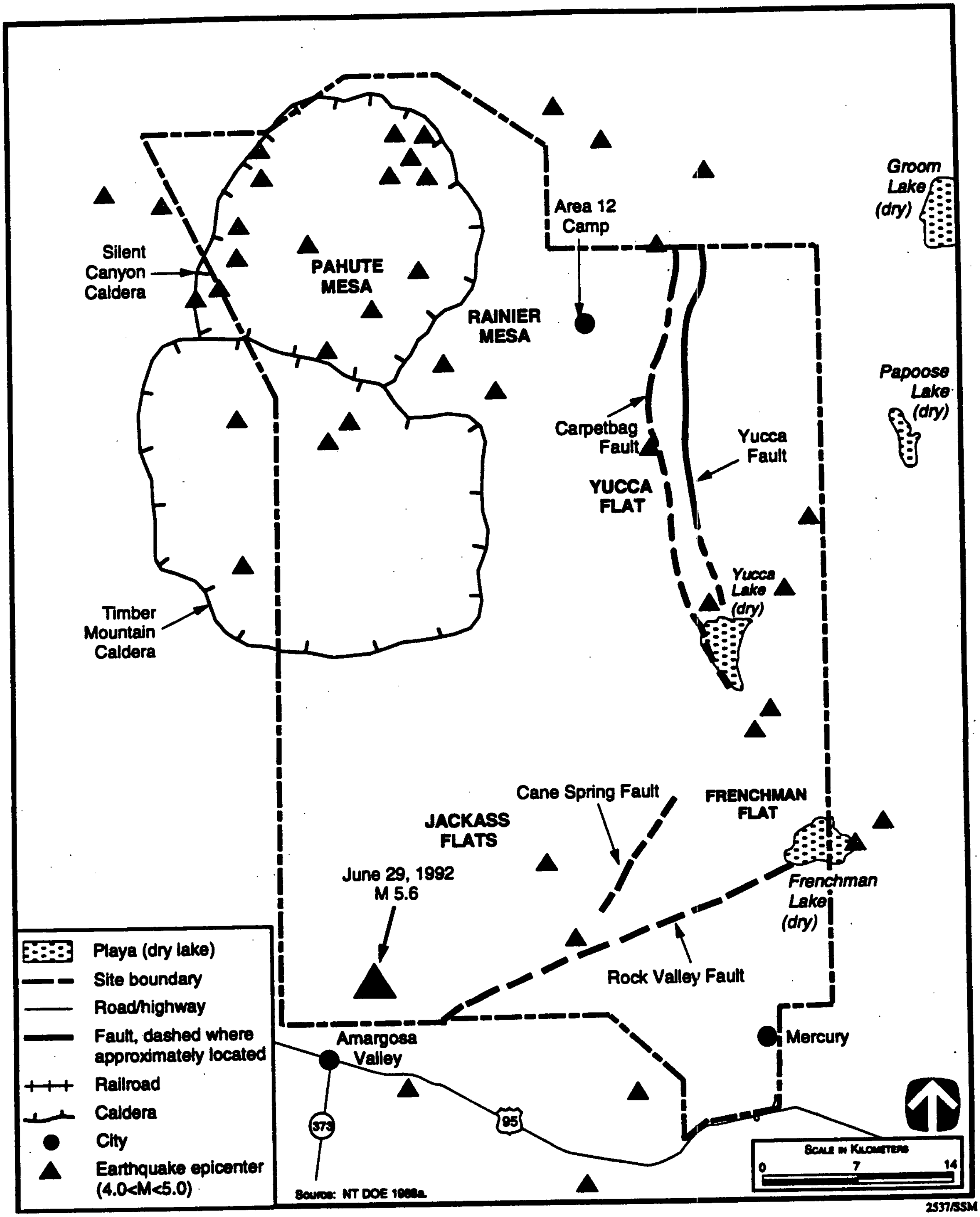


FIGURE 4.9.2.5–1.—*Major Fault Systems and Historic Earthquakes in Nevada Test Site Region.*

The Yucca and Carpetbag faults were active during the late Quaternary. The Yucca fault has undergone surface rupture within the past few thousand to tens of thousands of years. Some earthquakes can be directly associated with the fault trace and the area beyond the southern end of the mapped section in the Yucca Pass, suggesting that the fault may continue in that direction. No significant vertical surface displacement has occurred on the Carpetbag fault system during the past 150,000 years, but there is evidence of episodes of fracturing and possible minor faulting from 30,000 to 240,000 years ago, with average recurrence intervals at about 25,000 years for the last 125,000 years (NT DOE 1988e:30-31). The Carpetbag fault has been mapped in the subsurface beyond the southern end of Yucca Basin and may project to the northeast of the proposed project area. Possible magnitude, intensity, and acceleration of earthquakes along the Yucca and Carpetbag faults have not been estimated (DOE 1995i:4-117).

The Cane Spring fault, which lies approximately 8 km (5 mi) south of the proposed project area, does not show Holocene displacement but is thought to have been the source of a magnitude 4.3 earthquake in 1971. The maximum credible earthquake associated with the Cane Spring fault is expected to produce a peak acceleration of 0.67 G with a 6.7 magnitude (DOE 1995i:4-117). The recurrence interval is estimated at 10,000 to 30,000 years.

The most recent volcanic activity in the immediate area was 3.7 million years ago, and the likelihood for renewed activity in the next 10,000 years is slight (DOE 1995i:4-117). NTS lies approximately 241 km (150 mi) southeast of the Long Valley area of California, an area with potential volcanic eruption of the Mount St. Helens type.

Soils. Limited soil studies have been performed at NTS. Soil studies (borings) were done for the Device Assembly Facility. Studies in adjacent areas have divided soils into three major types: shallow soils developed in the uplands and mountains; soils on valley fill and nearly level to moderately sloping outwash plains, alluvial fans, and fan aprons; and playas and soils on nearly level flats and basins. Possible erosion hazards range from slight to severe, while the shrink-swell potential ranges from low to high for these soils. The potential for wind erosion and shrink-swell increases into the playas and basins. The potential for water erosion increases with increasing slope. The soils at NTS are considered acceptable for standard construction techniques. There is no prime farmland at NTS.

North Las Vegas Facility

NLVF is located within the Las Vegas Valley. Rugged mountain ranges surround the low lying alluvial filled valley. The valley consists primarily of fine grained Miocene and Pliocene sedimentary rocks. NLVF is located within seismic Zone 2 (figure A.1–1). The soils on NLVF range from stiff to very stiff silty and sandy clay and clay with interbedded medium-dense to dense clayey and silty sand. The soils at NLVF are considered acceptable for standard construction techniques.

4.9.2.6 *Biotic Resources*

The following section describes biotic resources at NTS and NLVF including terrestrial resources, wetlands, aquatic resources, and threatened and endangered species. Also presented in appendix C is a list of the threatened and endangered species that may be found onsite or in the vicinity of NTS.

Terrestrial Resources. NTS lies in a transition area between the Mojave and Great Basin deserts. As a result, flora and fauna characteristic of both deserts are found within the site boundaries (NT ERDA 1976a:34). Approximately 33 km^2 (12.7 mi^2) of NTS have been developed, which represent less than 1 percent of the site; thus, natural plant communities are found across most of NTS (NT DOE 1988d:3,4,6,7). The site has been divided into nine major communities as shown in figure 4.9.2.6–1. Of the communities present onsite, the mountains, hills and mesas, sagebrush, creosote bush, and hopsage-desert thorn communities are the most extensive. Saltbush and desert thorn communities occupy more limited areas adjacent to the playas in Frenchman and Yucca Flats. Introduced plants such as red brome (*Bromus rubens*), cheatgrass (*Bromus tectorum*), and Russian thistle (*Salsola kali*) have become important species in some areas. These plants rapidly invade disturbed areas and delay revegetation of areas by native species (NT ERDA 1976a:40; NT Hunter 1991a:1). A total of 711 taxa of vascular plants has been identified on or near NTS (NT ERDA 1976a:34).

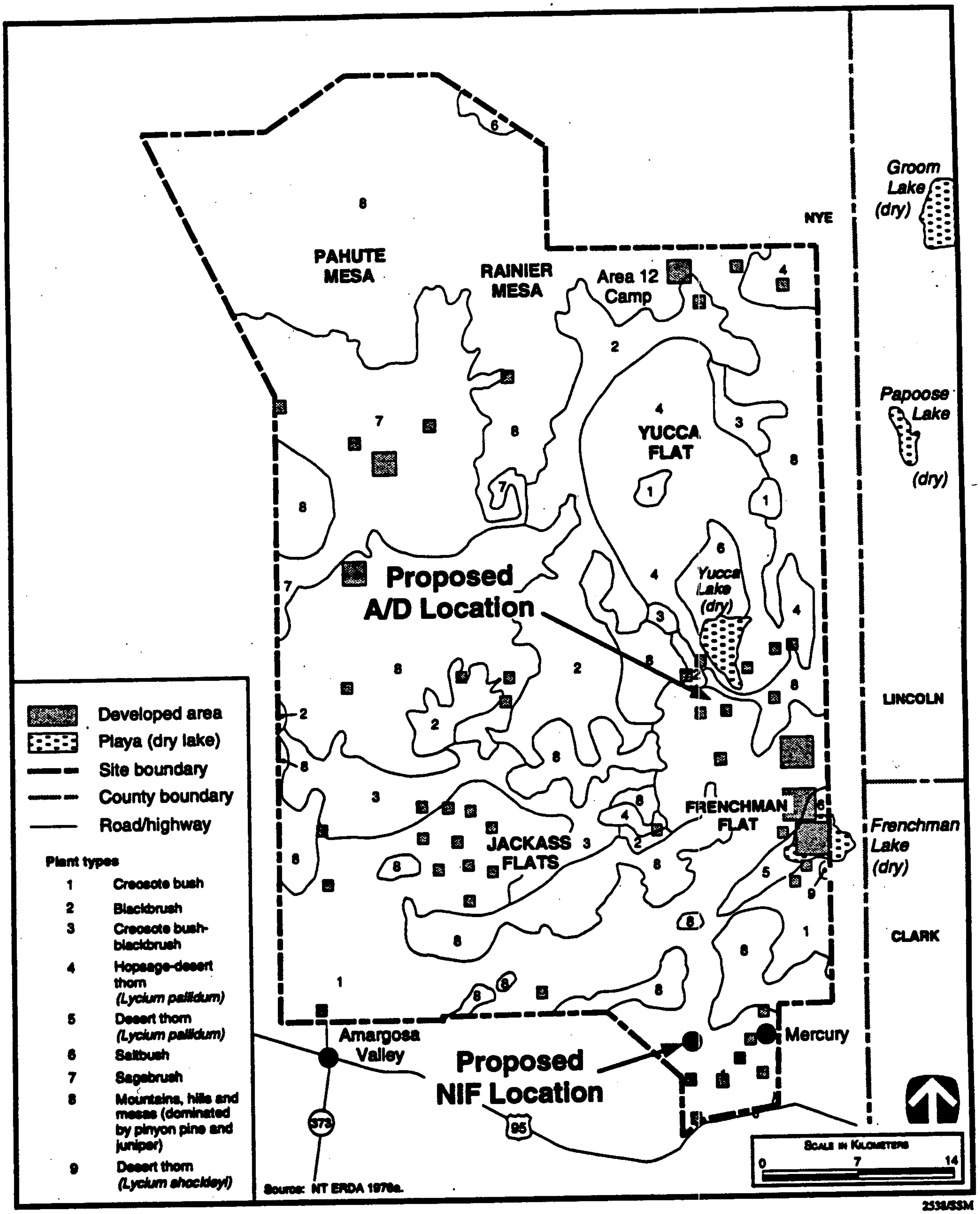


Figure 4.9.2.6–1.—*Distribution of Plant Communities at Nevada Test Site.*

Terrestrial wildlife found on NTS includes 33 species of reptiles, 222 species of birds, and 49 species of mammals (NT Greger 1992a; NTS 1990a:1; NTS 1990a:2). Species common to NTS include the side-blotched lizard (*Uta stansburiana*), western shovel-nosed snake (*Chionactis occipitalis*), blackthroated sparrow (*Amphispiza bilineata*), red-tailed hawk (*Buteo jamaicensis*), Merriam's kangaroo rat (*Dipodomys merriami*), and Great Basin pocket mouse (*Perognathus parvus*). Water holes, both natural and manmade, are important to many species of wildlife, including game animals such as pronghorn (*Antilocapra americana*) and mule deer (*Odocoileus hemionus*) (NT Greger nda). Hunting is not permitted anywhere on NTS. Raptors and carnivores are two ecologically important groups on NTS and are represented by species such as the turkey vulture (*Cathartes aura*) and rough-legged hawk (*Buteo lagopus*), and long-tailed weasel (*Mustela frenata*) and bobcat (*Lynx rufus*), respectively. A variety of migratory birds has been found at NTS. Migratory birds and their nests and eggs are protected by the *Migratory Bird Treaty Act*. Eagles are similarly protected by the *Bald and Golden Eagle Protection Act*.

The proposed NIF site would be located in an area of creosote bush habitat to the west of the Mercury Base Camp (figure 4.9.2.6–1). Wildlife present in the site area would include that associated with the Mojave desert and could include Merriam's kangaroo rat, Le Conte's thrasher (*Toxostoma lecontei*), and desert iguana (*Dipsosaurus dorsalis*).

Wetlands. National Wetland Inventory maps of NTS have not been prepared nor have wetlands been delineated on the site. However, small riparian areas (less than 0.4 ha [1.0 acres]) may be associated with site springs. There are no wetlands on or near the proposed NIF site (appendix I).

Aquatic Resources. Potential aquatic habitat on NTS includes surface drainages, playas, springs, and manmade reservoirs. There are no continuously flowing streams on the site, and permanent surface water sources are limited to a few small springs. These surface drainages, playas, and springs are unable to support permanent fish populations (DOE 1995w:2.4-61). Manmade construction water reservoirs located throughout the site support three introduced species of fish: bluegill (*Lepomis macrochirus*), goldfish (*Carassius auratus*), and golden shiners (*Notemigonus crysoleucas*) (NTS 1992a:6). There are no aquatic resources on or near the proposed NIF site (appendix I).

Threatened and Endangered Species. Nine Federal- and state-listed threatened, endangered, and other special status species may be found in the vicinity of NTS (appendix table C–7). Eight of these species have been observed on NTS, seven of which are listed as either Federal- or state-threatened or endangered species. No critical habitat for threatened or endangered species, as defined in the *Endangered Species Act* (50 CFR 17.11; 50 CFR 17.12), exists on NTS.

The Federal-listed bald eagle (*Haliaeetus leucocephalus*) and peregrine falcon (*Falco peregrinus*) have been recorded as rare migrants on NTS, but the desert tortoise (*Gopherus agassizii*) is the only resident Federal-listed species known to inhabit NTS. The range of the desert tortoise lies in the southern third of NTS. Tortoises on NTS are most commonly found in the areas shown in figure 4.9.2.6–2. Further surveys may reveal other areas of concentration. The abundance of tortoises on NTS is considered low to very low relative to other areas within this species' geographic range. Densities of tortoises on NTS range from 0 to 17 individuals per square km (0 to 45 individuals per square mile), with most habitats probably having densities of 0 to 8 individuals per square km (0 to 20 individuals per square mile) (NT DOE 1991b:3-23).

The only known population of the Devils Hole pupfish (*Cyprinodon diabolis*) lives in a single, spring-fed sinkhole pool in Ash Meadows, approximately 48 km (29.8 mi) southwest of the proposed project area. There is concern over the survival of the pupfish and other sensitive species found in the Ash Meadows area due to the threat of declining water levels (NT DOI 1991a:1,4-6). Several additional state-listed species have been recorded on NTS. These species include the spotted bat (*Euderma maculatum*), Beatley milkvetch (*Astragalus beatleyae*), and Mojave fishhook cactus (*Sclerocactus polyancistrus*). The Federal-candidate mountain plover has also been observed on NTS (appendix table C–7).

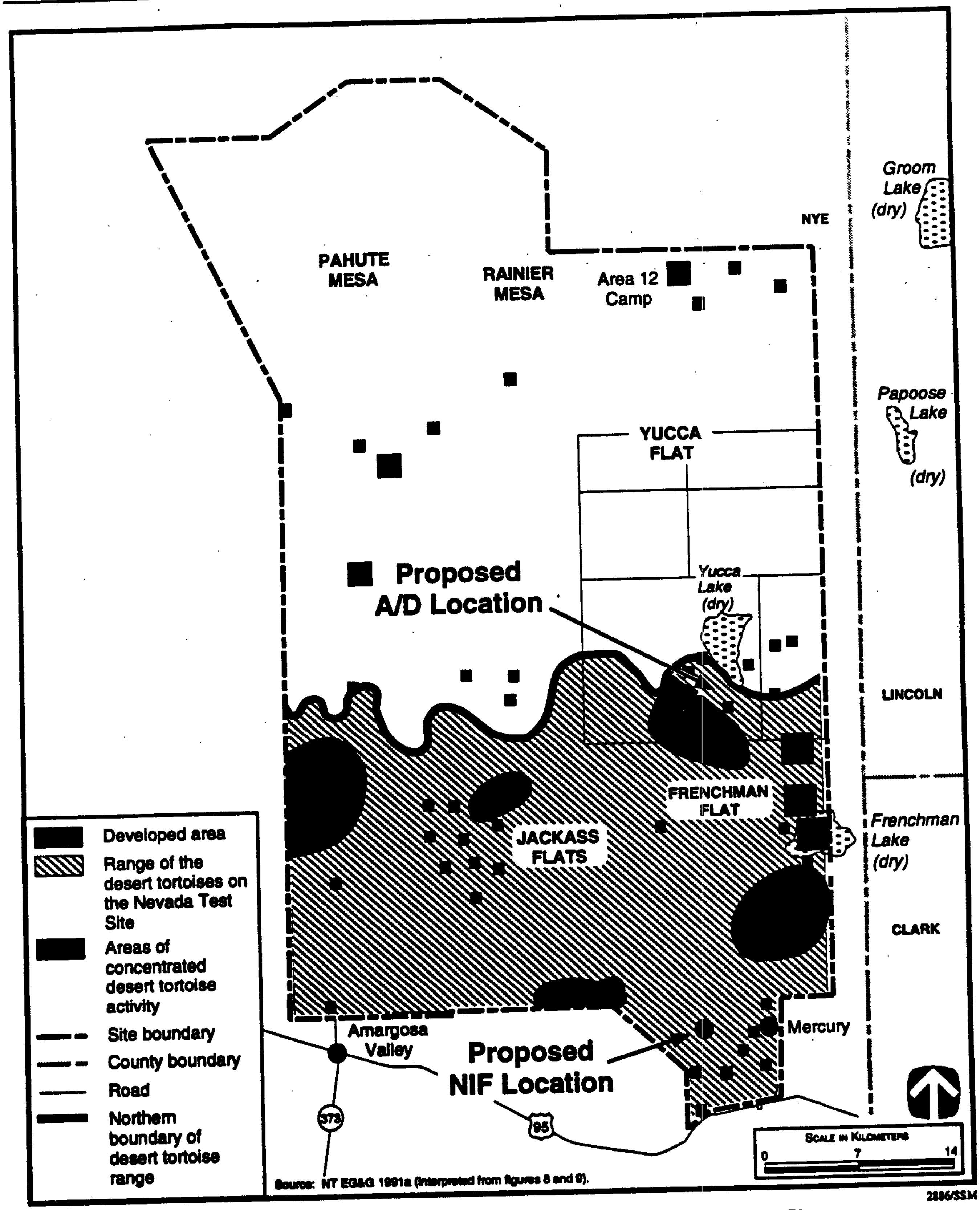


Figure 4.9.2.6–2.—*Distribution of Desert Tortoise at Nevada Test Site.*

The proposed NIF location contains habitat suitable for several special status species. The desert tortoise is the only Federal-listed species known to inhabit the area. A site-specific survey may be required to verify the existence of special status species.

North Las Vegas Facility

Terrestrial Resources. NLVF is in the Southern Basin and Range Ecoregion (see appendix I). NLVF was built on cleared, previously disturbed land that is now mostly covered by buildings, pavement, or landscaping. Exceptions include about 4.5 ha (11 acres) of undeveloped land at the western end of the facility (designated area for proposed new construction associated with NIF), the open area west of the Building C-3, and the stormwater detention basin south of the Building C-1. No original undisturbed native vegetation remains on the site (see appendix I).

Because NLVF is located in an urbanized area and contains little vegetation, few wildlife species exist. The only species that exist are those adapted to urban habitats which may include small mammals such as house mouse (*Mus musculus*) and Norway rat (*Rattus norvegicus*); and ubiquitous bird species such as American robin (*Turdus migratorius*), European starling (*Sturnus vulgaris*), house finch (*Carpodacus mexicanus*), house sparrow (*Passer domesticus*), and rock dove (*Columba livia*) (see appendix I).

Threatened and Endangered Species. Because NLVF is located within urban Las Vegas, and on previously disturbed land within a fenced site, it is not expected that any threatened, endangered, or rare species exist. No designated critical habitats for Federal-listed species exist at NLVF. The facility is within the range of the Federal-listed desert tortoise; however, urbanized areas of Clark County are not considered tortoise habitat. No desert tortoises were found during an offsite survey of undeveloped land located near the western boundary of NLVF (see appendix I).

4.9.2.7 *Cultural and Paleontological Resources*

Prehistoric Resources. Approximately 6 percent of NTS has been inventoried for cultural resources including all lands managed through a Memorandum of Agreement with Nellis Air Force Base. Excluding sites in the Yucca Mountain project area, over 1,600 prehistoric sites have been recorded at NTS. Prehistoric site types identified on NTS include habitation sites with wood and brush structures, windbreaks, rock rings, and cleared areas; rockshelters; petroglyphs (rock art); hunting blinds; rock alignments; quarries; temporary camps; milling stations; roasting ovens or pits; water caches; and limited activity locations. Milling stations are especially prevalent near the Yucca Lake playa margins. Several prehistoric rockshelters have been identified on Hogback Ridge.

At Frenchman Flat, in which the proposed A/D site would be located, 99 archaeological sites have been identified to date, including 2 historic sites and 2 sites related to nuclear testing (NT DOE 1996c:4-190). Forty-nine of these sites have been determined to be NRHP eligible, and a historic district composed of structures related to the development of nuclear weapons has also been proposed. Cultural resources surveys were conducted around the A/D site in 1984. No significant archaeological sites were found.

The proposed NIF would be located in Area 22. Only three prehistoric sites have been identified in Area 22, or Mercury Valley, and none are NRHP eligible. An archaeological survey was conducted at the proposed location and several scatters of debris were identified on the surface. These are not considered eligible for the NRHP.

Historic Resources. Historic site types on NTS include mines and prospects, trash dumps, settlements, campsites, ranches, homesteads, developed spring heads, trails, and roads. Nuclear test site structures and associated debris, including instrumentation stands and temporary storage bunkers, are also located within NTS. The test site area at Frenchman Flat, which includes the remains of many of these structures, has been recommended to the SHPO as a Historic District. Excluding the Yucca Mountain project area, 63 historic sites, including 7 associated with nuclear testing, have been recorded. One historic site was identified in Mercury Valley, but is not NRHP eligible. The only site currently listed on the NRHP is Sedan Crater. The Crater, located in Yucca Flat, was created in 1962 as part of the Plowshare Program, whose aim was to identify peaceful uses for nuclear explosions. The Emigrant Trail used by the "49ers" that traverses the southwestern corner of NTS is considered NRHP eligible.

Additional historic sites may occur on unsurveyed portions of NTS.

Native American Resources. At the time of European American contact, southern Nevada was inhabited by the Western Shoshone, the Southern Paiute, and the Owens Valley Paiute. Families lived in small groups from the spring through the fall. During winter, relatively stable villages of several families were established in relatively warm places, close to reserves of pine nuts, seeds, and dried meats.

Native American resources include burials, ceremonial sites, musical stones, medicine rocks, petroglyphs, and traditional use areas. Local plants important in traditional and religious activities include jimsonweed, juniper, greasewood, creosote, Indian tobacco, piñon pine, buckbush, and scrub oak. Concern has been expressed about the availability and accessibility of such resources. It is worth noting that many natural resources at NTS are viewed as cultural resources by Native Americans. As an example, sagebrush is used as a tool and for clothing and medicinal purposes. Both Mercury Valley and Frenchman Flat contain a wide variety of plants and animals significant to Native Americans.

Consultation with Native American cultural and religious leaders has been conducted for other projects at or near NTS to identify traditional cultural resources that may be affected by Federal actions, and to obtain Native American recommendations for mitigating potential adverse impacts on traditional cultural resources. DOE has established ongoing consultation with 17 Native American tribal organizations with cultural ties to NTS. According to these groups, no Native American resources have been identified in the proposed NIF location.

Paleontological Resources. The surface geology of NTS is characterized by alluvium-filled valleys surrounded by ranges composed of Paleozoic sedimentary rocks and Tertiary volcanic tuffs and lavas. The Pre-Cambrian and Paleozoic rocks at NTS represent relict deposits made in shallow water at the submerged edge of a continental platform which ran from Mexico to Alaska and existed throughout most of the Paleozoic. Although the Pre-Cambrian sedimentary deposits contain no fossils or only a few poorly preserved fossils, the Paleozoic marine limestones are moderately to abundantly fossiliferous. Marine fossils found in the same Paleozoic formations on Nellis Air Force Range, adjacent to NTS to the north, include trilobites, conodonts, ostracods, solitary and colonial corals, brachiopods, algae, gastropods, and archaic fish. These fossils, however, are relatively common and have low research potential.

Tertiary volcanic deposits are not expected to contain fossils; however the Late Pleistocene terrestrial vertebrate fossils of the Rancholabrean Land Mammal Age could be expected in the Quaternary deposits. The possibility of finding mammoth, horse, camel, and bison remains might be expected because such fossils have been found at Tule Springs, 56 km (34.8 mi) from the southern edge of NTS and in Nye Canyon. Fossils found at Tule Springs include bison, deer, a small donkey-like horse, camel, Columbia mammoth, ground sloth, giant jaguar, bobcat, coyote, muskrat, and a variety of rabbits, rodents, and birds. This paleontological assemblage has high research potential. Although Quaternary deposits with paleontological materials may occur on NTS, no known fossil localities have been recorded to date.

Other Pleistocene resources include pack rat middens, which are studied by scientists at the University of Nevada, Reno, the Desert Research Institute, and New Mexico Tech, to investigate paleoclimatic regimes. No paleontological resources are expected to exist within the area proposed for the NIF, as the geology in that area does not contain fossiliferous deposits.

North Las Vegas Facility

Although a historic site (Kyle Ranch) is located less than 1.6 km (1 mi) southwest of the proposed NIF location, no archaeological remains (prehistoric or historic) are likely to be present because of the heavy past disturbance of the surface and near-surface sediment (NT DOE 1996c:4-746). Lower lying deposits that are relatively undisturbed are too ancient to contain archaeological remains. No historic structures exist in the proposed NIF location. No Native American cultural resources have been identified at NLVF in the course of past consultation with potentially affected tribal organizations.

4.9.2.8 *Socioeconomics*

Socioeconomic characteristics addressed at NTS and NLVF include employment and regional economy, population, housing, and public finance. Statistics for employment and regional economy are presented for the regional economic area that encompasses 11 counties around NTS and NLVF in Arizona, Nevada, and Utah. Statistics for population, housing, and public finance are presented for the ROI, a two-county area in which 97 percent of all NTS employees reside: Clark County (82 percent) and Nye County (15 percent). The residential distribution of NLVF employees follows a similar pattern, with the vast majority of employees residing in these two counties. As a result, both DOE facilities occupy the same ROI and regional economic area. Figure 4.9.2.8–1 presents a map of the counties and selected cities that comprise the NTS and NLVF regional economic area and ROI. Supporting data are presented in appendix D.

Regional Economy Characteristics. Selected employment and economic statistics for the NTS and NLVF regional economic area are summarized in figure 4.9.2.8–2. The civilian labor force grew 64 percent between 1980 and 1990, an annual average of 6.4 percent. Total employment in the region was 587,533 in 1994. During 1994, unemployment in the regional economic area was 6.1 percent, comparable to state unemployment in Arizona (6.4 percent) and Nevada (6.2 percent), but higher than in Utah (3.7 percent). The 1993 regional economic area per capita income of $20,561 was almost 9 percent lower than Nevada's per capita income of $22,727, but significantly higher than the per capita income in Arizona ($18,085) and Utah ($16,354).

As shown in figure 4.9.2.8–2, the NTS regional economic area and Nevada have similar employment patterns. In both the region and the state, the service sector accounts for over 40 percent of the total employment. In Utah and Arizona, services account for about a third of employment, with manufacturing providing a greater source of employment in these states than in Nevada.

Population and Housing. The ROI population, which totalled 865,144 in 1992, increased by about 83 percent (6.9 percent annually) from the 1980 level, a rate of increase that exceeded the state annual population growth rate of about 5 percent during the same period. Some cities within the ROI grew at even faster rates; the city of Henderson, for example, increased at an average annual rate of over 20 percent between 1980 and 1992.

Increases in housing units averaged approximately 7 percent annually in the ROI between 1980 and 1990, greater than the approximately 3-percent annual increase for Nevada. The homeowner vacancy rate in the ROI averaged 3 percent in 1990, while the vacancy rate for rental units averaged 10 percent. Both rates were comparable to Nevada's vacancy rates. Population and housing statistics for the ROI are summarized in figure 4.9.2.8–3.

Public Finance. Financial characteristics of the local jurisdictions in the NTS ROI that are most likely to be affected by the proposed action are presented in this section. The data reflect total revenues and expenditures of each jurisdiction's general fund, special revenue funds, and, as applicable, debt service, capital project, and expendable trust funds. School district boundaries may or may not coincide with county or city boundaries, but the districts are presented under the county where they primarily provide services. Major revenue and expenditure fund categories for counties, cities, and school districts are presented in appendix tables D.2.3–14 and D.2.3–15. Figure 4.9.2.8–4 summarizes 1994 local government revenues and expenditures. Fund balances, which are dollars carried over from previous years, are not included in figure 4.9.2.8–4. All jurisdictions assessed had positive fund balances.

4.9.2.9 *Radiation and Hazardous Chemical Environment*

The following section provides a description of the radiation and hazardous chemical environments at NTS and NLVF. Also included are discussions of health effects studies, emergency preparedness considerations, and an accident history.

Radiation Environment. Major sources of background radiation exposure to individuals in the vicinity of NTS are shown in table 4.9.2.9–1. All annual doses to individuals from background radiation are expected to remain constant over time.

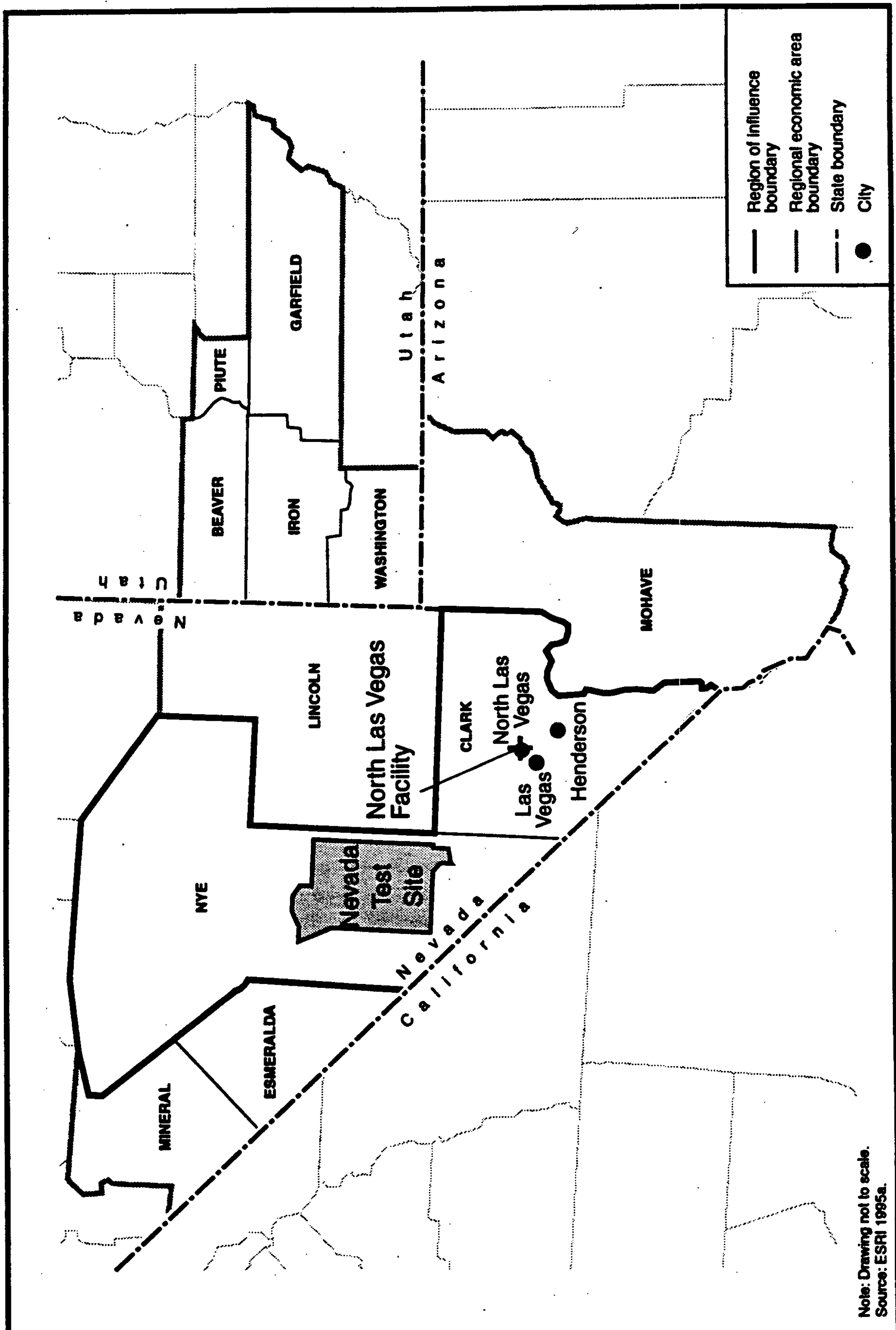
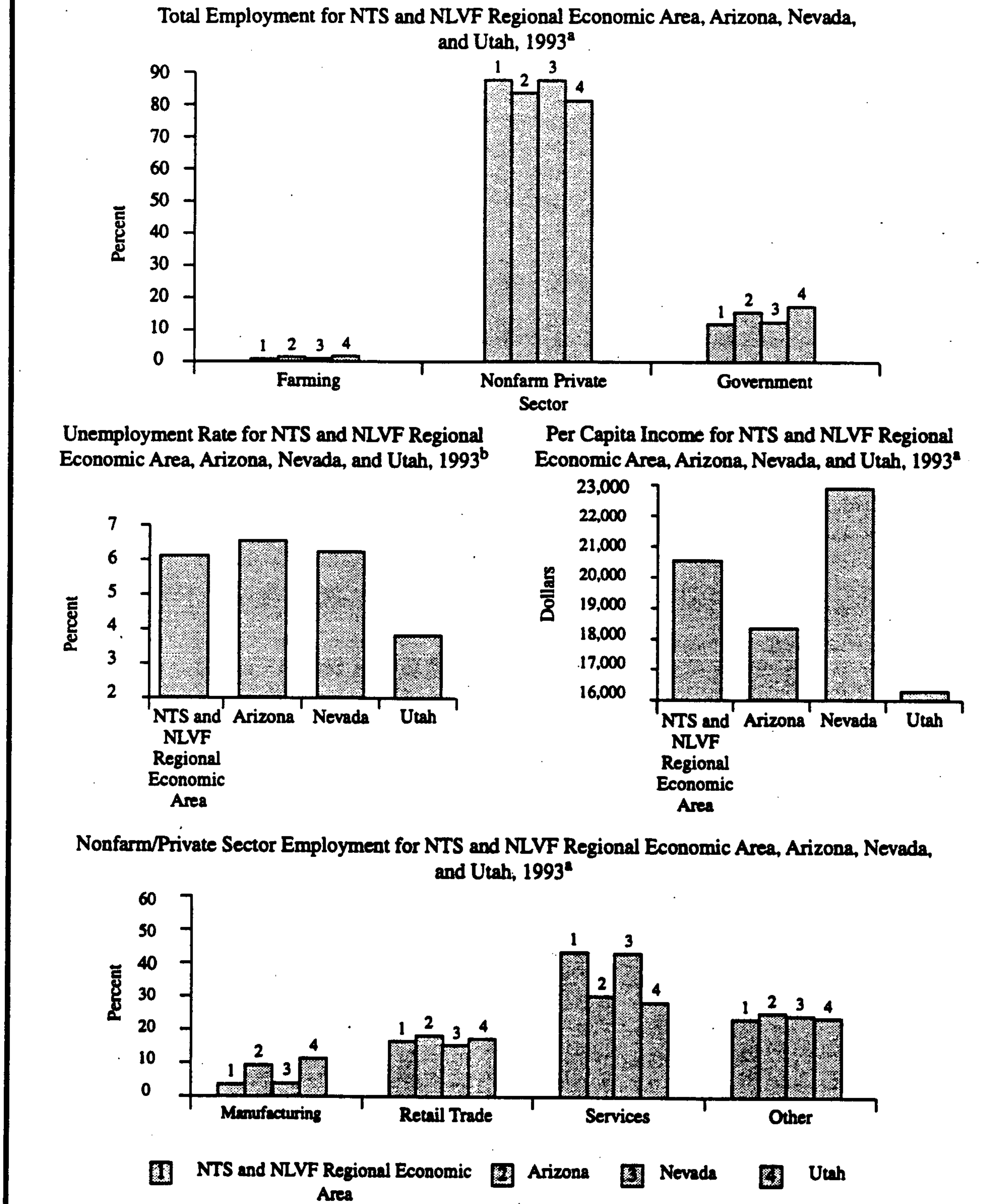


FIGURE 4.9.2.8–1.—*Regional Economic Area and Region of Influence for Nevada Test Site and North Las Vegas Facility.*



[a]DOC 1995a.
[b]DOL 1995a.

FIGURE 4.9.2.8–2.—*Economy for Nevada Test Site and North Las Vegas Facility Regional Economic Area, Arizona, Nevada, and Utah.*

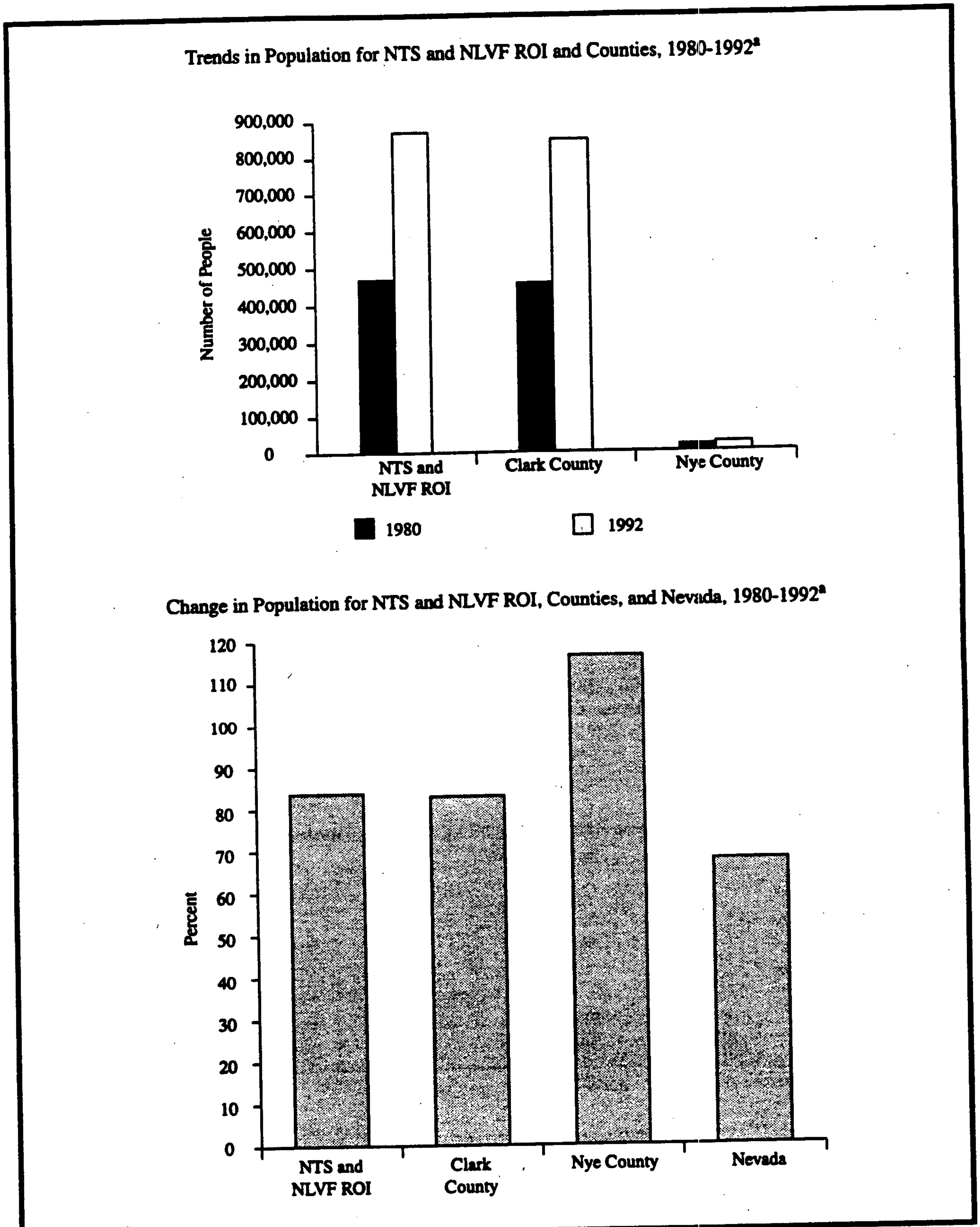
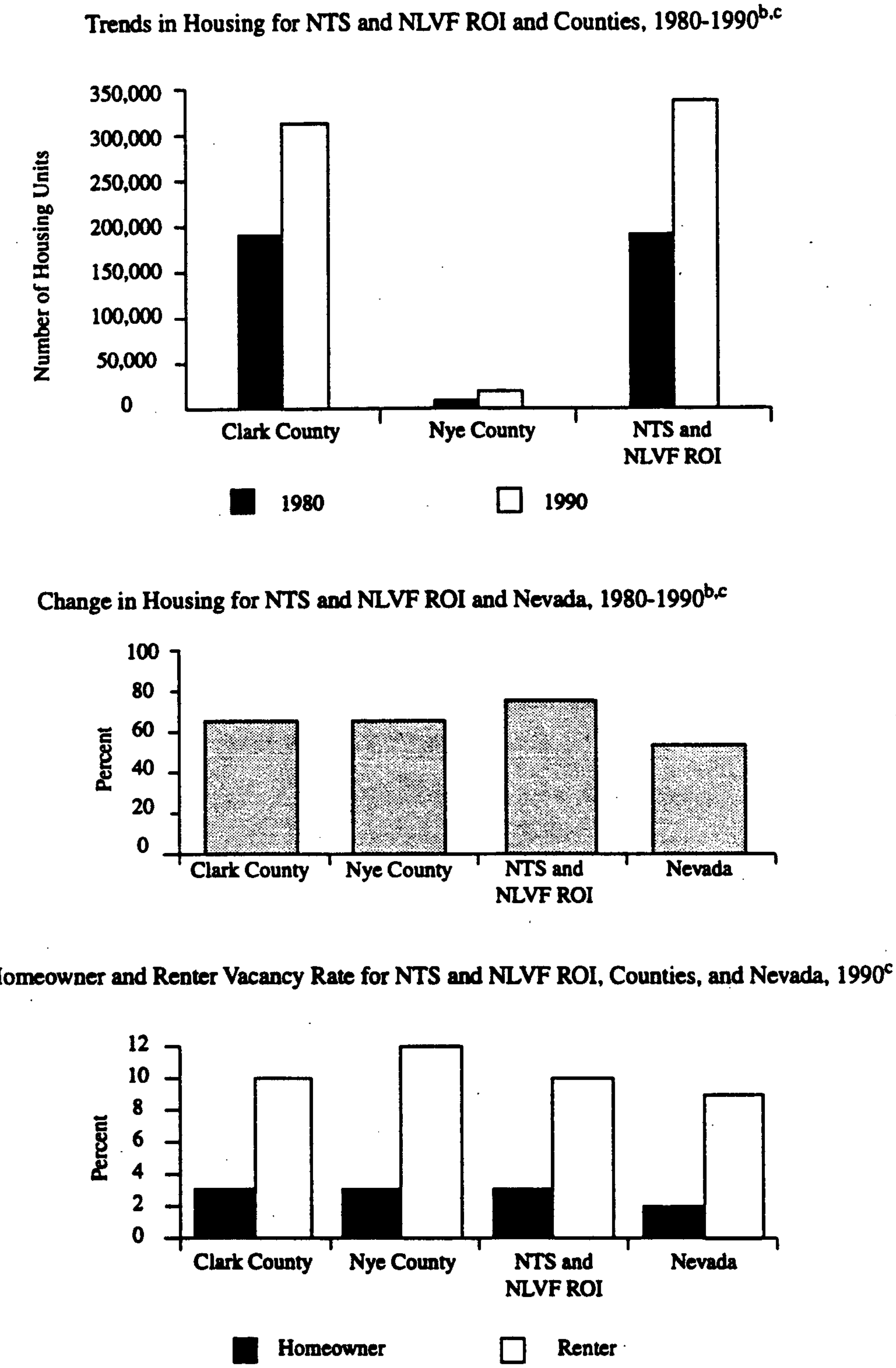
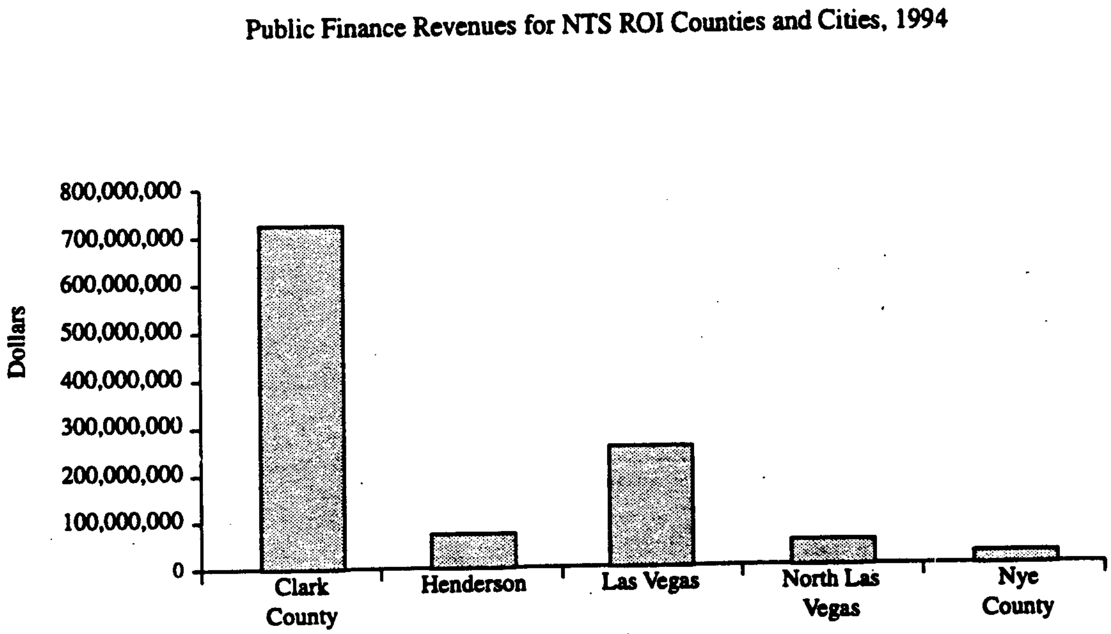


FIGURE 4.9.2.8–3.—*Population and Housing for Nevada Test Site and North Las Vegas Facility Region of Influence* [Page 1 of 2].



[a]Census 1994o.
[b]Census 1982w.
[c]Census 1991g.

FIGURE 4.9.2.8–3.—*Population and Housing for Nevada Test Site and North Las Vegas Facility Region of Influence* [Page 2 of 2].



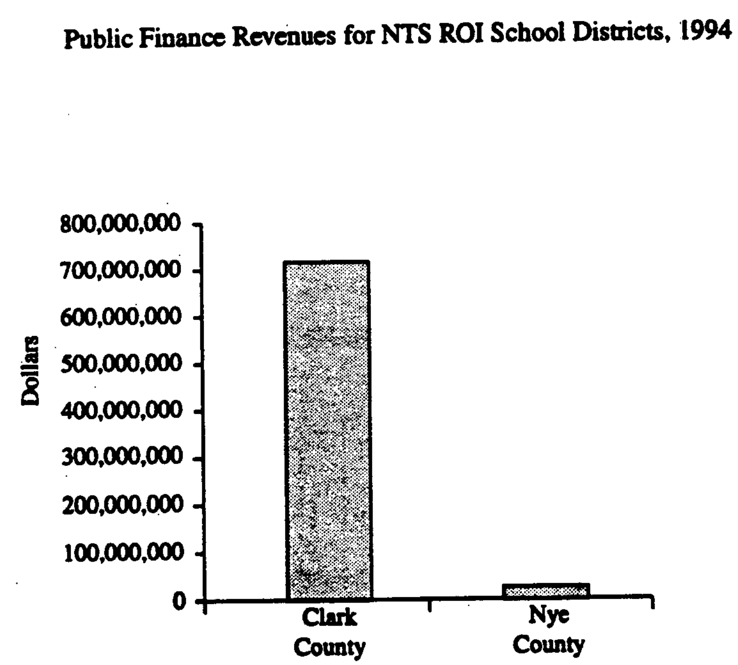
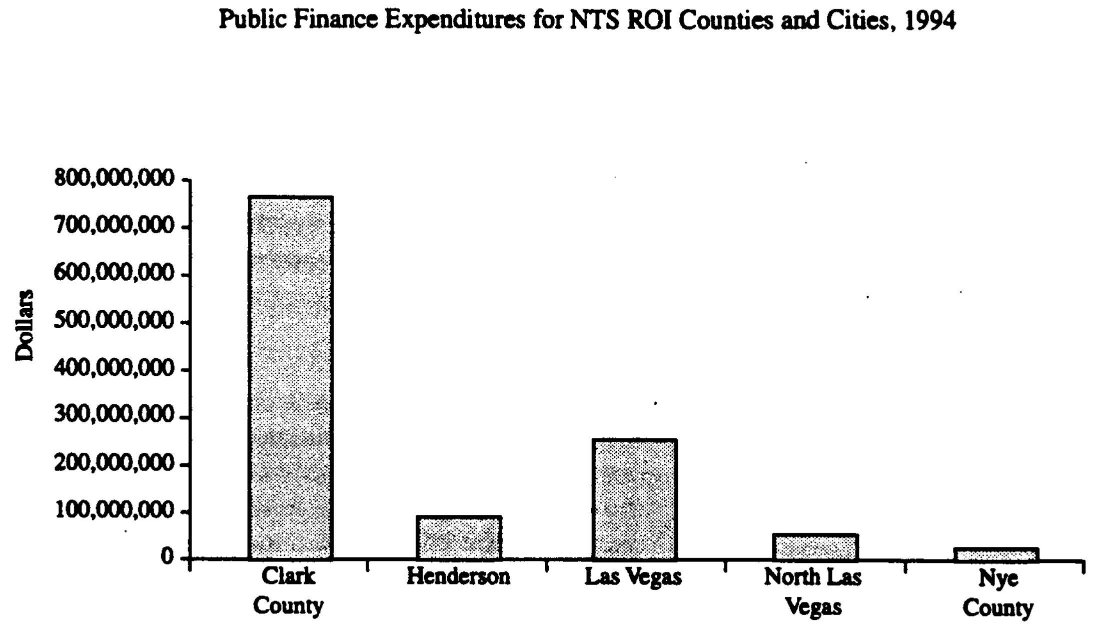
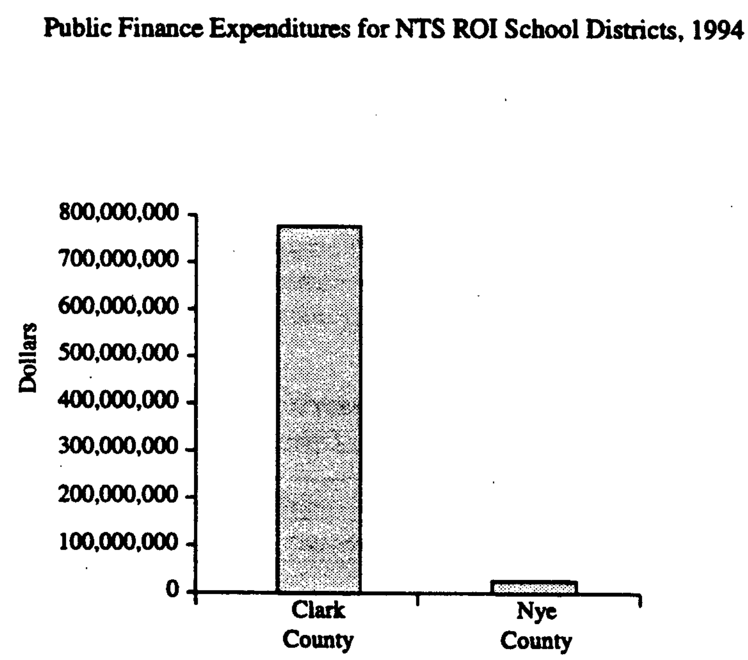


FIGURE 4.9.2.8–4.—*Local Government Public Finance for the Nevada Test Site and North Las Vegas Facility Region of Influence* [Page 1 of 2].





Note: 1994 financial audit data for Clark County is not available. Data presented is for 1993.
Source: NT City 1995a; NT County 1995b; NT School 1995b.

FIGURE 4.9.2.8–4.—*Local Government Public Finance for Nevada Test Site and North Las Vegas Facility Region of Influence* **[Page 2 of 2].**

The total dose to the population changes as population size changes. Background radiation doses are unrelated to NTS operations.

TABLE 4.9.2.9–1.—*Sources of Radiation Exposure to Individuals in the Vicinity, Unrelated to Nevada Test Site Operations*

Source	Committed Effective Dose Equivalent (mrem/yr)
Natural Background Radiation	
Cosmic and cosmogenic radiation[a]	74
Internal terrestrial radiation[b]	39
Radon in homes (inhaled)[b]	200
Other Background Radiation[b]	
Diagnostic x rays and nuclear medicine	53
Weapons test fallout	<1
Air travel	1
Consumer and industrial products	10
Total	378

[a] Derived from information given in EPA 1981b.
[b] NCRP 1987a.

Releases of radionuclides to the environment from NTS operations provide another source of radiation exposure to individuals in the vicinity of NTS. The radionuclides and quantities released from NTS operations in 1993 are listed in the *U.S. Department of Energy Nevada Operations Office Annual Site Environment Report-1993* (DOE/NV/11432-123). The doses to the public resulting from these releases are presented in table 4.9.2.9–2. These doses fall within radiological limits (DOE Order 5400.5) and are small in comparison to background radiation. The releases listed in the 1993 report were used in the development of the reference environment's (No Action) radiological releases at NTS in 2005 (section 4.9.3.9).

Based on a dose-to-risk conversion factor of 500 cancer deaths per 1 million person-rem ($5x10^{-4}$ fatal cancers per person-rem) to the public (appendix E), the fatal cancer risk to the maximally exposed member of the public due to radiological releases from NTS operations in 1993 is estimated to be $2.4x10^{-9}$. That is, the estimated probability of this person dying of cancer at some point in the future from radiation exposure associated with 1 year of NTS operations is about 2 chances in 1 billion. (Note that it takes several to many years from the time of exposure to radiation for a cancer to manifest itself.)

Based on the same conversion factor, $6.0x10^{-6}$ excess fatal cancers are projected in the population living within 80 km (50 mi) of NTS from normal operation in 1993. To place this number into perspective, it can be compared with the number of fatal cancers expected in this population from all causes. The 1990 mortality rate associated with cancer for the

TABLE 4.9.2.9–2.—*Doses to the General Public from Normal Operation at Nevada Test Site, 1993 (Committed Effective Dose Equivalent)*

Affected Environment	Atmospheric Releases		Liquid Releases		Total	
	Standard[a]	Actual	Standard[a]	Actual	Standard[a]	Actual
Maximally exposed individual (mrem)	10	0.0048	4	0.0	100	0.0048
Population within 80 kilometers[b] (person-rem)	None	0.012	None	0.0	100	0.012
Average individual within 80 kilometers[c] (mrem)	None	$5.5x10^{-4}$	None	0.0	None	$5.5x10^{-4}$

[a] The standards for individuals are given in DOE Order 5400.5. As discussed in that order, the 10 mrem/yr limit from airborne emissions is required by the CAA, the 4 mrem/yr limit is required by the SDWA, and the total dose of 100 mrem/yr is the limit from all pathways combined. The 100 person-rem value for the population is given in proposed 10 CFR 834 (58 FR 16268).
[b] In 1993, this population was approximately 21,750.
[c] Obtained by dividing the population dose by the number of people living within 80 km (50 mi) of the site.
Source: NT DOE 1994b.

entire U.S. population was 0.2 percent per year (Almanac 1993a:839). Based on this national rate, the number of fatal cancers from all causes expected during 1993 in the population living within 80 km (50 mi) of NTS was 44. This number of expected fatal cancers is much higher than the estimated 6.0×10^{-6} fatal cancers that could have resulted from NTS operations in 1993.

Workers at NTS receive the same dose as the general public from background radiation, but also receive an additional dose from working in the facilities. Table 4.9.2.9–3 includes the average, maximum, and total occupational doses to NTS workers from operations in 1992. These doses fall within radiological limits (10 CFR 835). Based on a dose-to-risk conversion factor of 400 fatal cancers per 1 million person-rem (4×10^{-4} fatal cancers per person-rem) among workers (appendix E), the number of excess fatal cancers to NTS workers from operations in 1992 is estimated to be 0.0008.

A more detailed presentation of the radiation environment, including background exposures and radiological releases and doses, is presented in the *U.S. Department of Energy Nevada Operations Office Annual Site Environment Report-1993* (DOE/NV/11432-123). The concentrations of radioactivity in various environmental media (e.g., air and water) and in animal tissue in the site region (onsite and offsite) are also presented in the same reference.

TABLE 4.9.2.9–3.—*Doses to the Onsite Worker from Normal Operation at Nevada Test Site, 1992*

	Onsite Releases and Direct Radiation	
Affected Environment	**Standard[a]**	**Actual[b]**
Average worker (mrem)	None	2.6
Maximally exposed worker (mrem)	5,000	750
Total workers (person-rem)	None	2.0

[a] 10 CFR 835. DOE's goal is to maintain radiological exposure as low as reasonably achievable.

[b] DOE 1993n:7. The number of badged workers in 1992 was approximately 780.

Chemical Environment. The background chemical environment important to human health consists of the atmosphere, which may contain hazardous chemicals that can be inhaled; drinking water, which may contain hazardous chemicals that can be ingested; and other environmental media with which people may come in contact (e.g., soil through direct contact or via the food pathway). The baseline data for assessing potential health impacts from the chemical environment are those presented in sections 4.9.2.3 and 4.9.2.4.

Adverse health impacts to the public can be minimized through administrative and design controls to decrease hazardous chemical releases to the environment and to achieve compliance with permit requirements. The effectiveness of these controls is verified through the use of monitoring information and inspection of mitigation measures. Health impacts to the public may occur during normal operations at NTS via inhalation of air containing hazardous chemicals released to the atmosphere by NTS operations. Risks to public health from ingestion of contaminated drinking water or direct exposure are also potential pathways.

Baseline air emission concentrations for hazardous air pollutants and their applicable standards are presented in section 4.9.2.3. These concentrations are estimates of the highest existing offsite concentrations and represent the highest concentrations to which members of the public could be exposed. These concentrations are compared with applicable guidelines and regulations. Information about estimating health impacts from hazardous chemicals is presented in appendix E.

Exposure pathways to NTS workers during normal operation may include inhaling the workplace atmosphere, drinking NTS potable water, and possible other contact with hazardous materials associated with work assignments. The potential for health impacts varies from facility to facility and from worker to worker, and available information is not sufficient to allow a meaningful estimation and summation of these impacts. However, workers are protected from hazards specific to the workplace through appropriate training, protective equipment, monitoring, and management controls. NTS workers are also protected by adherence to OSHA and EPA occupational standards that limit atmospheric and drinking water concentrations of potentially hazardous chemicals. Appropriate monitoring, which reflects the frequency and amounts of chemicals utilized in the operation processes, ensures that these standards are not exceeded. Additionally, DOE requirements ensure that conditions in the workplace are as free as possible from recognized hazards that cause or are likely to cause illness or physical harm. Therefore, worker health conditions at NTS are expected to be substantially better than required by standards.

Health Effects Studies. Several epidemiological studies have been conducted to investigate possible adverse health effects of low-level radioactive fallout on residents of Nevada and Utah. A mortality study of Utah children conducted by Lyon et al. investigated the relationship between childhood leukemia and radioactive fallout and found a significant excess of leukemia among children who died during the high fallout period (between 1951 and 1958) compared to those who died during the low fallout periods (between 1944 and 1950 and between 1959 and 1975). A followup to the Lyon et al. study conducted by Beck and Krey found that bone doses of southern Utah residents were too low to account for the excess leukemia deaths.

A nonstatistically significant excess of thyroid neoplasm was reported among children living near the nuclear testing sites (Utah/Nevada) when compared to a group living in Arizona (HP 1990c:739-746).

An excess number of leukemia cases were observed among men who participated in military maneuvers in August 1957. No excess in "total cancers" was observed but four cases of polycythemia vera were reported where 0.2 were expected (JAMA 1984a:662-664). For a more detailed description of the studies and the findings, refer to appendix section E.4.7.

Accident History. Nuclear testing began at NTS in 1951. There were some 100 atmospheric nuclear explosions before the Limited Test Ban Treaty was implemented in 1973. Since then, all nuclear tests have been conducted underground.

Since 1970, there have been 126 nuclear tests that released approximately 54,000 Ci (2,000 TBq) of radioactivity to the atmosphere. Of this amount, 11,500 Ci (430 TBq) were accidental due to containment failure (massive releases or seeps) and late-time seeps. (Seeps are small releases after a test when gases diffuse through pore spaces of the overlying rock.) The remaining 42,500 Ci (1,600 TBq) were operational releases. From the perspective of human health risk, if the same person had been standing at the boundary of NTS in the area of maximum concentration of radioactivity for every test since 1970, that person's total exposure would be equivalent to 32 extra minutes of normal background exposure, or the equivalent of one-thousandth of a single chest x ray (OTA 1989a).

Emergency Preparedness. Each DOE site has established an emergency management program that would be activated in the event of an accident. This program has been developed and maintained to ensure adequate response for most accident conditions and to provide response efforts for accidents not specifically considered. The emergency management program incorporates activities associated with emergency planning, preparedness, and response. The NTS Emergency Preparedness Plan is designed to minimize or mitigate the impact of any emergency upon the health and safety of employees and the public. The plan integrates all emergency planning into a single entity to minimize overlap and duplication and to ensure proper responses to emergencies not covered by a plan or directive. The manager of the Nevada Operations Office has the responsibility to manage, counter, and recover from an emergency occurring at NTS.

The plan provides for identification and notification of personnel for any emergency that may develop during operational and nonoperational hours. The Nevada Operations Office receives warnings, weather advisories, and any other communications that provide advance warning of a possible emergency. The plan is based upon current Nevada Operations Office vulnerability assessments, resources, and capabilities regarding emergency preparedness.

<u>North Las Vegas Facility</u>

NLVF provides calibration services using specialized radiation fields for a variety of instrument test packages in support of DOE Nevada operations. A detailed discussion of the radiation environment, including background, radiological releases, and doses to members of the public are presented in the

U.S. Department of Energy Nevada Field Office Annual Site Environmental Report-1993 (DOE/NV/11432-123, September 1994). The concentrations of radioactivity in various environmental media (i.e., air, water, and soil) in the site region and the dose to onsite workers at NLVF are also presented in that reference.

Calculated radiological doses are used to estimate the potential health impacts to the public and onsite workers at NLVF from any releases of radioactivity. Small atmospheric releases occurred on July 12 and August 14, 1995. The dose to a maximally exposed individual and to the surrounding population from these releases is expected to be negligible. The actual dose to these receptors will be quantified upon receipt of monitoring data. The annual doses to workers and the public are summarized in table 4.9.2.9–4; corresponding health risks are also presented in the table. These doses are in addition to those from natural background radiation, consumer products, and medical sources, which total about 360 mrem/yr. The onsite worker doses are within regulatory limits. Background radiation doses are unrelated to NLVF operations.

Chemical Environment. Exposure pathways to NLVF workers during normal operation may include inhaling the workplace atmosphere, drinking NLVF potable water, and possible other contact with hazardous materials associated with work assignments. The potential for health impacts varies from facility to facility and from worker to worker, and available information is not sufficient to allow a

TABLE 4.9.2.9–4.—*Annual Doses to the General Public and Onsite Workers from Normal Operation at North Las Vegas Facility, 1993*

Receptor	Atmospheric Releases		Liquid Releases		Total		
	Regulatory Limit[a]	Calculated	Regulatory Limit[a]	Calculated	Regulatory Limit[a]	Calculated	Risk[b]
Individual Dose							
Average exposed individual (mrem)	10	0.0[c]	4	0.0	100	0.0	0.0
Maximally exposed individual (mrem)	10	0.0[d]	4	0.0	100	0.0	0.0
Population Dose							
Population within 80 kilometers (person rem)	d	0.0[c]	d	0.0	d	0.0	0.0
Worker Dose							
Average worker (mrem)	NA[e]	0.0	NA[e]	0.0	5,000	82	$3.3x10^{-5}$
Maximally exposed worker (mrem)	NA[e]	0.0	NA[e]	0.0	5,000	440	$1.8x10^{-4}$
Total workers[f] (person-rem)	NA[e]	0.0	NA[e]	0.0	None	0.57	$2.3x10^{-4}$

[a] The regulatory limits for individuals are given in DOE Order 5400.5. The 10 mrem/yr limit from airborne emissions is required by the CAA. The 4 mrem/yr limit is required by the SDWA, and the total dose of 100 mrem/yr is the limit from all pathways combined. The regulatory limit for workers is 5,000 mrem (10 CFR 835).

[b] Based on latent fatal cancer risk factors of $5x10^{-4}$/mrem for individuals, $5x10^{-4}$/person-rem for population, and $4x10^{-4}$/mrem for workers (ICRP 1991a).

[c] Two very small atmospheric releases occurred on July 12 and August 14, 1995. Dose to any offsite individual is expected to be a fraction of a mrem (monitoring data is not yet available from all stations).

[d] No regulatory limits exist for population doses.

[e] NA - not applicable; worker doses were estimated on the basis of readings from monitoring devices called thermoluminescent dosimeters.

[f] The number of badged workers in 1994 was approximately seven.

Source: NTS 1995a:5.

meaningful estimation and summation of these impacts. However, workers are protected from hazards specific to the workplace through appropriate training, protective equipment, monitoring, and management controls. NLVF workers are also protected by adherence to OSHA and EPA occupational standards that limit atmospheric and drinking water concentrations of potentially hazardous chemicals. Appropriate monitoring, which reflects the frequency and amounts of chemicals utilized in the operation processes, ensures that these standards are not exceeded. The maximum daily quantities of NIF-related hazardous materials stored at NLVF are presented in appendix table I.4.4.1.7.2–1. NLVF stores and uses few hazardous materials in amounts greater than the threshold planning quantities that require reporting under 40 CFR 370 (NT DOE 1995g).

4.9.2.10 *Waste Management*

This section outlines the major environmental regulatory structure and ongoing waste management activities for NTS, including NLVF. A more detailed discussion of the ongoing waste management operations is provided in appendix section H.2.8.

DOE is working with Federal and state regulatory authorities to address compliance and cleanup obligations arising from its past operations at NTS. DOE is engaged in several activities to bring its operations into full regulatory compliance. These activities are set forth in negotiated agreements that contain schedules for achieving compliance with applicable requirements and financial penalties for nonachievement of agreed upon milestones. These agreements have been reviewed to assure the proposed actions are allowable under the terms of these agreements.

DOE has decided that underground testing areas should be governed pursuant to the provisions of CERCLA. Preliminary assessment/site investigation reports and a hazardous ranking system package were provided to EPA for their use in determining whether NTS should be included on the NPL. In May 1993, the state of Nevada issued a letter to DOE indicating it did not appear that EPA would make a decision on the NPL status of NTS in the near future.

DOE has published the Nevada Test Site Treatment Plan and *Federal Facility Compliance Act* consent order addressing environmental restoration and waste management on NTS. A mutual consent agreement between the state of Nevada and DOE, updated in June 1995, permits NTS to use the available capacity of the TRU waste storage pad for the storage of onsite generated mixed LLW that does not meet the land disposal provisions of RCRA.

The Nevada Operations Office completed a waste minimization plan for NTS in 1991 and created an organization whose mission is to promote waste minimization and pollution prevention and to ensure compliance with DOE requirements. NTS currently generates waste from ongoing operations and remediation associated with past activities and receives waste from other DOE facilities. NTS manages the following waste categories: TRU, LLW, mixed, hazardous, and nonhazardous. A discussion of the waste management operations associated with each of these categories follows.

Transuranic Waste. Although NTS does not currently generate any TRU wastes, from 1974 to 1990, 612 m^3 (800 yd^3) of mixed TRU waste was received from LLNL and is stored on a 8,300-m^2 (89,300-ft^2) asphalt storage pad at Area 5 of NTS (NT REECO 1995a:21). DOE and the State of Nevada signed a Settlement Agreement on July 23, 1992, allowing the Nevada Operations Office to retain this inventory of mixed TRU waste subject to an appropriate permitting process. None of these waste packages is WIPP certified. They will have to be certified before shipment to WIPP. These wastes have been moved to a 1,995-m^2 (21,470-ft^2) polyvinyl chloride-coated polyester fabric covered building for storage until WIPP is determined to be a suitable disposal facility, pursuant to the requirements of 40 CFR 191 and 40 CFR 268, or until another suitable repository is found (NT DOE 1996b:30-38). NTS has areas of plutonium-contaminated soil, for which treatment technology is being developed. This activity may produce additional volumes of TRU or mixed TRU waste. Limited quantities of TRU waste were also disposed of in trench 4C and in greater confinement units in Area 5.

Low-Level Waste. In 1993, NTS generated approximately 178 m^3 (233 yd^3) of solid LLW onsite (NT DOE 1994f:4). LLW has been generated and disposed of in eight areas at NTS, but currently only Areas 3 and 5 are active for disposal. Bulk waste is disposed of in Area 3, and packaged classified and unclassified waste is disposed of in Area 5. Disposal of onsite waste began in 1971, and in 1978 operations expanded to receive wastes generated offsite. In 1995, 15 generators shipped LLW to NTS for disposal. An additional nine generators are applying for or awaiting approval (NT DOE 1996c:4-61, 4-62). As of October 1994, approximately 301,667 m^3 (394,600 yd^3) of LLW in Area 3 (NT DOE 1996c:4-43) and as of December 1993 approximately 167,400 m^3 (218,900 yd^3) of LLW in Area 5 (NT REECO 1994a:12) have been disposed of. Standard shallow land burial techniques have been employed.

Mixed Low-Level Waste. In 1993, NTS did not generate any mixed waste. Disposal of mixed waste received from the Rocky Flats Environmental Technology Site has taken place at NTS. Mixed waste disposal at NTS ceased, pending issuance by the state of Nevada of a RCRA Part B Permit for NTS. environmental restoration at NTS could generate additional volumes of mixed waste which would require some form of treatment. A liquid waste treatment system is being designed to process these mixed wastes. Mixed waste generated in the state of Nevada that meets land disposal restrictions of RCRA can be disposed of in the Area 5 mixed waste disposal unit, Pit 3. Pit 3 currently has an inventory of 8,024 m^3 (10,500 yd^3) (NT DOE 1996c:4-46). Other units in Areas 3 and 5 where mixed waste was previously disposed of will be closed in conformance with RCRA. The Nevada Division of Environmental Protection provides RCRA oversight for NTS. The 1992 revised RCRA Part B Permit application to include a separate mixed waste storage and disposal unit at NTS, in accordance with the provisions of the *Federal Facility Compliance Act* of 1992, has been submitted to the state of Nevada. A mutual consent agreement between the state of Nevada and DOE permits the storage of mixed LLW that do not meet RCRA land disposal restrictions on the TRU waste storage pads. DOE has published the NTS Site Treatment Plan and *Federal Facility Compliance Act* Consent Order that establishes the basis for treatment, storage and disposal of mixed LLW at NTS.

Hazardous Waste. For 1993, NTS generated approximately 34.6 m^3 (45 yd^3) of hazardous wastes (NT DOE 1994f:4). Hazardous wastes result from ongoing operations that utilize solvents, lubricants, fuel, lead, metals, motor oil, and acids. Hazardous wastes are accumulated at satellite areas, stored at the Area 5 RCRA-permitted hazardous waste storage unit, and shipped offsite by truck to a commercial RCRA-permitted facility using DOT-approved transporters. Additional accumulation areas and new equipment are planned to prevent the possibility of cross contamination with radioactive wastes (creating mixed wastes) in handling these materials. PCB-contaminated waste is accumulated and stored in the Area 6 TSCA waste accumulation unit. Accumulated PCB waste is shipped offsite to a commercial TSCA-permitted treatment, storage, and disposal facility. Hazardous waste generation is decreasing as the result of an aggressive waste minimization program, and will substantially decrease in the future due to the present moratorium on nuclear testing.

NLVF generated about 8.2 m^3 (2,180 gal) of liquid and 3.5 m^3 (4.6 yd^3) of solid hazardous wastes in 1994. All hazardous wastes are treated, stored, or disposed of offsite at RCRA-permitted facilities. Spills or releases of hazardous materials have historically been minor in nature and have been promptly cleaned up upon discovery.

A Waste Minimization and Pollution Prevention Awareness Implementation Plan submitted to DOE on December 20, 1991, is in place for NLVF. A formalized system of waste minimization was developed through the implementation of EG&G/EM Policy No. 31-70, Waste Minimization and Pollution Prevention, and Standard Operating Procedure 31-006.A, Hazardous Waste Minimization Plan. Hazardous waste generation from various processes has already been reduced through product substitution or by permanently discontinuing the hazardous waste generating process.

There are no underground storage tanks for hazardous or petroleum substances at NLVF. All aboveground tanks employ either secondary containment or a double-walled tank with continuous leak detection. There are no hazardous waste treatment, storage, or disposal facilities requiring state or Federal permits at NLVF (NT DOE 1995g).

Nonhazardous Waste. Nonhazardous sanitary wastes are expected to be generated at the current rates for several years, then decline assuming the present moratorium on underground weapons testing continues. Liquid nonhazardous wastes are disposed of in septic tanks, sumps, or in ponds. Solid wastes are disposed of in landfills at various locations on the site. Recycling of paper, metals, glass, plastics, and cardboard has already resulted in some decreases in waste quantities. NTS generated 7,170 t (7,900 tons) of solid sanitary wastes in 1993 (NT DOE 1994f:4). Solid waste landfills located in Areas 6, 9, and 23 are in use for the disposal of solid nonhazardous wastes.

The Area 6 landfill is a Class III landfill that accepts hydrocarbon-burdened soil and debris. The Area 9 landfill is a Class II landfill because it accepts less than 18 t (20 tons) of solid waste per day. The Area 9 landfill is allowed to receive all types of nonhazardous solid waste, excluding radioactive waste, free liquids, and asbestos. Its current capacity is approximately 993,883 m^3 (1.3 million yd^3). Due to changes in state regulatory requirements, the Area 9 landfill will undergo partial closure and reopen as a Class III construction and demolition landfill. The Area 23 landfill receives all types of nonhazardous solid waste with nonpathogenic hospital waste, dead animals, and asbestos-containing materials being buried in separate cells that are identified by concrete markers. The current capacity is approximately 449,541 m^3 (588,000 yd^3). The Area 23 landfill is scheduled to remain in operation as a Class II landfill after modification to comply with the new state regulations (NT DOE 1996c:4-47).

Policies and procedures are in place at NLVF that promote recycling and resource recovery. Physical and administrative measures implemented at NLVF minimize or prevent the introduction of pollutants into stormwater. Stormwater from the NLVF site is discharged by concentrated conveyance or sheet flow onto Losee Road. Industrial wastewater and sanitary sewage from NLVF are discharged into city of North Las Vegas sewer lines, which are connected to the city of Las Vegas publicly owned treatment works. The publicly owned treatment works discharges treated wastewater directly into Lake Mead under a NPDES permit issued by the Nevada Division of Environmental Protection. NLVF discharges an average of 147,303 L (38,888 gal) of wastewater per day into the publicly owned treatment works, with a peak maximum of 369,318 L (97,000 gal) of wastewater per day. Approximately 32 to 35 percent of the total wastewater originates from industrial processes, while the remaining 65 percent is predominantly sanitary wastes. Wastewater quality historically has been in compliance with permit conditions established by the city of North Las Vegas to protect the publicly owned treatment works treatment processes and ultimately the water quality in Lake Mead (NT DOE 1995g).

4.9.3 Environmental Impacts

4.9.3.1 *Land Resources*

No Action. Under No Action, DOE would continue current and planned activities at NTS as described in section 3.2.9. No additional land-use impacts are anticipated at NTS beyond the effects of existing and future activities which are independent of the proposed action.

Management Alternatives

Assembly/Disassembly. The A/D mission at NTS would require construction of a new A/D Facility within Area 6. Construction of the A/D mission would disturb up to 3.2 ha (8 acres) of land. The required acreage represents a small portion of the land available for future development at NTS. The existing Device Assembly Facility would form the cornerstone of the proposed A/D Facility. The Pit Reuse Facility would serve as an adjunct to the Device Assembly Facility, which would require modification to support the Pit Reuse Facility. Construction of the new facility would not impact NTS land-use plans and would be compatible and consistent with existing activities performed at the site.

The movement of strategic reserve pits and HEU apart from the A/D mission at NTS at another DOE site location (an alternative in the Storage and Disposition Program) would result in fewer facilities being constructed. NTS has no existing facilities for strategic reserve storage, therefore no impact on NTS land-use plans and policies are expected.

Sensitivity Analysis. NTS would be able to accommodate all operations and support functions for A/D with the proposed construction of the new A/D Facility and existing facilities. Those facilities would be sufficient to support the low production case. In order to support the high production case, additional floor space within existing buildings would be required.

Stewardship Alternatives

Proposed National Ignition Facility. Approximately 18.2 ha (45 acres) within Area 22 would be required for buildings, walkways, building access, and buffer space. The required acreage represents a small portion of the total land available on NTS for future development. The proposed NIF would occupy approximately 34,344 m^2 (369,675 ft^2) and would be compatible and consistent with existing operations in the area. No impacts to land use outside Area 22 or to land-use plans or policies at NTS are expected.

North Las Vegas Facility

The principal impact of the proposed NIF project on land use at NLVF would be the conversion of limited open space. The proposed NIF would require about 3.2 open ha (8 acres), which represents approximately 10 percent of NLVF's total land area and 56 percent of land available for development at NLVF. The impact of this conversion would be reduced somewhat by the existence of other areas on the site (i.e., F-4, F-5, and F-6) that would remain open for future development. Potential onsite impacts to land use could also result from required waste and water system upgrades, but the presence of NIF should not preclude future land uses or development in the city of North Las Vegas or Clark County.

Potential Mitigation Measures. No mitigation measures for stockpile stewardship and management alternatives are anticipated.

4.9.3.2 *Site Infrastructure*

This section discusses site infrastructure for No Action and the modification and construction of facilities necessary for stockpile stewardship and management alternatives at NTS. The additional facilities will affect the site primarily by increasing electrical power use. A comparison of site infrastructure and facilities resource needs for No Action and the proposed alternatives is presented in table 4.9.3.2–1. Currently, NTS does not use natural gas; therefore, the equivalent amount of liquid fuel is used for determining the fuel requirements as shown in the table.

No Action. The missions discussed earlier in section 3.2.9 would continue under No Action. The infrastructure at NTS would continue to be maintained so that underground nuclear testing could be resumed in the event it is again required for national security. Facility improvements around the site would continue in a staged manner through 2014; however, overall operations would not increase.

Management Alternatives

Assembly/Disassembly. The A/D mission with non-intrusive modification pit reuse and an option to store strategic reserves of plutonium and uranium would add a new A/D Facility and several other associated facilities. A nonintrusive modification pit reuse facility, which would be an adjunct facility to the Device Assembly Facility, would take weapon components from the disassembled weapons, make modifications to them, and assemble the modified components into new weapons. For storing the strategic reserve of plutonium and uranium, an adjunct facility to the Device Assembly Facility would also be needed. For the potential A/D complex to support stockpile management, the peak electrical power load is estimated to be 7 MWe. This alternative would be within the site's current electrical capacity but above the No Action energy load.

Plutonium and HEU strategic reserves are not currently stored in any facilities at NTS. Therefore, if the strategic reserve were located at another DOE site (an alternative in the Storage and Disposition Program) fewer facilities would be constructed. The change in site infrastructure requirements would be negligible.

To connect the NTS road network with the A/D complex, approximately 2 km (1.24 mi) of additional secondary access roads would be required. Interconnection requirements for the A/D complex are not expected to add or change appreciably when specific site adaptions are completed.

Sensitivity Analysis. The high or low case production scenario would not substantially affect the site's operational infrastructure. The electrical use would change slightly; however, the peak load would remain the same. Oil use would also change slightly, affecting only the scheduling of oil deliveries. Construction of additional facilities would be required for

TABLE 4.9.3.2–1.—*Site Infrastructure Requirements and Changes for Stockpile Stewardship and Management Alternatives at Nevada Test Site*

	Electrical		Fuel		
Alternative	Energy (MWh/yr)	Peak Load (MWe)	Liquid (L/yr)	Gas[a] (m^3/yr)	Coal (t/yr)
Current Resources	121,460[b]	27.4	5,716,000	0	NA
No Action (2005)					
Total site requirement	124,940	24.7	5,716,000	0	NA
Change from current resources	0	-2.7	0	0	NA
Weapons Assembly/Disassembly					
Total site requirement	169,940	31.7	9,386,000	0	NA
Change from No Action	45,000	7	3,670,000	0	NA
National Ignition Facility					
Total site requirement	162,940	44.7	6,378,000	0	NA
Change from No Action	38,000	20	662,000	0	NA
Combined Program Impacts					
Total site requirement	207,940	51.7	10,048,000	0	NA
Change from No Action	83,000	27	4,332,000	0	NA

[a] Liquid fuel is the primary utility fuel at NTS. The weapons A/D Facility and NIF fuel requirements have been converted to liquid fuel equivalents; natural gas is assumed to be 1,000 British thermal units per ft^3, and liquid fuel (8 lb/gal) is assumed to be 19,000 British thermal units per pound.

[b] Current electrical usage is below site capacity. The electrical capacity is 176,844 MWh with a peak load capacity of 45 MW.

Note: NA - not applicable.

Source: NT DOE 1995b; NTS 1993a:4; NTS 1995a:1; NTS 1995a:2; NTS 1996a:1; appendix I.

the high case while the low case would require much less modification of the Device Assembly Facility.

Stewardship Alternatives

Proposed National Ignition Facility. The proposed NIF is the only stockpile stewardship alternative facility proposed for NTS. Support facilities to accommodate research, testing, and material requirements would cover 18.2 ha (45 acres). For the proposed NIF complex, the peak electrical power load is estimated to be 20 MWe. This power requirement would require additional high-voltage transmission lines from Las Vegas and electrical distribution and transmission equipment onsite. The proposed NIF would use less than 0.1 percent of the regional power pool capacity margin. The additional power for the proposed NIF could be supplied by the Nevada Power Company. An alternative for the supplying power would be to use the 100 MW solar facility proposed for NTS.

To connect the NTS road network with the proposed NIF complex, approximately 2 km (1.24 mi) of additional secondary access roads would be required. Interconnection requirements for the complex are not expected to add or change appreciably when specific site adaptions are completed.

North Las Vegas Facility

NLVF has adequate site infrastructure to support the proposed NIF without major modifications.

Potential Mitigation Measures. No mitigation measures for stockpile stewardship and management alternatives at NTS are anticipated.

4.9.3.3 *Air Quality*

No Action. No Action air quality utilizes estimated air emissions data from operations at NTS in 2005, assuming continuation of current site missions to calculate pollutant concentrations at or beyond the NTS site boundary. The emission rates for criteria and toxic/hazardous pollutants for No Action are presented in appendix table B.3.9–1. Table 4.9.3.3–1 presents the No Action pollutant concentrations calculated from the 2005 emission rates. In this table, pollutant concentrations are compared to applicable Federal and state regulations and guidelines. Concentrations are expected to remain within these standards.

Management Alternatives

Assembly/Disassembly. Gaseous emissions of criteria and toxic/hazardous air pollutants would be generated from the A/D mission. These emissions would result from open burn/open detonation of non-radioactive scrap HE and HE-contaminated waste, plant boiler operation, cleaning operations using solvents, and small-scale synthesis operations. Emission rates for criteria and toxic/hazardous pollutants for the A/D mission are presented in appendix table B.3.9–1. Table 4.9.3.3–1 presents the concentrations of criteria and toxic/hazardous pollutants resulting from No Action and those generated from operation of the A/D mission. The resulting concentrations of criteria and toxic/hazardous pollutants are expected to be within Federal and state regulations and guidelines.

The storage of strategic reserve pits and HEU apart from the A/D mission at NTS at another DOE site location (an alternative in the Storage and Disposition Program) would have no impact on air quality because NTS has no existing strategic reserve storage facilities.

Sensitivity Analysis. Impacts to air quality from either the low or high case scenario of the A/D alternative would result in higher and lower concentrations of criteria and toxic/hazardous pollutants for the high and low case, respectively. The concentrations of pollutants for both cases are expected to be within applicable Federal and state regulations and guidelines.

Stewardship Alternatives

Proposed National Ignition Facility. Operation of the proposed NIF would generate criteria and toxic/hazardous pollutants resulting from the combustion of boiler fuel for heating, operation of diesel generators, and solvent cleaning processes. The emissions consist of particulate matter, carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, and VOCs. Boiler fuel is assumed to be liquefied petroleum gas. Emission rates of criteria and toxic/hazardous pollutants for annual operation of the proposed NIF are presented in appendix table

TABLE 4.9.3.3–1.—*Estimated Concentrations of Pollutants from No Action and Stockpile Stewardship and Management Alternatives at Nevada Test Site*

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines (μg/m³)	2005 No Action (μg/m³)	Assembly/ Disassembly (μg/m³)	National Ignition Facility (μg/m³)
Criteria Pollutant					
Carbon monoxide	8-hour	10,000 [a]	2,290	2,290	2,290
	1-hour	40,000 [a]	2,748	2,748	2,748
Lead	Calendar quarter	1.5[a]	[b]	[b]	[b]
Nitrogen dioxide	Annual	100 [a]	[b]	[b]	[b]
Ozone	1-hour	235 [a]	[b]	[b]	[b]
Particulate matter	Annual	50 [a]	9.4	9.4	9.4
	24-hour	150 [a]	106	106	106
Sulfur dioxide	Annual	80 [a]	8.4	8.4	8.4
	24-hour	365 [a]	94.6	94.8	94.6
	3-hour	1,300 [a]	725	726.6	725
Mandated by Nevada					
Hydrogen sulfide	1-hour	112 [c]	[b]	[b]	[b]
Hazardous and Other Toxic Compounds					
No sources indicated	–	–	–	–	–

[a] Federal standard.
[b] No monitoring data available, concentration assumed less than applicable standard.
[c] State standard.
Source: 40 CFR 50; NT DOE 1995b; NTS 1995a:1; NV DCNR 1995a; appendix I.

B.3.9–1. Table 4.9.3.3–1 presents the concentration of criteria and toxic/hazardous pollutants resulting from No Action and those generated from operation of the proposed NIF. Concentrations of pollutants resulting from operation of the proposed NIF added to No Action concentrations are expected to be within Federal and state regulations.

North Las Vegas Facility

Operation of the proposed NIF would generate criteria and toxic/hazardous pollutants resulting from the combustion of boiler fuel for heating, operation of diesel generators, and solvent cleaning processes. The emissions consist of particulate matter, carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, and VOCs. Boiler fuel is assumed to be liquefied petroleum gas. Emission rates of criteria and toxic/hazardous pollutants for annual operation of the proposed NIF are presented in appendix table

B.3.9–1. Appendix table I.4.4.2.2.1–2 presents the emissions of criteria pollutants resulting from No Action and those generated from operation of the proposed NIF. Concentrations of pollutants resulting from operation of the proposed NIF added to No Action concentrations are expected to be within Federal and state regulations.

Construction Emissions. Estimated construction emissions, including site-clearing emissions and emissions associated with facility construction, are listed in table 4.9.3.3–2. The construction emission estimates are based on characteristics of the proposed NLVF location and on construction vehicle exhaust and fugitive emissions. Site clearing would occur in the first year, followed by facility construction for 4 years.

Detailed emission inventories associated with site clearing and facility construction, meteorological data used, air quality model assumptions, model input parameters, and potential project-specific mitigation measures are presented in appendix I.

TABLE 4.9.3.3–2.—*Estimated National Ignition Facility Construction Emissions for North Las Vegas Facility*

Pollutant	Total Emissions (t/yr)
Carbon monoxide	1.23
Lead	Negligible
Nitrogen dioxide	3.76
Particulate matter	6.89
Sulfur dioxide	0.43
Volatile organic compounds	0.44

Source: Appendix I.

With conventional dust control, maximum 24-hour average particulate matter concentrations of 156 $\mu g/m^3$ over background are predicted at the site boundary (10 m [32 ft] north of the proposed NIF location). These levels would be above the NAAQS and state standard for particulate matter. Additional dust-control measures, such as use of a calcium-based dust suppressant, reduction of activity, or use of intensified dust control measures should be implemented to comply with the NAAQS for particulate matter. Site clearing at NLVF would be expected to last less than a month, so ambient air quality impacts associated with site clearing would be minor, local, and temporary.

Operating Emissions. Air pollutant emissions from operation of the proposed NIF at NLVF are expected to be primarily due to fuel combustion and cleaning of the debris shields. Emissions of VOCs from debris shield cleaning is estimated at approximately 0.5 t/yr (0.45 tons/yr). Other potential air pollutant emission sources not considered significant are target destruction by either the direct drive or enhanced indirect drive options, emissions from vehicles used for freight shipments and employee commuting, and emissions from welding operations at the Fabrication Facility. The annual energy requirements for the proposed NIF are listed in appendix I. These energy requirements are assumed applicable to all sites. Fuel usage to meet these energy requirements is specific to NLVF.

Table 4.9.3.3–3 lists estimated annual air pollutant emissions based on the anticipated NIF annual energy requirements. External combustion units (boilers) would have to comply with best available control technology for carbon monoxide and nitrogen oxides for nonmajor sources (APCR sections 12.2.10.1, 12.2.11.1). Emissions of VOCs at the stated annual rate of 0.5 t/yr (0.45 tons/yr) may require additional controls depending on the type of solvent used (APCR Section 60.1.1). More detailed information on emission estimates and potential impacts is provided in appendix I.

TABLE 4.9.3.3–3.—*North Las Vegas Facility Annual Emission Increase with the Proposed National Ignition Facility Operation*

Pollutant	1990 Emissions (t/yr)	Projected National Ignition Facility Emissions (t/yr)	1990 Emissions Plus National Ignition Facility (t/yr)	National Ignition Facility Percent of 1990 Emissions
Carbon monoxide	0.23	0.56	0.79	241.56
Lead	Negligible	Negligible	Negligible	Negligible
Nitrogen dioxide	1.07	2.28	3.35	213.17
Particulate matter	0.78	0.21	0.99	27.00
Sulfur dioxide	0.07	0.04	0.11	50.96
Volatile organic compounds	3.45	0.57	4.02	16.56

Note: Percentages are calculated prior to rounding off emissions.
Source: Appendix I.

Potential Mitigation Measures. Mitigation measures to reduce emissions of particulate matter from site activities would probably not reduce the 24-hour particulate matter concentration below the regulatory limit due to the high naturally occurring background particulate concentrations in the desert environment in which NTS is located. Site-specific mitigation measures that would reduce particulate concentrations include paving unpaved roads and parking areas; watering to reduce dust emissions; applying nontoxic soil stabilizers to all inactive construction areas; covering, watering, or applying nontoxic soil binders to exposed piles (i.e., gravel, sand, and dirt); and suspending all excavation and grading operations when wind speeds warrant.

4.9.3.4 *Water Resources*

Environmental impacts associated with the construction and operation of the potential stockpile stewardship and management facilities at NTS could affect surface and groundwater resources. Potential water resource impacts at NLVF from the proposed NIF are discussed at the end of this section. All water required for construction or operation would be supplied from groundwater. The proposed sites for stewardship and management facilities do not lie within areas historically prone to flooding. There are no continuous flowing streams at NTS and no designated flood plains. Although a floodplain survey has not been conducted at NTS, such an analysis would be conducted before construction began. A description of the functions to be transferred to NTS and the facility locations selected to house these activities is presented in sections 3.3 and 3.4. Table 4.9.3.4–1 presents existing surface and groundwater resources and the potential changes to water resources at NTS and NLVF resulting from the proposed alternatives. The total site water resource requirements for each alternative including No Action are displayed in this table.

Surface Water

No Action. Under No Action, no impacts to surface water resources are anticipated because there are no surface water withdrawals, liquid discharges to streams, offsite surface drainage system, or publicly owned treatment works. A description of the mission and activities that would continue at NTS is provided in section 3.2.9.

Management Alternatives

Assembly/Disassembly. Surface water would not be used for any construction or operation activities associated with the A/D mission with nonintrusive pit reuse and storage of strategic reserves of plutonium and HEU at NTS. Consequently, impacts to surface water availability are not expected. The potential impacts to surface waters during construction would be erosion of disturbed land and sedimentation in drainage channels. To minimize soil erosion impacts, stormwater management and standard erosion control measures would be employed. The estimated 6.7 MLY (1.8 MGY) of nonhazardous wastewater generated during construction would either be recycled or treated and released to sewage or containment ponds that would be designed to minimize seepage. During operation, 53 MLY (14 MGY) of sanitary wastewater would be discharged to lagoons or evaporation ponds. Impacts to surface water quality are not expected. The existing lagoons and evaporation ponds just south of the Device Assembly Facility may have to be decommissioned and new facilities constructed due to the present system's proximity to the proposed A/D Facility.

The storage of strategic reserve pits and HEU apart from the A/D mission at NTS at another DOE site location (an alternative in the Storage and Disposition Program) would have no impact on surface or groundwater resources at NTS.

Stewardship Alternatives

Proposed National Ignition Facility. Floodplain maps are not available for the proposed NTS Area 22 location for NIF. Preliminary calculations indicate that the 500-year flood depth for the nearest drainage channel is about 0.09 m (0.3 ft). NIF facilities could be protected from potential floods by raising foundations above the projected flood elevation.

A total of 2.1 MLY (0.55 MGY) of nonhazardous wastewater generated during construction would either be recycled or treated and released to sewage or containment ponds that would be designed to minimize seepage. During operation, 19 MLY (5 MGY) of sanitary wastewater would be discharged to lagoons or evaporation ponds. Sewage treatment and disposal facilities would have to be constructed for the project. There are no NPDES

TABLE 4.9.3.4–1.—*Potential Changes to Water Resources from Stockpile Stewardship and Management Alternatives at Nevada Test Site*

Affected Resource Indicator	No Action Single-Shift Operation 2005	Assembly/ Disassembly Three-Shift Operation	National Ignition Facility at Nevada Test Site	National Ignition Facility at North Las Vegas Facility[a]
Construction				
Water Availability and Use				
Water source	Ground	Ground	Ground	Municipal Supply
Total site water operation water requirement[b] (MLY)	0[c]	2,416	2,403	72.3
Percent change from No Action water use (2,400 MLY)	NA	0.7	0.1	4.1
Water Quality				
Wastewater discharge to lagoons/evaporation ponds (MLY)	0[c]	6.7	2.1	56.9
Operation				
Water Availability and Use				
Water source	Ground	Ground	Ground	Municipal Supply
Total site water operation requirement (MLY)	2,400	2,498	2,552	221
Percent change from No Action water use (2,400 MLY)	NA	4.1	6.3	219
Percent change from current use (2,400 MLY)	0	4.1	6.3	219
Water Quality				
Wastewater discharge to lagoons/evaporation ponds (MLY)	0	53	18	72.6[d]
Floodplain				
Actions in 100-year floodplain	NA	Uncertain	Uncertain	None
Actions in 500-year floodplain	NA	Uncertain	Uncertain	None

[a] No Action water requirements and wastewater discharge for NLVF are 69.4 MLY and 54.8 MLY, respectively.
[b] Total water requirements for construction at NTS are based on a 6-year time period for A/D and a 5-year time period for NIF.
[c] No construction water would be used or construction wastewater generated. Total site water use and wastewater discharge would be the same as No Action operation.
[d] Wastewater discharge to city of North Las Vegas public wastewater treatment plant.
Note: NA - not applicable; MLY - million liters per year.
Source: NT DOE 1995b; NTS 1995a:1.

permits for the NTS site because there are no wastewater discharges to onsite or offsite surface waters; however, a state of Nevada permit for sewage discharge to sewage lagoons and ponds for NIF wastewater disposal would be required. Adverse impacts to surface water are not expected.

Groundwater

No Action. Under No Action, no additional impacts to groundwater availability or quality are anticipated beyond the effects of existing and future activities that are independent of and not affected by the proposed action. Baseline conditions and operations, described in section 4.9.2.4, would continue at NTS. No construction would occur under No Action; therefore, no additional construction groundwater would be used under No Action. Current groundwater usage of 2,400 MLY (634 MGY) is expected to remain the same in 2005 and would continue to be withdrawn from local groundwater sources. No additional impacts to groundwater quality are anticipated since there are no direct discharges to groundwater.

Management Alternatives

Assembly/Disassembly. Approximately 16.4 MLY (4.3 MGY) of groundwater is required for construction of facilities for the A/D mission with nonintrusive pit reuse and the option of storage of strategic reserves of plutonium and uranium. This amount represents a maximum increase of approximately 0.7 percent over projected groundwater withdrawal. The estimated 98.4 MLY (26 MGY) of groundwater required for operations would be an increase of less than 4.1 percent in projected water use, and would not be expected to cause depletion of the aquifer. The existing NTS water system supporting the proposed project area would have to be expanded to include one additional water well, treatment facilities, and an additional storage tank to provide for potable, fire, and process water.

As discussed in section 4.9.2.4, estimated perennial yields of the NTS aquifers range from 38,000 MLY (10,040 MGY) to 53,000 MLY (14,000 MGY). Based on these yields, total groundwater withdrawals required for the operation of the A/D alternative would remain below the lower rate. No adverse impacts on aquifer levels are expected.

The storage of strategic reserve pits and HEU apart from the A/D mission at NTS at another DOE site location (an alternative in the Storage and Disposition Program) would have no impact on surface or groundwater resources at NTS.

Sensitivity Analysis. Surface water and surface water quality would not be affected by either the low or high case production scenarios for the A/D mission at NTS. Groundwater and groundwater quality would not be affected by either the A/D mission low or high case production scenario.

Stewardship Alternatives

Proposed National Ignition Facility. Approximately 3 MLY (0.8 MGY) of groundwater is required for construction of NIF, which would represent a 0.13-percent increase over the projected groundwater withdrawal. The estimated 152 MLY (40.2 MGY) of groundwater required for operations would be a 6.3-percent increase in projected water use and would be well below the low estimate for recharge of the aquifer. Adverse impacts to groundwater supply are not expected.

Groundwater Quality. Under normal construction and operating conditions, sanitary wastewater disposed to the sewage or containment ponds would be the only discharge that could potentially reach the Valley-Fill aquifer. The wastewater would not have a measurable affect on groundwater quality because of the combined effects of a deep water table, low discharge volumes, high evaporation rates, and a composition and concentration consistent with treated and monitored sanitary wastewater. Adverse impacts to groundwater resources from A/D or NIF operations are not expected.

North Las Vegas Facility

Groundwater would not be used for construction or operation of the proposed NIF at NLVF; all water would be purchased from public suppliers. The proposed NIF location at NLVF is outside the 500-year floodplain of the local drainage (FEMA 1983a). Construction of NIF at NLVF would be expected to have minor to negligible affects on water quality with the implementation of a stormwater pollution and prevention plan to minimize soil erosion, sedimentation, and contamination of stormwater. Measures would be taken to comply with stormwater discharge regulations associated with construction activities under the CWA.

About 3 MLY (0.8 MGY) of water would be required for construction (LLNL 1995m). The total raw water supply required for NIF operation would be about 152 MLY (40.2 MGY), of which 18 MLY (4.8 MGY) would be for domestic use. The water required for NIF operation would be equivalent to an increase of 219 percent over the current usage of 69 MLY (18 MGY) (NT DOE 1995g; NTS 1995a:4). Sanitary wastewater volume is estimated to be 72.55 MLY (17.7 MGY). Water supply and sanitary wastewater treatment are provided by the city of North Las Vegas (NT DOE 1994g). Current water and wastewater utility capacity would be adequate to meet the additional requirement for the proposed NIF. Additional information regarding water and wastewater utility capacity at NLVF are presented in appendix I.

Potential Mitigation Measures. No mitigation measures for stockpile stewardship and management alternatives at NTS or NLVF are anticipated.

4.9.3.5 *Geology and Soils*

The proposed alternatives for NTS would have no adverse impact on geological resources described in section 4.9.2.5. Although a moderate seismic risk exists at NTS, it does not preclude safe construction and operation of the new facilities and would be considered in the design of any new structures. The hazard of volcanic activity is improbable and is not expected to impact the proposed facilities. Construction laydown and parking for the A/D mission would disturb up to 3.2 ha (8 acres) of land. Control measures would be used to minimize construction-related soil erosion. Potential impacts to geology and soils associated with the proposed alternatives at NTS are discussed below.

No Action. Under No Action, DOE would continue current and planned activities at NTS. Any impacts to geology and soils would be independent of and unaffected by the proposed action.

Management Alternatives

Assembly/Disassembly. Construction activities would not affect geological conditions. Designs of the facilities would ensure that they would not be adversely affected by geological conditions.

There are no known active faults that cross the proposed facilities. Based on the seismic history of the area, a moderate seismic risk exists at NTS but should not preclude safe construction and operation of the proposed facilities. The Cane Spring Fault, located approximately 8 km (5 mi) south of the Device Assembly Facility, is regarded as the most probable source for seismic activity in the vicinity of the proposed facilities, although a number of smaller faults are inferred in the alluvial areas of the site and in the Massachusetts Mountain area (DOE 1995i:4-148). The Yucca and Carpetbag Faults, which are located to the north of the proposed facilities, are also potential sources of seismic activity. The location of the proposed facilities would be evaluated at NTS during project-specific studies so that these faults and any associated potential ground rupture would be considered in facilities design. All facilities would be designed for earthquake-generated ground acceleration in accordance with DOE O 420.1 and accompanying safety guides.

Although there is a history of volcanism in the NTS area, volcanic eruptions are improbable (section 4.9.2.5). The most likely danger is from possible ash fall eruptions from the Long Valley area, 241 km (150 mi) to the west-northwest. Lava extrusion from sources at NTS could recur but is highly unlikely. Precursors, such as shallow earthquakes, fumarole activity, and higher groundwater temperatures, provide advance warning of most eruptions; no such activity is currently indicated at NTS or in the immediate vicinity. It is highly unlikely that landslides, sinkhole development, or other nontectonic events would affect project facilities. Slopes and underlying foundation materials are stable (DOE 1995i:4-148). Potential health impacts from accidents associated with geological hazards are discussed in section 4.9.3.9.

The properties and conditions of the soils underlying the proposed project site place no limitations on construction. These same soils would not adversely affect the safe operation of project facilities.

Soils would be impacted by construction and operation of the facilities. The soil disturbance from construction laydown and parking for the new facilities could be as much as 3.2 ha (8 acres). Also, the new building footprint would occupy approximately 4.3 ha (10.6 acres). Disturbance would occur at building, parking, and construction laydown areas, resulting in destruction of the soil profile, and leading to a possible temporary increase in erosion as a result of stormwater runoff and wind action. Soil losses would depend on frequency of storms; wind velocities; size and location of the facilities with respect to drainage and wind patterns; slope, shape, and area of the tracts of ground disturbed; and whether the soil is bare, particularly during the construction period. Appropriate erosion and sediment control measures would be used to minimize soil loss.

Net soil disturbance during operation would be less than for construction, because areas temporarily used for laydown would be restored. Although erosion from stormwater runoff and wind action could occur occasionally during operation, it is anticipated to be minimal.

The storage of strategic reserve pits and HEU apart from the A/D mission at NTS at another DOE site location (an alternative in the Storage and Disposition Program) would have less impacts on geology and soils at NTS because new facilities would not be constructed for storage.

Sensitivity Analysis. The high or low case operation scenario would not affect geology or soils.

Stewardship Alternatives

Proposed National Ignition Facility. The construction and operation of the proposed NIF at NTS would have no adverse impact on geological resources. An estimated 18.2 ha (45 acres) of land in Area 22 would be required for buildings, walkways, building access, and buffer space (see appendix I). Soil impacts during construction would be short term and minor with appropriate standard construction erosion and sediment control measures. Net soil disturbance during operation would be less than for construction because areas temporarily used for laydown would be restored. Seismic risks would be taken into account during construction and operation of NIF.

North Las Vegas Facility

The construction and operation of the proposed NIF at NLVF would have no adverse impact on geological resources. NIF would require about 3.2 ha (8 acres) of open land (see appendix I). Soil impacts during construction would be short term and minor with appropriate standard construction erosion and sediment control measures. The site has been disturbed in the past; therefore the impact due to the construction of NIF would be minor. Net soil disturbance during operation would be less than for construction because areas temporarily used for laydown would be restored. Seismic risks would be taken into account during construction and operation of NIF.

Potential Mitigation Measures. No mitigation measures for stockpile stewardship and management alternatives are anticipated.

4.9.3.6 *Biotic Resources*

The following sections address impacts to terrestrial resources, wetlands, aquatic resources, and threatened and endangered species at NTS. While the A/D Facility would not likely impact biotic resources, construction and operation of the proposed NIF would lead to a loss of terrestrial habitat and could impact the desert tortoise *(Gopherus agassizii)*.

No Action. Under No Action, the stewardship R&D missions described in section 3.2.9 would continue at NTS. This would result in no changes to current biotic resource conditions at the site as described in section 4.9.2.6.

Management Alternatives

Assembly/Disassembly. The existing Device Assembly Facility site would be used for A/D with nonintrusive pit reuse and storage of the strategic reserves of plutonium and uranium. Although some construction would be required, new structures would be built within areas that have already been disturbed. Existing wastewater facilities would be used for the disposal of nonhazardous liquid waste. This includes sewage settling ponds constructed for the Device Assembly Facility that have increased bird use of the Device Assembly Facility area (NT DOE 1995j:1). Direct impacts to the desert tortoise are unlikely; however, traffic associated with A/D has the potential to indirectly impact this species. Mitigation measures would be developed in consultation with the USFWS and could include reducing speed limits on roadways.

The storage of strategic reserve pits and HEU apart from the A/D mission at NTS at another DOE site location (an alternative in the Storage and Disposition Program) would have less impact on biotic resources at NTS because new facilities would not be constructed for storage.

Sensitivity Analysis. Implementation of either the low or high case workload would not change direct impacts to biological resources from those noted above. Indirect impacts to the desert tortoise could change in response to variations in the volume of traffic.

Stewardship Alternatives

Proposed National Ignition Facility

Terrestrial Resources. The proposed NIF would be located within an undeveloped portion of the creosote bush community (figure 4.9.2.6–1). Construction of new facilities would result in the disturbance of 18.2 ha (45 acres) of habitat. Proper erosion and sediment control measures would reduce the potential for disturbance of habitat adjacent to the construction area. Areas disturbed by construction, such as laydown areas and temporary construction parking lots, would be of minimal value to wildlife because of the difficulty in reestablishing a vegetative cover in a desert environment. In addition, introduced plants such as red brome, cheatgrass, and Russian thistle readily invade disturbed areas and delay vegetation by native plants. During construction, animal species within the disturbed area would be either destroyed or displaced depending upon whether they were able to move from the area. For example, reptiles and small mammals, as well as nests and young birds, would likely be destroyed, while larger mammals and birds would be able to leave the area. Wildlife may also be disturbed by the increased level of human activity associated with the project.

Wetlands. The proposed NIF site does not contain, nor is it located near, wetlands; therefore, construction and operation of the proposed facility would not adversely impact this resource.

Aquatic Resources. The proposed NIF site does not contain, nor is it located near, aquatic resources; therefore, construction and operation of the proposed facility would not adversely impact this resource.

Threatened and Endangered Species. Since the proposed NIF site is located in the southern portion of NTS, the potential exists for the desert tortoise to be impacted by construction and operation of the proposed facility and the associated 3.2-km (2.0-mi) underground water supply pipeline. Vehicular traffic associated with construction and operation could also pose a threat to the tortoise. Groundwater levels in Devils Hole are not expected to change due to operation of the proposed NIF; thus, no impacts to the Devils Hole pupfish (*Cyprinodon diabolis*) are expected.

North Las Vegas Facility

Terrestrial Resources. An environmental assessment conducted for the Nevada Support Facility (that would be located in the same general area as the proposed NIF at NLVF) concluded that no significant impacts to ecological resources would occur from construction and operation of that facility (see appendix I). That conclusion would also be applicable to the proposed NIF if it should be located at NLVF.

Construction of the proposed NIF at NLVF would occur within a 3.2-ha (8-acre) area of disturbed soil with scattered grasses and forbs. This area is of negligible value to wildlife. Landscaping around the new NIF buildings could add a minor amount of lawn with scattered shrubs and trees that could provide habitat for wildlife species adapted to suburban or industrial conditions. The general types of impacts that could result from proposed NIF construction at NLVF would be similar to those discussed for LLNL (see appendix I).

Wetlands and Aquatic Resources. The proposed NIF location at NLVF does not contain, nor is it located near, wetlands or surface water resources; therefore, construction and operation of the proposed NIF at NLVF would not be expected to adversely affect such resources.

Threatened and Endangered Species. Although NLVF is located within the range of the desert tortoise, it is not expected that tortoises would occur at the site of the proposed NIF. The proposed location is within a fenced area and does not contain adequate cover habitat for tortoises; therefore, no impacts to desert tortoises would be expected. Impacts to other listed species would not be expected because NLVF does not contain suitable habitat for listed species whose ranges encompass the facility.

Potential Mitigation Measures. For facilities located at NTS, certain mitigation measures would help lessen impacts to biotic resources. Minimization of the area to be disturbed and implementation of a soil erosion and sediment control plan would help to lessen short- and long-term impacts to terrestrial species and habitats. Disturbance to wildlife living in areas adjacent to facilities may be minimized by preventing workers from entering undisturbed areas. It may be necessary to survey disturbed areas for the nests of migratory birds prior to construction and to avoid clearing operations during the breeding season.

If any threatened or endangered species appear in disturbed areas, specific mitigation measures would be developed in conjunction with the USFWS. A Biological Opinion concerning the desert tortoise has been issued by the USFWS covering current projects (NT DOI 1992b). Recommended mitigation measures included providing worker training, putting restrictions on vehicle speeds and off-road movement, conducting clearance surveys prior to surface disturbance, providing stop work authority if tortoises are found within work areas, removing tortoises from trenches, landfills, and treatment ponds, inspecting trenches, and having biologists present when heavy equipment is in use. Similar recommendations would be considered for the proposed NIF. No mitigation measures would be required if the proposed NIF was located at the NLVF site.

4.9.3.7 *Cultural and Paleontological Resources*

For the discussion of impacts, the term cultural resources includes prehistoric, historic, and Native American resources. Cultural and paleontological resources may be affected directly through ground disturbance, building modifications, visual intrusion of the project to the historic setting or environmental context of historic sites, visual and audio intrusions to Native American resources, reduced access to traditional use areas, and unauthorized artifact collecting and vandalism. Some NRHP-eligible prehistoric and historic resources may be affected by the proposed action. Some Native American resources may be affected. Paleontological remains with high research potential may exist at NTS. Site-specific surveys and evaluations would be conducted in conjunction with tiered NEPA documentation.

No Action. Under No Action, DOE would continue the existing and planned missions of NTS described in section 3.2.9. Any impacts to cultural or paleontological resources from these missions would be independent of and unaffected by the proposed action.

Management Alternatives

Assembly/Disassembly. This alternative would require upgrades to existing facilities and new facility construction. New structures would be located adjacent to the existing Device Assembly Facility in Area 6. Cultural resources surveys were conducted around the proposed A/D site in 1984. No significant archaeological sites were found. Some of the buildings to be modified may be NRHP eligible. The area may contain resources important to Native American groups. Some paleontological resources with high research potential may exist at NTS. Project-specific surveys and evaluations would need to be conducted. Any project-related effects would be addressed in tiered NEPA documentation.

The storage of strategic reserve pits and HEU apart from the A/D mission at NTS at another DOE site location (an alternative in the Storage and Disposition Program) would not affect cultural and paleontological resources at NTS.

Sensitivity Analysis. The A/D high case scenario would involve the construction of a larger facility than that proposed for the base case. No prehistoric or historic sites are known to exist in the area, but it is possible that some Native American and paleontological resources may be affected during the construction of a larger facility because of the increase in disturbed area. Project-specific surveys and evaluations would be conducted. Any project-related effects would be addressed in tiered NEPA documentation. The base case production facility would be able to accommodate the low case production scenario without further modification.

Stewardship Alternatives

Proposed National Ignition Facility. Approximately 18.2 ha (45 acres) would be required for this alternative in Area 22. Few cultural and no paleontological resources have been identified in the proposed NIF location. No Native American resources have been identified in the proposed area.

North Las Vegas Facility

Construction and operation of the proposed NIF would have no effect on archaeological sites or historic structures that are listed on or eligible to be listed on the NRHP, important paleontological remains, or Native American cultural resources.

Potential Mitigation Measures. If NRHP-eligible sites cannot be avoided though project design or siting, and would result in adverse effects, then a Memorandum of Agreement would need to be negotiated among DOE, the Nevada SHPO, and the

Advisory Council on Historic Preservation. The Memorandum of Agreement would formalize mitigation measures agreed to by these consulting parties. Mitigation measures could include describing and implementing intensive inventory and evaluation studies, data recovery plans, site treatments, and monitoring programs. The appropriate level of data recovery for mitigation would be determined through consultation with the Nevada SHPO and the Advisory Council on Historic Preservation in accordance with Section 106 of the *National Historic Preservation Act*. Mitigation measures for specific NRHP-eligible sites would be identified during tiered NEPA documentation.

If Native American resources cannot be avoided through project design or siting, then acceptable mitigation measures to reduce project effects on them would be determined in consultation with the affected Native American groups. In accordance with the *Native American Graves Protection and Repatriation Act* and the *American Indian Religious Freedom Act*, such mitigations may include, but would not be limited to, appropriately relocating human remains, planting vegetation screens to reduce visual or noise intrusion, increasing access to traditional use areas during operations, or transplanting or harvesting important Native American plant resources.

Because scientifically important buried paleontological materials could be affected, paleontological monitoring of construction activities and data recovery of fossil remains would be appropriate mitigation measures.

4.9.3.8 *Socioeconomics*

No Action. Under No Action, the existing stewardship R&D missions would remain operational at NTS. No new employment would be generated, thus, no workers would in-migrate to the region. Projected regional economic and employment levels, population and housing changes, and public finance characteristics are presented in appendix D.

Regional Economy and Employment. Total employment in the regional economic area is projected to increase by about 3 percent annually between 1995 and 2000, and reach 701,400 in 2000. Long-range projections show employment growth averaging 1.4 percent annually from 2000 to 2020, then slowing to less than 1 percent through 2030, when employment is projected to total 932,400. No Action employment at NTS is projected to be 8,019 in 2005. Unemployment in the regional economic area was 6.1 percent in 1994 and is expected to remain at that level into the near future. Per capita income is projected to increase from approximately $22,083 in 1995 to $33,817 in 2030.

Population and Housing. Annual ROI county and city population and housing growth is projected to average about 3 percent over the period 1995 to 2000 and then slow to approximately 1.1 percent between 2000 and 2030. The ROI population is projected to increase from 962,800 in 1995 to 1,474,400 in 2030. During the same period, the total number of housing units is projected to increase from 392,300 to 600,700.

Public Finance. Between 2000 and 2005 all ROI county, city, and school district total revenues are projected to increase at an annual average of 1.8 percent or less. Total expenditures are projected to increase at an annual average of less than 1.6 percent during the same period. These rates of increase should continue until 2030.

Management Alternatives

Assembly/Disassembly. This alternative would involve the transfer of the weapons A/D mission from Pantex to NTS. In addition, nonintrusive pit reuse and storage of strategic reserves of plutonium and uranium would be collocated with the weapons A/D Facility. Under a second option, storage of the strategic reserve material would be removed from this alternative. However, the socioeconomic impacts associated with either option during operation would be identical because strategic material reserve storage would not require additional workers.

The storage of strategic reserve pits and HEU at another DOE site apart from the A/D mission at NTS (an alternative in the Storage and Disposition Program) would not change the A/D operation employment requirements. Resulting changes to the regional economy would be the same as from the A/D mission. If strategic reserve pits and HEU are stored at another site, no new storage facilities would be constructed at NTS. Therefore, construction worker requirements would be slightly less than discussed below. The impact on the regional economy during the construction period would be negligible.

Regional Economy and Employment. Both the construction and operation of the facility would generate small benefits to the regional economy. During peak construction a total of 1,284 jobs (662 direct and 622 indirect) would be generated. Regional unemployment would decrease by 0.2 percent, though the per capita income would remain essentially unchanged.

A total of 2,253 jobs (1,093 direct and 1,160 indirect) would be generated during operation of the facility. Changes to unemployment levels and per capita income due to operation would be less than 1 percent. These changes are shown in figure 4.9.3.8–1.

Population and Housing. During the operation period, the region's population would increase slightly over the No Action alternative. However, given the very strong growth in population, at both the regional and ROI level, this population increase would be imperceptible and projected housing vacancies would be sufficient to meet the increased demand. Population changes are shown in figure 4.9.3.8–2.

Public Finance. Construction of the A/D Facility would not require in-migrating workers. Therefore, changes to local finances compared to No Action projections would be due to income increases and would be negligible.

Changes in revenues and expenditures compared to No Action projections due to operation of the A/D Facility at NTS are shown in figure 4.9.3.8–3. At full operation, the total ROI revenues and expenditures would increase above No Action projections by approximately 0.5 and 0.4 percent, respectively. Although the majority of local jurisdictions would experience increases of less than 1 percent, Clark County's revenues and expenditures are expected to increase by nearly 1.3 and 0.8 percent, respectively.

Sensitivity Analysis. Construction employment requirements for the high or low case A/D mission at NTS are the same as for the base case surge discussed above. Therefore, the socioeconomic impacts on the region from construction would be the same. During full operation, however, employment requirements for the base case surge would exceed employment needs for the high and low cases. Under the base case surge scenario, additional workers would be needed to fulfill the labor requirements of a three-shift operation while both the high and low case scenarios involve single-shift operation. The region would still benefit economically from the high or low case, but on a smaller scale than from the base case surge.

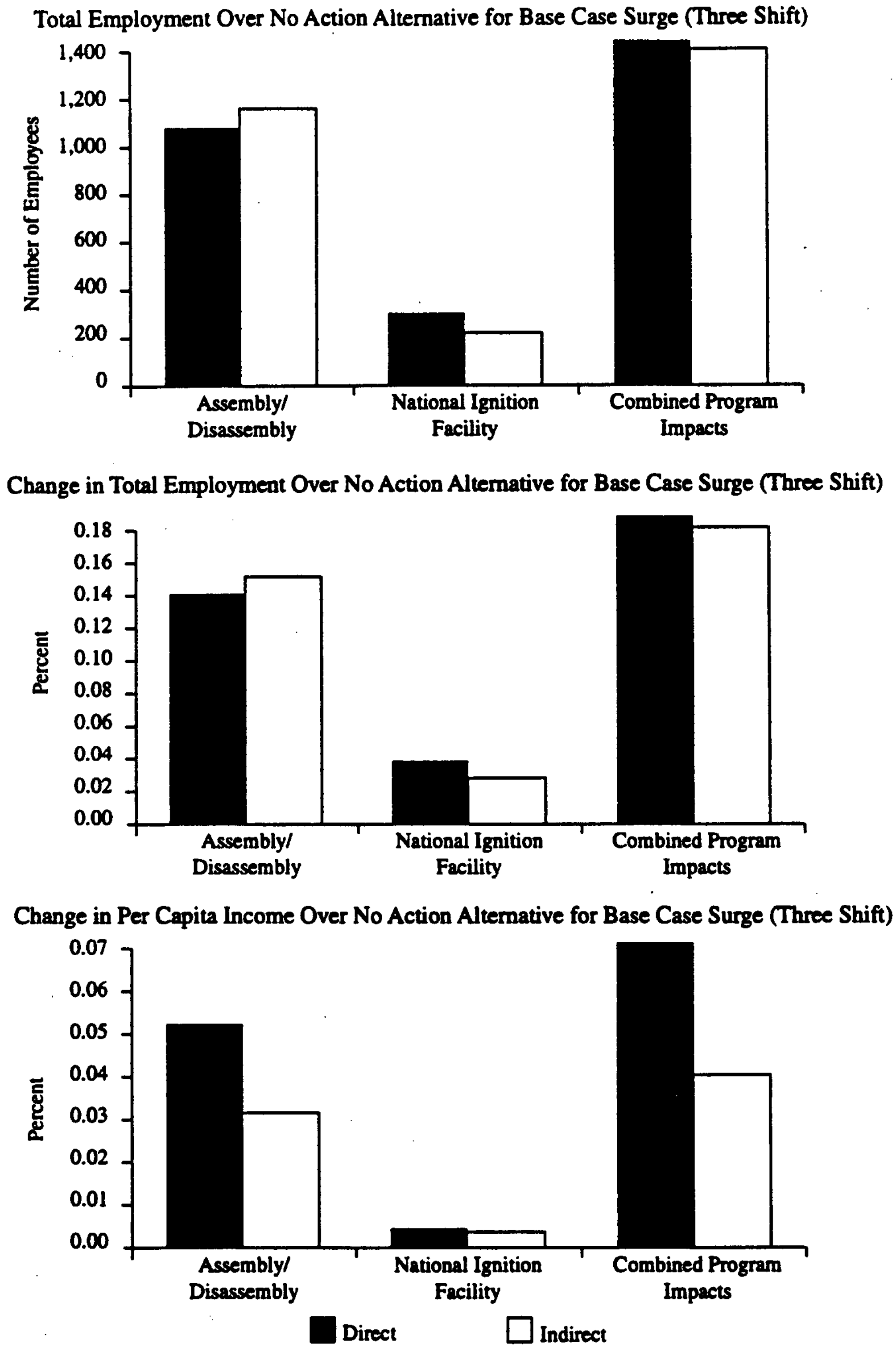
Stewardship Alternatives

Proposed National Ignition Facility. The following is a summary of the socioeconomic effects of construction of the proposed NIF at NTS and NLVF. See appendix I for a more detailed, project-specific discussion.

Regional Economy and Employment. Construction of the proposed NIF at NTS or NLVF would require 280 workers during the peak year of construction and would generate an additional 1,360 indirect jobs in the regional economic area. Employment for operation would begin phasing in as the construction phase neared completion. Operation of the facility would require 330 direct workers and would generate an additional 290 indirect jobs in the regional economic area. Construction activities would reduce the unemployment by up to 0.2 percent while operations would generate too few jobs to affect the unemployment rate.

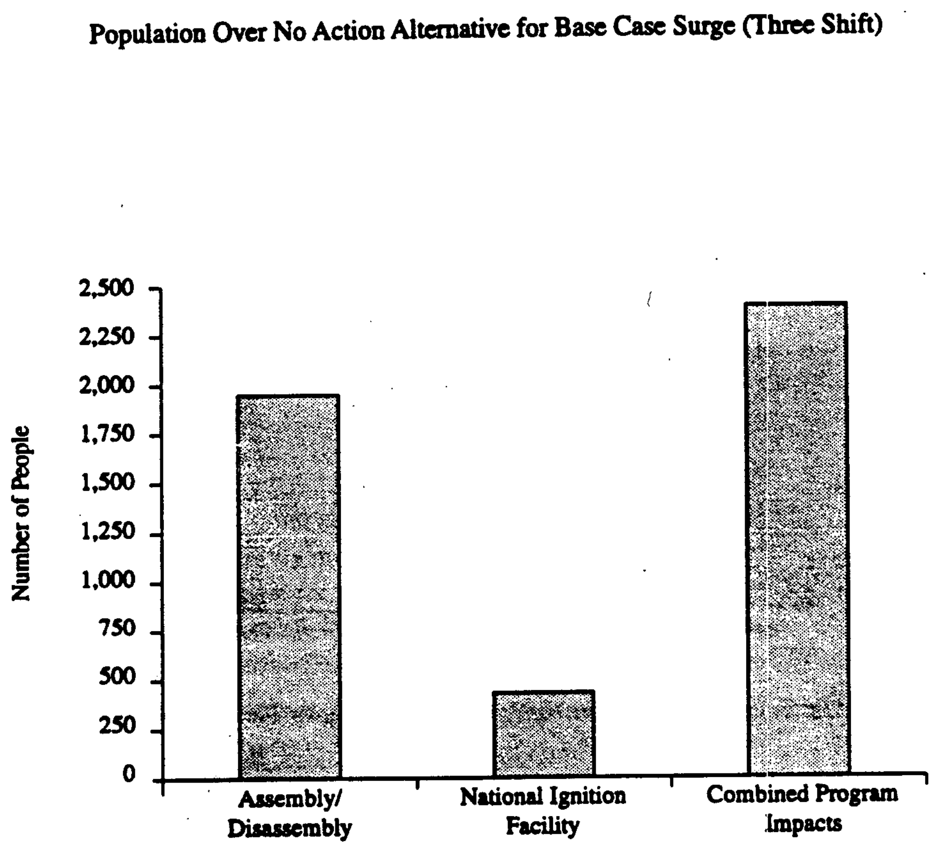
Population and Housing. Both construction and operation of the facility would require workers and their families to in-migrate to the NTS ROI. This in-migration would cause a slight increase in the population of the ROI. Because the additional housing demand arising from construction of NIF would absorb only 2 percent of the projected vacant housing, there would be no impacts to the rental or nonrental housing markets.

Public Finance. Both revenues and expenditures would increase as a result of the construction and operation of the proposed NIF at NTS or NLVF. Increases due to construction would peak in 1998 and then decline as construction neared completion in 2002. Increases due to operation of the facility would peak in 2003 and continue through the duration of NIF operation.



Note: No Action projections are baseline for comparing proposed alternatives; base case surge does not apply to NIF operation.
Source: Socio 1996b.

FIGURE 4.9.3.8–1.—*Employment and Income Changes Resulting from Stewardship and Management Alternatives in the Nevada Test Site Regional Economic Area, 2005.*



Note: No Action projections are baseline for comparing proposed alternatives; base case surge does not apply to National Ignition Facility operation.
Source: Socio 1996b.

FIGURE 4.9.3.8–2.—*Population Changes Resulting from Stewardship and Management Alternatives in the Nevada Test Site Region of Influence*, 2005.

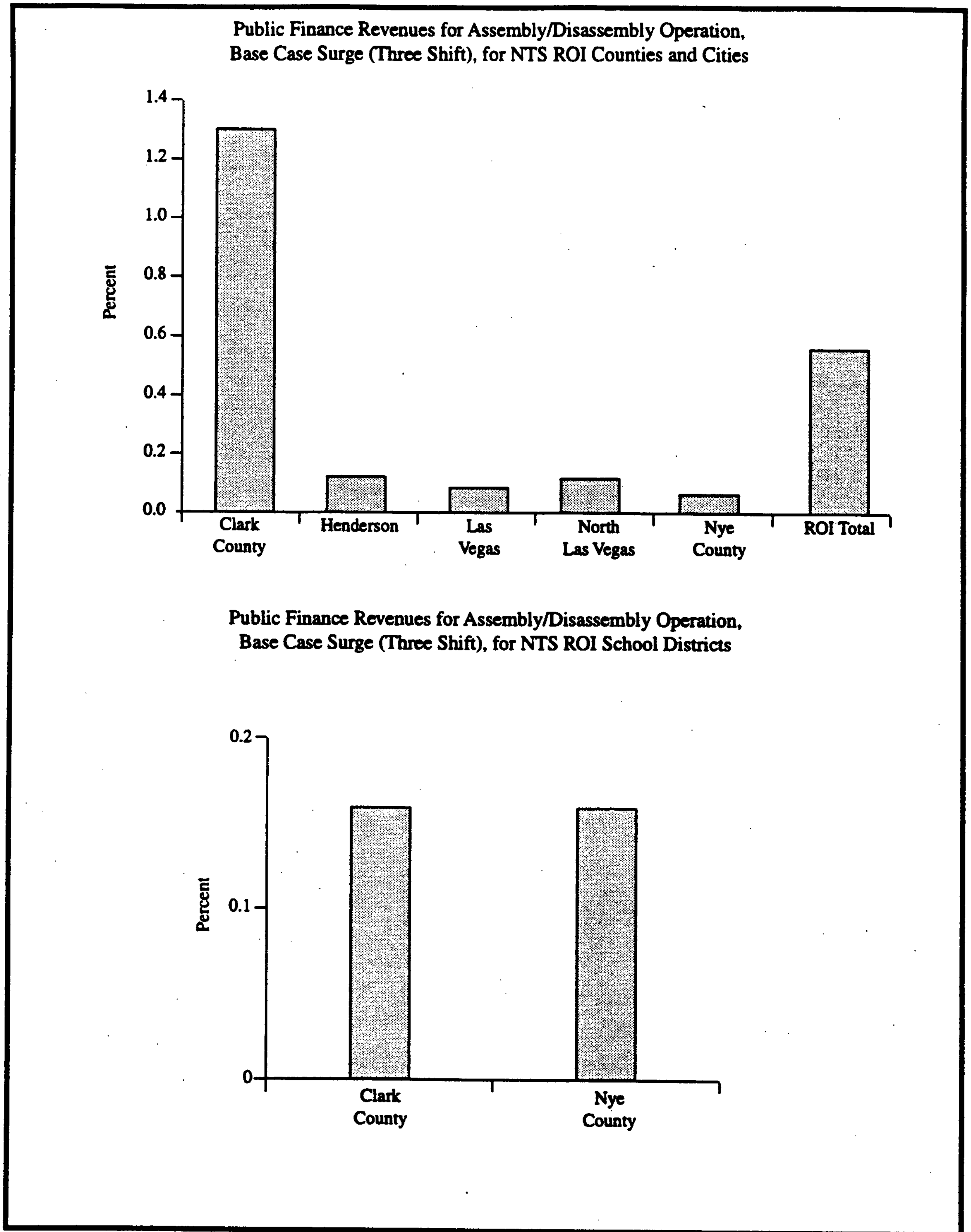
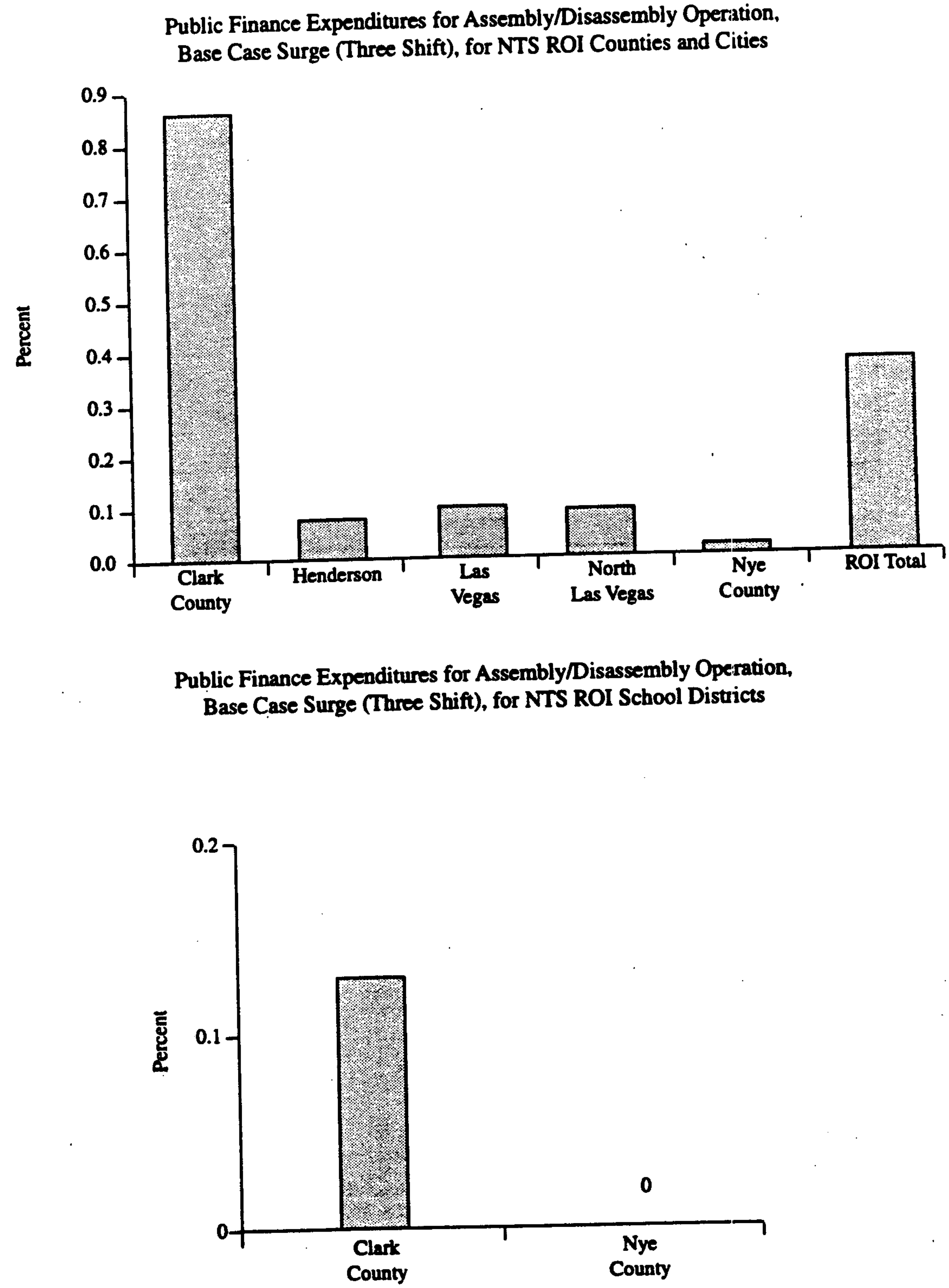


FIGURE 4.9.3.8–3.—***Percent Change from No Action Alternative in County, City, and School District Total Revenues and Expenditures in the Nevada Test Site Region of Influence with Assembly/Disassembly, Base Case Surge, 2005*** **[Page 1 of 2].**



Source: Socio 1996b.

FIGURE 4.9.3.8–3.—*Percent Change from No Action Alternative in County, City, and School District Total Revenues and Expenditures in the Nevada Test Site Region of Influence with Assembly/Disassembly, Base Case Surge 2005* [Page 2 of 2].

4.9.3.9 *Radiation and Hazardous Chemical Environment*

This section describes the radiological and hazardous chemical releases and their associated impacts that could result from No Action and the proposed alternatives at NTS. Within this section, impacts resulting from the base case scenario are quantitatively discussed, and a sensitivity analysis of the high and low case scenarios is qualitatively discussed.

Summaries of the prevailing radiological impacts at NTS to the public associated with normal operation are presented in table 4.9.3.9–1, impacts to workers at NTS are presented in table 4.9.3.9–2, and at NLVF in table 4.9.3.9–3. Accident radiological impacts are presented in tables 4.9.3.9–4 through 4.9.3.9–6. Table 4.9.3.9–7 presents the radiological risks and consequences of transporting tritium targets from manufacturing facilities to NLVF. The impact assessment methodology is described in section 4.1.9, and further supplementary methodological information is presented in appendixes E and F.

Normal Operation. There would be no radiological releases during the construction or modification of any facilities to support the Stockpile Stewardship and Management Program; however, limited hazardous chemical releases (e.g., small spills of diesel fuel from equipment refueling) would occur because of construction activities for the base case scenario and may increase slightly for the high case scenario. The concentration of these releases is expected to be well within the regulated exposure limits and would not result in any adverse health effects.

Water from processes containing hazardous chemicals is not discharged directly into surface water or groundwater that serves as potable water. Process and sanitary waste water that may contain hazardous chemicals is treated before discharge to state-permitted sewage lagoons. Water quality would not be adversely affected. Thus, the primary pathway considered for the public and the onsite worker is the air pathway.

For normal operation at NTS, all possible hazardous chemicals were examined for further analysis based on their toxicity, concentration, and frequency of use. The HI is a summation of the HQ for all chemicals. The HQ is the value used as an assessment of noncancer toxic effects of chemicals (e.g., kidney or liver disfunction). It is independent of cancer risk, which is calculated only for those chemicals identified as carcinogens. The HI was calculated for the No Action chemicals and all alternative chemicals proposed to be added (the increment) at the site to yield cumulative levels for the site. An HI of ≤ 1.0 indicates that all noncancer exposure values meet OSHA standards; if the cancer risk is $\leq 1 \times 10^{-6}$ (the default value, not a regulatory standard), no further analysis is indicated. A cancer risk of $\leq 1 \times 10^{-6}$ is considered acceptable by EPA (40 CFR 300.430) because this incidence of cancers cannot be distinguished from the cancer risk for an individual member of the population.

Information pertaining to OSHA-regulated exposure limits and toxicity profiles for all hazardous chemicals described in this PEIS may be found in the *Chemical Health Effects Technical Reference* (TTI 1996b).

No Action

Radiological Impacts. Radiological impacts to the public resulting from the No Action alternative are presented in table 4.9.3.9–1. These impacts are representative of the aggregated total which is estimated to exist from all future baseline operational contributions. Total impacts are provided to compare with applicable regulations governing total site operations. To place doses to the public from the No Action alternative into perspective, comparisons are made to natural background radiation. As shown in table 4.9.3.9–1, the total dose to the maximally exposed member of the public from annual total site operations is within radiological limits and would be 4.8×10^{-3} mrem for the No Action alternative. The annual population dose within 80 km (50 mi) in 2030 would be 0.012 person-rem.

Total site doses to onsite workers from normal operation for the No Action alternative are presented in table 4.9.3.9–2. The estimated annual dose to the entire facility workforce for this alternative would be 21 person-rem. The presented noninvolved worker impacts were not modeled because certain site-specific information was unavailable.

TABLE 4.9.3.9–1.—*Potential Radiological Impacts to the Public Resulting from Normal Operation of Stockpile Stewardship and Management Alternatives at Nevada Test Site*

Affected Environment	No Action Total Site	Assembly/Disassembly[a] Three-Shift Operation Total Site[b]	National Ignition Facility Total Site[b]
Maximally Exposed Individual (Public)			
Atmospheric Release			
Dose[c] (mrem/yr)	4.8×10^{-3}	4.8×10^{-3}	5.2×10^{-3}
Percent of natural background[d]	1.6×10^{-3}	1.6×10^{-3}	1.7×10^{-3}
25-year fatal cancer risk	6.1×10^{-8}	6.1×10^{-8}	6.5×10^{-8}
Liquid Release			
Dose[c] (mrem/yr)	0	0	0
Percent of natural background[d]	0	0	0
25-year fatal cancer risk	0	0	0
Atmospheric and Liquid Releases			
Dose[c] (mrem/yr)	4.8×10^{-3}	4.8×10^{-3}	5.2×10^{-3}
Percent of natural background[d]	1.6×10^{-3}	1.6×10^{-3}	1.7×10^{-3}
25-year fatal cancer risk	6.1×10^{-8}	6.1×10^{-8}	6.5×10^{-8}
Population Within 80 Kilometers			
Atmospheric and Liquid Releases in 2030			
Dose (person-rem)	0.012	0.012	0.013
Percent of natural background[d]	1.8×10^{-4}	1.8×10^{-4}	1.9×10^{-4}
25-year fatal cancers	1.5×10^{-4}	1.5×10^{-4}	1.6×10^{-4}

[a] Includes nonintrusive pit reuse and storage of the strategic reserve of plutonium and uranium. Annual incremental doses of 3.5×10^{-6} mrem to the maximally exposed individual and 3.1×10^{-6} person-rem to the population are incurred from this alternative.

[b] Includes impacts from No Action.

[c] The applicable radiological limits for an individual member of the public from total site operations are 10 mrem/yr from the air pathways, 4 mrem/yr from the drinking water pathway, 100 mrem/yr from all pathways combined (DOE Order 5400.5).

[d] Natural background radiation levels to the average individual is 313 mrem/yr; to the population within 80 km in the year 2030 is 6,800 person-rem.

Source: NT DOE 1994b; PX MH 1995a; appendix I.

Based on the radiological impacts associated with normal operation under the No Action alternative, all resulting doses would be within radiological limits and are well below levels of natural background radiation. The associated risks of adverse health effects to the public and to workers would be small.

Hazardous Chemical Impacts. Hazardous chemical impacts to the public resulting from normal operation under No Action at NTS are presented below. Analyses used to support the values presented in this section are provided in appendix table E.3.4–29. This PEIS does not purport to provide the level of detail needed to go beyond a conservative screening process for hazardous chemicals. As such, the analysis in this PEIS for the No Action alternative should not be relied upon as a basis for judging the sites as having a hazardous chemical health concern. The model used to calculate HI and cancer risk in this PEIS only establishes a baseline for comparison of alternatives among sites. The baseline is then used to determine the extent by which each alternative adds or subtracts from the No Action HI and cancer risk to the public at each site.

No hazardous chemical emissions are reported for operations with the No Action alternative at NTS. Therefore, the HI for the maximally exposed member of the public would be zero, and the cancer risk would be zero. The HI for the onsite worker would be zero, and the cancer risk would be zero.

The HIs for the public and for the onsite worker are within acceptable health levels. The cancer risks to the public and to the onsite worker are within the EPA default value of 1×10^{-6}.

TABLE 4.9.3.9–2.—*Potential Radiological Impacts to Workers Resulting from Normal Operation of Stockpile Stewardship and Management Alternatives at Nevada Test Site*

Affected Environment	No Action	Assembly/Disassembly Three-Shift Operation	National Ignition Facility
Involved Workforce[a]			
Average worker dose[b] (mrem/yr)	NA	10	30
25-year fatal cancer risk	NA	$1.0x10^{-4}$	$3.0x10^{-4}$
Total dose (person-rem/yr)	NA	2.6	8.0
Noninvolved Workforce[c]			
Average worker dose[b] (mrem/yr)	2.6	2.6	2.6
25-year fatal cancer risk	$2.6x10^{-5}$	$2.6x10^{-5}$	$2.6x10^{-5}$
Total dose (person-rem/yr)	21	21	21
Total Site Workforce[d]			
Dose (person-rem/yr)	21	24	29
25-year fatal cancers	0.21	0.24	0.29

[a] The involved worker is a worker associated with operations of the management and stewardship facilities. The estimated number of badged involved workers is 267 for NIF, and 260 for the A/D alternative.

[b] The radiological limit for an individual worker is 5,000 mrem/yr (10 CFR 835).

[c] The noninvolved worker is a worker onsite but not associated with operations of the management and stewardship facilities. The estimated number of badged noninvolved workers at NTS is 8,019 for NIF and 8,019 for the A/D alternative.

[d] The total site workforce is the sum of the number of involved and noninvolved workers. The estimated number of badged workers in the total site workforce at NTS is 8,286 for NIF; 8,279 for the A/D alternative; and 8,019 for No Action.

Note: NA - not applicable.

Source: DOE 1993n:7; PX MH 1995a; appendix I.

Management Alternatives

Assembly/Disassembly

Radiological Impacts. Radiological impacts to the public resulting from the A/D mission are presented in table 4.9.3.9–1. These impacts are representative of the aggregated total which is estimated to exist from all future baseline operational NTS contributions and from three-shift base case A/D operations at the site. Total impacts are provided to compare with applicable regulations governing total site operations. To place doses to the public from this alternative into perspective, comparisons are made to natural background radiation. As shown in table 4.9.3.9–1, the total dose to the maximally exposed member of the public from annual total site operations is within radiological limits and would be $4.8x10^{-3}$ mrem for this alternative. The annual population dose within 80 km (50 mi) in 2030 would be 0.012 person-rem. The impacts incurred from three-shift base case operations are negligible, when compared to the small totals which exist for No Action (see No Action column in table 4.9.3.9–1).

Total site doses to onsite-workers from normal operation for the A/D mission alternative are presented in table 4.9.3.9–2. The average annual dose to involved workers for this alternative would be 10 mrem. The dose to the entire facility workforce (involved workforce) would be 2.6 person-rem. As stated in the methodology section 4.1.9, all worker doses were referenced from the Radiation Exposures for DOE and DOE Contractor Employees 1992 Database which reports doses for similar types of operations; the presented noninvolved worker impacts were not modeled because certain site-specific information was unavailable.

The contributions to radiological impacts from the storage of the strategic reserve at NTS is included within the A/D mission alternative. Radiological impacts incurred from storage of the strategic reserve are extremely small; therefore, total site impacts would not be affected if the strategic reserve was not located at NTS.

Hazardous Chemical Impacts. Hazardous chemical impacts for the public and for the onsite worker resulting from normal operation due to the A/D mission with nonintrusive pit reuse and storage of the strategic reserve of plutonium and uranium at NTS are presented below. The HI and cancer risk would remain constant over 25 years of operation provided exposures remain the same. All analyses to support the values presented in this section are provided in appendix table E.3.4–30.

The incremental HI for the maximally exposed member of the public would be 6.30×10^{-5} and the incremental cancer risk would be 2.14×10^{-12} as a result of operating the A/D mission at NTS. The incremental HI to the onsite worker would be 0.0177, and the incremental cancer risk would be 3.35×10^{-9} as a result of operating the A/D mission at NTS.

Total site operations and the incremental effect of the A/D mission would result in HIs for the public and the onsite worker that are within acceptable health levels. The cancer risks to the public and the onsite worker are within the EPA default value of 1×10^{-6}.

It is likely that the options of not including storage of the strategic reserve of uranium in the A/D alternative at NTS would not increase and may slightly decrease the emissions of hazardous chemicals. Therefore, it is not expected that there would be any increase in HI or cancer risk impacts for the public or for the onsite worker.

Sensitivity Analysis. Radiological impacts may be subject to certain degrees of variance resulting from either high or low case operation. For the high case scenario, total impacts to both the public and the worker would be similar to three-shift base case operation. For the low-case scenario, total impacts to the public would be comparable to the No Action and the A/D mission alternatives, since the impacts between the alternatives are essentially indistinguishable. Impacts to the site workforce would be expected to fall within the increment (range) projected between the No Action and the A/D alternative (i.e., less than 2.6 person-rem/year increase to the total site workforce).

Based on the radiological impacts associated with normal operation of this alternative, all resulting doses would be within radiological limits and are well below levels of natural background radiation. The associated risks of adverse health effects to the public and to workers would be extremely small.

Operations under the low and high case scenarios for the A/D mission are expected to generate only minimal additional hazardous chemical emissions at NTS. No adverse impacts to HIs and cancer risks for the public and the onsite worker are expected under either scenario.

Stewardship Alternatives

Proposed National Ignition Facility

Radiological Impacts. Radiological impacts to the public resulting from normal operation of the proposed NIF for the enhanced option scenario are presented in table 4.9.3.9–1. These impacts are representative of the aggregate total which is estimated to exist from all future baseline operational NTS contributions and from enhanced option operations of NIF at the site. Total impacts are provided to compare with applicable regulations governing total site operations. To place doses to the public from this alternative into perspective, comparisons are made to natural background radiation. As shown in table 4.9.3.9–1, the total dose to the maximally exposed member of the public from annual total site operations is within radiological limits and would be 5.2×10^{-3} mrem for this alternative. The annual population dose within 80 km (50 mi) in 2030 would be 0.013 person-rem.

Total site doses to onsite workers from normal operation of NIF are presented in table 4.9.3.9–2. The average annual dose to involved workers for this alternative would be 30 mrem. The dose to the entire facility workforce (involved workforce) would be 8.0 person-rem. The presented total dose to noninvolved workers was not modeled because certain site-specific information was unavailable.

Based on the radiological impacts associated with normal operation of this alternative, all resulting doses would be within radiological limits and are well below levels of natural background radiation. The associated risks of adverse health effects to the public and to workers would be small.

Hazardous Chemical Impacts. No hazardous chemical impacts are expected from operation of NIF (see appendix I). Therefore, HI and cancer risk impacts were not calculated nor assessed.

Potential Mitigation Measures. Radioactive airborne emissions to the general population and onsite exposures to workers could be reduced by implementing the latest technology for process and design improvements. For example, to reduce public exposure to emissions, improved building and work area control methods could be used to remove radioactivity from the releases to the environment. Similarly, the use of remote, automated, and robotic production methods are examples of techniques that are being developed which would reduce worker exposure (see section 3.5.4). Mitigation measures for chemical hazards are not anticipated.

North Las Vegas Facility

This section describes potential radiological and hazardous chemical impacts resulting from normal operation of the proposed NIF at NLVF. Methods, data, and assumptions used in estimating impacts are presented in appendix I.

Normal Operation. The general public around NLVF and workers at NLVF may be exposed to small quantities of radionuclides released and radiation emitted from routine NIF operations; however, the expected level of radioactive releases and radiation emissions from routine NIF operations is well within regulatory limits. No impacts from hazardous chemicals should occur because only minute quantities of hazardous VOCs are expected to be emitted during routine NIF operation. Impacts from routine transportation of tritium targets are also not expected because there are no detectable levels of radiation outside the package carrying the low-energy beta-emitting tritium targets. Table 4.9.3.9–3 summarizes the potential impacts of radiation exposures from the conceptual design option and the enhanced option of NIF operations at NLVF.

Impacts to the Public. For the enhanced option, the estimated radiation dose to a maximally exposed member of the public located at about 210 m (690 ft) west of NIF is 0.6 mrem/yr, which is much less than the dose limit of 100 mrem/yr resulting from all pathways combined (DOE Order 5400.5). The likelihood of the maximally exposed individual contracting a fatal cancer is 1 in 130,000 for the entire operational life of NIF (dose/yr x 30 yr x fatal cancer risk factor). Estimated radiation dose to the surrounding public is 0.6 person-rem/yr; no cancer fatalities would be expected to occur in the public for the entire proposed NIF operations at NLVF. For the conceptual design option, estimated radiation impacts would be one-third the impacts from the enhanced option. No adverse health effects would result.

Impacts to Workers. In addition to the radionuclides, the general NLVF workers outside NIF could be exposed to direct radiation resulting from high-yield experiments at NIF. For the Enhanced Option, the estimated radiation dose to these non-NIF workers at

TABLE 4.9.3.9–3.—*Potential Radiological Impacts from Normal Operation of the Proposed National Ignition Facility at North Las Vegas Facility*

Receptor	Conceptual Design Option	Enhanced Option
Workers Onsite		
Dose (person-rem/yr)		
Non-NIF workers	0.02	0.07
NIF workers	10.0	10.0
30-year fatal cancers	0	0
Maximally Exposed Individual		
Dose (mrem/yr)	0.2	0.6
Percent of natural background	0.06	0.2
30-year fatal cancer probability	2.0×10^{-6}	8.0×10^{-6}
Population Within 80 Kilometers		
Dose (person-rem/yr)	0.2	0.6
Percent of natural background	7.0×10^{-5}	2.0×10^{-4}
30-year fatal cancers	0	0

Source: Appendix I.

NLVF is 0.07 person-rem/yr. No cancer fatalities would be expected to occur in workers involved with NIF operations at NLVF. For the conceptual design option, estimated radiation impacts are about three times lower than those of the enhanced option, and carry an extremely low risk of adverse health effects.

Potential radiation exposures inside NIF would be kept as low as reasonably achievable through facility design and administrative controls. The design objective of NIF is to keep radiation workers' doses to less than 500 mrem/yr. On average, a NIF worker would receive approximately 30 mrem/yr.

Facility Accidents. The proposed actions have the potential for accidents that may impact the health and safety of workers and the public. The potential for and associated consequences of reasonably foreseeable accidents that have been evaluated are summarized in this section and described in more detail in appendix F. The methodology used in the assessment is described in section 4.1.9. A list of accidents reviewed for applicable accident data is provided in appendix table F.1.1–1. The potential impacts from accidents, ranging from high-consequence/low-probability to low-consequence/high-probability events, have been evaluated in terms of potential cancer fatalities that may result for noninvolved workers and the public. The risk of cancer fatalities has also been evaluated to provide an overall measure of accident impacts and is calculated by multiplying the accident annual frequency (or probability) of occurrence by the consequences (number of cancer fatalities). A figure is also provided showing the risk of latent cancer fatalities in the population within 80 km (50 mi) that may result from accidents for the alternatives. Specifically, the curves in each figure show the probability (vertical axis) that the number of cancer fatalities in the offsite population within 80 km (50 mi) (horizontal axis) will be exceeded. The curves do reflect the probability of the accident.

In addition to the potential impacts to noninvolved workers and the offsite population, there are potential impacts to involved workers who would be located in the facilities associated with the proposed action. Quantitative statements of these impacts cannot be made until design details are developed further, at which time the number and location of facility workers, and protective and mitigating features can be estimated to support detailed accident impact analyses; however, depending on the type of accident, facility workers in close proximity to the point of the accident could receive high levels of exposure to radiation with potentially fatal impacts.

There are no strategic reserves of uranium or plutonium presently at NTS. Therefore, there are no risks of accidents to workers or the public that can be attributed to the strategic movement of reserves away from NTS.

No Action. Under the No Action alternative, stewardship R&D would continue to be performed at NTS with no changes to facilities and operations. Under existing conditions, potential accidents and their consequences have been addressed in facility safety documentation according to requirements in DOE orders.

Management Alternatives. This section provides accident information for A/D, nonintrusive pit modification, storage of strategic plutonium reserves, and storage of strategic uranium reserves.

Assembly/Disassembly. A set of potential accidents has been postulated for the A/D alternative for which there may be releases of radioactive materials or other hazardous effects that may impact onsite workers and the offsite population. The potential accidents analyzed are described in appendix F. The probability distribution showing the range of probable cancer fatalities that may result for the composite set of accidents identified in appendix F is shown in figure 4.9.3.9–1. For example, the probability of an A/D accident causing more than 10 cancer fatalities is approximately 10^{-6} per year. The curve reflects the probability of the accidents occurring. The impacts for the composite set of accidents and their consequences are shown in table 4.9.3.9–4. If an accident were to occur, there would be an estimated 4.4×10^{-5} cancer fatalities in the population within 80 km (50 mi) of the site. A noninvolved worker located 1,000 m (3,281 ft) from the accident would have an increased likelihood of cancer fatality of 2.7×10^{-6}. A maximally exposed individual located at the site boundary would have an increased likelihood of cancer fatality of 2.92×10^{-7}. The risks for the combined EBA and BEBA composite set of accidents, reflecting both the probability of the accident occurring and the consequences, are also shown in table 4.9.3.9–4. For the same worker, the maximally

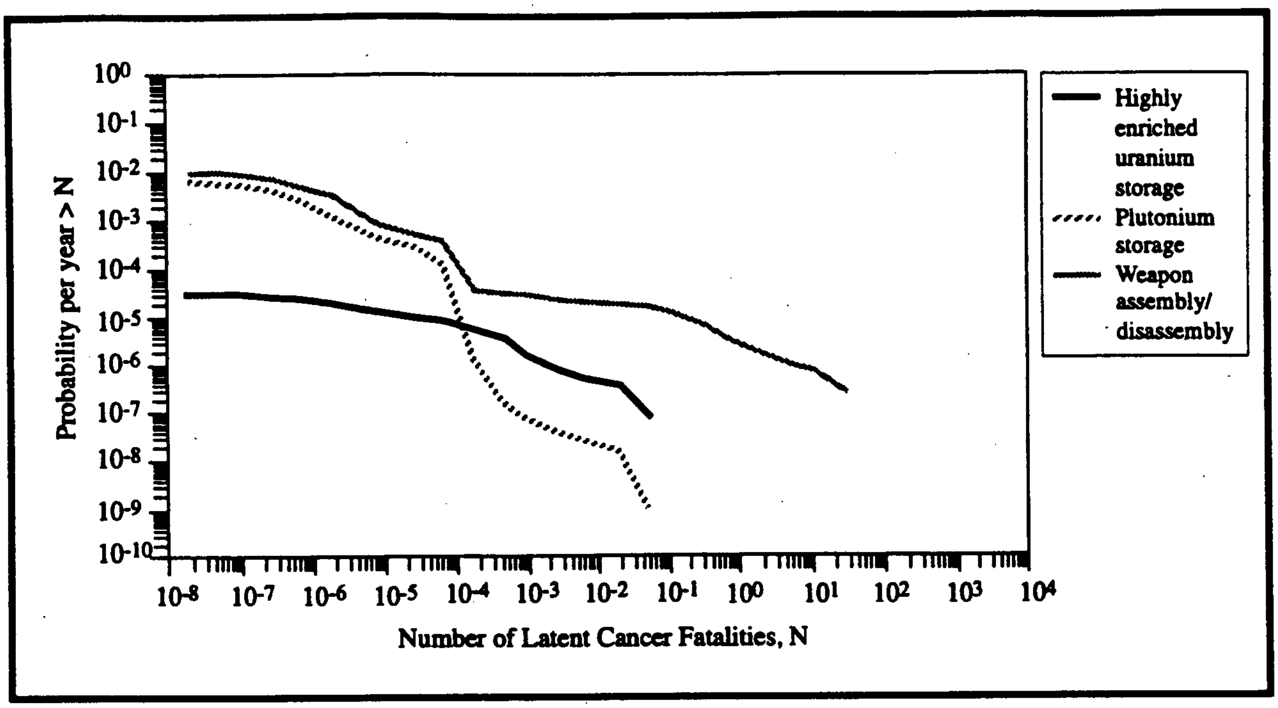


FIGURE 4.9.3.9–1.—*Combined Evaluation Basis Accidents and Beyond Evaluation Basis Accidents—Cancer Fatalities Complementary Cumulative Distribution Functions for Stockpile Management Alternatives at Nevada Test Site.*

exposed individual, and the population, the risks would be 7.4×10^{-8}, 8.1×10^{-9}, and 1.2×10^{-6} cancer fatalities per year, respectively. Table 4.9.3.9–4 also shows the impacts for EBA and BEBA only.

Nonintrusive Modification Pit Reuse. A set of potential accidents has been postulated for nonintrusive modification pit reuse for which there may be releases of radioactive materials or other hazardous effects that may impact collocated onsite workers and the offsite population. The accident impacts of greatest interest are those associated with A/D. Any potential accident impacts associated with nonintrusive modification would be bounded by A/D accident impacts.

Storage of Plutonium Strategic Reserves. A set of potential accidents has been postulated for storage of plutonium strategic reserves for which there may be releases of radioactive materials or other hazardous effects that may impact onsite workers and the offsite population. The potential accidents analyzed are described in appendix F. The probability distribution showing the range of probable cancer fatalities that may result for the composite set of accidents identified in appendix F is shown in table 4.9.3.9–4. For example, the probability of a plutonium storage accident causing more than 0.01 cancer fatalities is approximately 10^{-8} per year. The curve reflects the probability of the accidents occurring. The risk of the composite set of accidents and their consequences are shown in table 4.9.3.9–4. If an accident were to occur, there would be an estimated 6.7×10^{-6} cancer fatalities in the population within 80 km (50 mi) of the site. A noninvolved worker located 1,000 m (3,281 ft) from the accident would have an increased likelihood of cancer fatality of 3.8×10^{-6}. A maximally exposed individual located at the site boundary would have an increased likelihood of cancer fatality of 8.9×10^{-8}. The risks for the composite set of accidents, reflecting both the probability of the accident occurring and the consequences, are also shown in table 4.9.3.9–4. For the same worker, the maximally exposed individual, and the population, the risks would be 2.3×10^{9}, 5.3×10^{-11}, and 3.9×10^{-9} cancer fatalities per year, respectively. Table 4.9.3.9–4 also shows the impacts for EBA and BEBA only.

Storage of Uranium Strategic Reserves. A set of potential accidents has been postulated for storage of uranium strategic reserves for which there may be releases of radioactive materials or other hazardous

TABLE 4.9.3.9–4.—*Impacts of Accidents for Assembly/Disassembly and Storage of Plutonium Strategic Reserves at Nevada Test Site*

Parameter	Assembly/Disassembly			Storage of Plutonium Strategic Reserves		
	EBA	BEBA	EBA and BEBA Combined	EBA	BEBA	EBA and BEBA Combined
Composite Accident Frequency (Per Year)	0.028	$4.0x10^{-7}$	0.028	$6.0x10^{-4}$	[a]	$6.0x10^{-4}$
Consequences						
Noninvolved Worker						
Cancer fatality[b]	$2.7x10^{-6}$	$1.7x10^{-4}$	$2.7x10^{-6}$	$3.8x10^{-6}$	[a]	$3.8x10^{-6}$
Risk (cancer fatality per year)	$7.4x10^{-8}$	$6.7x10^{-11}$	$7.4x10^{-8}$	$2.3x10^{9}$	[a]	$2.3x10^{-9}$
Maximally Exposed Individual						
Cancer fatality[b]	$2.9x10^{-7}$	$1.9x10^{-5}$	$2.9x10^{-7}$	$8.9x10^{-8}$	[a]	$8.9x10^{-8}$
Risk (cancer fatality per year)	$8.1x10^{-9}$	$7.7x10^{-12}$	$8.1x10^{-9}$	$5.3x10^{-11}$	[a]	$5.3x10^{-11}$
Population Within 80 Kilometers[c]						
Cancer fatalities[d]	$4.4x10^{-5}$	$2.8x10^{-3}$	$4.4x10^{-5}$	$6.5x10^{-6}$	[a]	$6.5x10^{-6}$
Risk (cancer fatalities per year)	$1.2x10^{-6}$	$1.1x10^{-9}$	$1.2x10^{-6}$	$3.9x10^{-9}$	[a]	$3.9x10^{-9}$

[a] No BEBAs were identified for NTS.

[b] Probability (increased likelihood) of cancer fatality to a hypothetical member of the public located at the site boundary or to a noninvolved worker as a result of exposure to the indicated dose if the accident occurred.

[c] For the offsite population of 18,517, the average probability of cancer fatality/risk of cancer fatality (per year) for the combined EBA and BEBA is $2.4x10^{-9}/6.5x10^{-11}$ and $3.5x10^{-10}/2.1x10^{-13}$ respectively, for the listed alternative(s), A/D and storage of plutonium strategic reserve.

[d] Number of cancer fatalities in the population out to 80 km (50 mi) as a result of exposure to the indicated dose if the accident occurs.

Note: All values are mean values; BEBA - beyond evaluation basis accidents; EBA - evaluation basis accidents.

Source: Results shown are derived from accident analyses in appendix F.

effects that may impact collocated onsite workers and the offsite population.Any such impacts, however, would be bounded by the impacts of accidents associated with the A/D and storage of strategic plutonium reserves and are therefore not addressed further.

Stewardship Alternatives

Proposed National Ignition Facility. Studies of potential accidents associated with the proposed NIF have been performed. A bounding accident was postulated based on a preliminary hazard analysis. The bounding accident assumes a severe earthquake of 1 G occurring during a maximum-credible-yield fusion experiment. Beamlines streaking into the target chamber and building structures other than the target area building would fail during the postulated earthquake. The collapsed beamlines and building structures would provide a pathway for acute atmospheric releases of tritium in the tritium processing system, activated gases in the air, and activated material in the target chamber.

The frequency of this severe earthquake is estimated at 1×10^{-4} per year. The joint frequency of the severe earthquake during the maximum-credible-yield fusion experiment would be less than 2×10^{-8} per year. The radiological impacts of the accident, presented in table 4.9.3.9–5, were estimated using the GENII computer code.

Postulated Accidents. Radionuclides and hazardous chemicals could be released from accidents postulated at the proposed NIF and during the transportation of tritium targets. Tables 4.9.3.9–5 through 4.9.3.9–7 summarize potential impacts to the public and workers from postulated facility and transportation accidents. A description of each accident scenario evaluated is provided in appendix I.

Impacts to the Public. Studies of potential accidents associated with NIF have been performed. A bounding accident was postulated based on a preliminary hazard analysis. The bounding accident assumes a severe earthquake of 1 G horizontal ground acceleration occurring during a maximum-credible-yield fusion experiment. Beamlines streaking into the target chamber and building structures other than the target area building would fail during the postulated earthquake. The collapsed beamlines and building structures would provide a pathway for an acute atmospheric release of tritium in the tritium processing system, activated gases in the air, and activated material in the target chamber.

The frequency of this severe earthquake is estimated at 1×10^{-4} per year. The joint frequency of the severe earthquake during the maximum-credible-yield fusion experiment would be less than 2×10^{-8} per year. The radiological impacts of the accident, presented in table 4.9.3.9–6, were estimated using the GENII computer code.

Hazardous Chemical Impacts. A number of possible chemical accidents were studied in terms of their potential impacts on workers and the public outside NLVF site boundaries. Four of those possible accidents were studied in detail because their consequences would be likely to have the greatest impacts. The accidents considered and the four selected for more detailed study are discussed in appendix I. The four accident scenarios considered in detail were as follows: a mercury release, a combined alumina/silica release from the target chamber, a carbonyl fluoride release, and a hydrogen fluoride release.

The nearest site boundary (to a residential area) is 210 m (689 ft) west of the proposed NIF location. Potential impacts at that area and at the nearest onsite buildings are of principal interest.

A modeling study was conducted for each of the four release scenarios. That study applied a dispersion model to each of the releases and used a health criterion representative of acute impacts from an exposure that might happen once in a lifetime. The health criterion was the concentration below which if exposure occurred for 1 hour would still allow emergency action to occur and not lead to irreversible health effects. The results of the modeling yield the following conclusions:

The threat zone from each of the four accidents would not extend to the boundary with the public under either typical or extreme meteorological conditions except for the mercury release. The nearest members of the public would be 210 m (689 ft) west of the facility, and the maximum threat zone for the mercury release would be 239 m (784 ft). Residential homes there are more than 19 m (62 ft) from the street, so people in those homes should be protected. However,

TABLE 4.9.3.9–5.—*Consequences and Risk of the Bounding Proposed National Ignition Facility Accident at Nevada Test Site*

Receptor	Conceptual Design Option	Enhanced Baseline Option
Workers Onsite		
Dose (person-rem)	1.2	1.9
Fatal cancers	$4.8x10^{-4}$	$7.6x10^{-4}$
Risk (cancer fatality per year)	$1x10^{-11}$	$2x10^{-11}$
Maximally Exposed Individual		
Dose (person-rem)	$1x10^{-4}$	$2x10^{-4}$
Fatal cancers	$7x10^{-8}$	$1x10^{-7}$
Risk (cancer fatality per year)	$1x10^{-15}$	$2x10^{-15}$
Population Within 80 Kilometers		
Dose (person-rem)	41	70
Fatal cancers	0.02	0.035
Risk (cancer fatalities per year)	$4x10^{-10}$	$7x10^{-10}$

Source: Appendix I.

TABLE 4.9.3.9–6.—*Consequences and Risk of the Bounding Proposed National Ignition Facility Accident at North Las Vegas Facility*

Receptor	Conceptual Design Option	Enhanced Baseline Option
Workers Onsite		
Dose (person-rem)	28	[illegible]
Fatal cancers	0.011	[illegible]19
Risk (cancer fatality per year)	$2x10^{-10}$	4[illegible]0^{-10}
Maximally Exposed Individual		
Dose (person-rem)	0.040	0.068
Fatal cancers	$2x10^{-5}$	$3x10^{-5}$
Risk (cancer fatality per year)	$4x10^{-13}$	$7x10^{-13}$
Population Within 80 Kilometers		
Dose (person-rem)	3,000	4,900
Fatal cancers	1	2
Risk (cancer fatalities per year)	$3x10^{-8}$	$5x10^{-8}$

Source: Appendix I.

people outside and within the 239-m (784-ft) threat zone could be adversely affected by inhalation impacts of released mercury.

Nearby buildings and personnel outside would be at risk if any of the four accidents occurred. The assumption was made that the release would not be inhibited by walls of the NIF Laser and Target Area Building and that the wind would take the plume away from the building. The distances at which there would be no impacts from each of the accidents are as follows:

- Mercury scenario—239 m (784 ft) for conceptual design and enhanced options
- Alumina/silica scenario—171 m (561 ft) for conceptual design option and 231 m (758 ft) for enhanced option
- Carbonyl fluoride scenario—75 m (246 ft) for conceptual design and enhanced options
- Hydrogen fluoride release—101 m (331 ft) for conceptual design and enhanced options

The personnel in nearby buildings would likely be protected because the release (typically lasting

TABLE 4.9.3.9–7.—***Radiological Risks and Consequences of Transporting Tritium Targets from Manufacturing Facilities to North Las Vegas Facility***

Manufacturing Facility	Conceptual Design Option	Enhanced Option
General Atomics		
Dose risk (person-rem/yr)	$1.2x10^{-6}$	$9.5x10^{-6}$
Fatality risk (cancer fatality/yr)	$6.0x10^{-10}$	$5.0x10^{-9}$
Nonradiological accidents[a] (fatality/yr)	$8.0x10^{-4}$	$5.0x10^{-3}$
Nonradiological vehicular emissions (fatality/yr)	$8.0x10^{-4}$	$2.0x10^{-3}$
Lawrence Livermore National Laboratory		
Dose risk (person-rem/yr)	$1.2x10^{-6}$	$9.3x10^{-6}$
Fatality risk (cancer fatality/yr)	$6.0x10^{-10}$	$5.0x10^{-9}$
Nonradiological accidents[a] (fatality/yr)	$9.0x10^{-4}$	$5.0x10^{-3}$
Nonradiological vehicular emissions (fatality/yr)	$4.0x10^{-4}$	$1.0x10^{-3}$
Los Alamos National Laboratory		
Dose risk (person-rem/yr)	$2.4x10^{-6}$	$1.9x10^{-5}$
Fatality risk (cancer fatality/yr)	$1.0x10^{-9}$	$9.0x10^{-9}$
Nonradiological accidents[a] (fatality/yr)	$2.0x10^{-3}$	$5.0x10^{-3}$
Nonradiological vehicular emissions (fatality/yr)	$2.0x10^{-4}$	$5.0x10^{-4}$
Savannah River Site		
Dose risk (person-rem/yr)	$2.0x10^{-6}$	$1.6x10^{-5}$
Fatality risk (cancer fatality/yr)	$1.0x10^{-9}$	$8.0x10^{-9}$
Nonradiological accidents[a] (fatality/yr)	$8.0x10^{-4}$	$2.0x10^{-3}$
Nonradiological vehicular emissions (fatality/yr)	$2.0x10^{-4}$	$5.0x10^{-4}$
University of Rochester		
Dose risk (person-rem/yr)	$2.1x10^{-6}$	$1.6x10^{-5}$
Fatality risk (cancer fatality/yr)	$1.0x10^{-9}$	$8.0x10^{-9}$
Nonradiological accidents[a] (fatality/yr)	$6.0x10^{-4}$	$1.0x10^{-3}$
Nonradiological vehicular emissions (fatality/yr)	$2.0x10^{-4}$	$5.0x10^{-4}$
Maximum Consequence		
Accident–Population[b,c]		
Dose (person-rem)	0.33	3.3
Fatal cancers	$2.0x10^{-4}$	$2.0x10^{-3}$
Accident–Maximally Exposed Individual[b,d]		
Dose (rem)	$1.2x10^{-4}$	$1.2x10^{-3}$
Fatal cancer probability	$6.0x10^{-8}$	$6.0x10^{-7}$

[a] Fatalities resulting from nonradiological causes are calculated for 145 shipments (conceptual design option) and 335 shipments (enhanced option).

[b] The most severe accidents assume that 100 percent of the target tritium is released in an oxide form during an accident. Accident consequence results are determined using the RISKIND computer program (ANL 1993b). Stable weather conditions (Pasquill stability class F) with a wind speed of 1 m/s (2.2 mph) were assumed.

[c] Populations are assumed to extend at a uniform population density to a radius of 80 km (50 mi) from the accident site. Population exposure pathways include acute inhalation and resuspended inhalation. No ingestion dose is considered. The maximum-consequence accident is assumed to occur in an urban environment with a population density of 3,861 persons/km^2 (10,000 persons/mi^2).

[d] The maximally exposed individual is assumed to be at the location of maximum exposure. The location of the maximally exposed individual is assumed to be 380 m (1,247 ft) from the accident location under stable conditions. Individual exposure pathways include acute inhalation during passage of the plume. No ingestion dose is considered.

Note: The transportation risk assessment assumes 100 percent of the tritium targets are manufactured and transported to NIF from each site. In practice, tritium targets would be produced and transported from more than one manufacturer. The transportation risk assessment is performed for offsite transportation only. Transportation risks from onsite transport of tritium targets is assumed to be negligible compared to risks from offsite transportation.

Source: Appendix I.

15 minutes) would pass by the buildings with little infiltration. Personnel in the NIF Laser and Target Area Building and those outside in the immediate vicinity might be affected.

Transportation Impacts. Radiological impacts associated with the transportation of tritium targets would be the result of a release of tritium into the environment following a transportation accident. Since tritium is a pure beta emitter with no associated gamma radiation, radiological risks associated with routine (incident free) transportation operations would be considered negligible. The potential radiological impacts of transporting tritium targets are calculated for truck and air travel; the transportation of the tritium targets from the manufacturing sites to the nearest major airport is assumed to take place using trucks, while cargo aircraft are assumed to transport the tritium targets to McCarran International Airport. After arriving at the airport, the targets would be transferred to a truck for shipment to NIF at NLVF.

Table 4.9.3.9–7 presents the risks associated with the transportation of tritium targets from each of the tritium manufacturing facilities to NIF at NLVF. Radiological risk from transportation activities is defined as the product of the accident consequence (dose) and the probability of the accident occurring, and is calculated by considering a wide range of accidents, from high-probability low-consequence events to low-probability high-consequence events (see appendix I). Latent cancer fatality risks are obtained by multiplying the dose risk by 0.0005 latent cancer fatalities per person-rem (ICRP 1991a). Latent cancer fatality risks were found to range from $6x10^{-10}$ to $9x10^{-9}$ per year for all cases. Nonradiological impacts associated with the ground transport of tritium targets are calculated under both routine (incident free) and accident conditions. Nonradiological risks for routine operation are calculated by multiplying the distance traveled by truck in urban population density zones by a risk factor for latent mortality from pollutant inhalation (SNL 1982a). Nonradiological risks resulting from vehicular accidents are calculated in a similar manner by multiplying the state-specific accident fatality rate by the distance traveled by truck in the state.

The maximally exposed individual and population doses were calculated for a transportation accident involving the entire release of the tritium cargo. Radiological impacts resulting from a potential maximum-consequence accident were assessed for a general population in an urban population density zone. Maximally exposed individuals were assumed to be unshielded as the plume passed at a distance that would result in the largest dose to the individual. Radiological consequences were assessed using worst-case weather conditions (Pasquill stability class F) for both the collective population and the maximally exposed individual. For assessment purposes, it was assumed that the entire tritium cargo was released to the environment in oxide form. The estimated number of latent cancer fatalities from the maximum-severity transportation accident was calculated by multiplying the population committed effective dose equivalent by 0.0005 latent cancer fatalities per person-rem (ICRP 1991a). Table 4.9.3.9–7 summarizes the impacts of a maximum-consequence accident during transportation of tritium targets.

Impacts to Workers. For the enhanced option, the estimated radiation dose to all workers at NLVF is 47 person-rem. No cancer fatalities would be expected to occur in workers following the postulated accident at NLVF. For the conceptual design option, estimated radiation impacts would be about one-half the impacts from the enhanced option. No adverse health effects would be expected to result. The risk of radiation-caused cancer fatalities would essentially be zero considering the extremely low potential for the postulated accident to occur. NLVF has a comprehensive emergency plan, which would be expanded to incorporate NIF to ensure protection of workers in case of an accident or natural disaster.

4.9.3.10 *Waste Management*

This section summarizes the impacts on waste management at NTS under No Action and for each of the proposed alternatives. There is no spent nuclear fuel, HLW, or TRU waste associated with weapons A/D (which includes nonintrusive modification pit reuse and storage of strategic reserves of plutonium and uranium) or the proposed NIF. Therefore, no further discussion of these wastes is presented in this section. Table 4.9.3.10–1 lists the projected waste generation rates and treatment, storage, and disposal capacities under No Action. Projections for No Action were derived from 1994 environmental data, with the appropriate adjustments made for those changing

TABLE 4.9.3.10–1.—*Projected Waste Management Under No Action at Nevada Test Site*

Category	Annual Generation (m^3)	Treatment Method	Treatment Capacity (m^3/yr)	Storage Method	Storage Capacity (m^3)	Disposal Method	Disposal Capacity (m^3)
Low-Level							
Liquid	Dependent on restoration activities	Not determined	None	None	NA	NA	NA
Solid	15,000[a]	None	None	None	NA	Shallow burial	650,000[b]
Mixed Low-Level							
Liquid	None	None	NA	NA	NA	NA	NA
Solid	50[c]	None	NA	Containers on asphalt pads	See mixed TRU	Shallow land burial[d]	90,626[e]
Hazardous							
Liquid	Included in solid	Contracted offsite	None	RCRA-permitted pad	See solid hazardous	Contracted offsite	NA
Solid	212	Contracted offsite	None	RCRA-permitted pad	61.6[f]	Contracted offsite	NA
Nonhazardous (Sanitary)							
Liquid	Included in solid	Septic fields	As required	None	NA	Septic fields	As required
Solid	2,120	None	None	NA	NA	Landfill onsite	As required
Nonhazardous (Other)							
Liquid	Included in sanitary	Septic fields	As required	None	NA	Septic fields	As required
Solid	76,500	None	None	NA	NA	NA	NA

[a] Alternative 3, NTS Final EIS, additional solid LLW could be received from offsite.
[b] Area 3 and 5. Additional acreage available for expansion.
[c] Alternative 3, NTS Final EIS, additional mixed LLW could be generated from offsite environmental restoration activities and receipts from offsite for disposal.
[d] As required to meet RCRA requirements.
[e] Remaining capacity, Pit 3, Area 5 RWMS.
[f] Total capacity for solid and liquid hazardous wastes stored at the Hazardous Waste Storage Unit in Area 5.
Note: NA - not applicable.
Source: NTS 1996a:1.

TABLE 4.9.3.10–2.—*Estimated Annual Generated Waste Volumes for Stockpile Stewardship and Management Alternatives at Nevada Test Site*

Category	No Action[a] (m³)	Assembly/ Disassembly[b] (m³)	National Ignition Facility[c] (m³)	Combined Program Impacts (m³)
Low-Level				
Liquid	Dependent on restoration activities	<0.1 (+0.06)	<1 (+0.6)	<1 (+0.66)
Solid	15,000[d]	15,000[d] (+30)	15,000[d] (+3)	15,000[d] (+33)
Mixed Low-Level				
Liquid	None	Included in solid (+0)	2 (+2)	2 (+2)
Solid	50[e]	52[e] (+2)	50[e] (+0.3)	52[e] (+2)
Hazardous				
Liquid	Included in solid	6 (+6)	2 (+2)	8 (+8)
Solid	212	212 (+0.05)	220 (+8)	220 (+8)
Nonhazardous (Sanitary)				
Liquid	Included in solid	53,000 (+53,000)	17,900 (+17,900)	70,900 (+70,900)
Solid	2,120	2,220 (+100)	8,120 (+6,000)	8,220 (+6,100)
Nonhazardous (Other)				
Liquid	Included in sanitary	Included in sanitary	Included in sanitary	Included in sanitary
Solid	76,500 (+0)	76,500 (+0)	76,500 (+0)	76,500 (+0)

[a] No Action volumes are from table 4.9.3.10–1.
[b] Waste generation volumes for the A/D Facility are from table 3.4.1.2–3 and are based on surge operations (three shifts).
[c] NIF generation volumes are from table 3.3.2.2–3 and are based on the Conceptual Design.
[d] Alternative 3, NTS Final EIS, additional solid LLW could be received from offsite.
[e] Alternative 3, NTS Final EIS, additional mixed LLW could be generated from offsite environmental restoration activities and receipts from offsite for disposal.
Note: Waste generation volumes were rounded to three significant figures. Waste effluent volumes are found in sections 3.3 and 3.4.

operational requirements where the volume of waste generated is identifiable. The projection does not include waste from future, yet uncharacterized, environmental restoration activities.

Table 4.9.3.10–2 provides the total estimated operational waste volumes projected to be generated at NTS as a result of the various alternatives. The net increase over No Action is provided in table 4.9.3.10–2 in parentheses. The waste volumes generated and the resultant waste effluent are listed in table 3.4.1.2–3 for A/D and table 3.3.2.1–3 for the proposed NIF. Facilities that would support the Stockpile Stewardship and Management Program would treat and package all waste generated into forms that would enable long-term storage and/or disposal in accordance with the *Atomic Energy Act*, RCRA, and other applicable statutes as outlined in appendix section H.1.2.

The storage of strategic reserve pits and HEU apart from the A/D mission at NTS at another DOE site location (an alternative in the Storage and Disposition Program) would have no impact on waste management at NTS.

No Action. Under No Action, TRU, low-level, mixed, hazardous, and nonhazardous wastes would continue to be managed from the missions described in section 3.2.9. Disposal of wastes received from other DOE sites would dominate waste management activities at NTS since ongoing NTS activities generate little waste. The disposal of wastes received from other DOE sites would not involve treatment at NTS, since these wastes must be treated, packaged, and certified to NTS waste acceptance criteria before they can be shipped to NTS for disposal. Solid mixed LLW would be stored awaiting treatment in accordance with the NTS Site Treatment Plan. Hazardous waste would be accumulated, then shipped offsite for treatment and disposal at commercial RCRA-permitted facilities. Nonhazardous and sanitary wastes would be treated and disposed of in facilities located onsite.

Management Alternatives

Assembly/Disassembly. Construction and operation of an A/D Facility would have an impact on existing and planned NTS waste management facilities and activities by increasing the generation of low-level, mixed, hazardous, and nonhazardous wastes over that projected for No Action. The amount of waste generated from the storage of the strategic reserve of plutonium and HEU is minimal. Waste generated during construction would consist of hazardous solid and nonhazardous liquid and solid wastes. The nonhazardous wastes would be disposed of as part of the construction project. Hazardous wastes would be shipped to a commercial RCRA-permitted treatment and storage facility.

After treatment and volume reduction, approximately 15 m^3 (20 yd^3) of solid LLW consisting primarily of sanitized and demilitarized weapon parts, test residue, compacted wipes, rubber gloves, and vacuum filters would require disposal at the Area 5 Radioactive Waste Management Complex. This volume of waste would have a negligible impact on the LLW disposal facility. Contaminated solvent rags and wipes would be the principal contributor to the 1.5 m^3 (2 yd^3) of solid mixed LLW. The solid mixed LLW would be managed in accordance with the NTS Site Treatment Plan which was developed to comply with the *Federal Facility Compliance Act*.

Hazardous wastes would be generated from solvents from cleaning operations and residue from painting and bonding operations. The 6 m^3 (1,550 gal) of liquid and 0.05 m^3 (0.07 yd^3) of solid hazardous wastes could be handled by existing and planned hazardous waste storage areas while awaiting shipment to an offsite RCRA-permitted treatment and disposal facility. Approximately 53,000 m^3 (14,000,000 gal) of liquid nonhazardous wastes consisting of sewage and process wastewater would require treatment and disposal. The existing sanitary wastewater system, which consists of a series of facultative lagoons and evaporation ponds, would require expansion to accommodate this increase. The 50 m^3 (65 yd^3) of solid nonhazardous wastes would be disposed of in the onsite sanitary landfill after volume reduction.

Sensitivity Analysis. The waste volumes generated from the A/D Facility required to support a larger stockpile level (high case) operating on a single-shift basis are bounded by the base case under surge operations. Thus, there are no additional waste management impacts associated with the A/D Facility that would support a high case stockpile operating at a single-shift level. The volumes of waste generated from the A/D Facility required to support a low case stockpile would be reduced by a factor of at least three.

Stewardship Alternatives

Proposed National Ignition Facility. Construction and operation of the proposed NIF would have an impact on existing and planned NTS waste management activities by increasing the generation of low-level, mixed, hazardous, and nonhazardous wastes over that projected for No Action. Waste generated during construction would consist of nonhazardous liquid and solid wastes. The nonhazardous wastes would be disposed of as part of the construction project.

Approximately 0.6 m^3 (159 gal) of liquid LLW would require treatment in a liquid radwaste treatment facility. NTS does not currently have this capability; however, a liquid waste treatment system is planned. Approximately 3 m^3 (4 yd^3) of solid LLW consisting primarily of hardware from the NIF chamber would require disposal at the Area 5 Radioactive Waste Management Site. This volume would have a negligible impact on the LLW disposal facility. An estimated 2 m^3 (528 gal) of liquid and 0.3 m^3 (0.4 yd^3) of solid mixed LLW would be managed in accordance with the NTS Site Treatment

Plan which was developed to comply with the *Federal Facility Compliance Act*.

Current plans are to permit mixed solid waste disposal units, which meet RCRA land disposal requirements, at NTS for mixed waste generated both on and off site. A permit application has been submitted to the state of Nevada, and it is estimated that the units would be available in 1997. This should be well before the proposed NIF would begin operation. NTS currently has the capability, under interim status, to dispose of mixed waste generated onsite at the Area 5 Radioactive Waste Management Site.

The 2.3 m^3 (608 gal) of liquid and 8 m^3 (10 yd^3) of solid hazardous wastes would be accumulated while awaiting shipment to an offsite RCRA-permitted treatment and disposal facility. At NLVF, hazardous waste would be shipped to an RCRA-approved commercial treatment, storage, and disposal facility. Scheduled pick up and removal of hazardous waste is done through a subcontractor. The subcontractor can be called for nonscheduled removal, if necessary. Approximately 17,900 m^3 (4,720,000 gal) of liquid nonhazardous wastes consisting of sewage and process wastewater would require treatment and disposal. The existing sanitary wastewater system which consists of a series of facultative lagoons and evaporation ponds would require expansion to accommodate this increase. The 6,050 m^3 (7,910 yd^3) of solid nonhazardous wastes would be disposed of in the onsite sanitary landfill.

At NLVF, sanitary wastewater would be treated using the existing facility sewage removal outlets connected to the city of Las Vegas wastewater treatment system. NLVF has operated, and would continue to operate, under a NPDES permit. The addition of an estimated 17,900 m^3 (4,740,000 gal) of nonhazardous liquid waste would not have noticeable effects on the existing removal system at the facility or at the treatment operation downstream.

Disposal of solid nonhazardous wastes would be handled through the city of North Las Vegas waste removal contractor. The city's nonhazardous solid waste disposal contractor operates a transfer location less than 1 km (0.6 mi) to the northwest of NLVF. From the transfer station, the waste is removed to a landfill outside the city limits. The transfer station handles a large portion of the waste from the city of Las Vegas, and the estimated volume of 6,050 m^3 (7,910 yd^3) per year from the proposed NIF would not have a significant impact on the transfer station. Waste would be removed by obtaining bulk waste collection bins from the city contractor and arranging for scheduled pick-up times. At times of unusually heavy nonhazardous solid waste generation, the city contractor can be called for supplementary pickups.

Combined Program Impacts. If all the stockpile stewardship and management alternatives listed in table 4.9.3.10–2 were located at NTS, there would be no additional impacts from those previously discussed for the low-level, mixed low-level, and hazardous waste. Existing and planned facilities are adequate to handle the increase. The combined Program total of 70,900 m^3 (18.7 million gal) of liquid nonhazardous wastes consisting of sewage and process wastewater would require treatment for disposal. Additional facultative lagoons and evaporation ponds may be required. Following volume reduction, approximately 6,100 m^3 (7,980 yd^3) of solid nonhazardous wastes would be disposed of in the onsite sanitary landfill.

Potential Mitigation Measures. Waste quantities or waste forms could undergo additional reductions by utilizing emerging technologies, thereby further reducing or mitigating impacts. Pollution prevention and waste minimization would be considered in determining the final design of any facility constructed as part of the Stockpile Stewardship and Management Program at NTS. Pollution prevention and waste minimization would also be evaluated as part of any site-specific analyses and tiered NEPA documents.

4.9.3.11 *Environmental Justice*

The analysis of environmental justice focuses on potential disproportionate adverse effects of health or environmental risks to minority or low-income populations from the alternatives under consideration. Because no minority or low-income populations live within an 80-km (50-mi) radius of NTS, there is no potential for disproportionately high adverse impacts to these populations.

<u>North Las Vegas Facility</u>

For the population in the region within 80 km (50 mi) of NLVF, minorities are in a higher proportion, and low-income populations are in an equal proportion to other populations relative to Nevada as a whole (appendix I). Thus, minorities but not low-income populations would experience disproportionate regional socioeconomic impacts, which would be beneficial. The regional health impact of radiological doses to the population over the lifetime of the proposed NIF might result in one cancer fatality. This impact would occur in the majority minority population within the region. Thus, an environmental justice issue exists with the construction and operation of the proposed NIF at this site.

Minorities, but not low-income persons, are clustered in the local vicinity of NLVF (appendix I). Thus, the local area impacts from the construction and operation of NIF would disproportionately affect minorities but not low-income populations. None of these local area environmental or health impacts have been judged to be highly adverse or significant.

4.10 INTERSITE TRANSPORTATION

4.10.1 Methodology

This PEIS evaluates the potential impacts from transporting special nuclear materials, hazardous wastes, and other weapons-related materials associated with the activities under consideration by the Stockpile Stewardship and Management Program. All materials shipped by DOE are first stabilized, then packed and shipped in accordance with all applicable Federal and state transportation regulatory requirements. In most cases, DOE requirements exceed DOT and NRC standards for commercial transport. Baseline information, the existing transportation patterns for each site, and the types of containers required to ship the materials have been included for this analysis, as appropriate.

Actual and projected inventories were used for the transportation analysis. Data already collected were used to the extent possible. Environmental impacts of transporting materials between facilities were estimated using a homogeneous population (i.e., urban, suburban, and rural), an average container or truckload of material, and a unit of measure (i.e., risk per kilometer) for each of the material forms. The assessment provides an overview comparison of transportation impacts for the alternatives being considered.

The estimated health risks in terms of potential total fatalities from transporting special nuclear material and radioactive material between the sites were quantitatively analyzed with the RADTRAN 4 computer code. Unit risk factors were developed for each type of special nuclear material and radioactive material to estimate the potential risk of transporting truckload shipments by DOE safe secure trailer over intersite routes or transporting shipments by air. These unit risk factors were used in conjunction with the quantity of material, form, distance, and number of shipments to estimate potential radiological and nonradiological impacts to the transport crew and public. The potential fatality impacts are presented for each alternative considered. The transportation of HE was evaluated qualitatively based on past shipping experience.

4.10.2 Affected Environment

The volume of DOE's hazardous material (radioactive and nonradioactive) shipments is extremely small in comparison to the volume of non-DOE hazardous materials shipments. DOT estimates that approximately 3.6 billion t (4 billion tons) of regulated hazardous materials are transported each year and that approximately 500,000 shipments of hazardous materials occur each day (PL 101-615, Section 2[1]). There are approximately 2 million shipments of radioactive materials, involving about 2.8 million packages, annually. This is about 2 percent of the Nation's total annual hazardous materials shipments. Most radioactive shipments involve small or intermediate quantities of material in relatively small packages. By comparison, the Complex ships about 6,200 radioactive packages (commercial and classified) between its sites, annually. This represents less than 0.3 percent of all radioactive shipments in the United States.

DOE's unclassified radioactive, HE, and other hazardous materials are transported by commercial carrier (truck, rail, or air). The hazardous and nonhazardous cargo shipped by commercial carriers to and from each of the alternative sites is described in appendix tables G.2–1, G.2–2, and G.2–3. Special nuclear materials, such as plutonium and HEU in the form of pits and secondaries included in this assessment, are transported by DOE-owned and -operated safe secure trailers. The safe secure trailers are vehicles designed specifically for the cargo's safety and security, and the special nuclear materials receive continual surveillance and accountability from DOE's Transportation Safeguards Division at Albuquerque, NM. Shipments by safe secure trailer are accompanied by armed guards and are monitored by a tracking system. Tritium components are transported by DOE's air cargo contractor.

HE is a nonradioactive, hazardous material. HE shipments must meet the standard shipping criteria established by DOT (49 CFR Subchapter C) and supplemented by state, local, and DOE regulations. These standards require the shipper to comply with selecting the proper, authorized packaging for the material; properly certifying what is being shipped; properly marking, labeling, loading, blocking, and bracing the material; and meeting safety requirements. HE is usually transported by commercial or

Government truck (although DOE contract air shipments are allowed by DOT exemption).

4.10.2.1 *Materials Transported Between Existing Sites (No Action)*

Kansas City Plant. KCP produces nonnuclear components for nuclear weapons. These nonnuclear components are primarily transported from KCP to Pantex and SRS. A limited number of nonnuclear components are also shipped from KCP to LLNL and LANL for reliability testing. Nonnuclear components are transported by commercial truck.

Lawrence Livermore National Laboratory. LLNL performs nuclear weapons research, development, and testing (RD&T). LLNL also maintains a limited capability to fabricate plutonium components (pits), which are transported between sites by safe secure trailer. Presently, LLNL does not manufacture components for nuclear weapons. A limited amount of intersite transportation by commercial carriers, to or from LLNL, and the other DOE facilities is currently conducted to allow for research and testing needs. This transportation activity is unrelated to the direct weapons production activities.

Los Alamos National Laboratory. LANL performs nuclear weapons RD&T. Similar to LLNL, LANL also maintains a limited plutonium component (pit) fabrication capability. LANL currently produces and ships some nonnuclear components for nuclear weapons. Like LLNL, it does send and receive a limited number of weapons components to and from other DOE facilities by commercial carriers.

Nevada Test Site. NTS maintains the capability to conduct underground nuclear weapons testing and nonnuclear experiments. Nuclear weapons and fissile components to conduct such tests are transported by safe secure trailer from LLNL, LANL, and Pantex. Currently, there is no underground nuclear weapons testing. NTS has historically received LLW by truck from other DOE nuclear weapons sites, such as Pantex, for disposal. LLW is routinely transported to NTS from other DOE facilities by certified commercial truck carriers for disposal. NTS does not currently ship or receive nuclear weapon components for production, disposition, or testing.

Oak Ridge Reservation. The Y-12 Plant at ORR processes depleted uranium and HEU, and fabricates uranium components. Y-12 also produces lithium compounds and parts, provides precision machining and specialty subassembly of structural components, and provides storage for HEU. Y-12 ships secondaries to and receives secondaries from Pantex. A small number of secondaries are sometimes supplied to and from LLNL and LANL. HEU and secondaries and cases are transported by safe secure trailer. Other nonfissile components required by Y-12 are typically transported by commercial truck.

Pantex Plant. Pantex assembles and disassembles nuclear weapon components; performs weapons repair, modification, and disposal; conducts stockpile evaluation and testing; fabricates HE and nonnuclear components; and provides storage for plutonium in the form of pits. Fissile components such as pits, secondaries, or nuclear weapons are transported by safe secure trailer. Tritium reservoirs are transported between Pantex and SRS by air. HE and nonnuclear components are transported by commercial or Government truck.

Pantex receives weapons from the stockpile for disassembly, uranium components from Y-12, tritium reservoirs from SRS, and nonnuclear components from KCP. Pantex ships nuclear weapons to the stockpile, uranium components to Y-12, tritium limited-life components to SRS, and LLW to NTS.

Sandia National Laboratories. Nonnuclear components for nuclear weapons systems are designed and engineered at SNL. SNL currently ships a limited number of nonnuclear weapons components to Pantex, LLNL, and LANL by commercial truck.

Savannah River Site. SRS recovers tritium from returned reservoirs, purifies the recovered tritium, and fills and surveys new and refurbished tritium reservoirs. SRS also stores a limited amount of weapons-grade plutonium. Under its current tritium recycling mission, SRS ships and receives tritium reservoirs to and from Pantex and DOD sites. Tritium reservoirs are transported almost exclusively by air. Plutonium is transported by safe secure trailer.

4.10.2.2 *Site Transportation Interfaces for the Transport of Special Nuclear Materials*

The existing transportation modes that serve each candidate site and the links to those modes for the intersite transport of special nuclear materials, weapon components, radioactive waste, and other hazardous materials are summarized in table 4.10.2.2–1.

Although hazardous materials could be transported by rail, truck, air, and barge, the materials discussed in this PEIS would normally be transported by truck or aircraft. Plutonium and HEU would be transported exclusively by DOE safe secure trailer. Tritium reservoirs would be transported by DOE contract air carrier. TRU waste and LLW would be transported by certified commercial truck carriers to licensed or permitted disposal facilities. It is unlikely that there would be any barge or rail shipments.

Table 4.10.2.2–1 also depicts the relative transportation ratings of the Stockpile Stewardship and Management Program alternative sites. This table was established using the rating methodology and evaluation procedures established by the Nuclear Weapons Complex Reconfiguration Site Panel and has been adapted for the stockpile stewardship and management alternatives.

4.10.2.3 *Packaging*

Plutonium, HEU, and components containing tritium would always be transported in Type B packaging that meets stringent Nuclear Regulatory Commission (10 CFR) and DOT (49 CFR) requirements. Type B packaging is designed and tested to retain its containment and shielding properties in an accident. Thus, during normal operation, plutonium, HEU, or tritium-related transportation poses no significant risk to transportation workers or the public. Typical types of packagings used for stewardship and management materials are shown in table 4.10.2.3–1. Packaging is discussed further in appendix G.

4.10.3 Environmental Consequences

Two kinds of intersite transportation of special nuclear materials are analyzed in this PEIS: the one-time relocation of strategic reserve materials and the transport of plutonium pits, canned subassemblies, and tritium reservoirs to support normal operation.

Under No Action, key weapons functions would continue to be performed at existing locations. These functions include pit storage and weapons A/D at Pantex, HEU storage and secondary and case fabrication at ORR, pit fabrication at LANL (in limited quantities), and production of tritium components at SRS. The combined annual radiological and nonradiological impacts from transporting pits, secondaries, and tritium components for normal operation (100 weapons per year) under No Action is estimated to be 3.33×10^{-3} fatalities per year (see table 4.10.3–2).

For the stockpile stewardship and management alternatives, the one-time relocation of the plutonium strategic reserve (pits) from storage at Pantex to storage at NTS and/or the relocation of the HEU

TABLE 4.10.2.2–1.—*Transportation Modes and Comparison Ratings for the Candidate Sites*

Site	Nearest Interstate Highway (km)	Distance to Airport for Cargo Shipments (km)	Possible Weather Delays—TSS Shipments	Overall Level of Transport Service
KCP	5	68[a]	Minimal	Good
LLNL	3	61	No	Good
LANL	66	177	Yes	Satisfactory
NTS	97	105[a]	No	Good
ORR	6	50	Minimal	Good
Pantex	11	32	Minimal	Outstanding
SNL	8	11	Minimal	Good
SRS	48	32	Minimal	Good

[a] A closer onsite or nearby airfield could be used for DOE Transportation Safeguards System air cargo shipments only.
Note: TSS - Transportation Safeguards System.
Source: DOE 1991j.

TABLE 4.10.2.3–1.—*Types of Packaging for Stewardship and Management Materials*

Material	DOE-Approved Type B Packaging (NRC Performance Criteria)	DOT/NRC-Approved Type B Packaging	DOT-Approved Type A Wood or Metal Box	DOT-Approved Type A Drum	Strong Industrial Packaging
Pits	X				
Secondaries	X				
Tritium components	X	X			
Nonnuclear components					X
Transuranic waste		X			
Low-level waste			X	X	
Plutonium		X			
Highly enriched uranium		X			
High explosives			X		

Note: NRC - Nuclear Regulatory Commission.
Source: 49 CFR Subchapter C; NRC 1992a.

strategic reserve secondaries from ORR to either NTS or Pantex could be required. The impact from transporting these materials was calculated using the RADTRAN computer code for standardized truckloads of material. The assumed truckloads consisted of 117 kg (256 lbs) of plutonium per truckload or 54 kg (119 lbs) of uranium per truckload. The annual impacts from transporting these materials are shown in table 4.10.3–1.

The transportation in support of normal operation would affect the individual sites as indicated below:

- The nonnuclear fabrication mission could remain at KCP with transportation requirements the same as No Action. Alternative sites to perform KCP's nonnuclear functions are LLNL, LANL, and SNL (many sites would absorb the mission).
- Functions that could be relocated to LLNL are manufacturing secondary and case assemblies, nonnuclear components, and HE components. These functions would require the transport of nuclear components between LLNL and the A/D and/or the consolidated storage site and nonnuclear and HE components between LLNL and the A/D site.
- Functions that could be located at LANL would be fabricating pits, secondary and case assemblies, HE components, and nonnuclear components. These functions would require the transport of nuclear components between LANL and the A/D and/or the consolidated storage site and nonnuclear and HE components from LANL to the A/D site.

TABLE 4.10.3–1.—*Annual Health Impacts from the One-Time Transportation of Strategic Reserve Materials*

Option	Existing Storage Location	Potential Storage Location	Total Health Effect[a]
Relocate pits	Pantex	NTS	2.66×10^{-3}
Relocate secondaries	ORR	NTS	0.0170
Relocate secondaries	ORR	Pantex	9.06×10^{-3}

[a] Fatalities.
Source: RADTRAN model results.

- NTS could be an alternative site to perform weapons A/D, which includes modifying existing plutonium pits, and could include storing the strategic reserve of plutonium and HEU. Placing the A/D function at NTS would require the shipment of weapon components (nuclear, nonnuclear, limited-life, and HE) between NTS and the pit and secondary and case fabrication, nonnuclear fabrication, HE fabrication, and the tritium recycling locations. It would also require the shipment of weapons to and from DOD facilities.

- The secondary and case fabrication mission could remain at ORR with transportation requirements the same as No Action. The alternative sites to fabricate ORR's fabrication of secondary and case assemblies are LLNL and LANL.

- The A/D and HE functions or the A/D function alone could remain at Pantex. If the A/D and HE functions remained, the transportation requirements would be the same as No Action except that the locations might change for primaries, secondaries, and nonnuclear components. Moving only the HE mission from Pantex would require shipping HE components and HE waste between Pantex and the new HE site or sites.

- SNL could be an alternative site for location of the majority of nonnuclear fabrication. This function would require shipping more nonnuclear weapon components to the A/D site.

- The function to fabricate pits could be reestablished at SRS. This would require the transportation of plutonium components between SRS and the A/D site and/or the plutonium storage site.

The Storage and Disposition PEIS is evaluating alternatives that could possibly move the plutonium strategic reserve from existing storage at Pantex to either Hanford, Idaho National Engineering Facility (INEL), NTS, ORR, or SRS, and the HEU strategic reserve from ORR to either Hanford, INEL, NTS, Pantex, or SRS. The one-time transport of materials to these potential consolidated storage locations is not addressed in this Stockpile Stewardship and Management PEIS. The impacts from the relocation of the strategic reserve pits from Pantex to NTS and the relocation of the strategic reserve secondaries from ORR to either NTS or Pantex under stockpile stewardship and management are presented in table 4.10.3–1. This section evaluates the potential impacts associated with the operational transportation requirements necessary to support the proposed management alternatives with storage at one of these storage and disposition sites.

Tritium reservoirs would continue to be recycled at SRS; thus, in the future these components would be transported between the A/D site (NTS or Pantex) and SRS. Tritium reservoirs would be transported by DOE contract air carrier.

If the A/D and HE missions remain collocated at Pantex (No Action), there would be no intersite transportation of HE, except for small quantities being shipped to LANL and LLNL for testing. If the HE mission is relocated, or if NTS is selected as the A/D site, an estimated 150 classified HE component shapes would be transported from either LLNL or LANL to Pantex, or from LLNL, LANL, or Pantex to NTS. In addition, HE waste material generated from the disassembly of weapons would be transported from the A/D Facility to the HE fabrication site.

Most of Pantex's shipments of HE material have been surplus material sold to commercial buyers. It is assumed surplus shipments would continue from a relocated HE mission (see appendix G for a description of HE shipments in 1994). Transporting HE component shapes is estimated to require approximately 12 round-trip shipments per year (the return leg would transport HE waste). There would be no impacts from normal (accident-free) transportation. The accident risk from transporting this material would be no greater than that encountered by the public from industry's transport of similar explosives. The HE accident impacts from transportation are bounded by the risk analyzed and presented in the facility accident sections.

For the alternatives under consideration, there are eight potential sites which could fabricate nuclear components, store strategic reserves of plutonium and uranium, recycle tritium, or perform A/D. All possible route combinations between these sites were evaluated to determine the potential impacts from transporting pits, secondaries, and tritium components for normal operation. The annual health risk for each potential combination of routes is described in appendix table G.1–1. Radiological and nonradiological and accident and accident-free risks are included.

There are 12 possible combinations of the stockpile stewardship and management alternatives for A/D, pit fabrication, and secondary and case fabrication. For each of these combinations, table 4.10.3–2 gives the annual health impact for the situation where strategic storage is collocated with the A/D function. In addition, taking into account the other possible consolidated storage locations considered in the Storage and Disposition Draft PEIS, table 4.10.3–3 gives the highest and lowest risk determined by the storage location for each possible combination of stockpile stewardship and management functions. Specific risks for all possible routes, including a breakout of accident and accident-free risks, are presented in appendix G.

In summary, annual transportation risk to support the activities required by the alternatives considered in this PEIS could range from 0.0154 to 2.85×10^{-3} fatalities. More detailed information is presented in appendix G. The route combinations required to support the alternatives considered in this PEIS are expected to increase upper and lower bound limits as follows:

- The maximum annual transportation health impact would be 0.0154, or approximately one additional fatality in 65 years. It is projected that this potential upper bound impact would result from the alternative which would require transporting pits from consolidated storage at Hanford to pit fabrication at SRS, then transporting them to weapons assembly at NTS; transporting secondaries from Hanford to secondary and case fabrication at ORR, then transporting them to weapons assembly at NTS; and transporting tritium reservoirs from SRS to weapons assembly at NTS.
- It is projected that the potential minimum annual transportation health impact would be 2.85×10^{-3}, or approximately one additional fatality in 351 years. This projected impact would result from selecting the alternative that would require transporting pits from storage at Pantex to pit fabrication at LANL, then transporting them to weapons assembly at Pantex; transporting secondaries from Pantex to secondary and case fabrication at LANL, then transporting them to weapons assembly at Pantex; and transporting tritium reservoirs from SRS to weapons assembly at Pantex.

4.11 Next Generation Stockpile Stewardship Facilities

DOE recognizes that to be viable, its Stockpile Stewardship and Management Program must change over time to be responsive to national needs and the results of current research and evaluation activities. Accordingly, all facilities needed to fully implement the stockpile stewardship program over time cannot be fully identified at present. DOE has done some preliminary conceptual planning and research associated with the next generation of stockpile stewardship facilities, but is not yet able to define the facilities and/or their requirements sufficiently for decision-making. However, these next generation facilities can be defined in general terms at this time based on existing operating or proposed facilities such that broad environmental impacts can be discussed. These general impacts from construction and operation of such facilities are presented so that any significant cumulative environmental impacts that might be related to the ultimate science-based stockpile stewardship program can be identified in this PEIS and considered in the PEIS Record of Decision (ROD). At this time DOE has identified four potential facilities as next generation facilities for science-based stockpile stewardship: Advanced Hydrotest Facility (AHF), Advanced Radiation Source (ARS [X-1]), the Jupiter Facility, and High Explosive Pulsed Power Facility (HEPPF). The following section provides a broad description of what these proposed future facilities might look like and the types of environmental impacts associated with their construction and operation. In the future, DOE may choose to drop these concepts, expand

TABLE 4.10.3–2.—*Summary of Annual Transportation Health Risk for Proposed Stockpile Stewardship and Management Alternatives*

Alternative	Pit/ Secondary and Case Storage Site	Health Effects[a]		
		Accident	Accident-Free	Total
No Action	Pantex/ORR	$2.57x10^{-3}$	$7.64x10^{-4}$	$3.33x10^{-3}$
Assembly/Disassembly at NTS				
Pit Fabrication at LANL				
Secondary and case fabrication at ORR	NTS/ORR	$4.78x10^{-3}$	$1.34x10^{-3}$	$6.12x10^{-3}$
Secondary and case fabrication at LANL	NTS/NTS	$3.87x10^{-3}$	$1.02x10^{-3}$	$4.89x10^{-3}$
Secondary and case fabrication at LLNL	NTS/NTS	$3.58x10^{-3}$	$1.08x10^{-3}$	$4.66x10^{-3}$
Pit Fabrication at SRS				
Secondary and case fabrication at ORR	NTS/ORR	$7.03x10^{-3}$	$2.03x10^{-3}$	$9.06x10^{-3}$
Secondary and case fabrication at LANL	NTS/NTS	$6.13x10^{-3}$	$1.70x10^{-3}$	$7.83x10^{-3}$
Secondary and case fabrication at LLNL	NTS/NTS	$5.83x10^{-3}$	$1.77x10^{-3}$	$7.60x10^{-3}$
Assembly/Disassembly at Pantex				
Pit Fabrication at LANL				
Secondary and case fabrication at ORR	Pantex/ORR	$2.57x10^{-3}$	$7.64x10^{-4}$	$3.33x10^{-3}$[b]
Secondary and case fabrication at LANL	Pantex/Pantex	$2.25x10^{-3}$	$5.96x10^{-4}$	$2.85x10^{-3}$[c]
Secondary and case fabrication at LLNL	Pantex/Pantex	$5.92x10^{-3}$	$1.71x10^{-3}$	$7.63x10^{-3}$
Pit Fabrication at SRS				
Secondary and case fabrication at ORR	Pantex/ORR	$3.89x10^{-3}$	$1.20x10^{-3}$	$5.09x10^{-3}$
Secondary and case fabrication at LANL	Pantex/Pantex	$3.57x10^{-3}$	$1.03x10^{-3}$	$4.60x10^{-3}$
Secondary and case fabrication at LLNL	Pantex/Pantex	$7.24x10^{-3}$	$2.15x10^{-3}$	$9.39x10^{-3}$[d]

[a] Estimated fatalities per year.
[b] Same as No Action risk.
[c] Lowest potential impact of all site combinations.
[d] Highest potential impact of all site combinations.
Source: RADTRAN model results.

upon them, or add to them. Any proposals would be subject to NEPA review prior to any decision to implement them.

Advanced Hydrotest Facility. AHF would be the next generation hydrodynamic test facility following the DARHT Facility at LANL. The AHF would be an improved radiographic facility that would provide for imaging on more than two axes, each with multiple time frames, though the number of axes and time frames is still subject to requirements definition and design evolution. The facility would be used to better reveal the evolution of weapon primaries implosion symmetry and boost-cavity shape under normal conditions and in accident scenarios. Due to the nature of the dynamic experiments and hydrodynamic testing to be conducted with the facility, AHF would probably be considered for location at NTS and LANL only.

At this point, the feasibility and definition of an AHF is still insufficiently determined for DOE to propose such a facility or adequately analyze it for the purposes of NEPA. For example, performance requirements and specifications for such a facility (i.e., determination of what capabilities should be required of an AHF for assessment of stockpile aging and related effects, beyond those of DARHT) have not been fully established. In addition, the type of technology to provide the basis for the facility has not been determined, and concepts for the resultant physical plant accordingly would vary significantly. Three basic technology approaches are currently being examined. These include linear induction accelerators of a type similar to that in the baseline DARHT Facility design (DOE/EIS-0228), an inductive-adder pulsed-power technology based on technology now in use for other purposes at SNL and

TABLE 4.10.3–3.—*High and Low Range of Annual Transportation Health Risk for All Possible Site Combinations (Strategic Storage Located at Any Site)*

Alternative	Highest Risk				Lowest Risk			
		Health Effects[a]				Health Effects[a]		
	Pit/ Secondary and Case Storage Site	Accident	Accident-Free	Total	Pit/ Secondary and Case Storage Site	Accident	Accident-Free	Total
Assembly/Disassembly at NTS								
Pit Fabrication at LANL								
Secondary and case fabrication at ORR	Hanford/Hanford	$9.88x10^{-3}$	$2.84x10^{-3}$	0.0127	NTS/ORR	$4.78x10^{-3}$	$1.34x10^{-3}$	$6.12x10^{-3}$
Secondary and case fabrication at LANL	SRS/SRS	$6.39x10^{-3}$	$1.85x10^{-3}$	$8.24x10^{-3}$	Pantex/Pantex	$3.06x10^{-3}$	$8.06x10^{-4}$	$3.87x10^{-3}$
Secondary and case fabrication at LLNL	SRS/SRS	$8.16x10^{-3}$	$2.44x10^{-3}$	0.0106	NTS/NTS	$3.58x10^{-3}$	$1.08x10^{-3}$	$4.66x10^{-3}$
Pit Fabrication at SRS								
Secondary and case fabrication at ORR	Hanford/Hanford	$1.19x10^{-2}$	$3.49x10^{-3}$	0.0154[b]	ORR/ORR	$5.55x10^{-3}$	$1.61x10^{-3}$	$7.16x10^{-3}$
Secondary and case fabrication at LANL	Hanford/Hanford	$7.92x10^{-3}$	$2.23x10^{-3}$	0.0102	Pantex/Pantex	$4.84x10^{-3}$	$1.37x10^{-3}$	$6.21x10^{-3}$
Secondary and case fabrication at LLNL	SRS/SRS	$8.00x10^{-3}$	$2.39x10^{-3}$	0.0104	NTS/NTS	$5.83x10^{-3}$	$1.77x10^{-3}$	$7.60x10^{-3}$
Assembly/Disassembly at Pantex								
Pit Fabrication at LANL								
Secondary and case fabrication at ORR	Hanford/Hanford	$7.90x10^{-3}$	$2.28x10^{-3}$	0.0102	Pantex/ORR	$2.57x10^{-3}$	$7.64x10^{-4}$	$3.33x10^{-3}$
Secondary and case fabrication at LANL	SRS/SRS	$5.58x10^{-3}$	$1.64x10^{-3}$	$7.22x10^{-3}$	Pantex/Pantex	$2.25x10^{-3}$	$5.96x10^{-4}$	$2.85x10^{-3}$[c]
Secondary and case fabrication at LLNL	SRS/SRS	$9.33x10^{-3}$	$2.74x10^{-3}$	0.0121	NTS/NTS	$4.76x10^{-3}$	$1.39x10^{-3}$	$6.15x10^{-3}$
Pit Fabrication at SRS								
Secondary and case fabrication at ORR	Hanford/Hanford	$9.44x10^{-3}$	$2.85x10^{-3}$	0.0123	ORR/ORR	$3.10x10^{-3}$	$9.67x10^{-4}$	$4.07x10^{-3}$
Secondary and case fabrication at LANL	Hanford/Hanford	$6.64x10^{-3}$	$1.90x10^{-3}$	$8.54x10^{-3}$	Pantex/Pantex	$3.57x10^{-3}$	$1.03x10^{-3}$	$4.60x10^{-3}$
Secondary and case fabrication at LLNL	SRS/SRS	$8.71x10^{-3}$	$2.59x10^{-3}$	0.0113	NTS/NTS	$6.54x10^{-3}$	$1.96x10^{-3}$	$8.5x10^{-3}$

[a] Estimated fatalities per year. Specific risk for these different cases is presented in appendix table G.1–1.
[b] Highest potential impact of all site combinations.
[c] Lowest potential impact of all site combinations.
Source: RADTRAN model results.

elsewhere, and high-energy proton accelerators similar to technology in use at LANSCE and a number of facilities in the U.S. and internationally. The first two are different approaches to accelerating a high-current burst of electrons, which when stopped in a dense target produce x-rays for radiography. This is the approach used in the existing PHERMEX (LANL) and FXR (LLNL) facilities, and which will be used in DARHT. The third approach would use bursts of very energetic (approximately 20 billion-electron-volt) protons, magnetic lenses, and particle detectors to produce the radiographic image. These technologies still require development and validation.

It is likely that an AHF would require new building construction and considerable infrastructure (i.e., facilities, equipment, and personnel) in support of test events. Existing infrastructure at LANL or NTS might be used to the extent practical. The construction and operational requirements for AHF might be greater than that of the DARHT Facility. The impacts associated with construction and operation of facilities based on the different technology approaches could be significantly different. For example, the acreage required could be comparable to or somewhat larger than the 3.1 ha (9 acres) of land resources required for DARHT, but use of proton radiography could require an accelerator comparable in scale to the kilometer-long LANSCE or to other large accelerators operated by DOE. Based on information on the DARHT Facility, it is estimated that over 250 additional workers would be required for construction and operation of AHF. Construction and operation of AHF is not anticipated to use large quantities of water. New construction activities would be expected to result in an increase in short-term air emissions. Operation of AHF would be expected to have a minimal impact on the air quality considering the impacts projected for DARHT operations. AHF would not be expected to impact existing community infrastructure or services in the area; however, depending on the specific design, a proton accelerator could require significant electrical power resources. Waste volumes would not be expected to increase substantially over existing operations at LANL. Waste management associated with dynamic experiments with plutonium at NTS could require additional infrastructure.

To the extent the potential environmental impacts of an AHF can be forecast at this time, a significant part of the public and worker exposures and impacts due to normal operation of AHF would be those related to the conduct of hydrodynamic tests and dynamic experiments at the facility. While the impacts are inherently site-dependent, the hydrodynamic tests and dynamic experiments themselves can be anticipated to be similar to such activities as analyzed at DARHT in the DARHT Facility EIS (DOE/EIS-0228); therefore the DARHT Facility impacts are summarized here for reference. Population-based impacts may be expected to be lower at NTS. The normal radiological impacts of the DARHT Facility to the annual collective dose to the population residing within 80 km (50 mi) would be expected to be 0.57 person-rem. Latent cancer fatalities at this dose would not be expected. The maximum annual dose to any nearby resident would be about $2x10^{-5}$ rem with a corresponding latent cancer fatality of $1x10^{-8}$. The average annual dose to individual workers would probably not exceed 0.02 rem with a corresponding maximum probability of latent cancer fatality of $8x10^{-6}$. Routine exposure to chemicals is expected to be low. The likelihood of a severe facility accident occurring would be very small. The population dose resulting from acute accidental release in the bounding facility accident, accidental uncontained detonation of a plutonium-containing assembly, evaluated on a what-if basis (related DOE safety studies indicate a probability of less than 10^{-6} per year), would be expected to range from 9,000 to 24,000 person-rem in the maximally exposed sector, based on 50th or 95th percentile atmospheric dispersion factors, respectively. Five to twelve latent cancer fatalities would [not] be expected from this dose. Population dose from acute accidental plutonium release from a containment breach was estimated to range from 210 to 560 person-rem, for which no latent cancer fatalities would be expected. For workers, the likelihood of a severe accident occurring and resulting in death would be minimized by a comprehensive training program and an explosives safety program.

Advanced Radiation Source (X-1) and Jupiter Facility. ARS (X-1) would be an advanced pulsed-power x-ray source that would provide enhanced capabilities in the areas of weapons physics, radiation science effects, and pulsed-power technology. SNL would be a principal candidate site because of its extensive expertise in this weapon physics and radiation effects technology and because the ARS (X-1) could probably utilize existing infrastructure associated with the Saturn Facility and Technical Area IV. The ARS (X-1) would likely require new building construction. The Saturn Facility accelerator is used as a nuclear weapon effects and weapon physics simulator with a large area and intense source of radiation. The Saturn Facility accelerator is designed to generate bremsstrahlung, x rays, and other electromagnetic radiation.

New construction activities for ARS (X-1) would be expected to result in an increase in short-term air emissions. The construction and operational requirements for the ARS (X-1) would be similar to those of the existing Saturn Facility. Operation of ARS (X-1) would be expected to have a minimal impact on the air quality of Albuquerque and the surrounding region considering the impacts resulting from operating the Saturn Facility. Based on Saturn Facility information, it is estimated that additional workers would be required for construction and operation of ARS (X-1). However, they would not be expected to impact existing community infrastructure or services in the area. Waste volumes would not increase substantially over existing operations. No radioactive materials would be expected to be produced or released from ARS (X-1). Materials handling and disposal of other wastes would serve to minimize the pollution and/or contamination risks.

Based on operation of the Saturn Facility, no significant risk to the public health and safety or to the environment would be expected from operation of ARS (X-1). Offsite impacts to the environment would be expected to be negligible or nonexistent. Onsite personnel exposures would be expected to be below 0.1 rem/yr and site boundary annual exposure would most likely be undetectable. Employee risk from industrial accidents during operation of ARS (X-1) would be identified and reduced to a level that is as low as reasonably achievable for the facility.

The Jupiter Facility would be a next generation facility well beyond ARS (X-1). It is not expected to have any significant or unusual environmental impacts based on the similar types of experiments and technology involved.

High Explosives Pulsed Power Facility. HEPPF, a potential next-generation facility, would be a possible follow-on HE firing site, configured specially for HE-driven pulsed power experiments, beyond the existing capabilities in the Complex to support such experiments. These experiments would, for example, study physics related to weapons secondary at shock pressures and velocities approaching those of actual weapon conditions.

DOE has pursued the application of electrical pulsed power on the microsecond time scale to weapons research since the 1960s. This R&D program has involved HE pulsed-power generators of various types, which have been used at existing HE firing sites in the Complex, in addition to fixed-facility capacitor banks such as Pegasus II at LANL and the proposed Atlas Facility. HE generators are used to explore higher energy (higher current) frontiers than may be available in existing fixed facilities without major capital investment, albeit at a relatively low data rate, and capacitor banks provide repeatable (and indoor) experimental facilities with higher data rates, for broad experimental use. These activities are programmatically complementary aspects of R&D (appendix K considers reliance on explosive-driven pulsed-power experiments and discusses why this is not a reasonable alternative to Atlas). Ongoing HE pulsed-power experiments are conducted for pulsed-power technology R&D, for weapons stockpile stewardship applications, and for unclassified scientific collaborations including those with Russian and other foreign scientists.

A variety of HE pulsed-power generator types are used in experiments. These generators are one-time-use assemblies of HE and metal and other components (commonly copper, structural materials such as aluminum, steel, and plastic, and possibly other materials depending on the experiment). When detonated, the explosive motion of the assemblies acts as an electrical generator to produce a large current, which is delivered to an experimental configuration. High magnetic fields result from the current pulse. In principle, such experiments can be performed at any appropriately equipped firing location, of which there are many in routine use at the DOE stockpile stewardship sites, within environmental limits and the structural design limits of the individual firing site. However, some HE firing sites (e.g., at TA-39 at LANL) have been specially configured to support these HE pulsed-power experiments; a principal firing site at TA-39 has within its bunker a capacitor bank to provide the seed electrical current for the HE pulsed-power generators. Currently, most of the largest-scale HE pulsed-power experiments in the United States are conducted at this LANL location. The highest-current generator design presently in routine use in the United States is called Procyon, and is about 3 m (10 ft) in length. Impacts of these ongoing R&D activities are included in the cumulative impacts for the No Action alternative in this PEIS.

HEPPF, as conceptualized, would be specially designed to support HE pulsed-power experiments of larger scale and of greater complexity in support of the stockpile stewardship mission: for example, to support generators using much larger explosive charges, which though not yet fully demonstrated for experiments, could produce higher pressures in larger masses and volumes than can be accessed at the LANL site. HEPPF would probably be sited at NTS because of the amount of HE and because an existing infrastructure is already available. Since the idea of a new HEPPF was first conceived some years ago, Big Explosives Experimental Facility (BEEF) has been separately developed as a firing site at NTS, based on refurbished bunkers originally developed for atmospheric nuclear tests. Although BEEF does not have specially configured HE pulsed power like the principal LANL firing site, in its current configuration BEEF is suitable for a variety of HE experiments, including many pulsed-power technology experiments. Experiments related to such purposes have been part of recent qualification tests. Therefore it may be possible to make modifications to BEEF when the need for and definition of such modifications is clear, to satisfy any future need for a new HEPPF.

BEEF is located in north-central Area 4 of Yucca Flat. BEEF comprises Bunkers 4-300 and 4-480, which house modern test equipment for use during detonations of very large, conventional HE charges and devices. Bunker 4-300 contains the control room, the laser room, and the utility room. The control and utility rooms were modified to house the diagnostic and firing control electronics, digitizers, electronic recording equipment, and other electronic equipment necessary for hydrodynamic and pulsed power experiments. The laser room was modified to accommodate a pulsed Ruby laser for image-converter camera illumination and a laser for multibeam Fabry-Perot velocimetry. Bunker 4-480 is designed to contain up to five helium or nitrogen-gas-driven rotating-mirror framing cameras and five optical ports with access to the gravel firing pad. The area surrounding the bunkers is graded with new earthen berms which provide blast protection, shield from radiation, and serve as a downrange projectile stop.

BEEF contains a firing table approximately 20x20 m (66x66 ft), consisting of pea gravel 1.8 m (6 ft) to 2.4 m (8 ft) deep, within the graded area west of the bunkers. Three large steel cylinders (3 m [10 ft] in diameter and 6 m [20 ft] long) are placed outside the bunkers near the firing pad to house 2.3-million-electron volt Febetron x-ray sources for high-energy x-ray radiography. As at other firing sites, among the HE experiments that can be performed at BEEF are pulsed-power-generating experiments. The facility has the capability to support many of the sophisticated diagnostic techniques needed for the evaluation of hydrodynamic and pulsed-power experiments containing large amounts of HE. Analysis of the impacts of operating the existing BEEF for explosive experiments, including those that involve pulsed-power technology, is incorporated in the NTS EIS (DOE/EIS 0243). These impacts are also included in cumulative impacts for the No Action alternative in this PEIS.

Should a need for HEPPF be determined, existing infrastructure at NTS would be used, to the extent practical, to develop the facility. Definition of the required modifications and additions is not yet mature enough to support environmental analysis in this PEIS. However, modifications to BEEF could include construction of additional bunker/shelter space near the firing location. The additional bunker space could be reinforced concrete construction, buried or earth covered in a manner virtually identical to Bunkers 4-300 and 4-480. In addition, future experiments conducted at HEPPF may require recording of a large number (several hundred) of channels of electronic and optical data. An expanded, suitably sheltered recording station also may be required. Additional shelters and blast-shields may be temporary or permanent and constructed of native soil to form earth berms or steel and sandbags to form structures. Upgrading construction activities would be expected to result in an increase in short-term air emissions.

Additional workers would be required for construction; however, for operation, the number of workers would be expected to be similar to that of BEEF. Operation of HEPPF would be expected to have minimal impact on the air quality of Clark County and the surrounding region considering the impacts projected for BEEF operations. HEPPF would not be expected to impact existing community infrastructure or services in the area.

Based on the operation of BEEF as analyzed in the NTS EIS, no significant risk to workers, to the public health and safety, or to the environment would be expected for HEPPF. Offsite impacts to the environment would be expected to be negligible or nonexistent.

4.12 Environmental Impacts of Underground Nuclear Testing

The last underground nuclear test was conducted in the United States in 1992. Since then, the Nation has been observing a moratorium on underground nuclear testing while pursuing a Comprehensive Test Ban Treaty (CTBT). On August 11, 1995, the President announced that, "one of my Administration's highest priorities is to negotiate a Comprehensive Test Ban Treaty to reduce the danger posed by nuclear weapons proliferation." In this announcement, the President also stated that he would seek a "zero-yield" CTBT, which would "ban any nuclear weapon test explosion or any other nuclear explosion immediately upon entry into force." The President declared his commitment "to do everything possible to conclude the Comprehensive Test Ban Treaty negotiations as soon as possible so that a treaty can be signed next year."

As part of this announcement, the President also stated that he had been assured "that we can meet the challenge of maintaining our nuclear deterrent under a Comprehensive Test Ban Treaty through a science-based Stockpile Stewardship Program without nuclear testing." However, the President cautioned that, "while I am optimistic that the Stockpile Stewardship Program will be successful, as President I cannot dismiss the possibility, however unlikely, that the program will fall short of its objectives." The President went on further to say that, "In the event that I were informed by the Secretary of Defense and Secretary of Energy...that a high level of confidence in the safety or reliability of a nuclear weapons type which the two Secretaries consider to be critical to our nuclear deterrent could no longer be certified, I would be prepared, in consultation with Congress, to exercise our 'supreme national interests' rights under the Comprehensive Test Ban Treaty in order to conduct whatever testing might be required."

One of the primary purposes of the Stockpile Stewardship and Management PEIS is to evaluate ways of maintaining a continued safe and reliable nuclear deterrent in the absence of nuclear testing. Thus, the proposal described in chapter 3 of this PEIS does not include nuclear testing. However, because it is possible—although not probable—that under the CTBT the United States might one day exercise its "supreme national interests" rights to conduct underground nuclear testing to certify the safety and reliability of its nuclear weapons, the following programmatic evaluation of the environmental impacts of underground nuclear testing at NTS is provided. More detailed information on the environmental impacts of underground nuclear testing is contained in the *Environmental Impact Statement for the Nevada Test Site and Off-site Locations in the State of Nevada* (DOE/EIS 0243, 1996).

The various steps involved in conducting an underground nuclear test are summarized below to provide an overview to the reader, and to aid in understanding the potential environmental impacts associated with underground nuclear testing. (For other descriptions of the testing process, see NT USGS 1994a; OTA 1989a). Variations to this general description will occur based on which national laboratories performs the weapon emplacement and testing.

- In recent years, emplacement holes were drilled using mud or detergent and water and a dual-string reverse-circulation method. This method replaced the conventional circulation method that used bentonite or sepiolite mud. Steel casing is installed and extends 9 to 30 m (30 to 98 ft) from the surface. If the test point is below the static water level, a liner is also installed in the bottom of the emplacement hole, and the emplacement hole is dewatered. Otherwise, no liner is installed. Cement grout is placed around the casing and liner.

- Each test includes a test rack made of steel that is used to support the nuclear device and the various instruments and detectors used to measure test results. Typically, racks are more than 30 m (98 ft) in height and include from 2 to as many as 20 line-of-sight pipes, each with a window of a composition compatible with the desired measurement. The rack sits on top of a steel canister that contains the nuclear device.

- The canister is often lined with a mixture of boron and polyethylene. Large quantities of polyethylene are used on the racks. Other organic materials used include polyvinyl chloride, Teflon™, polystyrene, phenolic, and neoprene. Complex fluorescing compounds and laser dyes are used as part of some detectors. Typically, tens of tons of lead are used to shield both the canister and the rack. Copper is used for wiring and other purposes. Beryllium, nickel, and zinc may be present in small quantities in detector packages. Arsenic, chromium, cadmium, osmium, and thallium have been used in rare instances. Other commonly used metals include tungsten, tantalum, stainless steel (iron, chromium, and nickel), and aluminum.

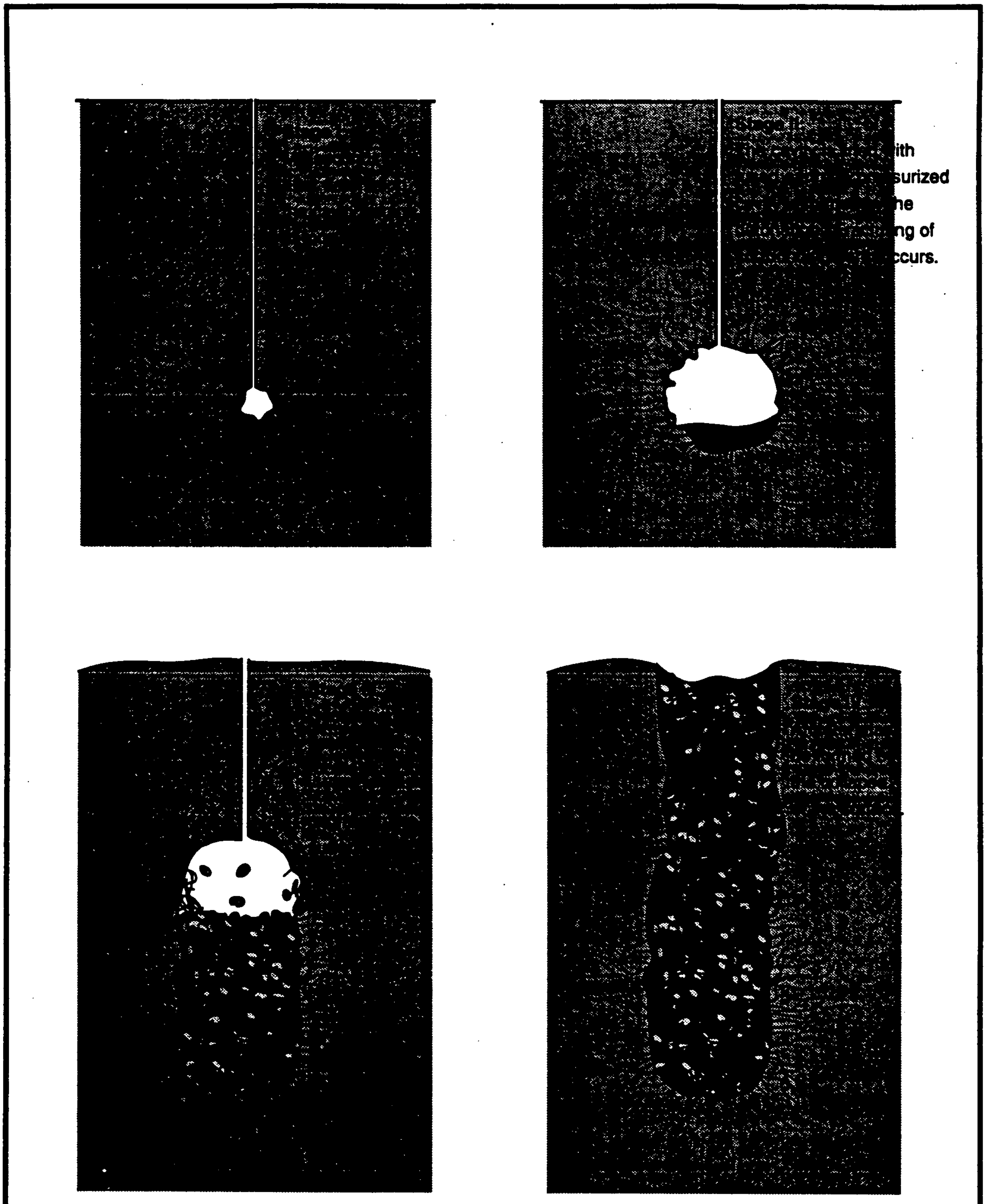
- Each test device contains nuclear materials, such as uranium, plutonium, tritium, lithium, and structural materials, such as steel, aluminum, beryllium, and gold. Radiochemical detectors (for example, yttrium, zirconium, thulium, and lutetium) and tracers (isotopes of uranium, plutonium, americium, or curium) are also used. The detectors and tracers are generally less than 100-g (3.5-oz) quantities.

- Magnetite powder is poured downhole to cover the sides and top of the rack. This naturally occurring mineral contains thorium and a variety of other impurities. Stemming materials are used to prevent the escape of radioactivity from the device upwards in the emplacement hole. Stemming materials consist of layers of coarse gravel with layers of fine gravel, sand, or bentonite. The gravel and sand are native materials. Two or more plugs made of two-part epoxy, coal-tar epoxy, sanded gypsum concrete, or sanded gypsum aggregate are placed in the hole, well above the cavity formed by the detonation, and remain intact after the test.

- As shown in figure 4.12–1, Stage I, the explosion initially creates a nearly spherical cavity filled with gases that are formed by atomization and vaporization of materials from the explosive device and its immediate surroundings. The molten cavity walls subsequently flow down to form a puddle that is vitrified as a result of quenching during condensation of the cavity gases as the cavity cools (Stage II). As gas pressure decreases, the rock above the cavity generally falls into the cavity with rubble (Stage III); this chimney-forming process may proceed upward all the way to the surface to form a crater, or it may stop at some intermediate point (Stage IV). Vaporized material is condensed and incorporated into molten rock or escapes into the chimney rubble where it may condense on solid rock. Volatile elements or materials tend to be enriched in the rubble zone, whereas refractory materials tend to remain in the puddle glass.

- The melt zone created by the nuclear test incorporates a mass (expressed in tons) of the same order of magnitude as the device yield (expressed in tons); the zone would extend well beyond the top of a 30-m (98-ft) rack if the yield was about 100 kt or more. In every test with a significant nuclear-energy release, the entire device is atomized and mixed with a relatively large quantity of rock.

- Reentry holes are typically drilled at an angle directed to intercept the test debris and puddle glass near its center. A profile of the radioactive material along the hole is measured with a downhole Geiger counter, and then samples of the puddle



Source: NT DOE 1996c.

3080/SSM

FIGURE 4.12–1.—*Formation of an Underground Nuclear Explosive Test Cavity, Rubble Chimney, and Surface Subsidence Crater.*

glass are collected using a sidewall sampler. The drilling procedure uses drilling mud with various additives, and a significant fraction of the mud is generally lost downhole into the highly permeable structure of the rubble created by the test. LLNL uses air foam for the upper part of the drill-back hole and drilling mud for the lower part of the hole.

The consequences of underground testing on the environment of the NTS can be evaluated on the basis of past testing actions. Through 1992, there have been 928 announced nuclear detonations on the NTS; 828 of these tests were underground tests. In general, the effects of underground testing that have occurred in the past, and those to be anticipated in the future, include impacts to land, geology, water resources, biotic, air quality, radiological and human health, and transportation. Each of these resource areas is discussed below.

Land. As shown in figure 4.12–2, underground nuclear testing would likely be conducted in the Yucca Flats, Painted Mesa, or Rainer Mesa Areas that are designated as the Nuclear Test Zone. Including a buffer zone, each underground nuclear test requires approximately 16 ha (40 acres). Approximately 5 ha (12 acres) of surface geologic media are disturbed in each underground nuclear test in Yucca Flat (Data Sheets, 1995). Radii of cavities at NTS range up to about 50 m (160 ft), and rubble chimneys range from up to about 50 m (160 ft) to about 350 m (1,150 ft) high (NT LLNL 1976a).

Because the land designated as the Nuclear Test Zone encompasses several hundred thousand hectares, the amount of potentially affected land would be a relatively small percentage (less than 1 percent). Additionally, underground testing would be a compatible use of the land; therefore, a change in land-use designation would not be required.

The formation of underground cavities and subsidence craters, as a result of underground testing, represent an unavoidable impact on the land in the vicinity of the planned tests. However, there are already hundreds of such cavities and craters on NTS.

Geology. Potential impacts on geological resources include fault reactivation and associated seismicity induced by underground testing of nuclear devices, offsite disturbances, and onsite radiological contamination of geological media. Fault reactivation from testing of nuclear devices disturbs subsurface and surface geologic media, which is potentially significant in terms of resultant limitations on land use or resultant changes in surface and subsurface water movement. Ground-motion studies have played a large role in the weapons testing program. SNL has developed a program for recording surface and subsurface motions resulting from underground nuclear explosions (SNL 1979a; SNL 1982b). There are several factors that influence the level and duration of ground motion from underground explosions, including yield of the device; ground-coupling at the source of explosion, which is a function of depth of the device, local geology, and stratigraphy; geological complexity along the transmission path; and the topography and geology at the location receiving ground motion. There is always some variation or unknown associated with estimating these factors; but, because of the long history of conducting weapon tests, the effects are reasonably predictable.

The yield or size of underground nuclear explosions is limited by the Limited Test Ban Treaty to a maximum HE equivalent of 150 kt. For the purposes of this evaluation, all future weapons testing is assumed to occur under this limitation. Historically, most underground nuclear testing has been conducted in the Paihute Mesa and Yucca Flat areas. Because geologic structure may differ considerably among the testing areas, effects of tests in the unused areas are uncertain. Nevertheless, the geographic areas for testing and the yield limits can be used to estimate ground-motion effects from future weapons tests.

Ground-motion hazards can result from the underground nuclear explosion and secondary seismic effects. Because of the rather complete recording of ground motions emanating from NTS activities, the effects of the weapons testing program are predictable, and damage effects have been documented. Communities within about 48 km (30 mi) of testing areas that could be most affected by ground motion from underground nuclear explosions are Beatty, Amargosa Valley, and Indian Springs. The closest potential testing areas for these communities are 31 to 40 km (19 to 25 mi) away. Table 4.12–1 is a tabulation of peak horizontal ground-motions for 150-kiloton tests at 31 km (19 mi) away, using regres-

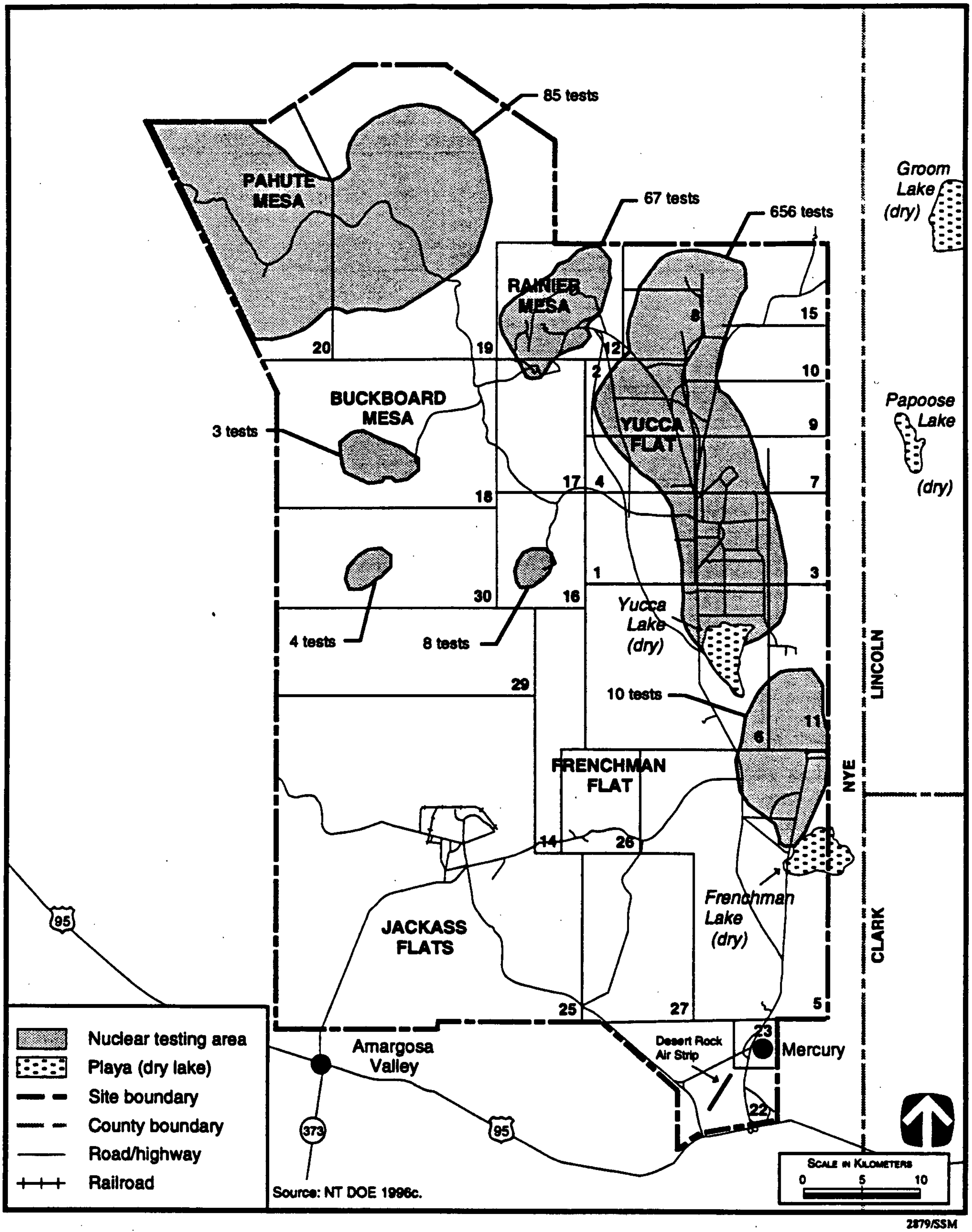


FIGURE 4.12–2.—*Location of Underground Testing Areas and Tests on the Nevada Test Site.*

TABLE 4.12–1.—*Predicted (50th and 84th Percentiles) Peak Ground Motions at Localities 31 Kilometers (19 Miles) from Underground Testing Areas*

Distance (km)	Yield (kt)[d]	Acceleration (g's)[a]		Velocity (m/sec)[b]		Displacement (cm)[c]	
		50 Percent	84 Percent	50 Percent	84 Percent	50 Percent	84 Percent
Rock							
31	150	0.012	0.029	0.009	0.021	0.23	0.5
Alluvium							
31	150	0.009	0.016	0.009	0.018	0.28	0.61

[a] Local acceleration due to gravity.
[b] Meters per second.
[c] Centimeters.
[d] Kilotons.
Note: All peak values reported are the largest of the radial and transverse components.
Source: NT DOE 1996c.

sions developed by Long (NT SNL 1986a). Peak ground acceleration, velocity, and displacement were computed at the 50th and 84th percentiles of the log-normal distributions given by Long (NT SNL 1986a) for rock and alluvium recording geology at 31 km (19 mi) for 150 kt tests. Expected peak ground accelerations are well below 0.05, which is the acceleration where slight damage might occur in typical buildings less than several stories in height.

Data pertaining to offsite damage support conclusions based on expected motion. Since the Threshold Test Ban Treaty, only a few reports of damage to local communities occur each year, and these are of a very minor nature. Beyond about 48 km (30 mi), structures would have to be higher than several stories tall before they would be affected. The closest location where structures of that height are located is in Las Vegas. A smaller number of similar complaints have been recorded from people in Las Vegas high-rise structures.

Several Nye County mines are located in the testing vicinity, but all are at a distance greater than 40 km (25 mi) from the closest potential testing area. Because the distances from these mines to the underground nuclear explosions are approximately the same as, or greater than, the distances for communities, damage to structures in the mines is not expected. In investigations of earthquake effects to mines (Owen 1981a), there are very few reports of damage. Surveys of mines in the vicinity of NTS by Owen and Scholl further support these findings (NT ERDA 1977a).

In addition to direct ground motion effects of underground nuclear explosions, there is also a potential hazard from secondary seismic effects. Secondary effects are associated with co-seismic strain release attributed to release of tectonic strain, aftershocks that can be associated with tectonic strain release, and events associated with the collapse of cavities created by the underground nuclear explosions. Beyond 5 to 10 km (3 to 6 mi) of even the largest, pre-Limited Test Ban Treaty underground nuclear explosion (greater than 1 megaton), there was no evidence of significant secondary seismic effects associated with testing, and in no case has the magnitude of an aftershock been larger than the magnitude of the underground nuclear explosion (NT SNL 1986b).

Underground conventional HE, hydrodynamic, and hydronuclear experiments would produce some of the physical effects on geologic media and processes associated with underground tests of nuclear devices (e.g., compression and fracturing). These effects are anticipated to be significant and irrevocable although small in relation to the effects of detonation of nuclear devices.

In addition to the direct effect on geologic media and processes of detonating nuclear and other devices, preparation for such tests also disturbs geologic media. Disturbances include any associated infrastructure, excavated tunnels, and an inventory of deep boreholes up to 3.6 m (11.8 ft) in diameter for detonation of nuclear devices. Geologic media excavated in tunnels, boreholes, and borrow pits are considered to be permanently lost. Excavation of tunnels and any testing conducted in those tunnels potentially could impact slope stability.

During an underground detonation, large quantities of neutrons are released. Naturally occurring materials in the host rock, such as iron, lead, and zinc, capture some of these neutrons. The result is the formation of unstable radioactive nuclei. The majority of atoms in the host rock occur in a stable form; the activation products that are generated are considered part of the total release from a test. Radioisotope contamination might extend up to five cavity radii from the point of detonation where radioactivity has been released into the geologic media. However, most of the radioactive materials that are created during an underground nuclear explosion are expected to be trapped within a pocket of resolidified rock melt in the explosion cavity. Radioactive noble gases and tritium may be released to the surface by gradual seepage from the cavities and by escape of gases during sampling operations. The effects of subsidence and the confined radioactivity on the environment will persist for many years.

Water Resources. Because underground nuclear testing does not utilize any significant amount of groundwater, it is unlikely that there would be any potential to impact groundwater availability. However, as an unavoidable consequence of underground nuclear testing, the quality of the groundwater under some portions of NTS has been affected. If any underground tests were to be detonated under or near the water table, additional impacts to water quality could be expected.

The effects of underground testing have been well documented (NT LLNL 1976a), and the hazardous materials associated with testing have been detailed by Bryant (NT DOE 1996c). The potential for a given test event to result in groundwater contamination is a function of the yield of the test device and its location relative to the water table.

The types of contaminants related to active testing include four major categories of radionuclides and hazardous substances: source term and fission products, activation products, stemming material, and ancillary operations that use radioactive or hazardous substances. The exact quantity of substances that are released during a given test is unknown, but can be approximated based upon the similarity in materials used and in the overall testing procedures.

Information concerning releases from a test is summarized in Borg et. al. (NT LLNL 1976a) and Glasstone (DOD 1962a). The source term that is released during a test includes the original nuclear material that did not undergo reaction during detonation. The fission products are those direct products generated as a consequence of the detonation. About 80 different fission products result from the fission of a given nuclear detonation, and about 200 different isotopes of 36 elements can be formed through their decay into a complex mixture of daughter products. There are also 3 specific source-term radionuclides (tritium, plutonium, and uranium) and 24 specific fission products that result from a typical nuclear test. The estimated total release of fission and source-term radionuclides and activation products is 804,500 curies per kiloton.

Another source of contamination from underground testing is from the use of stemming materials. For most tests, significant quantities of nonradioactive materials are emplaced underground, along with the nuclear device, and are collectively termed stemming materials. For a typical test, at least 59,000 kg (130,000 lb) of rack and stemming materials are placed underground (NT DOE 1996c). Lead is by far the major hazardous constituent at about 450 kg (1,000 lb) per test. Small quantities (less than 0.5 kg [1 lb] each) of arsenic, beryllium, naphthalene, and zinc are also commonly present in the stemming materials.

Because test yields and the location and proximity to the water table of any tests that might be conducted have not been defined, it is not possible to estimate the total potential releases to the groundwater. If any tests are conducted in or near the water table, then significant releases to the groundwater are to be expected. If any tests are conducted in or near the water table, then significant releases of radionuclides and hazardous materials into the near test environment are to be expected. Tests conducted well above the water table would release significant quantities of radionuclides and hazardous materials into the unsaturated zone. Some downward migration of these contaminants might occur and might have the potential to contaminate the underlying groundwater.

The ancillary operations related to testing are primarily surface based and have little potential for groundwater contamination. Minor quantities of drilling fluids or lost circulation materials might be introduced into the near-water-table environment during test hole drilling and postshot drill-back operations. Any contamination that results from these activities would be considered inconsequential compared to the releases from the actual test.

It is difficult to predict the significance of the releases from underground testing on the water resources of NTS. Perhaps the best gauge can be made based upon the results of past testing activities. There have been 111 tests conducted under the water table and 124 tests where the lower shot cavity was under, or within 75 m (250 ft) of the water table. The combined yield of the tests conducted under the water table and tests with cavities that extended below the water table was 28 megatons.

The results of the Long Term Hydrology Monitoring Program and research into tritium migration have found that the migration of radionuclides beyond the near test environment is rare. Instances have been found where radionuclides have moved through fracture injection at the time of the test (NT DOE 1996c). Tritium migration via groundwater flow has been confirmed, but in the more than 30 years that underground testing has been done, no offsite releases of tritium in the groundwater have been detected.

Underground testing would be expected to have a significant impact on groundwater quality only if the testing is conducted in, or near, the water table. In this event, large scale contamination of the near-test groundwater resources could occur. However, because of the conditions at NTS (low hydraulic conductivities, high absorption geologic media, and slight hydraulic gradients), it is not considered likely that any significant impacts would occur in areas downgradient of the underground testing locations.

Biotic Resources. Because DOE has already prepared sufficient sites to handle numerous underground tests, no new impacts on biological resources would arise from preparation for these tests. A subsidence crater would be created by the underground test of the nuclear device. Because this crater would form in the area disturbed during site preparation for the test, no new loss of habitat would occur. Underground testing might impact individuals of recreational important species, such as waterfowl and doves, and candidate species of bats and birds, as they would be exposed to drilling fluid in drilling sumps constructed during postshot operations. Exposure to drilling fluid additives might increase these organisms' probability of drowning (NT DOE 1996c). The impact would not be large enough to decrease offsite recreational opportunities.

Hazardous or radioactive material releases could cause the mortality of plants and animals over tens or hundreds of hectares (NT DOE 1996c). This could have a significant impact on the viability of rare plants found in the northern half of NTS. However, because past aboveground tests and vented underground tests have not caused the expiration of any species from NTS, it is unlikely that future accidental venting would have that effect.

Because nuclear tests are conducted north of the range of the desert tortoise and because these tests normally are conducted when the wind is blowing to the north or northeast, accidental venting should not impact this threatened species (DOD 1977a; NT DOE 1995i). Additional releases of tritium into the aquifer from the underground nuclear test would not likely increase the impact to threatened and endangered species located at Devils Hole National Monument or Ash Meadows National Wildlife Refuge, given the short half-life of tritium and the slow rate of water exchange between the nuclear test sites and those springs (GTI 1995a; NT LLNL 1976a). Transportation to study sites would be infrequent enough as to not significantly increase the impact of this program on biological resources.

Air Quality. The average, annual fugitive dust emission rate (PM_{10}), including various drilling and construction activities, is about 1,290 t (1,422 tons). These emissions represent 0.16 percent of the total Nye County fugitive emissions. Fugitive dust calculations assume a 50-percent reduction as a result of watering the sites. As construction activities are only expected to occur on a short-term basis, long-term air quality impacts are not expected. Nevada Administrative Code 445B.365 regulates fugitive dust from surface disturbance of 2 ha (5 acres) or more. DOE has current Operating Permit 2743, which expires March 1998, for variable disturbance of land at NTS. If any radioactive noble gases and tritium were released to the surface by gradual seepage from the cavities or by escape during sampling operations, such releases are expected to be so small that impacts would be negligible.

Radiological and Human Health. Potential exposures of workers are possible during the tests conducted as part of the underground nuclear testing. The human health effects due to these exposures are based on an average annual dose reported in the NTS Site-Wide EIS (DOE/EIS 0243), with the results included in table 4.12–2.

Potential accidental releases from underground nuclear weapons testing were determined based on historical information from past testing at the site. These effects are also included in table 4.12–2.

Should DOE be directed by the President to conduct underground nuclear-yield testing under Alternative 1 of the NTS Site-Wide EIS, the probability of a single latent cancer fatality in the offsite population being caused as a result of radiological accidents over the 10 years evaluated by the EIS would be about 0.0055 (about one in 180). The probability of any other detrimental health effect occurring in the offsite population would be about 0.0025 (about one in 400).

Device delivery and assembly, as part of the underground nuclear weapons testing, are conducted at the Device Assembly Facility. Accident analyses performed as part of the Device Assembly Facility SAR show that for various design basis and operational accident scenarios considered, the impacts in terms of latent cancer fatalities fall well below the nuclear safety goal. All device assembly facility risk estimates are based on the SAR for the Device Assembly Facility. Section 4.9.3.9 of this PEIS discusses potential impacts associated with accidents at the Device Assembly Facility.

Transportation. DOE evaluated and reported the risks (consequences and probabilities) associated with transporting DP materials in SNL's *Defense Programs Transportation Risk Assessment: Probabilities and Consequences of Accidental Dispersal of Radioactive Material Arising from Off-Site Transportation of Defense Programs Material (U)* (SAND93-1617, September 1994). In that study, the annual risk of shipments of various cargos was evaluated based on many factors, including, but not limited to the transportation mode, how often and how far each cargo must be shipped, the specific route, and the population density along specific routes.

Detailed information relating to methods and assumptions used for the risk analysis of DP materials is provided in appendix B of the transportation study. The results of the risk analysis indicate a very low potential for accidents; data analyzed from fiscal year 1984 through 1993 yielded an estimated 6.6 accidents per 161 million km (100 million mi). The risk of latent cancer fatalities (total to members of the public) and radiation detriment are significantly lower than the risk of fatalities and injuries from accidents (e.g., collision with a truck). Relating to onsite (within NTS) risk, the only potential hazard is on the 32 to 40 km (20 to 25 mi) of roadway that the safe secure trailer would travel. A group of flammable-liquid storage tanks located near the Mercury Facility is located about 30 m (100 ft) off the roadway and are protected by dikes. Based on accepted transportation accident rates, a transportation accident having serious consequences along this route would have a probability of less than or equal to 1 in 1 million.

TABLE 4.12–2.—*Human Health Risks and Safety Impacts from Underground Nuclear Testing*

Project	Routine Operation		Construction	
	Cancer	Detriment	Injury	Fatality
Underground nuclear weapons testing	0.034	0.013	6.8	0.012

Source: NT DOE 1996c.

4.13 Cumulative Impacts

Impacts from Stockpile Stewardship and Management Program alternatives are cumulative when added to impacts from other existing and planned activities at each of the alternative sites evaluated in this PEIS. An assessment incorporating the impacts from these other activities is important because cumulative impacts can result from several smaller actions that by themselves do not have impacts.

A cumulative impact is defined as the "impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7). This section describes potential impacts resulting from other facilities, operations, and activities that in combination with stockpile stewardship and management alternatives may contribute to cumulative impacts. The following documents and the associated proposed actions were considered in assessing cumulative impacts:

- Waste Management PEIS (Draft)
- Tritium Supply and Recycling PEIS (ROD)
- Storage and Disposition of Weapons-Usable Fissile Materials PEIS (Draft)
- Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Restoration and Waste Management Programs EIS (ROD)
- Disposition of Surplus Highly Enriched Uranium EIS (Final)
- Proposed Medical Isotope Production EIS (Final)
- Environmental Assessment, Yucca Mountain Site, Nevada Research and Development Area (Final)

The following documents and the associated actions were considered in assessing cumulative impacts, but were eliminated from further study because they do not contribute to cumulative impacts or had impacts that were already included in the 2005 No Action alternative:

- Stabilization of Plutonium Solutions Stored in the F-Canyon Facility at the Savannah River Site EIS (ROD)
- Defense Waste Processing Facility at the Savannah River Site EIS (ROD)
- Savannah River Site Waste Management EIS (Final)
- Continued Operation of the Lawrence Livermore National Laboratory and Sandia National Laboratory, Livermore EIS (ROD)
- Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel EIS (ROD)
- Los Alamos National Laboratory Site-Wide EIS (In preparation)
- Dual Axis Radiographic Hydrodynamic Test Facility EIS (ROD)
- Interim Management of Nuclear Materials, Savannah River Site EIS (ROD)
- Site-Wide EIS for the Continued Operation of the Pantex Plant (Draft)
- Nonnuclear Consolidation Environmental Assessment Nuclear Weapons Complex Reconfiguration Program (FONSI)
- Nevada Test Site Site-Wide EIS (Final)
- Environmental Assessment for the Proposed Interim Storage of Enriched Uranium Above the Maximum Historical Storage Level at the Y-12 Plant, Oak Ridge, Tennessee (FONSI)

No other Federal, state, local, or private reasonably foreseeable actions were found that would contribute to cumulative impacts. When possible, planned projects before the 2005 No Action baseline have been incorporated into the No Action alternative. The No Action alternative takes into account existing site operations and includes the impacts resulting from planned changes to operations until the year 2005. Projects planned for beyond the 2005 No Action baseline would be in such a preliminary stage as to make analysis speculative. Future tiered NEPA documents would further analyze the impacts from other Federal, state, local, and private actions.

4.13.1 Site-Specific Cumulative Impacts

The following sections discuss the cumulative impacts identified for each of the alternative sites evaluated in this PEIS. In order to show the highest potential cumulative impacts, the maximum impacts of the stockpile stewardship and management alternatives are used in the discussion. In addition to the impacts of these alternatives, impacts from other proposed projects that may contribute to a cumulative impact are also discussed. If proposed projects are in draft form (i.e., no ROD has been issued), alternatives that would contribute the highest potential for environmental impacts are identified and used for cumulative impact assessment. However, if a decision has been made on the proposed action (i.e., ROD is published), then the impacts associated with the alternative selected are used.

Detailed discussions of the resources are provided for each of the sites only when potentially notable cumulative impacts were identified. The analysis showed negligible cumulative impacts for the following resources:

Land Resources. Construction activities associated with the proposed NIF at LLNL, SNL, NTS, and LANL, the Nonnuclear Fabrication Facility at SNL, and the A/D facility at NTS would result in land resource impacts due to land clearing and site preparation. These sites would receive additional land resource impacts from the other proposed projects evaluated in the cumulative impact analysis. Cumulatively, the proposed facilities would use a small percentage of the available land. Additionally, these proposed new mission activities would be located in facilities or areas conducting the same or very similar types of activities. The proposed activities and land use would be consistent with the existing land use plans and policies of the alternative sites.

Geology and Soils. Construction activities associated with the proposed NIF at LLNL, SNL, NTS, and LANL, the Nonnuclear Fabrication Facility at SNL, and the A/D Facility at NTS would result in soil disturbances and a potential for temporary increases in erosion. The sites would receive additional impacts to geology and soils from the other proposed projects evaluated in the cumulative impact analysis. Cumulatively, the potential for soil disturbances would be minor. Standard construction soil erosion and stormwater control measures would mitigate any erosion from disturbed areas.

Biotic Resources. Construction activities associated with the proposed NIF at LLNL, SNL, NTS, and LANL, the Nonnuclear Fabrication Facility at SNL, and the A/D facility at NTS could potentially disturb biotic resources. Biotic resources combined program impacts are discussed in detail for LANL in section 4.13.1.5, and for NTS in section 4.13.1.8. The construction and operation of other proposed facilities evaluated in the cumulative impact analysis could also impact biotic resources at the sites. Cumulatively, the total area of the habitats potentially affected would be small in comparison to the entire area of habitat available and, except for the desert tortoise at NTS and several species at LANL, the habitat losses would not be expected to affect any threatened or endangered species.

Cultural and Paleontological Resources. No known cultural resources would be affected by any of the proposed alternatives. Site-specific surveys would be performed in future tiered NEPA documents to determine impacts to cultural resources. The construction of the Nonnuclear Fabrication Facility at SNL may affect some NRHP-eligible prehistoric and historic sites, important Native American resources, and scientifically important paleontological resources because of ground disturbance during construction. In addition, the replacement secondary and case fabrication alternative at ORR may affect several buildings eligible for inclusion in the NRHP.

Environmental Justice. No adverse impacts that would disproportionately affect minority or low-income populations were identified for any of the proposed projects evaluated in the cumulative impact analysis. The minority population located in the region of NLVF would experience disproportionate regional socioeconomic impacts from construction of the proposed NIF, which would be beneficial. This population would also experience negative health impacts due to radiological doses over the lifetime of the proposed NIF. Because no other projects are planned for NLVF, cumulative impacts to environmental justice are those discussed above.

4.13.1.1 *Oak Ridge Reservation*

ORR is a candidate site for downsizing secondary and case fabrication and for phaseout of secondary and case fabrication in this PEIS. In the Disposition of Highly Enriched Uranium EIS, ORR is a candidate site for blending HEU. ORR is also a candidate site for the location of a storage facility and as a disposition site in the Storage and Disposition PEIS. Additionally, ORR is a candidate site for the consolidation of LLW, mixed LLW, TRU, and hazardous waste in the Waste Management PEIS. In the Proposed Medical Isotope Production EIS, the Oak Ridge Research Reactor/Radioisotope Development Laboratory is an alternative for production of molybdenum-99 and other related medical isotopes for the U.S. medical community.

The stockpile management alternatives at ORR include the downsizing or the phaseout of the secondary and case fabrication mission. Reductions in resource consumption and waste generation from the downsizing and phaseout alternatives would result in slight beneficial impacts for the following resources: site infrastructure, water resources, air quality, and waste management. The beneficial impacts from downsizing would not substantially mitigate impacts from other proposed projects at ORR. The phaseout alternative would result in land resource impacts due to the transition of land, facilities, and infrastructures to EM.

The phaseout of the secondary and case fabrication mission at ORR would require the relocation of the highly enriched uranium strategic reserve from ORR to the A/D Facility at Pantex or NTS. Alternatives in the Storage and Disposition Draft PEIS could relocate the strategic reserve to Hanford, INEL, or SRS. Cumulative intersite transport impacts would result if the Storage and Disposition Draft PEIS requires a second relocation of the highly enriched uranium strategic reserve.

Socioeconomics. The phaseout of the secondary and case fabrication mission at ORR would result in the maximum potential cumulative impact contribution from the stockpile management alternatives. The phaseout would result in the loss of 4,721 operational jobs at ORR. However, D&D would add 2,160 operational jobs at ORR. The net loss would be 3,336 operational jobs at ORR. Total regional employment and per capita income would decrease less than 3 percent and less than 2 percent respectively. Termination of the secondary and case fabrication mission would also reduce the regional population and increase the housing vacancy rate. The cumulative impacts from other proposed projects are shown in table 4.13.1.1–1.

Cumulatively, the maximum positive socioeconomic impacts at ORR would result from the downsizing secondary and case fabrication under the Stockpile Stewardship and Management PEIS in combination with other proposed projects. Downsizing secondary and case fabrication at ORR would result in the loss of 1,957 direct operational jobs. However, D&D would add 1,152 operational jobs at ORR. The net loss would be 805 jobs at ORR. The siting of a storage and/or disposal facility under the Storage and Disposition PEIS would result in the largest socioeconomic gains for ORR. A total of 6,684 construction worker years and 3,663 operational jobs could result from all proposed projects at ORR. Impacts from the other proposed projects would offset potential socioeconomic losses from downsizing the secondary and case fabrication mission in the Stockpile Stewardship and Management PEIS. Cumulatively, the impacts would be minor because of the relatively large regional economy and the gradual implementation of the changes.

Radiation and Hazardous Chemical Environment—Normal Operations and Facility Accidents. The normal operation cumulative radiological doses and resulting health effects for the stockpile management alternative alongside other potential site activities at ORR, are presented in table 4.13.1.1–2. Although these impacts could be added, it should be noted that the exact locations of the facilities for planned actions may change. This would be addressed in site-specific detailed analyses. Also, for the various actions, the location of the maximally exposed individual is different, alternate dose assessment models are used, and different operational time periods exist. Impacts from potential accidents asso-

TABLE 4.13.1.1–1.—*Socioeconomic Cumulative Impacts at Oak Ridge Reservation*

Category	No Action	Medical Isotope Production	Highly Enriched Uranium	Storage and Disposition[a]	Waste Management	Stockpile Stewardship and Management	Total Change Over No Action
Construction							
Direct employment (worker years)	0	111	0	6,501	b	72	6,684
Operation							
Direct employment	15,171	62	125	700	3,581	-805	3,663

[a] Data represents the maximum values for storage alternatives. A nonsite-specific analysis of the disposition alternatives shows that 16,566 construction worker years and 2,622 operational jobs would result from the disposition alternative with the maximum impacts.

[b] Included in operation.

Source: DOE 1995cc; DOE 1996a; DOE 1996h; DOE 1996m; section 4.2.3.8.

ciated with downsizing secondary and case fabrication and phaseout of secondary and case fabrication are assessed for ORR in section 4.2.3.9 of this PEIS. A potential exists that other proposed projects could be sited at ORR. These other proposed projects also have the potential to produce impacts from accidents. A beyond design basis earthquake could potentially impact multiple facilities within ORR, resulting in the simultaneous release of radioactive materials from these facilities to the environment. Table 4.13.1.1–3 is a summary of potential consequences to the maximally exposed individual and the surrounding population from accidental radiological releases caused by a single earthquake. Probabilities of an earthquake accident occurring are not presented; instead, the information presented is based on the conservative assumption that the worst consequence accident for the activity has occurred, based on existing NEPA analyses. The cumulative impacts associated with accidents from these other reasonably foreseeable activities at ORR, and the stockpile management activities at ORR, would be the sum of the impacts presented below and those presented in section 4.2.3.9.

4.13.1.2 *Savannah River Site*

As part of the Stockpile Stewardship and Management PEIS, SRS is an alternative site for pit fabrication and intrusive modification pit reuse. Related NEPA actions involving SRS for which data are available include the Waste Management Draft PEIS, the Programmatic Spent Nuclear Fuel Management and INEL Environmental Restoration and Waste Management Programs EIS, the Tritium Supply and Recycling PEIS, the Storage and Disposition Draft PEIS, and the Disposition of Highly Enriched Uranium EIS.

The most adverse impacts to SRS from the Waste Management Draft PEIS would occur as a result of some centralized and regionalized alternatives where treatment and disposal facilities would be constructed for SRS to manage its own LLW and mixed LLW, in addition to accepting offsite mixed LLW and LLW for treatment and disposal, offsite TRU waste for treatment, and offsite HLW canisters for storage (DOE 1995cc:11-68). The ROD for the Programmatic Spent Nuclear Fuel Management EIS selected regionalizing spent nuclear fuel management by fuel types (Alternative 4a) at three sites, one of which is SRS. The ROD for the Tritium Supply and Recycling PEIS designated SRS as the preferred site for an accelerator, an upgraded tritium recycling facility, and an extraction facility. SRS is also an alternative for the blending down of highly enriched uranium to low enriched uranium under the Disposition of Highly Enriched Uranium EIS. Lastly, SRS is a candidate site for the location of a storage and/or disposal facility under the Storage and Disposition Draft PEIS. Impacts resulting from the Stockpile Stewardship and Management Program would contribute to cumulative impacts when added to impacts resulting from these related NEPA actions.

Site Infrastructure. The stockpile management alternative would contribute minimal site infrastructure impacts at SRS. The pit fabrication alternative would result in an increase in electric power, liquid fuel, and coal use by 2 percent or less over No Action

TABLE 4.13.1.1–2.—*Estimated Annual Cumulative Radiological Doses and Resulting Health Effects to Offsite Population and Facility Workers at Oak Ridge Reservation*

Program	Maximally Exposed Individual		Total Population Within 80 km[a]		Workers	
	Total dose[b] (rem)	Fatal cancer risk[c]	Total dose (person-rem)	Number of fatal cancers[c]	Total dose[d] (person-rem)	Number of fatal cancers[c]
No Action[e]	3.0×10^{-3}	1.5×10^{-6}	40	2.0×10^{-2}	81	0.032
Highly Enriched Uranium	3.9×10^{-5}	2.0×10^{-8}	0.16	8.0×10^{-5}	11.3	4.5×10^{-3}
Proposed Medical Isotope Production	3.1×10^{-4}	1.6×10^{-7}	15	7.5×10^{-3}	25	1.0×10^{-2}
Waste Management	5.8×10^{-4}	2.9×10^{-7}	19	9.4×10^{-3}	0.45	1.8×10^{-4}
Storage and Disposition	4.6×10^{-8}	2.3×10^{-11}	8.2×10^{-4}	4.1×10^{-7}	25	0.010
Stockpile Management	2.0×10^{-4}	1.0×10^{-7}	0.60	3.0×10^{-4}	-1.8	-7.2×10^{-4}

[a] Collective dose to the 80-km (50-mi) population surrounding each given site.
[b] The applicable limits for an individual member of the public from total site operations are 10 mrem/yr from the air pathways, 4 mrem/yr from the drinking water pathway, and 100 mrem/yr from all pathways combined.
[c] Annual incidence of excess fatal cancers.
[d] Dose presented is for the total workforce.
[e] Includes impacts from Y-12 Interim Storage.
Source: DOE 1993n:7; DOE 1995cc; DOE 1996a; DOE 1996h; DOE 1996m; OR DOE 1994c; OR DOE 1994d; tables 4.2.3.9–1 and 4.2.3.9–2.

TABLE 4.13.1.1–3.—*Summary of Earthquake Accident Consequences from Other Proposed Projects at Oak Ridge Reservation*

Other Proposed Projects	Offsite MEI Dose (rem)	Offsite MEI Number of Cancer Fatalities	Offsite Population[a] Dose (person-rem)	Offsite Population[a] Number of Cancer Fatalities
Highly Enriched Uranium	8.6	$4.3x10^{-3}$	7,600	3.8
Storage and Disposition				
Storage[b]	80	0.058	11,900	6
Disposition[c]	665	0.33	47,300	23
Plutonium conversion	12	$5.8x10^{-3}$	1,860	0.93
Pit assembly/disassembly	5.2	$2.6x10^{-3}$	841	0.42
Mixed oxide fuel fabrication	1.3	$5.6x10^{-3}$	1,990	1
Waste Management[d]				
Low-level waste	0.002	$1x10^{-6}$	20	e
Mixed low-level waste	0.04	$2x10^{-5}$	400	e
Medical Isotope Production	ND	ND	11,000	6

[a] Population within 80 km (50 mi).
[b] Consolidation of plutonium and collocation of HEU.
[c] Evolutionary Light Water Reactor.
[d] Treatment facility accidents.
[e] Greater than zero, but less than 0.5.
Note: ND - no data; MEI - maximally exposed individual.
Source: DOE 1995cc; DOE 1996a; DOE 1996h; DOE 1996m.

and be well within available resource supply for the site.

Cumulative electrical power requirements for the proposed activities would increase by approximately 585 percent over No Action. This increase results primarily from the accelerator alternative for tritium supply and recycling and the storage and disposition alternatives. These proposed actions would require that new and upgraded transmission lines and facilities be in place for the increased electrical requirements (DOE 1995i:4-404; DOE 1996a:4-429). Cumulative liquid fuel and coal supply requirements for all of the proposed actions are readily available in the area and can be satisfied through normal contractual means. As shown in table 4.13.1.2–1, the contribution to site infrastructure cumulative impacts from the pit fabrication alternative would be small in comparison to other proposed projects at SRS.

Air Quality. The generation of criteria and toxic/hazardous pollutants, from the pit fabrication alternative would contribute minimal air quality impacts at SRS, and would be within applicable Federal and state regulations and guidelines. The Waste Management Draft PEIS does not provide air concentration modeling data, but does state that no air quality standards would be exceeded (DOE 1995cc:11-70). The contribution to cumulative impacts from the Waste Management Draft PEIS cannot be quantitatively estimated. However, emissions generated from the Waste Management Draft PEIS alternatives are not expected to substantially add to adverse air quality.

Cumulative air concentrations would be within applicable Federal and state regulations and guidelines. As shown in table 4.13.1.2–2, the greatest contribution to cumulative air quality impacts would result from the alternatives in the Storage and Disposition Draft PEIS.

Water Resources. Implementation of the pit fabrication alternative would contribute minimal water resources impacts at SRS. The pit fabrication alternative at SRS would use groundwater to satisfy water requirements and would require less than a 0.35-percent increase over No Action requirements. Withdrawal of this amount would not adversely impact regional groundwater levels. Wastewater

TABLE 4.13.1.2–1.—*Site Infrastructure Cumulative Impacts at Savannah River Site*

Category	No Action	Tritium Supply and Recycling	Storage and Disposition[a]	Highly Enriched Uranium	Waste Management	Spent Nuclear Fuel	Stockpile Stewardship and Management	Total Change Over No Action
Electrical								
Energy consumption (MWh/yr)	659,000	3,740,000	76,000	5,000	13.7[b]	24,400	9,700	3,855,100
Fuel								
Liquid (L/yr)	28,400,000	13,200	49,000	56,800	ND	0	28,400	147,400
Coal (t/yr)	210,000	0	5,000	360	ND	0	1,090	6,450

[a] Data represents the maximum values for storage alternatives only. A nonsite-specific analysis of the disposition alternatives shows that the alternative with the maximum impact would require the following resources: 1,157,000 MWh/yr of electricity, 8,976,000 m^3/yr of natural gas, and 836,750 L/yr of liquid fuel.

[b] Megawatts of power, not included in total.

Note: ND - no data.

Source: DOE 1995i; DOE 1995p; DOE 1995cc; DOE 1996a; DOE 1996m; table 4.3.3.2–1.

discharge to surface waters would increase by 6.6 percent over No Action.

Cumulative groundwater requirements for the proposed activities would increase by approximately 7 percent over No Action. Cumulative wastewater discharge would increase by approximately 80 percent over No Action. As shown in table 4.13.1.2–3, this increase results primarily from the Storage and Disposition Draft PEIS alternatives. Wastewater capacities at SRS may require improvements from the increased demands caused by the proposed activities.

Socioeconomics. The pit fabrication alternative would result in small beneficial socioeconomic impacts. The new mission would require 801 worker years for construction. Operation-related employment would require 810 direct jobs and would reduce the unemployment rate by 0.7 percent. Population in the SRS ROI would increase by less than 1 percent. Operation of the pit fabrication facilities at SRS would increase demand for additional housing units.

The impacts from the tritium supply and recycling accelerator alternative and the storage and disposition alternatives would result in the largest socioeconomic impacts. The location of a tritium supply technology and upgraded tritium recycling facility would increase population and housing demands in the ROI slightly (2 percent) over No Action projections during peak construction. The effects are expected to be fewer (less than 1 percent) during the operation of the proposed action (DOE 1995i:4-436).

Cumulatively, the proposed projects would stimulate economic growth. If all these programs were located at SRS, transportation congestion and the demand for new housing and other public services would increase. As illustrated in table 4.13.1.2–4, the impacts of the stockpile stewardship and management alternatives are small in comparison to other proposed projects.

Radiation and Hazardous Chemical Environment–Normal Operations and Facility Accidents. The normal operation cumulative radiological doses and resulting health effects for the stockpile management alternative, alongside other potential site activities at SRS, are presented in table 4.13.1.2–5. Although these impacts could be added, it should be noted that the exact locations of the facilities for planned actions may change; this would be addressed in site-specific detailed analyses. Also, for the various actions, the location of the maximally exposed individual is different, alternate dose assessment models are used, and different operational time periods exist. Impacts from potential accidents associated with pit fabrication are assessed for SRS in section 4.3.3.9 of this PEIS. A potential exists that other proposed projects could be sited at SRS. These other proposed projects also have the potential to produce impacts from accidents. A beyond design

TABLE 4.13.1.2–2.—*Air Quality Cumulative Impacts at Savannah River Site*

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines (μg/m³)	2005 No Action (μg/m³)	Tritium Supply and Recycling (μg/m³)	Storage and Disposition[a] (μg/m³)	Highly Enriched Uranium (μg/m³)	Waste Management[b] (μg/m³)	Spent Nuclear Fuel (μg/m³)	Stockpile Stewardship and Management (μg/m³)	Total Including No Action (μg/m³)
Carbon monoxide	8-hour	10,000	22	0	2.4	0.01	c	0.2	0.9	25.51
	1-hour	40,000	171	1	11.28	0.01	c	1.2	4.4	188.89
Lead	Calendar quarter	1.5	0.0004	c	0	c	c	c	<0.01	<0.01
Nitrogen dioxide	Annual	100	5.7	0	1.08	0.01	c	<0.01	0.7	7.5
Ozone	1-hour	235	c	c	c	c	c	c	c	c
Particulate matter	Annual	50	3	0	0.07	<0.01	c	<0.01	0	3.08
	24-hour	150	50.6	1	1.44	<0.01	c	c	0.9	53.95
Sulfur dioxide	Annual	80	14.5	0	1.78	0.02	c	<0.01	0.3	16.61
	24-hour	365	196	2	34.49	0.32	c	0.02	15.6	248.43
	3-hour	1,300	823	4	222.58	0.71	c	0.09	100.9	1,151.28

[a] Data represents the maximum values for storage alternatives only.
[b] No air quality standard exceedances.
[c] Data not available, concentration assumed less than applicable standard.
Source: DOE 1995i; DOE 1995p; DOE 1995cc; DOE 1996a; DOE 1996m; table 4.3.3.3-1.

TABLE 4.13.1.2–3.—*Water Cumulative Impacts at Savannah River Site*

Category	No Action	Tritium Supply and Recycling	Storage and Disposition[a]	Highly Enriched Uranium	Waste Management	Spent Nuclear Fuel	Stockpile Stewardship and Management	Total Change Over No Action
Groundwater (MLY)	13,249	83	450	19	325	49	46	972
Wastewater discharge (MLY)	700	143	220	18	83	49	46	559

[a] Data represents the maximum values for storage alternatives only. A nonsite-specific analysis of the disposition alternatives shows that 534 MLY of groundwater would be used and 424 MLY of wastewater would be generated as a result of the disposition alternative with the maximum impact.
Source: DOE 1995i; DOE 1995p; DOE 1995cc; DOE 1996a; DOE 1996m; table 4.3.3.4–1.

TABLE 4.13.1.2–4.—*Socioeconomic Cumulative Impacts at Savannah River Site*

Category	No Action	Tritium Supply and Recycling	Storage and Disposition[a]	Highly Enriched Uranium	Waste Management	Spent Nuclear Fuel	Stockpile Stewardship and Management	Total Change Over No Action
Construction								
Direct employment (worker years)	0	6,700	6,195	0	[b]	2,350	801	16,046
Operation								
Direct employment	19,288	600	614	125	5,670	0	810	7,819

[a] Data represents the maximum values for storage alternatives only. A nonsite-specific analysis of the disposition alternatives shows that 16,566 construction worker years and 2,622 operational jobs would result from the disposition alternative with the maximum impacts.

[b] Included in operation.

Note: ND - no data.

Source: DOE 1995i; DOE 1995p; DOE 1995cc; DOE 1996a; DOE 1996m; section 4.3.3.8.

basis earthquake could potentially impact multiple facilities within SRS, resulting in the simultaneous release of radioactive materials from these facilities to the environment. Table 4.13.1.2–6 is a summary of potential consequences to the maximally exposed individual and the surrounding population from accidental radiological releases caused by a single earthquake. Probabilities of an earthquake accident occurring are not presented; instead, the information presented is based on the conservative assumption that the worst consequence accident for the activity has occurred, based on existing NEPA analyses. The cumulative impacts associated with accidents from these other reasonably foreseeable activities at SRS, and the stockpile management activities at SRS, would be the sum of the impacts presented below and those presented in section 4.3.3.9.

Waste Management. The pit fabrication alternative would impact existing and planned SRS waste management activities by increasing the generation of TRU, LLW, mixed, hazardous, and nonhazardous wastes. Wastes generated from the pit fabrication alternative would have minor contributions to cumulative impacts. Table 4.13.1.2–7 shows cumulative waste management impacts at SRS.

Accelerator production of tritium under the tritium supply and recycling preferred alternative would increase annual LLW disposal area, require additional treatment facilities for liquid sanitary wastes, and may require new RCRA-permitted staging facilities and expansion of treatment facilities for mixed LLW (DOE 1995i:4-467,4-468). The impacts of spent nuclear fuel activities on SRS waste management capacities would be minimal because the site could accommodate the waste with existing and planned radioactive waste storage and disposal facilities (DOE 1995p:5-51). Impacts to waste management at SRS from the Storage and Disposition Draft PEIS may impact existing domestic water treatment capabilities and may require construction or expansion of sanitary, utility, and/or process wastewater treatment systems (DOE 1996a:4-505). The largest potential impact on waste management is expected to result if SRS is selected for a regional treatment and disposal facility for LLW and mixed LLW from the Waste Management Draft PEIS. The construction of new treatment and disposal facilities discussed in the Waste Management Draft PEIS may mitigate potential capacity impacts.

4.13.1.3 *Kansas City Plant*

As part of the Stockpile Stewardship and Management PEIS, KCP is being considered as an alternative site for downsizing the nonnuclear fabrication mission or transferring the mission to SNL, LANL, or LLNL. Since these alternatives are mutually exclusive, the impacts associated with the alternatives are not additive. There are no other proposed projects identified at KCP that would add cumulatively to impacts. Therefore, impacts from the Stockpile Stewardship and Management Program would be the only cumulative impacts at the site.

TABLE 4.13.1.2–5.—*Estimated Annual Cumulative Radiological Doses and Resulting Health Effects to Offsite Population and Facility Workers at Savannah River Site*

	Maximally Exposed Individual		Total Population Within 80 km[a]		Workers	
Program	Total dose[b] (rem)	Fatal cancer risk[c]	Total dose (person-rem)	Number of fatal cancers[c]	Total dose[d] (person-rem)	Number of fatal cancers[c]
No Action[e]	3.2×10^{-4}	1.6×10^{-7}	21.6	0.011	500	0.20
Highly Enriched Uranium	2.5×10^{-6}	1.3×10^{-9}	0.16	8.0×10^{-5}	11.3	4.5×10^{-3}
Interim Management of Nuclear Materials	2.8×10^{-3}	1.4×10^{-6}	110	0.055	140	0.056
Tritium Supply and Recycling	2.5×10^{-3}	1.2×10^{-6}	210	0.11	42	1.7×10^{-2}
Stabilization of Plutonium Solutions	8.9×10^{-6}	4.5×10^{-9}	0.38	1.9×10^{-4}	131	5.2×10^{-2}
Waste Management[f]	3.3×10^{-5}	1.7×10^{-8}	1.5	7.5×10^{-4}	81	3.2×10^{-2}
Plant Vogtle	1.7×10^{-4}	8.5×10^{-8}	0.057	2.9×10^{-5}	NA	NA
Storage and Disposition	1.4×10^{-8}	7.0×10^{-12}	7.8×10^{-4}	3.9×10^{-7}	25	0.010
Spent Nuclear Fuel	5.0×10^{-4}	2.5×10^{-7}	18.4	9.2×10^{-3}	76	0.034
Stockpile Management	1.0×10^{-8}	5.0×10^{-12}	5.9×10^{-4}	3.0×10^{-7}	156	0.062

[a] Collective dose to the 80-kilometer population surrounding each given site.
[b] The applicable limits for an individual menber of the public from total site operations are 10 mrem/yr from the air pathways, 4 mrem/yr from the drinking water pathwway, and 100 mrem/yr from all pathways combined.
[c] Annual incidence of excess fatal cancers.
[d] Dose presented is for the total workforce.
[e] Includes impacts from the Defense Waste Processing Facility and Foreign Reactor Spent Fuel.
[f] Data presented are from the Savannah River Waste Management EIS.
Note: NA - not applicable.
Source: DOE 1993n:7; DOE 1995i; DOE 1995p; DOE 1995cc; DOE 1996a; DOE 1996m; SR DOE 1994a; SR DOE 1995b; SR DOE 1995e;WSRC 1994d; tables 4.3.3.9–1 and 4.3.3.9–2.

TABLE 4.13.1.2–6.—***Summary of Earthquake Accident Consequences from Other Proposed Projects at Savannah River Site***

Other Proposed Projects	Offsite MEI Dose (rem)	Offsite MEI Number of Cancer Fatalities	Offsite Population[a] Dose (person-rem)	Offsite Population[a] Number of Cancer Fatalities
Tritium Supply and Recycling				
Accelerator Production of Tritium[b]	0.0063	$3.1x10^{-6}$	24	0.012
Tritium Target Extraction Facility	0.013	$6.4x10^{-6}$	86	0.043
Tritium Recycling Facility	0.045	$2.2x10^{-5}$	302	0.15
Storage and Disposition				
Storage[c]	0.43	$2.2x10^{-4}$	3,050	1.5
Disposition[d]	9.5	$5x10^{-3}$	8,460	4.2
Plutonium conversion	0.11	$5x10^{-5}$	500	0.25
Pit assembly/disassembly	0.048	$2.4x10^{-5}$	225	0.11
Mixed oxide fuel fabrication	0.15	$7.6x10^{-5}$	457	0.23
Highly Enriched Uranium	0.22	$1.1x10^{-4}$	8,600	4.3
Waste Management				
Mixed low-level waste[e]	0.001	$5x10^{-7}$	40	f
High-level waste[g]	$8x10^{-9}$	$4x10^{-12}$	<100	f
Spent Nuclear Fuel	0.006	$3x10^{-6}$	50	0.025

[a] Population within 80 km (50 mi).
[b] SILC Target System.
[c] Consolidation of plutonium and collocation with HEU.
[d] Evolutionary Light Water Reactor.
[e] Treatment facility accident.
[f] Greater than zero, but less than 0.5.
[g] Storage facility accident.
Note: MEI - maximally exposed individual.
Source: DOE 1995i; DOE 1995p; DOE 1995cc; DOE 1996a; DOE 1996m.

4.13.1.4 *Pantex Plant*

The stockpile management alternatives for Pantex include downsizing A/D operations, downsizing A/D and HE fabrication, and phaseout of both A/D and HE fabrication operations. Pantex is also a candidate site for the location of a storage facility and a disposition site in the Storage and Disposition Draft PEIS. Additionally, Pantex is a candidate site for the management of LLW and mixed LLW in the Waste Management Draft PEIS.

The reduction in resource consumption and waste generation from the downsizing and phaseout alternatives for stockpile management would result in slight beneficial impacts for the following resources: site infrastructure, water resources, air quality, and waste management. The beneficial impacts from downsizing at Pantex would not substantially mitigate impacts from other proposed projects at Pantex. The phaseout alternative could result in land resources impacts from potential changes in land use due to the transition of land, facilities, and infrastructure to EM.

The phaseout of the A/D mission at Pantex would require the relocation of the plutonium strategic reserve to NTS. Alternatives in the Storage and Disposition Draft PEIS could relocate the plutonium strategic reserve to Hanford, INEL, ORR, or SRS. Cumulative intersite transport impacts would result if

TABLE 4.13.1.2–7.—*Waste Management Cumulative Impacts at Savannah River Site*

Category	No Action	Tritium Supply and Recycling	Storage and Disposition[a]	Highly Enriched Uranium	Waste Management	Spent Nuclear Fuel	Stockpile Stewardship and Management	Total Change Over No Action
Transuranic (m^3/yr)	338	0	6	0	444[b]	700	157	1,307
Mixed Transuranic (m^3/yr)	0	0	4	0	Included in TRU	0	11	15
Low-Level (m^3/yr)	90,400	413	1,279	830	26,835[c]	16,000	168	45,525
Mixed Low-Level (m^3/yr)	9,300	5	66	46	340[d]	0	0	457
Hazardous (m^3/yr)	16,360	2	4	88	151[e]	0	0.5	246
Nonhazardous (Sanitary) (m^3/yr)	764,200	926,000	194,440	19,600	Not analyzed	0	47,700	1,187,740

[a] Data represents the maximum values for storage alternatives only.

[b] Regionalized alternatives 2 and 3: SRS would treat its own TRU waste and receive TRU waste from Argonne National Laboratory, Mound Plant, ORR, Paducah Gaseous Diffusion Plant, West Valley Demonstration Project, and University of Missouri for treatment.

[c] Regionalized alternatives 6 and 7: SRS would treat its own LLW and dispose of LLW from Ames Laboratory, Argonne National Laboratory, Bettis Atomic Power Laboratory, Brookhaven National Laboratory, Fernald Environmental Management Project, Fermi National Accelerator Laboratory, Knolls Atomic Power Laboratory, KCP, Mound Plant, ORR, Paducah Gaseous Diffusion Plant, Pinellas Plant, Portsmouth Gaseous Diffusion Plant, Princeton Plasma Physics Laboratory, RMI Titanium Company, and West Valley Demonstration Project.

[d] Regionalized alternatives 1 and 2: SRS would treat and dispose of its mixed LLW as well as receive mixed LLW from Bettis Atomic Power Laboratory, Charleston Naval Shipyard, Mound Plant, Norfolk Naval Shipyard, Pinellas Plant, University of Missouri, and West Valley Demonstration Project for treatment and disposal.

[e] Regionalized alternative 1: SRS would treat its hazardous waste.

Source: DOE 1995i; DOE 1995p; DOE 1995cc; DOE 1996a; DOE 1996m; table 4.3.3.10–2.

the Storage and Disposition Draft PEIS requires a second relocation of the plutonium strategic reserve.

Socioeconomics. The phaseout of A/D and HE fabrication mission would result in the maximum potential impacts to socioeconomic resources at Pantex from the stockpile stewardship and management alternatives. The phaseout of these operations would result in the termination of DP operations at Pantex and the loss of approximately 1,644 direct jobs at the site. Additional indirect job losses in the regional economy would result if the Pantex mission were terminated. Unemployment rates for the regional economic area would increase from a projected rate of 4.8 to 6.2 percent. If all displaced workers and their families were to leave the ROI to seek employment elsewhere, the ROI population could decrease by 3.9 percent. While these socioeconomic losses are small relative to the size of the region, these impacts would nonetheless be measurable.

Cumulatively, the maximum socioeconomic impacts at Pantex would result from the downsizing of A/D and the HE fabrication under the Stockpile Stewardship and Management PEIS in combination with other proposed projects. The downsizing A/D and HE fabrication alternative would result in the addition of 280 workers at Pantex. In addition, the Waste Management Draft PEIS and the Storage and Disposition Draft PEIS would also result in beneficial socioeconomic impacts in the Pantex region. The new projects would create 1,535 new jobs at Pantex. The population influx from all proposed projects may result in a temporary strain on public services and the regional housing market. Traffic congestion would also increase as a result of the proposed projects. Table 4.13.1.4–1 shows the cumulative socioeconomic impacts from stockpile stewardship and management and other proposed projects at Pantex.

TABLE 4.13.1.4–1.—*Socioeconomic Cumulative Impacts at Pantex Plant*

Category	No Action	Storage and Disposition[a]	Waste Management	Stockpile Stewardship and Management	Total Change Over No Action
Construction					
Direct employment (worker years)	0	6,172	[b]	145	6,317
Operation					
Direct employment	1,215	601	654	280	1,535

[a] Data represents the maximum values for storage alternatives. A nonsite-specific analysis of the disposition alternatives shows that 16,566 construction worker years and 2,622 operational jobs would result from the disposition alternative with the maximum impacts.

[b] Included in operation.

Source: DOE 1995cc; DOE 1996a; section 4.5.3.8.

Radiation and Hazardous Chemical Environment–Normal Operations and Facility Accidents. The normal operation cumulative radiological doses and resulting health effects for the stockpile management alternative alongside other potential site activities at Pantex, are presented in table 4.13.1.4–2. Although these impacts could be added, it should be noted that the exact locations of the facilities for planned actions may change; this would be addressed in site-specific detailed analyses. Also, for the various actions, the location of the maximally exposed individual is different, alternate dose assessment models are used, and different operational time periods exist. Impacts from potential accidents associated with downsizing A/D operations, downsizing A/D and HE fabrication, and phaseout of both A/D and HE fabrication operations are assessed for Pantex in section 4.5.3.9 of this PEIS.

A potential exists that other proposed projects could be sited at Pantex. These other proposed projects also have the potential to produce impacts from accidents. A beyond design basis earthquake could potentially impact multiple facilities within Pantex, resulting in the simultaneous release of radioactive materials from these facilities to the environment. Table 4.13.1.4–3 is a summary of potential consequences to the maximally exposed individual and the surrounding population from accidental radiological releases caused by a single earthquake. Probabilities of an earthquake accident occurring are not presented; instead, the information presented is based on the conservative assumption that the worst consequence accident for the activity has occurred, based on existing NEPA analyses. The cumulative impacts associated with accidents from these other reasonably foreseeable activities at Pantex, and the stockpile stewardship and management activities at Pantex, would be the sum of the impacts presented below and those presented in section 4.5.3.9.

4.13.1.5 *Los Alamos National Laboratory*

LANL is a candidate site for pit fabrication, secondary and case fabrication, HE fabrication, nonnuclear fabrication, the proposed NIF, and the proposed Atlas Facility in the Stockpile Stewardship and Management PEIS. LANL is also a candidate site for the consolidation of waste management for LLW, mixed LLW, TRU, and hazardous waste in the Waste Management PEIS. In the Proposed Medical Isotope EIS, LANL is a candidate site for the reactor production of medical isotopes. A Site-Wide EIS is currently in preparation for the continued operation of LANL. Due to the preliminary stage of the Site-Wide EIS, no data is available for the cumulative impact analysis.

Site Infrastructure. The maximum cumulative impact from the Stockpile Stewardship and Management Program would result from the selection of LANL as the location for all six of the alternatives considered for the site. The construction and operation of all of the alternatives would result in a 25 percent increase in electrical consumption and a 10 percent increase in gas consumption over No Action. The stockpile stewardship and management alternatives would also require the use of 197,400 L/yr of liquid fuel. The regional electric power pool has sufficient capacity margin to accommodate the power requirements of all of the stockpile stewardship and management alternatives and additional fuel requirements could be satisfied using the existing fuel procurement system. Table 4.13.1.5–1 shows the cumulative site infrastructure impacts at LANL.

TABLE 4.13.1.4–2.—*Estimated Annual Cumulative Radiological Doses and Resulting Health Effects to Offsite Population and Facility Workers at Pantex Plant*

Program	Maximally Exposed Individual		Total Population Within 80 km[a]		Workers	
	Total dose[b] (rem)	Fatal cancer risk[c]	Total dose (person-rem)	Number of fatal cancers[c]	Total dose[d] (person-rem)	Number of fatal cancers[c]
No Action	5.8×10^{-8}	2.9×10^{-11}	1.4×10^{-4}	7.0×10^{-8}	10.7	4.3×10^{-3}
Waste Management	5.9×10^{-7}	2.9×10^{-10}	6.9×10^{-3}	3.5×10^{-6}	6.9×10^{-4}	2.8×10^{-7}
Storage and Disposition	9.7×10^{-9}	4.9×10^{-12}	4.6×10^{-5}	2.3×10^{-8}	25	0.010
Stockpile Management	4.0×10^{-8}	2.0×10^{-11}	4.0×10^{-4}	2.0×10^{-7}	-7.7	-3.5×10^{-3}

[a] Collective dose to the 80-km (50-mi) population surrounding each given site.
[b] The applicable limits for an individual member of the public from total site operations are 10 mrem/yr from the air pathways, 4 mrem/yr from the drinking water pathwway, and 100 mrem/yr from all pathways combined.
[c] Annual incidence of excess fatal cancers.
[d] Dose presented is for the total workforce.
Source: DOE 1993n:7; DOE 1995cc; DOE 1996a; tables 4.5.3.9–1 and 4.5.3.9–2.

TABLE 4.13.1.4–3.—***Summary of Earthquake Accident Consequences from Other Proposed Projects at Pantex Plant***

Other Proposed Projects	Offsite MEI Dose (rem)	Offsite MEI Number of Cancer Fatalities	Offsite Population[a] Dose (person-rem)	Offsite Population[a] Number of Cancer Fatalities
Waste Management PEIS				
Mixed low-level waste[b]	0.0001	$5.0x10^{-8}$	1	c
Storage and Disposition				
Storage[d]	0.34	$1.7x10^{-4}$	867	0.43
Disposition[e]	181	0.09	5,150	2.6
Plutonium conversion	1.3	$6.4x10^{-4}$	148	0.074
Pit assembly/disassembly	0.058	$2.9x10^{-4}$	67	0.033
Mixed oxide fuel fabrication	1.3	$6.4x10^{-4}$	148	$7.4x10^{-2}$

[a] Population within 80 km (50 mi).
[b] Treatment facility accident.
[c] Greater than zero, but less than 0.5.
[d] Consolidation of plutonium and collocation of HEU.
[e] Evolutionary Light Water Reactor.
Note: MEI - maximally exposed individual.
Source: DOE 1995cc; DOE 1996a.

Consolidation of waste management at LANL in the Waste Management Draft PEIS would require additional site infrastructure resources for the construction and operation of new treatment and disposal facilities. Cumulatively, the electrical power requirements for the proposed activities are expected to be within the available regional power pool capacity, and additional fuel requirements could be satisfied using the existing fuel procurement system.

Air Quality. The maximum impact from the stockpile stewardship and management alternatives would result from the selection of LANL for all six of the alternatives considered for the site. The operation of the alternatives would result in the emission of gaseous criteria air pollutants as shown in table 4.13.1.5–2. The concentration of pollutants resulting from the operation of the LANL alternatives added to the No Action concentrations are compared with all Federal and state regulations, and with the exception of nitrogen dioxide, would not add substantially to adverse air quality.

The Waste Management Draft PEIS does not provide air concentration modeling data, but does state that no air quality standards would be exceeded (DOE 1995cc:11-35). The contribution to cumulative impacts from the Waste Management Draft PEIS can not be quantitatively estimated. However, emissions generated from Waste Management Draft PEIS alternatives are not expected to increase cumulative air concentration to a level which would exceed standards.

Water Resources. The maximum cumulative impact from the stockpile stewardship and management alternatives would result from the selection of LANL for all six of the proposed alternatives for the site. Each of the new missions proposed for LANL would use groundwater to satisfy water requirements. If all six of the proposed missions were implemented at LANL, the water demand would increase by 5 percent over No Action. Groundwater allotment usage at LANL would increase from 85 to 89 percent as a result of the proposed facilities. The new wastewater treatment plant under construction at LANL would have enough capacity to handle the approximate 9-percent increase in wastewater generation from the proposed new mission facilities.

Table 4.13.1.5–3 shows the cumulative impacts from the other proposed projects at LANL. The cumulative groundwater demand as a result of all of the proposed projects would increase by approximately 10 percent over No Action, and use of the groundwater allotment for LANL would increase to 92.8 percent. In the event that groundwater demand exceeds the groundwater allotment, LANL holds water rights to 1,480 MLY (391 MGY) of surface water currently in reservoir storage. The 15-percent

TABLE 4.13.1.5–1.—*Site Infrastructure Cumulative Impacts at Los Alamos National Laboratory*

Category	No Action	Medical Isotope Production	Waste Management	Stockpile Stewardship and Management	Total Change Over No Action
Electrical Consumption					
Energy (MWh/yr)	381,425	500	7.43[a]	94,965	95,465
Fuel					
Liquid (L/yr)	0	ND	ND	197,400	197,400
Natural gas (m^3/yr)	43,414,560	ND	ND	4,491,240	4,491,240

[a] Megawatts of power, not included in total change over No Action.

Note: ND - no data.

Source: DOE 1995cc; DOE 1996h; table 4.6.3.2–1.

TABLE 4.13.1.5–2.—*Air Quality Cumulative Impacts at Los Alamos National Laboratory*

Pollutant	Averaging Time	Most Stringent Regulation or Guideline ($\mu g/m^3$)	2005 No Action ($\mu g/m^3$)	Medical Isotope Production ($\mu g/m^3$)	Waste Management[a] ($\mu g/m^3$)	Stockpile Stewardship and Management ($\mu g/m^3$)	Total Including No Action ($\mu g/m^3$)
Criteria Pollutant							
Carbon monoxide	8-hour	7,689	115	b	b	50.59	165.59
	1-hour	11,578	630	b	b	277.41	907.41
Lead	Calendar quarter	1.5	<0.01	b	b	0.01	0.02
Nitrogen dioxide	Annual	73	3.84	b	b	15.71	19.55
	24-hour	145	2	b	b	276.69	278.69
Ozone	1-hour	235	139	b	b	c	139
Particulate matter	Annual	50	8.01	b	b	0.08	8.09
	24-hour	150	24.3	b	b	1.49	25.79
Sulfur dioxide	Annual	40	1.3	b	b	5.33	6.63
	24-hour	202	0.006	b	b	94.95	94.96
	3-hour	1,300	0.03	b	b	467.77	476.80
Mandated by New Mexico							
Hydrogen sulfide	1-hour	11	c	b	b	b	b
Total reduced sulfur	30-minute	3	c	b	b	b	b
				b	b		
Total suspended particulates	Annual	60	8.0	b	b	0.08	8.08
	30-day	90	<21	b	b	<1.49	<22.49
	7-day	110	<21	b	b	<1.49	<22.49
	24-hour	150	21	b	b	1.49	22.49

[a] No air quality standard exceedances.

[b] Data not available, concentration assumed less than applicable standard.

[c] Not monitored.

Source: DOE 1995cc; DOE 1996h; table 4.6.3.3–1.

TABLE 4.13.1.5–3.—*Water Cumulative Impacts at Los Alamos National Laboratory*

Category	No Action	Medical Isotope Production	Waste Management	Stockpile Stewardship and Management	Total Change Over No Action
Groundwater (MLY)	5,760	120	130	299	549
Wastewater (MLY)	693	ND	40	63	103

Note: ND - no data.
Source: DOE 1995cc; DOE 1996h; table 4.6.3.4–1.

cumulative increase in wastewater generation would be handled by the new wastewater treatment facility.

Biotic Resources. The construction of the proposed NIF at LANL may result in minor habitat loss of several special status species, should they be present at the NIF location. Potential foraging and nesting habitat for the Mexican spotted owl, gray vireo southwestern willow flycatcher, and spotted bat may be impacted by construction and by increased levels of human activity. No impacts to biotic resources are expected from the other stockpile stewardship and management alternatives.

Construction activities related to Waste Management Draft PEIS may also result in the destruction of some habitat. The cumulative impact of these projects on biotic resources is expected to be minor.

Socioeconomics. The maximum cumulative impact from the stockpile stewardship and management alternatives would result from the selection of LANL for all six of the proposed alternatives for the site. Location of all six of the new missions at LANL would result in the creation of 1,172 new operational jobs. Approximately 610 people would in-migrate into the LANL ROI to fill the available operation jobs. There would be a negligible population increase in the ROI due to the in-migration.

The selection of LANL for consolidation of waste in the Waste Management Draft PEIS would require another 1,741 workers and could put an additional strain on the housing supply in the region. Cumulatively, the stockpile stewardship and management alternatives would contribute approximately 40 percent of the potential 2,954 new jobs at LANL. Table 4.13.1.5–4 shows the potential cumulative impacts from the projects at LANL.

Radiation and Hazardous Chemical Environment–Normal Operations and Facility Accidents. The normal operation cumulative radiological doses and resulting health effects for the stockpile stewardship and management alternatives alongside other potential site activities (including existing plutonium storage) at LANL, are presented in table 4.13.1.5–5. Although these impacts could be added, it should be noted that the exact locations of the facilities for planned actions may change; this would be addressed in site-specific detailed analyses. Also, for the various actions, the location of the maximally exposed individual is different, alternate dose assessment models are used, and different operational time periods exist. Impacts from potential accidents associated with pit fabrication, secondary and case fabrication, HE fabrication, nonnuclear fabrication, the proposed NIF, and the proposed Atlas Facility are assessed for LANL in section 4.6.3.9 of this PEIS. A potential exists that other proposed projects could be sited at LANL. These other proposed projects also have the potential to produce impacts from accidents. A beyond design basis earthquake could potentially impact multiple facilities within LANL, resulting in the simultaneous release of radioactive materials from these facilities to the environment. Table 4.13.1.5–6 is a summary of potential consequences to the maximally exposed individual and the surrounding population from accidental radiological releases caused by a single earthquake. Probabilities of an earthquake accident occurring are not presented; instead, the information presented is based on the conservative assumption that the worst consequence accident for the activity has occurred, based on existing NEPA analyses. The cumulative impacts associated with accidents from these other reasonably foreseeable activities at LANL, and the stockpile stewardship and management activities at LANL, would be the sum of the impacts presented below and those presented in section 4.6.3.9.

TABLE 4.13.1.5–4.—*Socioeconomic Cumulative Impacts at Los Alamos National Laboratory*

Category	No Action	Waste Management	Medical Isotope Production	Stockpile Stewardship and Management	Total Change Over No Action
Construction					
Direct employment (worker years)	0	[a]	92	2,004	2,096
Operation					
Direct employment	6,545	1,741	41	1,172	2,954

[a] Included in operation.
Source: DOE 1995cc; DOE 1996h; section 4.6.3.8.

Waste Management. The selection of LANL for the siting of all six of the stockpile stewardship and management alternatives would result in the greatest contribution to cumulative impacts. The alternatives would impact waste management by increasing the production of LLW, TRU, mixed TRU, mixed LLW, hazardous waste, and nonhazardous waste. The increased generation of liquid LLW and mixed waste may impact the storage capacity of existing disposal areas. Existing waste treatment systems would accommodate the increased TRU, hazardous, and nonhazardous waste volumes.

LANL is also under consideration for the consolidation of waste management for LLW, mixed LLW, TRU, and hazardous waste in the Waste Management Draft PEIS. The proposed alternative would require construction of treatment and disposal facilities for LANL to manage its own waste in addition to accepting offsite mixed LLW, LLW, and TRU waste for treatment and mixed LLW and LLW for disposal. The construction of new treatment and disposal facilities in the Waste Management Draft PEIS may mitigate potential capacity impacts from stockpile stewardship and management alternatives. The cumulative impacts at LANL are shown in table 4.13.1.5–7.

4.13.1.6 *Lawrence Livermore National Laboratory*

As part of the stockpile stewardship and management proposal, LLNL is being considered for secondary and case fabrication, HE fabrication, nonnuclear fabrication, the proposed CFF, and the proposed NIF. LLNL is also a candidate site in the Waste Management Draft PEIS. The most adverse impacts from the waste management alternatives would result from construction of treatment and disposal facilities to manage LLNL's own waste in addition to accepting mixed LLW and LLW from offsite for treatment and disposal. Treatment and disposal facilities under the Waste Management Draft PEIS would be located at Site 300. The proposed actions under the LLNL Site-Wide EIS are included in the stockpile stewardship and management No Action alternative and are not discussed in this cumulative impact analysis.

Site Infrastructure. Cumulative impacts from the Stockpile Stewardship and Management Program would result from the implementation of the proposed alternatives at LLNL. Facility improvements would be required for each of the alternatives, with the exception of nonnuclear fabrication. Cumulative site infrastructure impacts at LLNL are shown in table 4.13.1.6–1.

Cumulative impacts to site infrastructure from stockpile stewardship and management alternatives at LLNL include a 14-percent increase in electrical energy over No Action requirements; 179-percent increase in liquid fuel use over No Action requirements; and an 8-percent increase in natural gas use over No Action requirements.

Additional site infrastructure resources would be required for the construction and operation of new treatment and disposal facilities in the Waste Management Draft PEIS. Cumulative electrical power requirements at LLNL for the proposed activities are expected to be within the available regional power pool capacity, and additional oil requirements could be satisfied using the existing fuel procurement system.

Air Quality. The maximum contribution to cumulative impacts from stockpile stewardship and manage-

TABLE 4.13.1.5–5.—*Estimated Annual Cumulative Radiological Doses and Resulting Health Effects to Offsite Population and Facility Workers at Los Alamos National Laboratory*

	Maximally Exposed Individual		Total Population Within 80 km[a]		Workers	
Program	**Total dose[b] (rem)**	**Fatal cancer risk[c]**	**Total dose (person-rem)**	**Number of fatal cancers[c]**	**Total dose[d] (person-rem)**	**Number of fatal cancers[c]**
No Action	$6.5x10^{-3}$	$3.3x10^{-6}$	2.7	$1.4x10^{-3}$	196	0.078
Waste Management	$1.3x10^{-2}$	$6.5x10^{-6}$	$1.3x10^{2}$	0.065	12	$4.8x10^{-3}$
Medical Isotopes Production	$1.5x10^{-4}$	$7.5x10^{-8}$	0.66	$3.3x10^{-4}$	12	$4.8x10^{-3}$
Stockpile Stewardship and Management	$2.0x10^{-4}$	$1.0x10^{-7}$	0.60	$3.0x10^{-4}$	64	0.026

[a] Collective dose to the 80-km (50-mi) population surrounding each given site.
[b] The applicable limits for an individual member of the public from total site operations are 10 mrem/yr from the air pathways, 4 mrem/yr from the drinking water pathway, and 100 mrem/yr from all pathways combined.
[c] Annual incidence of excess fatal cancers.
[d] Dose presented is for the total workforce.
Source: DOE 1993n:7; DOE 1995cc; DOE 1996h; tables 4.6.3.9–1 and 4.6.3.9–2.

TABLE 4.13.1.5–6.—*Summary of Earthquake Accident Consequences from Other Proposed Projects at Los Alamos National Laboratory*

Other Proposed Projects	Offsite MEI Dose (rem)	Offsite MEI Number of Cancer Fatalities	Offsite Population[a] Dose (person-rem)	Offsite Population[a] Number of Cancer Fatalities
Medical Isotope Production	b	b	b	b
Waste Management[c]				
Low-level waste	0.8	$4x10^{-4}$	1,800	1
Mixed low-level waste	0.008	$4x10^{-7}$	2	d

[a] Population within 80 km (50 mi).
[b] No earthquake accident analysis.
[c] Treatment facility accident.
[d] Greater than zero, but less than 0.5.
Note: MEI - maximally exposed individual.
Source: DOE 1995cc; DOE 1996h.

TABLE 4.13.1.5–7.—*Waste Management Cumulative Impacts at Los Alamos National Laboratory*

Category	No Action	Medical Isotope Production	Waste Management	Stockpile Stewardship and Management	Total Change Over No Action
Transuranic (m^3/yr)					
Liquid	0	ND	Included in solid	5	5
Solid	54	ND	414[a]	43	457
Mixed Transuranic (m^3/yr)					
Liquid	0	ND	Included in TRU	0	0
Solid	255	ND	Included in TRU	2	2
Low-Level (m^3/yr)					
Liquid	21,400	5.2	Included in solid	208	213
Solid	2,690	17.6	4,200[b]	1,080	5,298
Mixed Low-Level (m^3/yr)					
Liquid	0	ND	Included in solid	32	32
Solid	45	ND	1,138[c]	108	1,246
Hazardous (m^3/yr)					
Liquid	273	ND	Included in solid	80	80
Solid	669	ND	441[d]	237	678
Nonhazardous (sanitary) (m^3/yr)					
Liquid	693,000	ND	Not analyzed	57,600	57,600
Solid	5,450	ND		7,730	7,730

[a] Regionalized alternative 2: LANL would treat its TRU waste in addition to accepting TRU waste from SNL for treatment.
[b] Regionalized alternative 4: LANL would treat and dispose of its LLW in addition to receiving LLW from Pantex and SNL for treatment and LLW from Pantex, SNL, KCP, and Rocky Flats Environmental Technology Site for disposal.
[c] Regionalized alternative 2: LANL would treat and dispose of its mixed LLW in addition to receiving mixed LLW from Pantex and SNL for treatment and mixed LLW from Pantex, SNL, Grand Junction Projects Office, KCP and Rocky Flats Environmental Technology Site for disposal.
[d] Regionalized alternative 1: LANL would treat its own hazardous waste and receive hazardous waste from Pantex and SNL for treatment.
Note: ND - no data.
Source: DOE 1995cc; DOE 1996h; table 4.6.3.10–2.

TABLE 4.13.1.6–1.—*Site Infrastructure Cumulative Impacts at Lawrence Livermore National Laboratory*

Category	No Action	Waste Management	Stockpile Stewardship and Management	Total Change Over No Action
Electrical Consumption				
Energy (MWh/yr)	352,050	2.58[a]	51,008	51,008
Fuel				
Liquid (L/yr)	79,022	ND	141,650	141,650
Natural gas (m^3/yr)	15,970,000	ND	1,204,900	1,204,900

[a] MW of energy, not included in total.
Note: ND - no data.
Source: DOE 1995cc; table 4.7.3.2–1.

ment would occur from implementation of the five proposed alternatives at LLNL. The operation of these alternatives would result in an increase in criteria pollutants as shown in tables 4.13.1.6–2 and 4.13.1.6–3, respectively.

The Waste Management Draft PEIS does not provide air concentration modeling data, but does state that no air standards would be exceeded (DOE 1995cc:11-31). The contribution to cumulative impacts from the Waste Management Draft PEIS cannot be quantitatively estimated. However, emissions generated from the Waste Management Draft PEIS alternatives are not expected to increase cumulative air concentrations to a level which would adversely affect air quality.

Cumulative air concentrations from the proposed projects were compared with applicable Federal and state regulations and guidelines and with the exception of the nitrogen dioxide would not be expected to adversely affect air quality at the Livermore Site. Since the No Action concentration for 1-hour nitrogen dioxide is above the compliance concentration, the addition of the stockpile stewardship and management alternatives and the Waste management Draft PEIS alternatives would contribute cumulatively to adverse air quality. Cumulative concentrations of pollutants at Site 300 compared with Federal and state regulations would not be expected to adversely affect air quality in the area.

Water Resources. Cumulative impacts to water resources would occur from implementation of stockpile stewardship and management alternatives at LLNL. The proposed alternatives at the Livermore Site would increase withdrawal from the public water supply by approximately 36 percent over No Action and increase wastewater discharge by approximately 28 percent over No Action. Alternatives at Site 300 would increase groundwater withdrawal by approximately 68 percent over No Action and increase wastewater discharge by approximately 227 percent over No Action. Adverse impacts to water resources from these alternatives are not expected.

The stockpile stewardship and management alternatives and the Waste Management Draft PEIS alternatives at Site 300 would increase groundwater withdrawal by approximately 131 percent over No Action and wastewater discharge by approximately 591 percent over No Action. Although Site 300 is currently using groundwater, LLNL has the option to withdraw surface water from the Hetch Hetchy Resevoir through a new tapline. Surface water withdrawal from the proposed projects would be within the capacity 693 MLY (183 MGY) of the new tapline to the Hetch Hetchy Resevoir at Site 300. However, the increase in wastewater from the proposed projects would exceed the capacity of the existing Site 300 leach fields and septic system. Additional leach fields or modifications to the septic systems would have to be planned to meet the projected discharges. Tables 4.13.1.6–4 and 4.13.1.6–5 show cumulative impacts at the Livermore Site and Site 300.

Socioeconomics. The maximum cumulative impacts from stockpile stewardship and management alternatives would result from implementation of all five alternatives at LLNL. Changes in the regional total employment and per capita income from stockpile stewardship and management alternatives would be less than 1 percent. There would be sufficient

TABLE 4.13.1.6–2.—*Air Quality Cumulative Impacts at the Livermore Site*

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines (μg/m³)	2005 No Action (μg/m³)	Waste Management[a] (μg/m³)	Stockpile Stewardship and Management (μg/m³)	Total Including No Action (μg/m³)
Carbon monoxide	8-hour	10,000	55.79	b	14.17	69.96
	1-hour	23,000	187.80	b	47.7	235.5
Lead	Calendar quarter	1.5	<0.01	b	<0.01	<0.02
	30-day	1.5	<0.01	b	<0.01	<0.02
Nitrogen dioxide	Annual	100	5.46	b	0.62	6.08
	1-hour	470	1082.64	b	123.11	1,205.75
Ozone	1-hour	180	b	b	b	b
Particulate matter	Annual	30	0.78	b	0.05	0.83
	24-hour	50	15.32	b	0.86	16.18
Sulfur dioxide	Annual	80	0.07	b	0.01	0.08
	24-hour	105	1.42	b	0.17	1.59
	3-hour	1,300	9.35	b	1.09	10.44
	1-hour	655	14.35	b	1.66	16.01

[a] No air quality standard exceedances.
[b] Data not available, concentration assumed less than applicable standard.
Source: DOE 1995cc; table 4.7.3.3–1.

TABLE 4.13.1.6–3.—*Air Quality Cumulative Impacts at Site 300*

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines (μg/m³)	2005 No Action (μg/m³)	Waste Management[a] (μg/m³)	Stockpile Stewardship and Management (μg/m³)	Total Including No Action (μg/m³)
Carbon monoxide	8-hour	10,000	4.96	b	0.3	5.26
	1-hour	23,000	39.68	b	2.43	42.11
Lead	Calendar quarter	1.5	<0.01	b	<0.01	<0.02
	30-day	1.5	<0.01	b	<0.01	<0.02
Nitrogen dioxide	Annual	100	0.28	b	0.01	0.29
	1-hour	470	183.54	b	5.34	188.88
Ozone	1-hour	180	b	b	b	b
Particulate matter	Annual	30	0.03	b	<0.01	0.04
	24-hour	50	0.91	b	0.02	0.93
Sulfur dioxide	Annual	80	<0.01	b	<0.01	<0.02
	24-hour	105	0.09	b	0.01	0.10
	3-hour	1,300	0.71	b	0.09	0.80
	1-hour	655	2.12	b	0.29	2.41

[a] No air quality standard exceedances.
[b] Data not available, concentration assumed less than applicable standard.
Source: DOE 1995cc; table 4.7.3.3–2.

TABLE 4.13.1.6–4.—*Water Cumulative Impacts at the Livermore Site*

Category	No Action	Stockpile Stewardship and Management	Total Change Over No Action
Public supply (MLY)	967	350	350
Wastewater discharge (MLY)	456	126	126

Source: Table 4.7.3.4–1.

TABLE 4.13.1.6–5.—*Water Cumulative Impacts at Site 300*

Category	No Action	Waste Management	Stockpile Stewardship and Management	Total Change Over No Action
Groundwater (MLY)	90	57	60	117
Wastewater discharge (MLY)	4.4	18	8	26

Source: DOE 1995cc; table 4.7.3.4–2.

TABLE 4.13.1.6–6.—*Socioeconomic Cumulative Impacts at Lawrence Livermore National Laboratory*

Category	No Action	Waste Management	Stockpile Stewardship and Management	Total Change Over No Action
Construction				
Direct employment (worker years)	0	[a]	978	978
Operation				
Direct employment	8,435	777	780	1,557

[a] Included in operation.
Source: DOE 1995cc; section 4.7.3.8.

available labor in the projected labor force to fill any employment requirements and population and housing would remain as projected in the No Action alternative. Cumulative socioeconomic impacts at LLNL from stockpile stewardship and management alternatives and Waste Management Draft PEIS alternatives are shown in table 4.13.1.6–6.

Radiation and Hazardous Chemical Environment–Normal Operation and Facility Accidents. The normal operation cumulative radiological doses and resulting health effects for the stockpile stewardship and management alternatives alongside other potential site activities at LLNL, are presented in table 4.13.1.6–7. Although these impacts could be added, it should be noted that the exact locations of the facilities for planned actions may change; this would be addressed in site-specific detailed analyses. Also, for the various actions, the location of the maximally exposed individual is different, alternate dose assessment models are used, and different operational time periods exist. Impacts from potential accidents associated with secondary and case fabrication, HE fabrication, nonnuclear fabrication, the proposed CFF, and the proposed NIF are assessed for LLNL in section 4.7.3.9 of this PEIS. A potential exists that other proposed projects could be sited at LLNL. These other proposed projects also have the potential to produce impacts from accidents. A beyond design basis earthquake could potentially impact multiple facilities within LLNL, resulting in the simultaneous release of radioactive materials from these facilities to the environment. Table 4.13.1.6–8 is a summary of potential consequences to the maximally exposed individual and the surrounding population from accidental radiological releases caused by a single earthquake. Probabilities of an earthquake accident occurring are not presented; instead, the information presented is based on the conservative assumption that the worst consequence accident for the activity has occurred, based on existing NEPA analyses. The cumulative impacts associated with accidents from these other reasonably foreseeable activities at LLNL, and the stockpile stewardship and management activities at LLNL, would be the sum of the impacts presented below and those presented in section 4.7.3.9.

Waste Management. Cumulative impacts to waste management would occur from implementation of the proposed stockpile stewardship and management alternatives at LLNL. Stockpile stewardship and management alternatives may impact the available storage capacity for future mixed waste at the Livermore Site and Site 300. In addition, the alternatives at the Livermore Site may require additional sanitary wastewater capacity to accommodate the increase in liquid nonhazardous sanitary waste.

LLNL is a candidate site for treatment, storage, or disposal of mixed LLW and LLW in the Waste Management Draft PEIS. Regionalized alternatives would require construction of treatment and disposal facilities at Site 300 to manage its own waste in addition to accepting mixed LLW and LLW from offsite for treatment and disposal (DOE 1995cc:11-29). The construction of new treatment and disposal facilities in the Waste Management Draft PEIS may mitigate potential capacity impacts at LLNL from the stockpile stewardship and management alternatives. Cumulative waste management impacts are shown in tables 4.13.1.6–9 and 4.13.1.6–10.

4.13.1.7 *Sandia National Laboratories*

As part of the stockpile stewardship and management proposal, SNL is being considered as a candidate site for nonnuclear fabrication and the proposed NIF. SNL is also a candidate site for the management of mixed LLW, LLW, and TRU waste in the Waste Management Draft PEIS. The maximum contribution to cumulative impacts at SNL from the waste management alternatives would result from the decentralized alternatives in which treatment and disposal facilities would be constructed at SNL for managing its own waste. In addition, SNL is part of the preferred alternative in the Proposed Medical Isotope Production EIS for target irradiation and isotope extraction in the Annular Core Research Reactor and associated hot-cell facilities.

Site Infrastructure. The maximum potential cumulative impacts from stockpile stewardship and management alternatives would result from implementation of the proposed NIF and nonnuclear fabrication at SNL. Selection of SNL for both of these alternatives would increase electrical energy usage by approximately 44 percent over No Action; increase liquid fuel usage by approximately 0.22 percent; and increase natural gas usage by approximately 26 percent over No Action. The stockpile stewardship and management alternatives would require upgrades or extensions to existing utility infrastructure. Table 4.13.1.7–1 shows cumulative site infrastructure impacts at SNL.

TABLE 4.13.1.6–7.—*Estimated Annual Cumulative Radiological Doses and Resulting Health Effects to Offsite Population and Facility Workers at Lawrence Livermore National Laboratory*

Program	Maximally Exposed Individual		Total Population Within 80 km[a]		Workers	
	Total dose[b] (rem)	Fatal cancer risk[c]	Total dose (person-rem)	Number of fatal cancers[c]	Total dose[d] (person-rem)	Number of fatal cancers[c]
No Action	6.5×10^{-5}	3.3×10^{-8}	0.76	3.8×10^{-4}	18	7.2×10^{-3}
Waste Management	1.8×10^{-3}	9.0×10^{-7}	110	0.055	1.5	6.0×10^{-4}
Stockpile Stewardship and Management	1.3×10^{-3}	6.5×10^{-7}	1.0	5.0×10^{-4}	9	3.6×10^{-3}

[a] Collective dose to the 80-kilometer population surrounding each given site.
[b] The applicable limits for an individual menber of the public from total site operations are 10 mrem/yr from the air pathways, 4 mrem/yr from the drinking water pathwway, and 100 mrem/yr from all pathways combined.
[c] Annual incidence of excess fatal cancers.
[d] Dose presented is for the total workforce.
Source: DOE 1993n:7; DOE 1995cc; tables 4.7.3.9–1 through 4.7.3.9–4.

TABLE 4.13.1.6–8.—*Summary of Earthquake Accident Consequences from Other Proposed Projects at Lawrence Livermore National Laboratory*

Other Proposed Projects	Offsite MEI Dose (rem)	Offsite MEI Number of Cancer Fatalities	Offsite Population[a] Dose (Person-rem)	Offsite Population[a] Number of Cancer Fatalities
Waste Management[b]				
Low-level waste	0.8	$4x10^{-4}$	6,000	3
Mixed low-level waste	0.008	$2x10^{-6}$	20	c

[a] Population within 80 km (50 mi).
[b] Treatment facility accident.
[c] Greater than zero, but less than 0.5.
Note: MEI - maximally exposed individual.
Source: DOE 1995cc.

TABLE 4.13.1.6–9.—*Waste Management Cumulative Impacts at the Livermore Site*

Category	No Action	Stockpile Stewardship and Management	Total Change Over No Action
Low-Level (m^3/yr)	488	479	479
Mixed Low-Level (m^3/yr)	71	564	564
Hazardous (m^3/yr)	579	576	576
Nonhazardous (Sanitary) (m^3/yr)	460,280	136,400	136,400

Source: Tables 4.7.3.10–1.

TABLE 4.13.1.6–10.—*Waste Management Cumulative Impacts at Site 300*

Category	No Action	Waste Management	Stockpile Stewardship and Management	Total Change Over No Action
Low-Level (m^3/yr)	463	226[a]	-16	210
Mixed Low-Level (m^3/yr)	0	31[b]	10	41
Hazardous (m^3/yr)	432	0	63	63
Nonhazardous (Sanitary) (m^3/yr)	4,735	Not analyzed	7,630	7,630

[a] Regionalized Alternative 2: LLNL will treat and dispose of its LLW and that from Lawrence Berkeley Laboratory and Stanford Linear Accelerator Center.
[b] Regionalized Alternative 1: LLNL will treat its mixed LLW in addition to accepting mixed LLW for treatment from Energy Technology Engineering Center, General Atomics, Lawrence Berkeley Laboratory, Laboratory for Engineer-Related Health Research , Mare Island Naval Shipyard (LLNL will treate its own contacted handled mixed LLW as well as that from Lawrence Berkeley Laboratory); and dispose if its own mixed LLW as well as that from Energy Technology Engineering Center, General Atomics, Lawrence Berkeley Laboratory, Laboratory for Engineer-Related Health Research, and Mare Island Naval Shipyard (disposal at LLNL does not include contact-handled mixed LLW treated at LLNL).
Source: DOE 1995cc; table 4.7.3.10–2.

As a candidate site in the Waste Management Draft PEIS, additional site infrastructure resources would be required for the construction and operation of new treatment and disposal facilities at SNL. The SNL site infrastructure resources are adequate to accommodate all of the proposed alternatives.

Air Quality. Impacts to air quality from the proposed NIF and the Nonnuclear Fabrication Facility would result in the generation of criteria and toxic/hazardous pollutants from operations. Cumulative concentrations of pollutants were compared with applicable Federal and state regulations and would not be expected to adversely affect air quality in the area. Cumulative air quality impacts for SNL are shown in table 4.13.1.7–2.

The Waste Management Draft PEIS does not provide air concentrations modeling data, but does state that no air quality standards would be exceeded (DOE 1995cc:11-66). The contribution to cumulative impacts from the Waste Management Draft PEIS can not be quantitatively estimated. However, emissions generated from the Waste Management Draft PEIS alternatives are not expected to increase cumulative air concentrations to a level which would adversely affect air quality in the area. No criteria air pollutant data was available for analysis from the Medical Isotope Production EIS.

Water Resources. The selection of SNL for the location of the proposed NIF and the Nonnuclear Fabrication Facility would result in the maximum cumulative impacts for the stockpile stewardship and management alternatives. The construction and operation of these facilities would impact only groundwater; no surface water would be withdrawn for use by these facilities. The use of groundwater from stockpile stewardship and management alternatives would increase by approximately 75 percent over No Action. Wastewater discharge to the city of Albuquerque would increase by approximately 41 percent over No Action. Table 4.13.1.7–3 shows the cumulative water usage at SNL from stockpile stewardship and management alternatives and the Waste Management Draft PEIS.

Socioeconomics. The increase in employment from the Nonnuclear Fabrication Facility and the proposed NIF at SNL in conjunction with other proposed projects would result in cumulative impacts to socioeconomics. Construction and operation of the stockpile stewardship and management alternatives would require workers and their families to in-migrate to the ROI. This in-migration would cause a slight increase in the population of the ROI. Vacant housing would be sufficient to house in-migrating workers and their families.

The Waste Management Draft PEIS would contribute minor socioeconomic impacts at SNL. Cumulative socioeconomic impacts are shown in table 4.13.1.7–4.

Radiation and Hazardous Chemical Environment–Normal Operations and Facility Accidents. The normal operation cumulative radiological doses and resulting health effects for the stockpile stewardship alternatives alongside other potential site activities at SNL, are presented in table 4.13.1.7–5. Although these impacts could be added, it should be noted that the exact locations of the facilities for planned actions may change; this would be addressed in site-specific detailed analyses. Also, for the various actions, the location of the maximally exposed individual is different, alternate dose assessment models are used, and different operational time periods exist. Impacts from potential accidents associated with nonnuclear fabrication and the proposed NIF are assessed for SNL in section 4.8.3.9 of this PEIS. A potential exists that other proposed projects could be sited at SNL. These other proposed projects also have the potential to produce impacts from accidents. A beyond design basis earthquake could potentially impact multiple facilities within SRS, resulting in the simultaneous release of radioactive materials from these facilities to the environment. Table 4.13.1.7–6 is a summary of potential consequences to the maximally exposed individual and the surrounding population from accidental radiological releases caused by a single earthquake. Probabilities of an earthquake accident occurring are not presented; instead, the information presented is based on the conservative assumption that the worst consequence accident for the activity has occurred, based on existing NEPA analyses. The cumulative impacts associated with accidents from these other reasonably foreseeable activities at SNL, and the stockpile stewardship and management activities at SNL, would be the sum of the impacts presented below and those presented in section 4.8.3.9.

Waste Management. The proposed NIF and the Nonnuclear Fabrication Facility alternatives may impact the storage capacity of existing disposal areas as well as the capacity of the Albuquerque sanitary landfill. Under the Waste Management Draft EIS, no additional waste would be generated as treatment and disposal facilities would be constructed at SNL for managing its own waste (DOE 1995cc:11-64). Table 4.13.1.7–7 shows waste management cumulative impacts at SNL.

TABLE 4.13.1.7–1.—*Site Infrastructure Cumulative Impacts at Sandia National Laboratories*

Category	No Action	Medical Isotope Production	Waste Management	Stockpile Stewardship and Management	Total Change Over No Action
Electrical					
Energy consumption (MWh/yr)	186,944	400	0.54[a]	81,700	82,100
Fuel					
Liquid (L/yr) (propane)	1,301,598	ND	ND	2,800	2,800
Gas (m^3/yr)	15,773,761	ND	ND	4,080,000	4,080,00

[a] Megawatts of energy, not included in total.

Note: ND - no data.

Source: DOE 1995cc; DOE 1996h; table 4.8.3.2–1.

TABLE 4.13.1.7–2.—*Air Quality Cumulative Impacts at Sandia National Laboratories*

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines (μg/m^3)	2005 No Action (μg/m^3)	Medical Isotope Production	Waste Management[a] (μg/m^3)	Stockpile Stewardship and Management (μg/m^3)	Total Including No Action (μg/m^3)
Carbon monoxide	Annual	4,600	1,603	b	b	0	1,603
	8-hour	10,000	4,924	b	b	1	4,925
	1-hour	15,000	10,307	b	b	4	10,311
Lead	Calendar quarter	1.5	0.0667	b b	b	b	0.0667
	30-day	3	b	b	b	b	b
Nitrogen dioxide	Annual	94	30	b	b	0.12	30.12
	24-hour	117	77	b	b	1.29	78.29
Ozone	1-hour	235	188	b	b	b	188
Particulate matter	Annual	50	15.92	b	b	0.01	15.93
	24-hour	150	66	b	b	0.12	66.12
Sulfur dioxide	Annual	11	0.8	b	b	b	0.8
	24-hour	92	5.2	b	b	0.02	5.22
	3-hour	1,300	21.7	b	b	0.09	21.79

[a] No air quality standard exceedances.

[b] Data not available, concentration assumed less than applicable standard.

Source: DOE 1995cc; DOE 1996h; table 4.8.3.3–1.

TABLE 4.13.1.7–3.—*Water Cumulative Impacts at Sandia National Laboratories*

Category	No Action	Medical Isotope Production	Waste Management	Stockpile Stewardship and Management	Total Change Over No Action
Groundwater (MLY)	1,390	40	8	1,045	1,093
Wastewater discharge (MLY)	757	ND	2.0	309	311

Note: ND - no data.

Source: DOE 1995cc; DOE 1996h; table 4.8.3.4–1.

TABLE 4.13.1.7–4.—*Socioeconomic Cumulative Impacts at Sandia National Laboratories*

Category	No Action	Medical Isotope Production	Waste Management	Stockpile Stewardship and Management	Total Change Over No Action
Construction					
Direct employment (worker years)	0	84	[a]	2,408	2,492
Operation					
Direct employment	8,500	61	143	1,490	1,694

[a] Included in operations.
Source: DOE 1995cc; DOE 1996h; section 4.8.3.8.

4.13.1.8 *Nevada Test Site*

In the Stockpile Stewardship and Management PEIS, NTS is a candidate site for the proposed NIF and for the A/D Facility. NTS is also a candidate site for location of a storage facility and a disposition site in the Storage and Disposition Draft PEIS, and for the management of mixed LLW, LLW, and TRU in the Waste Management Draft PEIS. In addition, Yucca Mountain, located within the vicinity of NTS, is being considered as a nuclear waste repository. The location of the repository at Yucca Mountain could potentially contribute to cumulative socioeconomic impacts. The timeframe for the proposed project is unknown at this time. However, in order to show the highest potential cumulative impacts it is assumed that construction and operation of the repository at Yucca Mountain would occur within the timeframe of the Stockpile Stewardship and Mangement Program.

NLVF is a candidate site for construction and operation of the proposed NIF. The impacts associated with NIF have been addressed in previous sections. Since no other projects are planned for NLVF, the impacts from the construction and operation of NIF are the only cumulative impacts at the site.

Site Infrastructure. The maximum potential cumulative impacts from the stockpile stewardship and management alternatives would result from locating both NIF and the A/D Facility at NTS. Selection of NTS for both of these facilities would result in an increase in energy use of 68 percent over No Action. The increased power demands would require the construction of new high voltage transmission lines from Las Vegas and the construction of electrical distribution and transmission equipment at NTS. The consumption of liquid fuel would increase by 76 percent and 4 km (2.5 mi) of new roads would need to be constructed as a result of the new stockpile stewardship and management projects.

The cumulative impacts to site infrastructure resources at NTS as a result of other projects are shown in table 4.13.1.8–1. Cumulative fuel consumption requirements are readily available in the area and can be satisfied by existing methods of procurement. The cumulative electrical demand would require the construction of new high voltage transmission lines and electrical distribution equipment.

Air Quality. The maximum contribution to cumulative impacts from the stockpile stewardship and management alternatives would result from the selection of NTS for the proposed NIF and the A/D Facility. The operation of these alternatives would generate some criteria pollutants as shown in table 4.13.1.8–2. The concentrations of the pollutants resulting from the operation of the proposed NIF and the A/D Facility added to the No Action concentrations were compared with all Federal and state regulations and would not be expected to adversely affect air quality in the area. The contribution of the stockpile stewardship and management alternatives to cumulative air quality concentrations represents less than 1 percent of the most stringent regulation or guideline concentration.

TABLE 4.13.1.7–5.—*Estimated Annual Cumulative Radiological Doses and Resulting Health Effects to Offsite Population and Facility Workers at Sandia National Laboratories*

Program	Maximally Exposed Individual		Total Population Within 80 km[a]		Workers	
	Total dose[b] (rem)	Fatal cancer risk[c]	Total dose (person-rem)	Number of fatal cancers[c]	Total dose[d] (person-rem)	Number of fatal cancers[c]
No Action	1.6×10^{-6}	8.0×10^{-10}	0.027	1.4×10^{-5}	11	4.4×10^{-3}
Waste Management	1.1×10^{-6}	5.5×10^{-10}	0.028	1.4×10^{-5}	1.7×10^{-4}	6.8×10^{-8}
Medical Isotopes Production	1.7×10^{-4}	8.5×10^{-8}	13	6.5×10^{-3}	25	0.01
Stockpile Stewardship	4.0×10^{-6}	2.0×10^{-9}	0.20	1.0×10^{-4}	8	3.2×10^{-3}

[a] Collective dose to the 80-km (50-mi) population surrounding each given site.

[b] The applicable limits for an individual member of the public from total site operations are 10 mrem/yr from the air pathways, 4 mrem/yr from the drinking water pathwway, and 100 mrem/yr from all pathways combined.

[c] Annual incidence of excess fatal cancers.

[d] Dose presented is for the total workforce.

Source: DOE 1993n:7; DOE 1995cc; DOE 1996h; tables 4.8.3.9–1 and 4.8.3.9–2.

TABLE 4.13.1.7–6.—***Summary of Earthquake Accident Consequences from Other Proposed Projects at Sandia National Laboratories***

	Offsite MEI Dose (rem)	Offsite MEI Number of Cancer Fatalities	Offsite Population[a] Dose (Person-rem)	Offsite Population[a] Number of Cancer Fatalities
Medical Isotope Production	ND	ND	2,350	1
Waste Management	b	b	b	b

[a] Population within 80 km (50 mi).
[b] No earthquake accident analysis.
Note: ND - no data.
Source: DOE 1995cc; DOE 1996h.

TABLE 4.13.1.7–7.—***Waste Management Cumulative Impacts at Sandia National Laboratories***

Category	No Action	Medical Isotope Produciton	Waste Management	Stockpile Stewardship and Management	Total Change Over No Action
Low-Level (m^3/yr)	54	56	34[a]	3.7	94
Mixed Low-Level (m^3/yr)	2	0	3[b]	2.3	5
Hazardous (m^3/yr)	828	0	0	42	42
Nonhazardous (Sanitary) (m^3/yr)	84,770	0	1,980	323,000	325,000

[a] Decentralized alternative: SNL would treat and dispose of its LLW.
[b] Decentralized alternative: SNL would treat and dispose of its mixed LLW with the exception of contact-handled mixed LLW that would be disposed of at LANL.
Source: DOE 1995cc; DOE 1996h; table 4.8.3.10–2.

TABLE 4.13.1.8–1.—*Site Infrastructure Cumulative Impacts at Nevada Test Site*

Category	No Action	Storage and Disposition[a]	Waste Management	Stockpile Stewardship and Management	Total Change Over No Action
Electrical					
Energy consumption (MWh/yr)	121,460	89,000	11.0[b]	83,000	172,000
Fuel					
Oil (L/yr)	5,715,850	38,000	ND	4,332,000	4,370,000
Gas (m^3/yr)	0	3,964,000	ND	0	3,964,000

[a] Data represents the maximum values for storage alternatives. A nonsite-specific analysis of the disposition alternatives shows that the disposition alternative with the maximum impact would require the following resources: 1,157,000 MWh/yr of electricity, 8,976,000 m^3/yr of natural gas, and 836,750 L/yr of liquid fuel.

[b] Megawatts, not included in total.

Note: ND - no data.

Source: DOE 1995cc; DOE 1996a; table 4.9.3.2–1.

TABLE 4.13.1.8–2.—*Air Quality Cumulative Impacts at Nevada Test Site*

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines (μg/m³)	2005 No Action (μg/m³)	Waste Management[a] (μg/m³)	Storage and Disposition[b] (μg/m³)	Stockpile Stewardship and Management (μg/m³)	Total Including No Action (μg/m³)
Carbon monoxide	8-hour	10,000	2,290	c	0.6	c	2,290.06
	1-hour	40,000	2,748	c	4.22	c	2,752.22
Lead	Calendar quarter	1.5	c	c	c	c	c
Nitrogen dioxide	Annual	100	c	c	0.01	c	0.01
Ozone	1-hour	235	c	c	c	c	c
Particulate matter	Annual	50	9.4	c	c	c	9.4
	24-hour	150	106	c	c	c	106.06
Sulfur dioxide	Annual	80	8.4	c	c	c	8.4
	24-hour	365	94.6	c	c	0.2	94.8
	3-hour	1,300	725	c	c	1.6	726.6

[a] No air quality standard exceedances.

[b] Data represents maximum values from storage alternatives only.

[c] Data not available, concentration assumed less than applicable standard.

Source: DOE 1995cc; DOE 1996a; table 4.9.3.3–1.

TABLE 4.13.1.8–3.—*Water Cumulative Impacts at Nevada Test Site*

Category	No Action	Storage and Disposition[a]	Waste Management	Stockpile Stewardship and Management	Total Change Over No Action
Groundwater (MLY)	2,400	220	147	251	618
Wastewater (MLY)	0	13	61	72	146

[a] Data represents the maximum values for storage alternatives only. A nonsite-specific analysis of the disposition alternatives shows that 534 MLY of groundwater would be used and 424 MLY of wastewater would be generated as a result of the disposition alternative with the maximum impact.

Source: DOE 1995cc; DOE 1996a; table 4.9.3.4–1.

Water Resources. The selection of NTS for the location of the proposed NIF and the A/D Facility would result in the maximum cumulative impacts for the Stockpile Stewardship and Management Program. The construction and operation of these facilities would impact only groundwater; no surface water would be withdrawn for use by these facilities. The use of groundwater would increase by 11 percent over No Action for the operation of the proposed NIF and the A/D Facility. Additional lagoons and evaporation ponds would need to be constructed to handle the additional wastewater volumes.

The cumulative impacts to water resources from other projects are shown in table 4.13.1.8–3. The stockpile stewardship and management alternatives contribute 39 percent of the cumulative increase in water usage and 50 percent of the wastewater generation increase. The proposed stockpile stewardship and management facilities would have a relatively minor contribution to cumulative impacts.

Biotic Resources. The construction and operation of NIF and the A/D Facility could impact the Federal-listed desert tortoise. The proposed NIF site is located in the habitat for the desert tortoise. The worker vehicular traffic associated with both of these projects could also impact the desert tortoise.

Construction and operation of facilities proposed for the other projects would contribute to the cumulative impacts to biotic resources. The Waste Management Draft PEIS and the Storage and Disposition Draft PEIS would both require construction which could disturb additional habitats.

Socioeconomics. The construction and operation of the proposed NIF and the A/D Facility would have the maximum impact on socioeconomic issues. Location of both facilities would require 3,318 worker years for construction and 1,423 operational jobs at NTS. The operation of proposed facilities would require in-migration of workers and their families. Projected housing vacancies would be sufficient to meet the increased housing demands. Impacts to other socioeconomic issues would be neglible.

The selection of NTS as a location for other proposed projects would contribute to cumulative impacts as shown in table 4.13.1.8–4. Stockpile stewardship and management alternatives would contribute approximately 21 percent of the 6,845 cumulative operational jobs. The Base Realignment and Closure Commission is considering the expansion of Nellis Air Force Base which is adjacent to NTS. The potential exists for impacts to socioeconomic resources if Nellis Air Force Base is expanded. Due to the large population and the very strong growth in the region, the cumulative socioeconomic impacts at NTS would be minor.

Radiation and Hazardous Chemical Environment–Normal Operation and Facility Accidents. The normal operation cumulative radiological doses and resulting health effects for the stockpile stewardship and management alternatives alongside other potential site activities at NTS, are presented in table 4.13.1.8–5. Although these impacts could be added, it should be noted that the exact locations of the facilities for planned actions may change; this would be addressed in site-specific detailed analyses. Also, for the various actions, the location of the maximally exposed individual is different, alternate dose assessment models are used, and different operational time periods exist. Impacts from potential accidents associated with the proposed NIF and the A/D Facility are assessed for NTS in section 4.9.3.9 of this PEIS. A potential exists that other proposed projects could be sited at NTS. These other proposed projects also have the potential to produce impacts from accidents. A beyond design basis earthquake could potentially impact multiple facilities within NTS, resulting in the simultaneous release of radioactive materials from these facilities to the environment. Table 4.13.1.8–6 is a summary of potential consequences to the maximally exposed individual and the surrounding population from accidental radiological releases caused by a single earthquake. Probabilities of an earthquake accident occurring are not presented; instead, the information presented is based on the conservative assumption that the worst consequence accident for the activity has occurred, based on existing NEPA analyses. The cumulative impacts associated with accidents from these other reasonably foreseeable activities at NTS, and the stockpile stewardship and management activities at NTS, would be the sum of the impacts presented below and those presented in section 4.9.3.9.

Waste Management. The selection of NTS for construction of the proposed NIF and A/D Facility would result in the maximum cumulative impacts. Increased volumes of low-level, mixed, hazardous, and nonhazardous wastes would be produced as a result of the new facilities. The increase in the production of nonhazardous wastes would require the expansion of the existing wastewater treatment system.The increased production from the other waste streams would be handled by existing and planned waste management facilities.

As illustrated in table 4.13.1.8–7, it is expected that the proposed stockpile stewardship and management facilities would have smaller impacts than other proposed projects. The Storage and Disposition Draft PEIS would result in the production of TRU and mixed LLW streams, which are not currently handled at NTS.

NTS could potentially receive offsite LLW, transuranic, and mixed LLW as a result of the Waste Management Draft PEIS. The construction of treatment and disposal facilities in the Waste Management Draft PEIS may mitigate any potential treatment or disposal capacity problems resulting from cumulative impacts.

TABLE 4.13.1.8–4.—*Socioeconomic Cumulative Impacts at Nevada Test Site*

Category	No Action	Yucca Mountain	Storage and Disposition[a]	Waste Management	Stockpile Stewardship and Management	Total Change Over No Action
Construction						
Employment (worker years)	0	9,722	5,970	[b]	3,318	19,010
Operation						
Employment	8,019	1,400	750	3,272	1,423	6,845

[a] Data represents maximum values for storage alternatives. A nonsite-specific analysis of the disposition alternatives shows that 16,566 construction worker years and 2,622 operational jobs would result from the disposition alternative with the maximum impacts.

[b] Included in operation.

Source: DOE 1995cc; DOE 1996a; section 4.9.3.8.

TABLE 4.13.1.8–5.—*Estimated Annual Cumulative Radiological Doses and Resulting Health Effects to Offsite Population and Facility Workers at Nevada Test Site*

Program	Maximally Exposed Individual		Total Population Within 80 km[a]		Workers	
	Total dose[b] (rem)	Fatal cancer risk[c]	Total dose (person-rem)	Number of fatal cancers[c]	Total dose[d] (person-rem)	Number of fatal cancers[c]
No Action	4.8×10^{-6}	2.4×10^{-9}	0.012	6.0×10^{-6}	21	8.4×10^{-3}
Waste Management	7.8×10^{-12}	3.9×10^{-15}	3.0×10^{-8}	1.5×10^{-11}	8.4×10^{-8}	3.4×10^{-11}
Storage and Disposition	5.6×10^{-9}	2.8×10^{-12}	1.2×10^{-6}	6.0×10^{-10}	40	0.016
Yucca Mountain Operations[e]	ND	ND	ND	ND	70	0.028
Stockpile Stewardship and Management	3.5×10^{-9}	1.8×10^{-12}	3.1×10^{-6}	1.6×10^{-9}	2.6	1.0×10^{-3}

[a] Collective dose to the 80-km (50-mi) population surrounding each given site.
[b] The applicable limits for an individual member of the public from total site operations are 10 mrem/yr from the air pathways, 4 mrem/yr from the drinking water pathwway, and 100 mrem/yr from all pathways combined.
[c] Annual incidence of excess fatal cancers.
[d] Dose presented is for the total workforce.
[e] As discussed in NT DOE 1986b, public exposure to effluents is essentially nonexistent; therefore, no data were established for this program.
Note: ND - no data.
Source: DOE 1993n:7; DOE 1995cc; DOE 1996a; NT DOE 1986b; tables 4.9.3.9–1 and 4.9.3.9–2.

TABLE 4.13.1.8–6.—*Summary of Earthquake Accident Consequences from Other Proposed Projects at Nevada Test Site*

Other Proposed Projects	Offsite MEI Dose (rem)	Offsite MEI Number of Cancer Fatalities	Offsite Population[a] Dose (person-rem)	Offsite Population[a] Number of Cancer Fatalities
Yucca Mountain	$2.4x10^{-4}$	$1.2x10^{-7}$	$3.1x10^{-3}$	$1.6x10^{-6}$
Waste Management PEIS	b	b	b	b
Storage and Disposition				
Storage[c]	0.74	$3.7x10^{-4}$	54	0.027
Disposition[d]	24	0.12	93	0.047
Plutonium conversion	0.12	$6.2x10^{-5}$	9.2	$4.6x10^{-3}$
Pit assembly/disassembly	0.057	$2.8x10^{-5}$	4.2	$2.1x10^{-3}$
Mixed oxide fuel fabrication	0.13	$6.3x10^{-5}$	9.2	$4.6x10^{-3}$

[a] Population within 80 km (50 mi).
[b] No earthquake accident analysis.
[c] Consolidation of plutonium and collocation of HEU.
[d] Evolutionary Light Water Reactor.
Note: MEI - maximally exposed individual.
Source: DOE 1995cc; DOE 1996a; NT DOE 1986b.

TABLE 4.13.1.8–7.—*Waste Management Cumulative Impacts at Nevada Test Site*

Category	No Action	Storage and Disposition[a]	Waste Management	Stockpile Stewardship and Management	Total Change Over No Action
Low-Level (m^3/yr)					
Liquid	0	17	Included in solid	<1	17
Solid	32,400	1,300	74,000[b]	33	75,333
Mixed Low-Level (m^3/yr)					
Liquid	Included in solid	0	Included in solid	2	3
Solid	4,170	66	11,300[c]	2	11,368
Hazardous (m^3/yr)					
Liquid	29	2	Included in solid	8	10
Solid	15	2	0	8	10
Nonhazardous (Sanitary) (m^3/yr)					
Liquid	Included in solid	189,000	Not analyzed	70,900	259,900
Solid	5,350	980		6,100	7,080

[a] Data represents maximum values for storage alternatives only.
[b] Centralized alternative 2: NTS would dispose of its LLW and would receive LLW for disposal after minimum treatment at all DOE sites.
[c] Regionalized alternative 3: NTS would dispose of its mixed LLW and would receive mixed LLW for disposal from all DOE sites after treatment at seven sites.
Source: DOE 1995cc; DOE 1996a; table 4.9.3.10–2.

4.14 Operating Conditions Common to All Sites

Current operations at each Complex site result in the emission of pollutants to the atmosphere, discharge of pollutants in wastewater, and the generation of wastes. DOE orders require that site operations be conducted in accordance with all regulatory standards and provide for protection of the public and the environment. Monitoring is conducted at each site to determine compliance with these standards. When monitoring indicates noncompliance, DOE orders require that appropriate corrective actions and followups be performed. Monitoring activities conducted at DOE sites are reported in accordance with permit, regulatory, and DOE operational requirements. Additionally, monitoring results and analyses are included in the site's annual environmental surveillance reports, which are available to the public as required by DOE Order 5400.1, *General Environmental Protection Program.*

All sites are subject to state environmental requirements for solid mixed and hazardous waste under RCRA and regulated wastes under TSCA. Nonhazardous (sanitary) solid wastes are governed by RCRA subtitle D standards. All radioactive and mixed waste management activities at the sites are conducted primarily under DOE Order 5820.2A and RCRA. All mixed waste storage areas must meet RCRA containment system requirements. The recent *Federal Facility Compliance Act* (October 6, 1992) required DOE to submit site-specific plans to EPA and the states containing schedules for providing treatment capacity for mixed waste streams at DOE sites. DOE has developed proposed treatment plans that are being negotiated with EPA and the states.

In accordance with RCRA, as amended, the *Pollution Prevention Act* of 1990, and DOE Order 5400.1, all sites have an active pollution prevention and waste minimization program to reduce the volume and toxicity of waste generated, to the extent that is economically practical. The site programs are an organized and continual effort to systematically reduce waste generation. The overall focus of these programs is on pollution prevention, which involves the elimination/minimization of pollutant releases to all environmental media from all aspects of site operations. This includes air emissions and water discharges to sewer systems, as well as the offsite disposal of solid waste.

Some of the solvents used in the Complex and used in the nonnuclear facilities have been identified as ozone-depleting pollutants. Attempts are being made, both internationally and nationally, to reduce ozone-depleting gases. In September 1987, 27 nations, including the United States, signed the Montreal Protocol, which limits the production of chlorofluorocarbons and halogens. Schedules contained in Title VI of the CAA Amendments (November 1990) call for the phaseout of all chlorofluorocarbons and halogens between 2015 and 2030. A second meeting regarding the Montreal Protocol extended the phasing out of ozone-depleting gases into the early 21st century because of the slow development of chlorofluorocarbon alternatives. All DOE sites have, or are developing, site-specific plans to meet the CAA-mandated phaseout schedule. Potential ozone-depleting chemicals identified in 40 CFR 82 and discussed in this PEIS include 1,1,1-trichloroethane, CCI4, chlorodifluoromethane, dichlorodifluoromethane, and trichlorotrifluoroethane.

Workplace Safety and Accidents. Operations at all DOE sites expose workers to occupational hazards during the normal conduct of their work activities. Occupational safety and health training is provided for all employees at DOE facilities and includes specialized job safety and health training appropriate to the work performed. Such training also includes informing employees of their rights and responsibilities under OSHA Executive Order 12196, which established OSHA Federal agency standards; 29 CFR 1960, *OSHA Standards for Federal Agencies*, which describes the safety and health programs that Federal agencies must establish and implement under Executive Order 12196; and DOE O 440.1, *Worker Protection Management for DOE Federal and Contractor Employees*. DOE provides implementation guidance in DOE O 440.1, including the requirements and guidelines for the DOE *Federal Employee Industrial Hygiene Program*. The following is DOE policy:

- Provide places and conditions of employment that are as free as possible from recognized hazards that cause or are likely to cause illness or physical harm

- Assure that employees and employee representatives shall have the opportunity to participate in the *Federal Employees Occupational Safety and Health Program*

- Establish programs in safety and health training for all levels of Federal employees

- Consider 29 CFR 1960 requirements to be the minimum standards for DOE employees

DOE contractor operations at each site expose workers to hazardous constituents. DOE orders require that site operations have programs for the protection of workers. DOE O 441.1, *Radiological Protection for DOE Activities*, and DOE O 440.1, *Worker Protection Management for DOE Federal and Contractor Employees*, establish procedures for protection of workers against radiological and hazardous materials, respectively. DOE M 232.1-1, *Occurrence Reporting and Processing of Operations Information*, provides for reporting and guides appropriate corrective action and followup should exposure occur.

DOE O 451.1, *National Environmental Policy Act Compliance Program*; DOE O 5480.23, *Nuclear Safety Analysis Reports*; and DOE O 430.1, *Lifecycle Asset Management*, provide the basis for review of all planned and existing construction and operation for potential accidents and the assessment of the associated human health and environmental consequences of an accident. These reviews are required before authorization of construction or start of operation. These reviews also involve the identification of hazards and an analysis of normal, abnormal, and accident conditions. This analysis includes consideration of natural and manmade external events, including fires, floods, tornadoes, earthquakes, other severe weather events, human errors, and explosions. The sites associated with the Stockpile Stewardship and Management Program have complied with applicable DOE orders.

In accordance with DOE O 151.1, *Comprehensive Emergency Management System*, emergency response planning and training are provided to mitigate the consequences of potential accidents. Additionally, should an accident occur, the incident would be reported in accordance with DOE M 232.1-1, *Occurrence Reporting and Processing of Operations Information*. The reports would also include appropriate corrective actions and followup.

Operation Consequences Common to All Sites. Consolidating or relocating stockpile stewardship and management functions to a site could increase the emissions of pollutants to the atmosphere, discharge of pollutants in wastewater, and generation of wastes. Members of the public could be exposed to pollutants that are released to the environment. Additionally, these functions, as with all industrial processes, would have the potential for exposing workers to hazardous constituents and accidents.

The monitoring currently conducted at each Complex site would be reviewed to ensure that monitoring activities are adequate to assess whether new operations and site conditions are adversely affecting members of the public, workers, or the environment. At each site, modifications to monitoring activities would be made, as appropriate. Any modifications, as well as the bases for the modification, would be documented in the sites' Environmental Protection Program. The results of these monitoring activities and the potential for exposures to the public and workers would be reviewed, processed, and reported, as discussed earlier.

In many cases, the functions proposed for relocation are similar to or the same as activities currently being performed at the receiver site. In addition, the processes and materials associated with relocated functions are similar to or the same as those currently performed and used at the receiver sites. These processes and materials have been previously reviewed and analyzed in accordance with applicable regulatory and DOE order requirements and have been documented in various forms, including memoranda, safety assessments, and various NEPA documents. In all cases, current activities at these sites have received the appropriate authorization to operate.

The human health impacts of relocating a stockpile stewardship and management function to a receiver site were assessed in the following manner for each site: from an operational perspective, the additional impacts associated with the activity and the cumulative impacts after relocation were determined and presented; from an accident perspective, the processes to be transferred and the potential hazards they present were assessed. This assessment included the review of NEPA documents, SAR, and other applicable documents. Additionally, all proposed stockpile stewardship and management functions to be consolidated or relocated are currently being performed at existing DOE sites and do not constitute new activities within the Complex.

Potential Consequences of the Stockpile Stewardship and Management Program on Workplace Safety and Accidents. Downsizing and consolidating Complex missions could potentially result in increased exposure of site workers to industrial-type work hazards and accidents. In addition, levels of risk to workers in new construction increases in relation to the amount of new construction required for stockpile stewardship and management facilities. Based on the length of construction periods for new facilities, the new A/D Facility at NTS (2,768 worker years) would have the largest construction accident risk and the new Nonnuclear Fabrication Facility at SNL (781 worker years) would have the lowest construction accident risk. Table 4.14–1 shows the relative risk of fatalities due to construction (both new building and existing building modification) by alternative. Before implementing the Stockpile Stewardship and Management Program alternatives at any site, the site's environment, safety, and health staff would be notified that a new process or facility was being considered for change or modification to allow them to evaluate the impact of the anticipated change on the work environment.

Appropriate measures would be implemented to minimize work hazards and accidents based on this early evaluation. Once operational, as part of the Occupational Safety and Health Program at each site, ongoing surveillance of the new or modified processes or activities would be performed to identify potential health hazards. If potential health hazards are identified, a hazard evaluation would be conducted to determine the extent of the hazard and, if required, the recommended control measures. Where feasible, engineering controls would be used to protect worker health and safety. Administrative controls and personal protective equipment would supplement engineering controls, as appropriate.

4.15 Unavoidable Adverse Environmental Impacts

Siting, construction, modification, and operation of stockpile stewardship and management facilities at ORR, SRS, KCP, Pantex, LANL, LLNL, SNL, or NTS would result in adverse environmental impacts. The impact assessment conducted in this PEIS has identified these potential adverse impacts along with mitigative measures that could be implemented to either avoid or minimize these impacts. The residual adverse impacts remaining after mitigation are unavoidable and the bounding case impacts of all stockpile stewardship and management alternatives at all alternative sites are discussed below.

At NTS 18.2 ha (45 acres) of land would be disturbed to construct and operate the proposed NIF and provide additional supporting infrastructure and access roads. Loss of habitat in the disturbed area would be unavoidable. Land requirements for the proposed NIF would represent less than 11 percent of the uncommitted land at each alternative site except for the NLVF alternative at NTS where 56 percent would be required. Soil erosion in the disturbed area due to wind and stormwater runoff would be minor with appropriate sediment control measures. Small areas of potential wetlands could be unavoidably impacted, but mitigation measures approved by the U.S. Corps of Engineers would be implemented.

Construction, modification, and operation of stockpile stewardship and management facilities would generate criteria and toxic/hazardous pollutants that have the potential to exceed Federal and state ambient air quality standards and guidelines. Concentrations of PM_{10} and TSP are expected to be close to or exceed the 24-hour ambient PM_{10} and TSP standards during peak construction periods under dry and windy conditions. Such exceedances are not uncommon for large construction projects. Air pollutant concentrations during operation are expected to remain within Federal and state ambient air quality standards, except for 1-hour ozone concentrations at KCP, 1-hour nitrogen dioxide concentrations at LLNL, 24-hour nitrogen dioxide concentrations at LANL, and annual PM_{10} concentrations at KCP.

TABLE 4.14–1.—*Estimated Number of Construction Worker Fatalities by Alternatives*

Alternatives	Worker Years	Construction Period (years)	Potential Accidental Workers Deaths[a]
Stewardship			
National Ignition Facility	1,627	5	0.358
Contained Firing Facility	60	2	0.013
Atlas Facility	53	4	0.012
Management			
Assembly/Disassembly			
Pantex Plant	99	3	0.022
Nevada Test Site	2,768	6	0.609
Nonnuclear Fabrication			
Kansas City Plant	459	4	0.101
Los Alamos National Laboratory	12	2	0.003
Lawrence Livermore National Laboratory	19	5	0.004
Sandia National Laboratories	781	3	0.172
Pit Fabrication			
Los Alamos National Laboratory	216	3	0.048
Savannah River Site	801	5	0.176
Secondary and Case Fabrication			
Oak Ridge Reservation	72	6	0.016
Los Alamos National Laboratory	205	4	0.045
Lawrence Livermore National Laboratory	330	3	0.073
High Explosives Fabrication			
Pantex Plant	46	3	0.01
Los Alamos National Laboratory	77	2	0.017
Lawrence Livermore National Laboratory	19	1	0.004

[a] Results are based on the death rates experienced for construction workers in 1993. For the construction industry in general in 1993, the death rate was 22 deaths per 100,000 worker-years.

Source: NSC 1994a.

For each of the alternatives considered, use of water is unavoidable and could represent an adverse impact depending on the site. The maximum amount of surface water required for stockpile stewardship and management facilities operation would be about 1,510 MLY (400 MGY) at ORR, and the maximum groundwater requirement would be 893 MLY (236 MGY) at SNL. Increased turbidity during construction activities could impact some fish spawning and feeding habitat. It is expected that this loss would be small in comparison with resident fish populations and reproductive capabilities.

Federal-listed threatened or endangered species, such as the desert tortoise, could be affected directly or by disruptions to benthic and foraging habitats during construction and operation of stockpile stewardship and management facilities. Several candidate or state-listed animal species and special status plant species may also be affected at different sites. Preactivity surveys for such species would be conducted prior to the start of projects and any mitigation measures would be developed in consultation with the USFWS. It may be necessary to survey the sites for the nests of migratory birds prior to construction and to avoid clearing operations during the breeding season. While such disruptions may be unavoidable, appropriate measures would be implemented and monitored to ensure that any impacts are not irreversible. Construction of new facilities would have some adverse unavoidable effects on animal populations. Larger mammals and birds would move to similar habitats nearby, while less mobile animals within the project areas, such as amphibians, reptiles, and small mammals, would be destroyed during land-clearing activities.

Some NRHP-eligible prehistoric and historic resources may occur within the disturbed area at each candidate site. The appropriate SHPO would be consulted to minimize unavoidable adverse impacts. Monitoring of construction activities by a paleontologist may be an appropriate mitigative measure in areas where scientifically important paleontological materials may be affected. Native American resources may be unavoidably affected by land disturbance and audio or visual intrusions on Native American sacred sites or due to reduced access to traditional use areas. DOE would consult with the affected tribes to minimize any impacts.

During construction of stockpile stewardship and management facilities, there would be no in-migration at any site. However, for operation of these facilities, there would be in-migration at some of the sites. The site and regional population would increase by as much as 1,950 (0.1 percent) during A/D operation at NTS. In most cases, vacancies in the existing housing stock would be sufficient for the in-migrating population. Some additional housing construction would be needed during operation of pit fabrication at SRS. Effects on the public finances of local governments in the ROI would be for the most part positive. An increase in vehicle traffic associated with construction and operation of stockpile stewardship and management facilities would affect the roads and transportation network surrounding some of the alternative sites. The resulting impacts in traffic, congestion, and road accidents resulting from socioeconomic growth is unavoidable, but can be reversed. For example, site access roads which are degraded during construction can be upgraded beyond their original condition to accommodate increased worker traffic.

Some amount of radiation would be released unavoidably by normal stockpile stewardship and management operations. The largest annual radiation dose to the maximally exposed member of the public would be 6.7 mrem from atmospheric and liquid releases at LANL. The associated risk of fatal cancers from 25 years of operations with these doses is $8.4x10^{-5}$. The greatest annual population dose from total site operations through 2030 would be 40.8 person-rem at ORR; such a total dose would result in 0.52 fatal cancers over the entire 25 years of operation. The largest average annual dose to a site worker would be 380 mrem at SRS and LANL and would result in an associated risk of fatal cancer of $3.8x10^{-3}$ from 25 years of operation. The greatest annual dose to the total site workforce would be 505 person-rem occurring at SRS and would result in 5.0 fatal cancers over 25 years of operation.

Since hazardous and toxic chemicals are present during construction and operation of stockpile stewardship and management facilities, worker exposure to these chemicals is unavoidable. The maximum hazard to site workers, based solely on emissions of hazardous chemicals, is represented by an HI of 2.39 at LLNL for the No Action alternative. The incremental effects of the stockpile stewardship and management alternative at SRS would not appreciably change this No Action value. The incremental cancer risks to the public and site workers are essentially zero.

Although each site would implement waste minimization techniques, generation of additional low-level, hazardous and nonhazardous wastes is unavoidable. Any introduction of new waste types could be an adverse impact since treatment, storage, and disposal facilities may have to be developed and permitted to deal with certain new types of wastes. In addition, the generation of additional LLW at Pantex would require one additional shipment to NTS every 2 years. Generation of additional hazardous or mixed wastes could require expansion of existing or planned treatment, storage, and disposal facilities for these wastes at some sites. Generation of additional nonhazardous wastes may also require expansion of existing, or construction of new, liquid and solid waste treatment facilities, or reduce the lifetimes of current solid waste landfills.

4.16 Relationship Between Local Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

The use of land on any of the eight alternative sites being considered for stockpile stewardship and management facilities would enhance the long-term productivity on each site in two ways. First, stockpile stewardship and management missions represent long-term R&D and production functions compatible with historic nuclear weapons support and require a technically competent, skilled and stable workforce. Second, in light of current reductions in the nuclear weapons stockpile, the lack of new weapons development or production, the moratorium on nuclear testing, and concerns about safety and reliability in the aging stockpile, DOE plans to downsize or consolidate existing facilities. In addition, DOE plans to provide upgraded or new experimental and computational capabilities that will enhance the long-term productivity of the selected sites.

Each alternative requires the use of additional land for increased disposal of radiological and hazardous materials. Such short-term usage would remove this land from other beneficial uses indefinitely because of the presence of long-lived hazards. Disposal of solid nonhazardous waste generated from facilities construction and operations would require additional land at onsite sanitary landfills. Solid nonhazardous waste generated from these facilities would continuously require additional land at a sanitary landfill site that would be unavailable for other uses in the long term. LLW would require additional space for onsite storage and waste processing and would involve the commitment of associated land, transportation, processing facilities, and other disposal resources. Creation of land disposal facilities allows the site to be productive for the long term by protecting the overall environment and complying with Federal and state environmental requirements.

One specific activity has been identified that requires short-term resource use that could compromise long-term productivity. The range of the endangered desert tortoise lies in the southern third of NTS. Construction and operation of new facilities associated with the A/D mission have the potential to impact the Federal-listed threatened desert tortoise. Measures designed to avoid impacts to the desert tortoise from previous projects at NTS have been implemented with mitigation measures developed in consultation with USFWS.

Losses of other terrestrial and aquatic habitats from natural productivity to accommodate new facilities and temporary disturbances required during construction are possible. Land clearing and construction activities resulting in large numbers of personnel and equipment moving about an area would disperse wildlife and temporarily eliminate habitats. Although some destruction would be inevitable during and after construction, these losses would be minimized by site selection and through environmental reviews at the site-specific level. In addition, short-term disturbances of previously undisturbed biological habitats from the construction of new facilities could cause long-term reductions in the biological productivity of an area. These long-term effects could occur, for example, at facilities located in arid areas of the western United States such as SNL, LANL, LLNL, and NTS, where biological communities recover very slowly from disturbances.

Potential termination of DP activities at ORR, KCP, and Pantex offers the possibility of restoring existing facilities at these sites to other purposes. Environmental restoration activities could have minor or short-term impacts similar to those normally associated with construction activities such as habitat disturbance and soil erosion. If contaminated structures were removed and site areas restored to a natural state, these areas could provide improved conditions for the long term.

4.17 Irreversible and Irretrievable Commitments of Resources

This section describes the major irreversible and irretrievable commitments of resources that can be identified at this programmatic level of analysis. A commitment of resources is irreversible when its primary or secondary impacts limit the future options for a resource. An irretrievable commitment refers to the use or consumption of resources neither renewable nor recoverable for later use by future generations.

The Stockpile Stewardship and Management Program was initiated to ensure the safety and reliability of the Nation's nuclear weapons stockpile. As such, the programmatic decisions resulting from this PEIS will ensure the commitment of resources to the new construction or modification of facilities that are essential to the efficacy and efficiency of the Complex. This section discusses three major resource categories that are committed irreversibly or irretrievably to the proposed action: land, materials, and energy. Values for irreversible or irretrievable commitments of resources are shown in tables 4.17–1 through 4.17–4.

Land Use. The land that is currently occupied by, or designated for, future stockpile stewardship and management facilities, could ultimately be returned to open space uses if buildings, roads, and other structures were removed, areas cleaned up, and the land revegetated. Alternatively, the facilities could be modified for use in other nuclear programs. Therefore, the commitment of this land is not necessarily irreversible.

However, land rendered unfit for other purposes, such as that set aside for radiological and hazardous chemical waste disposal facilities, represents an irreversible commitment because wastes in below-ground disposal areas may not be completely removed at the end of the project. The land could not be restored to its original condition or to minimum cleanup standards, nor could the site feasibly be used for any other purposes following closure of the disposal facility. This land would be perpetually unusable because the substrata would not be available for other potential intrusive uses such as mining, utilities, or foundations for other buildings. However, the surface area appearance and biological habitat lost during construction and operation of the facilities could be restored to a large extent.

Material. The irreversible and irretrievable commitment of material resources during the entire lifecycle of stockpile stewardship and management existing or proposed facilities includes construction materials that cannot be recovered or recycled, materials that are rendered radioactive but cannot be decontaminated, and materials consumed or reduced to unrecoverable forms of waste. Where construction is necessary, materials required include wood, concrete, sand, gravel, plastics, steel, aluminum, and other metals. At this time, no unusual construction material requirements have been identified either as to type or quantity. The construction resources, except for those that can be recovered and recycled with present technology, would be irretrievably lost. However, none of these identified construction resources is in short supply and all are readily available in the vicinity of locations being considered for new functions. The commitment of materials to be manufactured into new equipment that cannot be recycled at the end of the project's useful lifetime is irretrievable. Consumption of operating supplies, miscellaneous chemicals, and gases, while irretrievable, would not constitute a permanent drain on local sources or involve any material in critically short supply in the United States as a whole. Materials consumed or reduced to unrecoverable forms of waste, such as uranium, are also irretrievably lost. However, strategic and critical materials, or resources having small natural reserves, are of such value that economics promotes recycling. Plans to recover and recycle as much of these valuable, depletable resources as is practical would depend on need. Each item would be considered individually at the time a recovery decision is required.

Energy. The irretrievable commitment of resources during construction and operation of the facilities would include the consumption of fossil fuels used to generate heat and electricity for the sites. Energy would also be expended in the form of diesel fuel, gasoline, and oil for construction equipment and transportation vehicles. The amounts of irretrievable energy required to construct and operate new or modified facilities are estimated in chapter 3. These estimates are roughly comparable to past energy requirements for the Complex.

4.18 Facility Transition

The final disposition of all Complex facilities is the responsibility of DOE. DOE is committed to remediate these sites, to comply with all applicable environmental requirements, and to protect public and worker health and safety. DOE is currently considering many technologies for the treatment of contaminated materials and equipment, and for the long-term management of sites. DOE is preparing a

TABLE 4.17–1.—*Irreversible and Irretrievable Commitments of Construction Resources for Assembly/Disassembly, Nonnuclear Fabrication, and Stockpile Stewardship Facilities*

Construction	Contained Firing Facility	National Ignition Facility[a]	Atlas Facility	Assembly/Disassembly: Pantex	Assembly/Disassembly: NTS[b]	Nonnuclear Fabrication: KCP	Nonnuclear Fabrication: LANL[c]	Nonnuclear Fabrication: LLNL[c]	Nonnuclear Fabrication: SNL[c]
Resource Requirements									
Electrical energy (MWh)	64	24	520	609	38,000	0	0.105	21	46.8
Liquid fuel (L)	56,800	1,500,000	<1,000	28,800	3,030,000	0	0	19,900	2,600,000
Concrete (m^3)	3,000	60,000	<100	840	75,000	286	0	7.6	12,800
Carbon and stainless steel (t)	1,500	10,000	<10	15	16,300	220	0	7.3	5,440
Industrial gases (m^3)	4,300	9,000	0	600	65,100	0	0	7.5	0
Water (L)	3,790,000	$1.43x10^7$	<10,000	1,400,000	$9.84x10^7$	0	9,500	79,500	2,200,000
Employment									
Total employment (worker years)	60	1,627	53	99	2,768	459	12	19	781
Construction period (years)	2	5	4	3	6	4	2	5	3

[a] NIF values reflect nonsite-specific requirements. See appendix I for site-specific information.
[b] Values reflect requirements if Pantex is phased out.
[c] Values reflect requirements if KCP is phased out.
Source: Derived from text.

TABLE 4.17–2.—*Irreversible and Irretrievable Commitments of Construction Resources for Stockpile Management Alternatives*

Construction	Pit Fabrication and Modification		Secondary and Case Fabrication			High Explosives Fabrication		
	SRS[a]	LANL[b]	ORR	LANL[c]	LLNL[c]	Pantex	LANL[d]	LLNL[d]
Resource Requirements								
Electrical energy (MWh)	15	Minimal	2.7	4,130	3,500	257	Minimal	15
Liquid fuel (L)	175,000	Minimal	10,000	22,700	908,000	12,200	Minimal	9,500
Concrete (m^3)	1,600	Minimal	100	245	612	356	Minimal	190
Carbon and stainless steel (t)	249	Minimal	20	54	73	6	Minimal	15
Industrial gases (m^3)	3,780	Minimal	300	11,500	142	258	Minimal	3
Water (L)	30,000,000	Minimal	2,000,000	4,160,000	8,710,000	644,000	Minimal	1,230,000
Employment								
Total employment (worker years)	801	216	72	205	330	46	77	19
Construction period (years)	5	3	6	4	3	3	2	1

[a] Values reflect requirements if SRS receives this mission.
[b] Values reflect requirements if LANL receives this mission.
[c] Values reflect requirements if ORR is phased out.
[d] Values reflect requirements if Pantex is phased out.
Source: Derived from text.

TABLE 4.17–3.—*Irreversible and Irretrievable Commitments of Operation Resources for Assembly/Disassembly, Nonnuclear Fabrication, and Stockpile Stewardship Facilities*

Operations	Contained Firing Facility	National Ignition Facility[a]	Atlas Facility	Assembly/Disassembly		Nonnuclear Fabrication			
				Pantex	NTS[b]	KCP	LANL[c]	LLNL[c]	SNL[c]
Resource Requirements									
Electrical energy (MWh/yr)	1,600	58,000	5,360	43,000	45,000	225,000	525	108	39,700
Fuel, gas (m^3/yr)	0	1,100,000	0	7,150,000	3,680,000	18,900,000	340	28,900	3,270,000
Liquid fuel (L/yr)	2,650	5,820	0	740,000	432,000	0	0	0	0
Coal (t/yr)	0	NA	0	NA	NA	NA	NA	NA	NA
Total water (L/yr)	$2.3x10^6$	$1.52x10^8$	10,000	$1.96x10^8$	$9.84x10^7$	$1.34x10^9$	$4.83x10^7$	3,790,000	$8.93x10^8$
Liquid chemicals (kg/yr)	0	0	90	49,216	18,979	15,259,650	8,343	283,203	15,259,650
Solid chemicals (kg/yr)	0	0	0	70,068	11,027	0	124,860	0	0
Gaseous chemicals (kg/yr)	0	0	0	65,772	65,772	9,305	0	135	9,305
Plant Footprint (ha)[d]	0.4	20	0.3	e	4.3	e	e	e	9
Employment									
Total workforce	26	267	15	1,266	1,093	2,257	315	114	1,160

[a] NIF values reflect nonsite-specific requirements. See appendix I for site-specific information.
[b] Values reflect requirements if Pantex is phased out.
[c] Values reflect requirements if KCP is phased out.
[d] In addition to existing facilities.
[e] Existing facilities would be used.
Note: NA - not applicable.
Source: Derived from text.

TABLE 4.17–4.—*Irreversible and Irretrievable Commitments of Operation Resources for Stockpile Management Alternatives*

Operations	Pit Fabrication and Modification		Secondary and Case Fabrication			High Explosives Fabrication		
	SRS[a]	LANL[b]	ORR	LANL[c]	LLNL[c]	Pantex	LANL[d]	LLNL[d]
Resource Requirements								
Electrical energy (MWh/yr)	9,700	5,480	118,000	36,000	15,000	3,250	5,600	4,300
Fuel, gas (m^3/yr)	0	30,900	$1.7x10^7$	0	566,000	500,000	3,650,000	0
Liquid fuel (L)	28,400	0	250,000	100,000	85,200	55,600	94,600	53,100
Coal (t/yr)	1,090	0	500	0	NA	NA	NA	NA
Total water (L/yr)	$4.62x10^7$	$3.02x10^7$	$1.51x10^9$	$5.5x10^7$	$1.94x10^8$	$1.25x10^7$	$1.3x10^7$	$5.82x10^7$
Liquid chemicals (kg/yr)	9,191	57,772	199,466	153,728	58,107	8,050	9,049	2,776
Solid chemicals (kg/yr)	7,138	99,278	54,223	56,340	15,845	51,480	49,669	76,159
Gaseous chemicals (kg/yr)	52,521	1,533,089	6,488,333	1,568,333	1,883,037	1,810	1,361	885
Plant Footprint (ha)[e]	f	f	f	f	f	f	f	0.8
Employment								
Total Workforce	813	628	1,376	523	760	37	200	232

[a] Values reflect requirements if SRS receives this mission.
[b] Values reflect requirements if LANL receives this mission.
[c] Values reflect requirements if ORR is phased out.
[d] Values reflect requirements if Pantex is phased out.
[e] In addition to existing facilities.
[f] Existing facilities would be used.
Note: NA - not applicable.
Source: Derived from text.

PEIS to identify configurations for selected waste management facilities. The term "configurations" as used in this context means the arrangement of facilities and related activities at one or more DOE sites for a specific waste type. The selected waste management facilities for each of these waste types are: interim storage facilities for treated HLW; treatment and storage facilities for TRU waste in the event that treatment is required before disposal; treatment and disposal facilities for LLW; interim storage facilities for commercial Greater-Than-Class C LLW; treatment and disposal facilities for mixed LLW; and treatment facilities for hazardous waste.

4.19 Use of Plutonium-242 for Research and Development

Interim Management of Nuclear Materials Environmental Impact Statement (DOE/EIS-0220) dated October 20, 1995, categorized certain isotopes of plutonium, neptunium, americium, and curium as programmatic, leaving the issue of long-term use of these materials to various Program offices within DOE. The ROD for the Interim Management of Nuclear Materials EIS dated December 12, 1995, left programmatic decisions for the plutonium-242 material to DP. DP has determined that the plutonium-242 from SRS would be useful for future R&D activities. The issue for this PEIS concerns where to store the plutonium-242 material for such use. This section provides an analysis of the alternatives for storing SRS plutonium material for future R&D use. Further information regarding use of this material is contained in a classified appendix to this PEIS.

As discussed in the ROD for the Interim Management of Nuclear Materials EIS, existing plutonium-242 in nitrate solutions at H-Canyon will be stabilized by conversion to plutonium oxide in the HB-line. The portion of the HB-line where the conversion to oxide will occur is called Phase III. Phase III is being used to produce plutonium-238 for National Aeronautic and Space Administration for use as a thermal power source. The plutonium-242 in solution will be converted to oxide form (stabilized) between July and December 1996. The oxide will then be stored at existing facilities at either FB-Line or Building 235F at SRS.

A new DOE standard entitled *DOE Criteria for Safe Storage of Plutonium Metals and Oxides* (DOE-STD-3013-94) requires the handling and packaging of plutonium without the use of plastic and other organic materials (e.g., rubber or elastomeric seals). The ROD for the Interim Management of Nuclear Materials EIS determined that a new Actinide Packaging and Storage Facility will be constructed in the F-Area at SRS to allow for packaging this oxide as specified in the above-mentioned standard. The Actinide Packaging and Storage Facility is planned to be a fiscal year 1997 construction line item and construction completion is expected by May 2001. If the plutonium oxide were to remain at SRS, the material would be transferred from its storage location at FB-Line or Building 235F to the Actinide Packaging and Storage Facility once construction is completed.

The alternatives being evaluated in this Stockpile Stewardship and Management PEIS for the plutonium-242 oxide are to leave the material in place at SRS (the No Action alternative) or transport the material to LANL or LLNL for use in R&D. Both LANL and LLNL have a history of working with plutonium (including plutonium oxide) for research purposes. LANL currently performs most of the plutonium research for the Complex and has the necessary analytical facilities for plutonium. LLNL, although a reasonable alternative, is currently reducing its inventory of plutonium.

Environmental Impacts. The plutonium-bearing nitrate solutions in the F- and H- Canyons at SRS are being converted to plutonium oxide to stabilize the material in accordance with the Interim Management of Nuclear Materials and the F-Canyons Plutonium Solutions RODs. As stated above, the plutonium oxide will be stored at existing SRS facilities.

Under the No Action alternative, the material would be stored at FB-Line or Building 235F until it could be treated and then stored in the new Actinide Packaging and Storage Facility at SRS in accordance with newly developed standards. At LANL, TA-55 is the expected location for storing the material. The potential storage location at LLNL is Building 332 within the high security Superblock Complex. Regardless of the storage location for this material, there would be negligible environmental impacts. At SRS, LANL, or LLNL, this small quantity of plutonium oxide is within the historical quantities stored at these sites. Previous environmental analyses (LLNL and SNL Final EIS [DOE/EIS-0157, August 1992], Final EIS Interim Management of Nuclear Materials [DOE/EIS-0220, October 1995], and the *Environmental Assessment for Nuclear Material Storage for TA-55* [DOE/EA-0273, November 1985]) provide the NEPA documentation for continued storage of radioactive materials. No new additional risks to workers or the public would result from storage of this material at any of the three sites. No wastes are generated from storing the material. No additional site infrastructure or workers are required. No additional air or liquid releases would occur from normal operation. Therefore, this Stockpile Stewardship and Management PEIS analyzes the transportation from SRS to LANL or LLNL, against the No Action alternative of not transporting the plutonium oxide.

Transportation. The No Action alternative is to leave the plutonium oxide stored at SRS in the Actinide Packaging and Storage Facility. Under No Action, there would be no transportation impacts, and thus, no further environmental impacts associated with this storage.

Transportation of this plutonium oxide from SRS to either LANL or LLNL would only require a fraction of one safe secure trailer shipment. Although the material could be packaged in a small number of containers, for the purposes of this analysis, a safe secure trailer loaded with 26 containers was assumed. The actual quantity of plutonium-242 is much less than is assumed for this analysis. Thus, these stated risks conservatively bound the true risk of transportation. The potential total health impacts of transportation of one such safe secure trailer shipment from either SRS to LANL, or SRS to LLNL, are shown in table 4.19–1. There could be a total health impact of $6.63x10^{-4}$ deaths from a one-time shipment of 26 canisters of plutonium-242 from SRS to LLNL. A one-time shipment of the same material from SRS to LANL could result in a total health impact of $4.14x10^{-4}$ deaths. The risks from transportation to LLNL are slightly higher only because of the greater distance traveled from SRS to LLNL. This table indicates that there are essentially no impacts from either alternative.

TABLE 4.19–1.—*Total Potential Fatalities from the One-Time Transportation of Plutonium-242 (Oxide) from Savannah River Site to Lawrence Livermore National Laboratory or Los Alamos National Laboratory*

Route	Health Effects[a]		
	Accident	Accident-Free	Total
SRS to LLNL	$5.10x10^{-4}$	$1.53x10^{-4}$	$6.63x10^{-4}$
SRS to LANL	$3.17x10^{-4}$	$9.70x10^{-5}$	$4.14x10^{-4}$

[a] Assumes all plutonium-242 would be transported in one truckload.
Source: RADTRAN model results.

CHAPTER 5

Chapter 5

Chapter 5

CHAPTER 5: ENVIRONMENTAL, OCCUPATIONAL SAFETY & HEALTH PERMITS, AND COMPLIANCE REQUIREMENTS

Chapter 5 identifies the environmental, occupational safety and health permits, and compliance requirements associated with the proposed action as specified by the major Federal and state statutes, regulations, orders, and agreements.

5.1 INTRODUCTION AND PURPOSE

Chapter 5 provides information concerning the environmental standards and statutory requirements that impact the various stockpile stewardship and management facilities to the extent necessary to assist in making programmatic-level decisions. It presents some of the more important regulatory requirements associated with the proposed action by identifying the applicable environmental statutes, regulations, and approval requirements. These requirements are found in Federal and state statutes, regulations, permits, approvals, and consultations, as well as in Executive and Department of Energy (DOE) Orders, Consent Orders, Federal Facility Agreements, Federal Facility Compliance Agreements, and Agreements In Principle. These documents provide the standard for evaluating the ability of alternative sites to meet the environment, safety, and health (ES&H) requirements and for obtaining required Federal and state permits and licenses necessary to implement programmatic decisions. The remainder of the chapter provides historical background on environmental protection at nuclear weapons production facilities, explains the concept of shared Federal and state enforcement, and summarizes compliance with occupational safety and health requirements.

Compliance with the applicable requirements of each of the major environmental statutes, regulations, or orders identified in the tables would allow DOE to construct and operate the stockpile stewardship and management facilities to meet existing ES&H requirements. To be environmentally sound, programmatic decisions must also plan for future ES&H considerations and requirements described in section 3.3 of the *Nuclear Weapons Complex Reconfiguration Study* (DOE/DP-0083) in order for the stockpile stewardship and management facilities to accomplish their mission in a timely and cost-effective manner.

5.2 BACKGROUND

Since the majority of the Nuclear Weapons Complex (Complex) facilities were constructed in the 1940s and 1950s before the advent of today's environmental and worker health requirements, safety and the ability to satisfy national security requirements played dominant roles in the design and operation of these major industrial plants; however, with the emerging awareness of environmental and health-related issues and the enactment of environmental and worker health programs, DOE shifted a great deal of its resources into programs designed to achieve compliance with all applicable Federal, state, and local ES&H requirements. Today, many government agencies at the Federal, state, and local levels have regulatory authority over DOE facility operations. DOE has entered into enforceable compliance agreements with the regulators at most of its facilities. These agreements detail specific programs, funding levels, and schedules for achieving compliance with applicable ES&H statutory and regulatory requirements.

All newly constructed and modified facilities must comply with the increasing number and complexity of environmental regulations. The application of constantly changing requirements to facilities that are more than 40 years old makes it difficult to achieve compliance quickly. These older facilities generally do not meet all current standards for seismic design, fire protection, and environmental protection (air emissions, liquid effluents, and the management of solid and hazardous wastes). However, modernization of facilities to meet all applicable ES&H requirements now and into the 21st century and the development of a system to adequately manage the wastes generated by these facilities would take place regardless of the proposed action addressed in this programmatic environmental impact statement (PEIS).

5.3 Environmental Statutes, Orders, and Agreements

The *Atomic Energy Act* of 1954, as amended, directs DOE to protect public health and minimize dangers to life or property with respect to activities under its jurisdiction. The Environmental Protection Agency (EPA), under authority of the *Atomic Energy Act*, has set radiation protection standards for workers and the public. EPA has also promulgated Federal environmental regulations and implemented statutes to protect the environment and to control the generation, handling, treatment, storage, and disposal of hazardous materials and waste substances.

Because of their length, and for ease of reading, all tables in this chapter are presented consecutively at the end of the text. Table 5.3–1 lists the applicable Federal environmental statutes, regulations, and Executive Orders, and also identifies the associated permits, approvals, and consultations generally required to site, construct, or operate stockpile stewardship and management facilities. Except for limited Presidential exemptions, Federal agencies must comply with all applicable provisions of Federal environmental statutes and regulations, in addition to all applicable state and local requirements. DOE is committed to fully complying with all applicable environmental statutes, regulatory requirements, and Executive and internal orders. Table 5.3–2 lists selected DOE ES&H orders that apply to all sites, but which may affect each site differently.

DOE has entered into agreements with regulatory agencies on behalf of all of the DOE facilities being considered in this PEIS. These agreements normally establish a schedule for achieving full compliance at these DOE facilities. Table 5.3–3 lists those DOE environmental agreements with Federal and state regulatory agencies that have substantive provisions in effect. Appendix section A.1 summarizes the applicability of and provides more detail on the environmental regulatory compliance agreements and consent orders still in effect at each of the nuclear facilities. These agreements and consent orders are generally available from the regulatory agency that is a party to the agreement, normally the state environmental department or EPA region, and also from the local DOE information resource center or reading room. Table 5.3–4 lists the potential requirements imposed by the major state environmental statutes and regulations applicable to this PEIS. These requirements apply to Federal activities within the jurisdiction of the enforcing authority. Just as table 5.3–1 identifies requirements based on Federal laws, table 5.3–4 identifies the permits, approvals, and consultations generally required to site, construct, or operate stockpile stewardship and management facilities in accordance with state statutes and regulations.

5.4 Federal and State Environmental Enforcement

Under various Federal environmental statutes (table 5.3–1), EPA may delegate the implementation and execution of the laws' various provisions to states with approved programs that are at least as stringent as the minimum Federal requirements contained in the laws and EPA regulations. Table 5.3–4 lists many of the states' laws and regulations, including provisions that are more stringent than the minimum requirements. In addition, the *Federal Facility Compliance Act* of 1992 waives sovereign immunity from enforcement of the *Resource Conservation and Recovery Act* (RCRA) at Federal facilities and thereby gives states the authority to assess fines and penalties under certain conditions. It further requires DOE to develop plans and enter into agreements with states as to specific management actions for particular mixed waste streams. Such agreements could have a direct effect on the wastes generated as a result of the implementation of the proposed action, yet such an effect cannot be determined until such time as these agreements are approved according to the terms of the *Federal Facility Compliance Act*.

Some environmental regulatory programs are enforced through review, approval, and permitting requirements that attempt to minimize the negative impacts from releases to the environment from potential pollution sources by limiting activities to established standards. Federal and state agencies share environmental regulatory authority over DOE facility operations when Federal legislation delegates permitting or review authority to qualifying states. Some examples are the following: National

Emission Standards for Hazardous Air Pollutants and the Prevention of Significant Deterioration under the *Clean Air Act*; the Water Quality Standards and the National Pollutant Discharge Elimination System under the *Clean Water Act*; the Hazardous Waste Programs under RCRA; and the Drinking Water and Underground Injection Control Programs under the *Safe Drinking Water Act*. When Federal legislation allows delegation of enforcement authority, states must set standards equal to or more stringent than those required by Federal law to obtain such authority. Where the Federal regulatory agency has delegated its authority, the state or local regulations set the governing standards; however, when Federal legislation does not provide for delegation of enforcement authority to the states (e.g., the *Toxic Substances Control Act*), the standards are administered and enforced solely by the Federal Government.

5.5 COMPLIANCE WITH OCCUPATIONAL SAFETY AND HEALTH REQUIREMENTS

The health and safety of all workers associated with the stockpile stewardship and management facilities is a primary consideration in the programmatic decision resulting from this PEIS. A comprehensive nuclear and occupational safety and health initiative was announced by the Secretary on May 5, 1993, entailing closer consultation with the Occupational Safety and Health Administration (OSHA) regarding regulation of worker safety and health at DOE contractor-operated facilities. Regulation of worker health and safety at DOE contractor-operated facilities will gradually shift from DOE to OSHA. The *Occupational Safety and Health Act* of 1970 (Public Law 91-596) establishes Federal requirements for ensuring occupational safety and health protection for employees. DOE facilities also comply with the *Emergency Planning and Community Right-To-Know Act* (42 USC §11001), which requires facilities to report the release of extremely hazardous substances and other specified chemicals; to provide material safety data sheets or lists thereof; and to provide estimates of the amounts of hazardous chemicals onsite. The reporting and emergency preparedness requirements are designed to protect both individuals and communities.

TABLE 5.3–1.—*Federal Environmental Statutes, Regulations, and Orders* [Page 1 of 6]

Resource Category	Statute/Regulation/Order	Citation	Responsible Agency	PEIS-Level Potential Applicability: Permits, Approvals, Consultations, and Notifications
Air resources	*Clean Air Act* (CAA), as amended	42 USC §§7401 et seq.	EPA	Requires sources to meet standards and obtain permits to satisfy: National Ambient Air Quality Standards (NAAQS), State Implementation Plans, Standards of Performance for New Stationary Sources, National Emission Standards for Hazardous Air Pollutants (NESHAP), and Prevention of Significant Deterioration.
	National Ambient Air Quality Standards/State Implementation Plans	42 USC §§7409 et seq.	EPA	Requires compliance with primary and secondary ambient air quality standards governing sulfur dioxide, nitrogen oxide, carbon monoxide, ozone, lead, and particulate matter and emission limits/reduction measures as designated in each state's implementation plan.
	Standards of Performance for New Stationary Sources	42 USC §7411	EPA	Establishes control/emission standards and recordkeeping requirements for new or modified sources specifically addressed by a standard.
	National Emission Standards for Hazardous Air Pollutants	42 USC §7412	EPA	Requires sources to comply with emission levels of carcinogenic or mutagenic pollutants; may require a preconstruction approval, depending on the process being considered and the level of emissions that will result from the new or modified source.
	Prevention of Significant Deterioration	42 USC §§7470 et seq.	EPA	Applies to areas that are in compliance with NAAQS. Requires comprehensive preconstruction review and the application of Best Available Control Technology to major stationary sources (emissions of 100 t/year) and major modifications; requires a preconstruction review of air quality impacts and the issuance of a construction permit from the responsible state agency setting forth emission limitations to protect the Prevention of Significant Deterioration increment.
	Noise Control Act of 1972	42 USC §§4901 et seq.	EPA	Requires facilities to maintain noise levels that do not jeopardize the health and safety of the public.
Water resources	*Clean Water Act* (CWA)	33 USC §§1251 et seq.	EPA	Requires EPA or state-issued permits and compliance with provisions of permits regarding discharge of effluents to surface waters.
	National Pollutant Discharge Elimination System (NPDES) (section 402 of CWA)	33 USC §1342	EPA	Requires permit to discharge effluents (pollutants) and stormwaters to surface waters; permit modifications are required if discharge effluents are altered.
	Dredged or Fill Material - (section 404 of CWA)/*Rivers and Harbors Appropriations Act* of 1899	33 USC §1344/ 33 USC §§401 et seq.	U.S. Army Corps of Engineers	Requires permits to authorize the discharge of dredged or fill material into navigable waters or wetlands and to authorize certain work in or structures affecting navigable waters.

TABLE 5.3–1.—*Federal Environmental Statutes, Regulations, and Orders* [Page 2 of 6]

Resource Category	Statute/Regulation/Order	Citation	Responsible Agency	PEIS-Level Potential Applicability: Permits, Approvals, Consultations, and Notifications
Water resources (continued)	*Wild and Scenic Rivers Act*	16 USC §§1271 et seq.	Fish and Wildlife Service (USFWS), Bureau of Land Management, Forest Service, National Park Service	Consultation required before construction of any new Federal project associated with a river designated as wild and scenic or under study in order to minimize and mitigate any adverse effects on the physical and biological properties of the river.
	Safe Drinking Water Act (SDWA)	42 USC §§300f et seq.	EPA	Requires permits for construction/operation of underground injection wells and subsequent discharging of effluents to ground aquifers.
	Executive Order 11988: Floodplain Management	3 CFR, 1977 Comp., p. 117	Water Resources Council, Federal Emergency Management Agency, Council on Environmental Quality (CEQ)	Requires consultation if project impacts a floodplain.
	Executive Order 11990: Protection of Wetlands	3 CFR, 1977 Comp., p. 121	U.S. Army Corps of Engineers/USFWS	Requires Federal agencies to avoid the long- and short-term adverse impacts associated with the destruction or modification of wetlands.
	Compliance with Floodplain/Wetlands Environmental Review Requirements	10 CFR 1022	DOE	Requires DOE to comply with all applicable floodplain/wetlands environmental review requirements.
Hazardous wastes and soil resources	*Resource Conservation and Recovery Act* (RCRA)/Hazardous and Solid Waste Amendments of 1984	42 USC §§6901 et seq./PL 98-616	EPA	Requires notification and permits for operations involving hazardous waste treatment, storage, or disposal facilities; changes to site hazardous waste operations could require amendments to RCRA hazardous waste permits involving public hearings.
	Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)/*Superfund Amendments and Reauthorization Act* of 1986 (SARA)	42 USC §§9601 et seq./PL 99-499	EPA	Requires cleanup and notification if there is a release or threatened release of a hazardous substance; requires DOE to enter into Interagency Agreements with EPA and state to control the cleanup of each DOE site on the National Priorities List (NPL).
	Executive Order 12580: Superfund Implementation	3 CFR, 1987 Comp., p. 193	EPA	DOE shall comply with the National Contingency Plan (NCP) in addition to the other requirements of the order, as amended.

TABLE 5.3–1.—*Federal Environmental Statutes, Regulations, and Orders* [Page 3 of 6]

Resource Category	Statute/Regulation/Order	Citation	Responsible Agency	PEIS-Level Potential Applicability: Permits, Approvals, Consultations, and Notifications
Hazardous wastes and soil resources (continued)	*Community Environmental Response Facilitation Act*	PL 102-426	EPA	Amends CERCLA (40 CFR 300) to establish a process for identifying, prior to the termination of Federal activities, property that does not contain contamination. Requires prompt identification of parcels that will not require remediation to facilitate the transfer of such property for economic redevelopment purposes.
	Farmland Protection Policy Act of 1981	7 USC §§4201 et seq.	Soil Conservation Service	DOE shall avoid any adverse effects to prime and unique farmlands.
	Federal Facility Compliance Act of 1992	42 USC §6961	States	Waives sovereign immunity for Federal facilities under RCRA and requires DOE to develop plans and enter into agreements with states as to specific management actions for specific mixed waste streams.
Biotic resources	*Fish and Wildlife Coordination Act*	16 USC §§661 et seq.	USFWS	Requires consultation on the possible effects on wildlife if there is construction, modification, or control of bodies of water in excess of 10 acres (4 ha) in surface area.
	Bald and Golden Eagle Protection Act	16 USC §§668 et seq.	USFWS	Consultations should be conducted to determine if any protected birds are found to inhabit the area. If so, DOE must obtain a permit prior to moving any nests due to construction or operation of project facilities.
	Migratory Bird Treaty Act	16 USC §§703 et seq.	USFWS	Requires consultation to determine if there are any impacts on migrating bird populations due to construction or operation of project facilities. If so, DOE will develop mitigation measures to avoid adverse effects.
	Wilderness Act of 1964	16 USC §§1131 et seq.	Department of Commerce and Department of the Interior	DOE shall consult with the Department of Commerce and Department of the Interior and minimize impact.
	Wild Free-Roaming Horses and Burros Act of 1971	16 USC §§1331 et seq.	Department of the Interior	DOE shall consult with Department of the Interior and minimize impact.
	Endangered Species Act of 1973	16 USC §§1531 et seq.	USFWS/National Marine Fisheries Service	Requires consultation to identify endangered or threatened species and their habitats, assess DOE impacts thereon, obtain necessary biological opinions, and, if necessary, develop mitigation measures to reduce or eliminate adverse effects of construction or operations.
Cultural resources	*National Historic Preservation Act* of 1966, as amended	16 USC §§470 et seq.	President's Advisory Council on Historic Preservation	DOE shall consult with the State Historic Preservation Office (SHPO) prior to construction to ensure that no historical properties will be affected.
	Archaeological and Historical Preservation Act of 1974	16 USC §§469 et seq.	Department of the Interior	DOE shall obtain authorization for any disturbance of archaeological resources.

TABLE 5.3–1.—*Federal Environmental Statutes, Regulations, and Orders* [Page 4 of 6]

Resource Category	Statute/Regulation/Order	Citation	Responsible Agency	PEIS-Level Potential Applicability: Permits, Approvals, Consultations, and Notifications
Cultural resources (continued)	*Archaeological Resources Protection Act* of 1979	16 USC §§470aa et seq.	Department of the Interior	DOE shall obtain authorization for any excavation or removal of archaeological resources.
	Antiquities Act	16 USC §§431-33	Department of the Interior	DOE shall comply with all applicable sections of the act.
	American Indian Religious Freedom Act of 1978	42 USC §1996	Department of the Interior	DOE shall consult with local Native American Indian tribes prior to construction to ensure that their religious customs, traditions, and freedoms are preserved.
	Native American Graves Protection and Repatriation Act of 1990	25 USC §3001	Department of the Interior	DOE shall consult with local Native American Indian tribes prior to construction to guarantee that no Native American graves are disturbed.
	Executive Order 11593: Protection and Enhancement of the Cultural Environment	3 CFR 154, 1971-1975 Comp., p. 559	Department of the Interior	DOE shall aid in the preservation of historic and archaeological data that may be lost during construction activities.
Worker safety and health	*Occupational Safety and Health Act* (OSHA)	5 USC §5108	OSHA	Agencies shall comply with all applicable worker safety and health legislation (including guidelines of 29 CFR 1960) and prepare, or have available, Material Safety Data Sheets.
	Hazard Communication Standard	29 CFR 1910.1200	OSHA	DOE shall ensure that workers are informed of, and trained to handle, all chemical hazards in the DOE workplace.
Other	*Atomic Energy Act* of 1954	42 USC §2011	DOE	DOE shall follow its own standards and procedures to ensure the safe operation of its facilities.
	National Environmental Policy Act (NEPA)	42 USC §§4321 et seq.	Council on Environmental Quality (CEQ)	DOE shall comply with NEPA implementing procedures in accordance with 10 CFR 1021.
	Uranium Mill Tailings Radiation Control Act of 1978	42 USC §§7901 et seq.	EPA	DOE shall enforce and implement health and environmental standards and acquire licenses when required.
	Toxic Substances Control Act (TSCA)	15 USC §§2601 et seq.	EPA	DOE shall comply with inventory reporting requirements and chemical control provisions of TSCA to protect the public from the risks of exposure to chemicals; TSCA imposes strict limitations on use and disposal of polychlorinated biphenyl-contaminated equipment.
	Hazardous Materials Transportation Act	49 USC §§1801 et seq.	Department of Transportation (DOT)	DOE shall comply with the requirements governing hazardous materials and waste transportation.
	Hazardous Materials Transportation Uniform Safety Act of 1990	49 USC §1801	DOT	Restricts shippers of highway route-controlled quantities of radioactive materials to use only permitted carriers.

TABLE 5.3–1.—*Federal Environmental Statutes, Regulations, and Orders* [Page 5 of 6]

Resource Category	Statute/Regulation/Order	Citation	Responsible Agency	PEIS-Level Potential Applicability: Permits, Approvals, Consultations, and Notifications
Other (continued)	*Emergency Planning and Community Right-To-Know Act* of 1986	42 USC §§11001 et seq.	EPA	Requires the development of emergency response plans and reporting requirements for chemical spills and other emergency releases, and imposes right-to-know reporting requirements covering storage and use of chemicals which are reported in toxic chemical release forms.
	Pollution Prevention Act of 1990	42 USC 11001-11050	EPA	Establishes a national policy that pollution should be reduced at the source and requires a toxic chemical source reduction and recycling report for an owner or operator of a facility required to file an annual toxic chemical release form under section 313 of SARA.
	Executive Order 12843: Procurement Requirements and Policies for Federal Agencies for Ozone-Depleting Substances	April 21, 1993	EPA	Requires Federal agencies to minimize procurement of ozone depleting substances and conform their practices to comply with Title VI of CAA Amendments referencing stratospheric ozone protection and to recognize the increasingly limited availability of Class I substances until final phaseout.
	Executive Order 12856: Federal Compliance with Right-To-Know Laws and Pollution Prevention Requirements	August 3, 1993	EPA	Requires Federal agencies to achieve 50-percent reduction of agency's total releases of toxic chemicals to the environment and offsite transfers, to prepare a written facility pollution prevention plan not later than 1995, to publicly report toxic chemicals entering any waste stream from Federal facilities, including any releases to the environment, and to improve local emergency planning, response, and accident notification.
	Executive Order 12873: Federal Acquisition, Recycling, and Waste Prevention	October 20, 1993	EPA	Requires Federal agencies to develop affirmative procurement policies and establishes a shared responsibility between the system program manager and the recycling community to effect use of recycled items for procurement.
	Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations	February 11, 1994	EPA	Requires Federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.
	Executive Order 12088: Federal Compliance with Pollution Control Standards	3 CFR, 1978 Comp., p. 243	Office of Management and Budget	Requires Federal agency landlords to submit to Office of Management and Budget an annual plan for the control of environmental pollution and to consult with EPA and state agencies regarding the best techniques and methods.
	Executive Order 11514: Protection and Enhancement of Environmental Quality	3 CFR, 1966-1970 Comp., p. 902	CEQ	Requires Federal agencies to demonstrate leadership in achieving the environmental quality goals of NEPA; provides for DOE consultation with appropriate Federal, state, and local agencies in carrying out their activities as they affect the environment.

TABLE 5.3–1.—*Federal Environmental Statutes, Regulations, and Orders* [Page 6 of 6]

Resource Category	Statute/Regulation/Order	Citation	Responsible Agency	PEIS-Level Potential Applicability: Permits, Approvals, Consultations, and Notifications
Other (continued)	*Nuclear Waste Policy Act* of 1982	42 USC §§10101 et seq.	EPA	DOE shall dispose of radioactive waste in accordance with 40 CFR 191.
	Low-Level Radioactive Waste Policy Act	42 USC §§2021b-2021d	Nuclear Regulatory Commission	DOE shall dispose of low-level wastes (LLW) in accordance with the states in which it operates.

TABLE 5.3–2.—*Selected Department of Energy Environment, Safety, and Health Orders*

DOE Order	Order Title
5400.1	General Environmental Protection Program
5400.5	Radiation Protection of the Public and the Environment
5480.4	Environmental Protection, Safety, and Health Protection Standards
5480.19	Conduct of Operations Requirements for DOE Facilities
5480.21	Unreviewed Safety Questions
5480.22	Technical Safety Requirements
5480.23	Nuclear Safety Analysis Reports
5482.1B	Environment, Safety, and Health Appraisal Program
5484.1	Environmental Protection, Safety, and Health Protection Information Reporting Requirements
5530.1A	Accident Response Group
5530.4	Aerial Measuring System
5630.12A	Safeguards and Security Inspection and Assessment Program
5632.1C	Protection and Control of Safeguards and Security Interests
5700.6C	Quality Assurance
5820.2A	Radioactive Waste Management
M 231.1	Environment, Safety, and Health Reporting
N 441.1	Radiological Protection for DOE Activities
O 151.1	Comprehensive Emergency Management System
O 232.1-1	Occurrence Reporting and Processing of Operations Information
O 420.1	Facility Safety
O 430.1	Life Cycle Asset Management
O 440.1	Worker Protection Management for DOE Federal and Contractor Employees
O 451.1	*National Environmental Policy Act* Compliance Program
O 460.1	Packaging and Transportation Safety
O 460.2	Departmental Materials Transportation and Packaging Management
O 470.1	Safeguards and Security Program

TABLE 5.3–3.—*Department of Energy Agreements with Federal and State Environmental Regulatory Agencies* [Page 1 of 2]

Facility	Resource Category	Parties (Agency/State)	Scope of Agreement	Effective Date
Kansas City Plant	Soil	DOE/EPA	RCRA Section 3008 (h) Administrative Order on Consent. Groundwater cleanup primarily for volatile organic compounds (VOCs) and PCBs (agreement between DOE and EPA but Missouri Department of Natural Resources maintains RCRA authority over the KCP groundwater monitoring program)	06/23/89
Lawrence Livermore National Laboratory	Water	DOE/EPA/CA-RWQCB, CA-Dept. Health Svcs	Federal Facility Agreement-Regulates groundwater cleanup activities at LLNL under CERCLA/SARA Section 120	11/02/88
	Water/Soil	DOE/EPA/CAEPA Department of Toxic Substances Control/RWQCB	CERCLA-Federal Facility Agreement describes the groundwater and soil investigations to be conducted at Site 300 and specifies reporting dates.	9/92
	Air/Soil	DOE/EPA/CAEPA Department of Toxic Substances Control	Hazardous Waste Compliance Agreement 92/93-031 governing open burning of explosives wastes at Site 300.	
Los Alamos National Laboratory	Water	DOE/EPA	CWA-NPDES compliance agreement	08/29/91
Nevada Test Site	Air/Water	DOE/NV	Agreement in Principle for DOE to provide funding to Nevada for oversight of environmental, safety and health activities	10/90
	Soil	DOE/NV	RCRA-Settlement Agreement-TRU mixed waste	07/23/92
	Cultural	DOE/NV	Programmatic Agreement-Archaeological and Historic Preservation activities	05/08/93
Oak Ridge Reservation	Air	DOE/EPA	CAA-Federal Facility Compliance Agreement, Radionuclide NESHAP	05/26/92
	Soil	DOE/EPA/TN	CERCLA-Federal Facility Agreement	01/01/92
	Soil	DOE/EPA	RCRA-Federal Facility Compliance Agreement for storage of mixed waste subject to land disposal restrictions	06/12/92
	Soil	DOE/EPA/TN	Federal Facility Compliance Act Commissioners Order ORR Site-Specific Treatment Plan for Mixed Waste	9/26/95
	All except Radiological	DOE/TN Dept. of Environment and Conservation	Oversight of environmental monitoring programs	5/13/91
	Cultural	DOE/TN	DOE commitment to prepare a cultural resource management plan for ORR and to conduct a survey to identify significant historical properties located within the ORR; interim programmatic exclusions from Section 106 review	5/24/94

TABLE 5.3–3.—*Department of Energy Agreements with Federal and State Environmental Regulatory Agencies* **[Page 2 of 2]**

Facility	Resource Category	Parties (Agency/State)	Scope of Agreement	Effective Date
Pantex Plant	Soil	DOE/EPA	RCRA-Section 3008 (h) Administrative Order on Consent	12/10/90
Sandia National Laboratories/NM	Soil	DOE/NM	RCRA-Groundwater monitoring at chemical waste landfill	12/29/89
Savannah River Site	Air	DOE/EPA	CAA-Federal Facility Compliance Agreement, Radionuclide NESHAP	10/31/91
	Soil	DOE/SC	RCRA-Settlement Agreement 87-52-SW with amendment, Part B application deficiencies; groundwater monitoring	11/12/87, 05/10/91
	Soil	DOE/EPA	RCRA-Federal Facility Compliance Agreement for land disposal restrictions, with amendment 1, Docket No. 91-01-FFR	03/13/91, 04/24/92
	Soil	DOE/EPA/SC	CERCLA/RCRA-Federal Facility Agreement	01/15/93
	Cultural	DOE/SHPO ACHP	Programmatic Memorandum of Agreement-Management of Archaeological Sites	08/90

TABLE 5.3–4.—*State Environmental Statutes, Regulations, and Orders* **[Page 1 of 9]**

Resource Category	Legislation	Citation	Responsible Agency	Potential Applicability/Permits
		Kansas City Plant, MO		
Air resources	Missouri Air Conservation Law	MO Stat., Title 40, Chapter 643	MO Department of Natural Resources	Permit required prior to the construction or modification of an air contaminant source.
	Missouri Air Quality Standards	MO Code 10-6.060	MO Department of Natural Resources	Permit required prior to the construction or modification of an air contaminant source.
Water resources	Missouri Clean Water Law	MO Stat., Title 40, Chapter 644	MO Department of Natural Resources	Permit required prior to the construction or modification of a water discharge source.
Hazardous wastes and soil resources	Missouri Solid Waste Law	MO Code, Title 10, Division 80	MO Department of Natural Resources	Permit required prior to the construction or modification of a solid waste disposal facility.
	Missouri Hazardous Waste Management Law	MO Code, Title 10, Division 25	MO Department of Natural Resources	Permit required prior to the construction or modification of a hazardous waste disposal facility.
	Missouri Underground Storage Tank Act	MO Code, Title 10	MO Department of Natural Resources	Permit required prior to the construction or modification of an underground storage tank.
Biotic resources	Missouri Wildlife Code	Rule 3 CSR10-4.111	MO Department of Conservation	Prohibits transactions involving endangered plants and animal species. Lists species endangered in Missouri.

TABLE 5.3–4.—*State Environmental Statutes, Regulations, and Orders* [Page 2 of 9]

Resource Category	Legislation	Citation	Responsible Agency	Potential Applicability/Permits
		Kansas City Plant, MO (continued)		
Biotic resources (continued)	Missouri Wildlife Code	Revised Statutes of Missouri Rule (RSMO) 252.240	MO Department of Natural Resources	Prohibits transactions involving endangered species as listed by the U.S Department of the Interior and prohibits collecting, digging, or picking of any rare or endangered plants without the owner's permission.
Cultural resources	*State Historic Preservation Act*	RSMO Sections 253.408 to 253.412	MO Department of Natural Resources Historic Preservation Program	Establishes State Historic Preservation Officer, and a state historic preservation office with duties including conducting comprehensive survey of cultural resources, assisting Federal and state agencies to carry out historic preservation responsibilities, and coordinating with state and Federal agencies to ensure that historic properties are taken into consideration at all levels of planning and development.
	Historic Preservation Revolving Fund Act	RSMO Sections 253.400 to 253.407	MO Department of Natural Resources Historic Preservation Program	Establishes a fund to protect and preserve the historic properties of Missouri, to be administered throughout the State Department of Natural Resources.
	Unmarked Human Burial Sites	RSMO Sections 194.400 to 194.410	MO Department of Natural Resources Historic Preservation Program	Requires notification of local law enforcement or SHPO if an unmarked human burial or human skeletal remains are encountered during construction or any ground disturbing activities on state land or waters.
	Private Cemeteries	RSMO Section 214.131	MO Department of Natural Resources Historic Preservation Program	Makes desecration or destruction of abandoned family or private cemeteries a misdemeanor.
	Historic Shipwrecks, Salvage, or Excavation Regulations	RSMO Section 253.420	MO Department of Natural Resources Historic Preservation Program	The State Department of Natural Resources shall monitor and grant permits for salvage excavations of submerged or embedded abandoned shipwrecks in the state.

TABLE 5.3–4.—*State Environmental Statutes, Regulations, and Orders* [Page 3 of 9]

Resource Category	Legislation	Citation	Responsible Agency	Potential Applicability/Permits
		Kansas City Plant, MO (continued)		
Cultural resources (continued)	*Missouri Indian Affairs Commission Act*	March 24, 1994	MO Department of Natural Resources Historic Preservation Program	Creates the Missouri Indian Affairs Commission within the Department of Natural Resources. The Commission will act as a liaison between the Indian people and various Indian agencies, including Federal and state agencies.
Worker safety and health	No state-level legislation identified	NA	MO Department of Natural Resources	NA
		Lawrence Livermore National Laboratory, CA		
Air resources	*California Clean Air Act*	CA Health and Safety Code, Sections 39000 et seq.	CA Environmental Protection Agency, Air Resources Board and local districts	Permit required prior to construction or modification of an air contaminant source.
	Air Toxics "Hot Spots" Information and Assessments Act	CA Health and Safety Code, Sections 44300 et seq.	CA Environmental Protection Agency, Air Resources Board and local districts	Screening Risk Assessment required to estimate human health impacts to a resident living near the boundary of the site.
Water resources	*California Porter-Cologne Water Quality Act*	Water Code, Sections 13000 et seq.	CA Environmental Protection Agency, Water Resources Control Board and Regional Water Quality Control Boards	Permit required prior to construction or modification of water discharges sources.
Hazardous wastes and soil resources	*California Hazardous Waste Control Act*	CA Health and Safety Code, Sections 25100 et seq.	CA Environmental Protection Agency, Department of Toxic Substances Control	Permit required prior to construction or modification of hazardous waste management facility.
	The Hazardous Waste Source Reduction and Management Review Act of 1989	CA Health and Safety Code, Sections 25244.12 et seq.	CA Environmental Protection Agency, Department of Toxic Substances Control	Requires reports and plans describing how mandatory percentage reductions in waste streams will be achieved.
	"Hazardous Materials" Department of the California Highway Patrol	13 C.C.R, Chapter 6	CA Highway Patrol	Defines routes, stopping places, and rules of the road for transportation of hazardous materials.
	California Environmental Quality Act	CA Public Resources Code, Section 21081.6	CA Environmental Protection Agency	Requires evaluation of environmental impacts associated with Department of Toxic Substances Control permitting decisions.

TABLE 5.3–4.—*State Environmental Statutes, Regulations, and Orders* [Page 4 of 9]

Resource Category	Legislation	Citation	Responsible Agency	Potential Applicability/Permits
Lawrence Livermore National Laboratory, CA (continued)				
Biotic resources	*California Endangered Species Act*	CA Fish and Game Code, Sections 2050-2098	CA Department of Fish and Game	States that agencies should not approve projects that would jeopardize the continued existence of threatened or endangered species or result in destruction or adverse modification of habitat essential to the continued existence of those species if conservation alternatives are reasonable and prudent.
Cultural resources	*California Environmental Quality Act*	CA Public Resources Code, Section 21083.2	CA Office of Planning and Research	Requires consideration of the effects of a project on prehistoric and historic cultural resources.
Worker safety and health	*California Occupational Safety and Health Act* does not directly apply to LLNL			
Los Alamos National Laboratory, NM and Sandia National Laboratories/NM				
Air resources	*New Mexico Air Quality Control Act*	NM Stat., Title 74, Article 2	NM Environment Department	Permit required prior to the construction or modification of an air contaminant source.
	New Mexico Air Quality Standards and Regulations	NM Air Quality Control Regs., §100	NM Environment Department	Permit required prior to the construction or modification of an air contaminant source.
Water resources	*New Mexico Water Quality Act*	NM Stat., Title 74, Article 6	NM Water Quality Control Com.	Permit required prior to the construction or modification of a water discharge source.
	New Mexico Water Quality Regulations	NM Water Regulations	NM Water Quality Control Com.	Permit required prior to the construction or modification of a water discharge source.
Hazardous wastes and soil resources	*New Mexico Solid Waste Act*	NM Stat., Chap. 74, Article 8	NM Environment Department	Permit required prior to the construction or modification of a solid waste disposal facility.
	New Mexico Solid Waste Management Regulations	NM Solid Waste Mgmt. Regs.	NM Environment Department	Permit required prior to the construction or modification of a solid waste disposal facility.
	New Mexico Hazardous Waste Management Regulations	NM Hazardous Waste Mgmt. Regs.	NM Environment Department	Permit required prior to the construction or modification of a hazardous waste disposal facility.

TABLE 5.3–4.—*State Environmental Statutes, Regulations, and Orders* [Page 5 of 9]

Resource Category	Legislation	Citation	Responsible Agency	Potential Applicability/Permits
Los Alamos National Laboratory, NM and Sandia National Laboratories/NM (continued)				
Hazardous wastes and soil resources (continued)	New Mexico Underground Storage Tank Regulations	NM Underground Storage Tank Regulations	NM Environment Department	Permit required to comply with tank requirements prior to the construction or modification of an underground storage tank.
Biotic resources	*New Mexico Wildlife Conservation Act*	NM State Act 1978, Sections 17–2–37 through 17–2–46	NM Department of Game and Fish	Permit and coordination required if a project may disturb habitat or otherwise affect threatened or endangered species.
	New Mexico Endangered Plant Species Act	NM State Act 1978, Sections 75–6–1	NM State Forestry Department	Coordination with the department required.
Cultural resources	*New Mexico Cultural Properties Act*	NM State Act 1978, Sections 18–6–1 through 18–6–23	NM State Historic Preservation Office	Established State Historic Preservation Office and requirements to prepare an archaeological and historic survey and consult with the State Historic Preservation Office.
Worker safety and health	No state-level legislation identified	NA	NA	NA.
Nevada Test Site, NV				
Air resources	Nevada Air Pollution Control Law	NV Statutes, Title 40	NV State Environmental Commission	Permit required prior to construction or modification of an air contaminant source.
	Nevada Air Quality Regulations	NV Admin. Code, Chapter 445	NV State Environmental Commission	Permit required prior to construction or modification of an air contaminant source.
Water resources	Nevada Water Pollution Control Law	NV Statutes, Title 40, Chapter 445	NV Department of Environmental Protection	Permit required prior to construction or modification of a water discharge source.
	Nevada Water Pollution Control Regulations	NV Admin. Code, Chapter 445	NV Department of Environmental Protection	Permit required prior to construction or modification of a water discharge source.

TABLE 5.3–4.—*State Environmental Statutes, Regulations, and Orders* [Page 6 of 9]

Resource Category	Legislation	Citation	Responsible Agency	Potential Applicability/Permits
		Nevada Test Site, NV (continued)		
Hazardous wastes and soil resources	Nevada Underground Storage Tank Rules	NV Admin. Code, Chapter 459	NV Department of Environmental Protection	Permit required prior to construction or modification of an underground storage tank.
	Nevada Solid Waste Disposal Law	NV Statutes, Title 40, Chapter 444	NV Department of Environmental Protection	Permit required prior to construction or modification of a solid waste disposal facility.
	Nevada Solid Waste Disposal Regulations	NV Admin. Code, Chapter 44	NV Department of Environmental Protection	Permit required prior to construction or modification of a solid waste disposal facility; permit for septage hauling may be required.
	Nevada Hazardous Waste Disposal Law	NV Statutes, Title 40, Chapter 459	NV Department of Environmental Protection	Permit required prior to construction or modification of a hazardous waste disposal facility.
	Nevada Hazardous Waste Facility Regulations	NV Admin. Code, Chapter 444	NV Department of Environmental Protection	Permit required prior to construction or modification of a hazardous waste disposal facility.
Biotic resources	*Nevada Non-Game Species Act*	NV Admin. Code, Title 45, Chapter 503	NV Department of Wildlife	Consult with NV Department of Wildlife and minimize impact.
Cultural resources	Historic Preservation and Archaeology Regulations	NV Statutes, Title 26, Chapter 381-383	NV Advisory Board for Historic Preservation and Archaeology	Permit required prior to the investigation, exploration, or excavation of a historic or prehistoric site.
Worker safety and health	No state-level legislation identified	NA	NA	NA.
		Oak Ridge Reservation, TN		
Air resources	Tennessee Air Pollution Control Regulations	TN Rules, Division of Air Pollution	TN Air Pollution Control Board	Permit required to construct, modify, or operate an air contaminant source; sets fugitive dust requirements.
Water resources	*Tennessee Water Quality Control Act*	TN Code, Title 69, Chapter 3	TN Water Quality Control Board	Authority to issue new or modify existing NPDES permits required for a water discharge source.

TABLE 5.3–4.—*State Environmental Statutes, Regulations, and Orders* [Page 7 of 9]

Resource Category	Legislation	Citation	Responsible Agency	Potential Applicability/Permits
Oak Ridge Reservation, TN (continued)				
Hazardous wastes and soil resources	Tennessee Underground Storage Tank Program Regulations	TN Rules, Chapter 1200-1-15	TN Division of UST Programs	Permit required prior to construction or modification of an underground storage tank.
	Tennessee Hazardous Waste Management Act	TN Code, Title 68, Chapter 46	TN Division of Solid Waste Management	Permit required to construct, modify, or operate a hazardous waste treatment, storage, or disposal facility.
	Tennessee Solid Waste Processing and Disposal Regulations	TN Rules, Chapter 1200-1-7	TN Division of Solid Waste Management	Permit required to construct or operate a solid waste processing or disposal facility.
Biotic resources	Tennessee State Executive Order on Wetlands	TN State Executive Order	TN Division of Water Quality Control	Consultation with responsible agency.
	Tennessee Threatened Wildlife Species Conservation Act of 1974	TN Code, Title 70, Chapter 8	TN Wildlife Resources Agency	Consultation with responsible agency.
	Tennessee Rare Plant Protection and Conservation Act of 1985	TN Code, Title 70, Chapter 8-301 et seq.	TN Wildlife Resources Agency	Consultation with responsible agency.
	Tennessee Water Quality Control Act	TN Code, Title 69, Chapter 3	TN Division of Water Quality Control	Permit required prior to alteration of a wetland.
Cultural resources	Tennessee Desecration of Venerated Objects	TN Code, Title 39, Chapter 17-311	TN Historical Commission	Forbids a person to offend or intentionally desecrate venerated objects including a place of worship or burial.
	Tennessee Abuse of Corpse	TN Code, Title 39, Chapter 17-312	TN Historical Commission	Forbids a person from disinterring a corpse that has been buried or otherwise interred.
	Native American Indian Cemetery Removal and Reburial	TN Comp. Rules and Regulations, Chapter 400-9-1	TN Historical Commission	Requires notification if Native American Indian remains are uncovered.
	Tennessee Protective Easements	TN Code, Title 11, Chapter 15-101	TN State Government	Grants power to the state to restrict construction on land deemed as a "protective" easement.
Worker safety and health	No state-level legislation identified	NA	NA	NA.
Pantex Plant, TX				
Air resources	Texas Air Pollution Control Regulations	TX Admin. Code, Title 30, Chapter 101-125, 305	TX Natural Resource Conservation Commission (effective 9/1/93)	Permit required prior to construction or modification of an air contaminant source.

TABLE 5.3–4.—*State Environmental Statutes, Regulations, and Orders* [Page 8 of 9]

Resource Category	Legislation	Citation	Responsible Agency	Potential Applicability/Permits
		Pantex Plant, TX (continued)		
Water resources	Texas Water Quality Standards	TX Admin. Code, Title 30, Chapter 305, 308-325	TX Natural Resource Conservation Commission (effective 9/1/93)	Permit may be required prior to any modification of waters of the state including stream alteration for the construction of intakes, discharges, bridges, submarine utility crossings, etc.
	Texas Consolidated Permit Rules	TX Admin. Code, Title 30	TX Natural Resource Conservation Commission (effective 9/1/93)	Permit may be required prior to any modification of waters of the state including stream alteration for the construction of intakes, discharges, bridges, submarine utility crossings, etc.
	Texas Water Quality Acts	TX Code, Title 30, Chapter 290	TX Natural Resource Conservation Commission (effective 9/1/93)	Permit may be required prior to any modification of waters of the state including stream alteration for the construction of intakes, discharges, bridges, submarine utility crossings, etc.
Hazardous wastes and soil resources	Texas Underground Storage Tanks Rules	TX Admin. Code, Title 30, Chapter 334	TX Natural Resource Conservation Commission (effective 9/1/93)	Permit required prior to construction or modification of an underground storage tank.
	Texas Solid Waste Management Regulations	TX Admin. Code, Title 30, Chapter 305, 335	TX Natural Resource Conservation Commission (effective 9/1/93)	Permit required prior to construction or modification of a solid waste disposal facility.
	Texas Solid Waste Disposal Act	TX Admin. Code, Title 30, Chapter 305, 334, and 335	TX Natural Resource Conservation Commission (effective 9/1/93)	Permit required prior to construction or modification of a solid waste disposal facility.
Biotic resources	Texas Parks and Wildlife Regulations	TX Parks and Wildlife Code, Chapter 67, 68, and 88	TX Parks and Wildlife Department	Permit required by anyone who possesses, takes, or transports endangered, threatened, or protected plants or animals.
Cultural resources	Antiquities Code of Texas	TX Statutes, Volume 17, Article 6145	TX State Historical Survey Committee	Permit required for the examination or excavation of sites and the collection or removal of objects of antiquity.
Worker safety and health	No state-level legislation identified			

TABLE 5.3–4.—*State Environmental Statutes, Regulations, and Orders* [Page 9 of 9]

Resource Category	Legislation	Citation	Responsible Agency	Potential Applicability/Permits
		Savannah River Site, SC		
Air resources	*South Carolina Pollution Control Act*/South Carolina Air Pollution Control Regulations and Standards	SC Code, Title 48, Chapter 1	SC Dept. of Health and Environmental Control (SCDHEC)	Permit required prior to construction or modification of an air contaminant source.
	Augusta-Aiken Air Quality Control Region	40 CFR 81.114	SC and GA	Requires SRS and surrounding communities in the 2-state region to attain National Ambient Air Quality Standards (NAAQS).
	South Carolina Atomic Energy & Radiation Control Act	SC Code, Title 13, Chapter 7	SCDHEC	Establishes standards for radioactive air emissions.
Water resources	*South Carolina Pollution Control Act*	SC Code, Title 48, Chapter 1	SCDHEC	Permit required prior to construction or modification of a water discharge source.
	South Carolina Water Quality Standards	SC Code, Title 61, Chapter 68	SCDHEC	Permit required prior to construction or modification of a water discharge source.
	South Carolina Safe Drinking Water Act	SC Code, Title 44, Chapter 55	SCDHEC	Establishes drinking water standards.
Hazardous wastes and soil resources	*South Carolina Underground Storage Tanks Act*	SC Code, Title 44, Chapter 2	SCDHEC	Permit required prior to construction or modification of an underground storage tank.
	South Carolina Solid Waste Regulations	SC Code, Title 61, Chapter 60	SCDHEC	Permit required to store, collect, dispose, or transport solid wastes.
	South Carolina Industrial Solid Waste Disposal Site Regulations	SC Code, Title 61, Chapter 66	SC Pollution Control Authority	Permit required for industrial solid waste disposal systems.
	South Carolina Hazardous Waste Management Act	SC Code, Title 44, Chapter 56	SCDHEC	Permit required to operate, construct, or modify a hazardous waste treatment, storage, or disposal facility.
	South Carolina Solid Waste Management Act	SC Code, Title 44, Chapter 96	SCDHEC	Establishes standards to treat, store, or dispose of solid waste.
Biotic resources	*South Carolina Nongame and Endangered Species Conservation Act*	SC Code, Title 50, Chapter 15	SC Wildlife and Marine Resources Department	Consult with SC Wildlife and Marine Resources Department and minimize impact.
Cultural resources	South Carolina Institute of Archaeology and Anthropology	SC Code, Title 60, Chapter 13-210	SC State Historic Preservation Office	Consult with SC State Historic Preservation Office and minimize impact.
Worker safety and health	No state-level legislation identified	NA	NA	NA

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CHAPTER 6: REFERENCES

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WSRC 1995a — WSRC, *Proposed Site Treatment Plan*, Volumes I and II, WSRC-TR-94-0608, May 30, 1995.

WSRC 1995b — WSRC, *Proposed Site Treatment Plan Reference Document*, WSRC-TR-94-0608, May 30, 1995.

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The References are obtained from a database that contains references common to the *Programmatic Environmental Impact Statement for Tritium Supply and Recycling*, the *Stockpile Stewardship and Management Programmatic Environmental Impact Statement*, the *Storage and Disposition of Weapons-Usable Fissile Materials Programmatic Environmental Impact Statement*, and the *Disposition of Surplus Highly Enriched Uranium Environmental Impact Statement*. Therefore, the list of references may include perceived gaps in references. For example, NT DOE 1993c may not appear, while NT DOE 1993b and NT DOE 1993d both do. These gaps occur because the references are all a part of a larger set of references, not all of which appear in this Programmatic Environmental Impact Statement.

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ist of Preparers

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List of Agencies

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CHAPTER 8: LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THIS STATEMENT WERE SENT

This chapter lists agencies, organizations, and persons who requested Volumes I, II, III, and IV of the *Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management*. Not listed are the organizations and persons who requested only the Summary or Volumes II, III, or IV.

Federal-Elected Officials Representing Affected Areas

States: Arizona
California
Georgia
Kansas
Missouri
Nevada
New Mexico
South Carolina
Tennessee
Texas
Utah

Governors Representing Affected Areas

States: Arizona
California
Georgia
Kansas
Missouri
Nevada
New Mexico
South Carolina
Tennessee
Texas
Utah

State Elected Officials Representing

States: Arizona
California
Georgia
Kansas
Missouri
Nevada
New Mexico
South Carolina
Tennessee
Texas
Utah

NEPA State Single Points of Contact

States: Arizona
California
Georgia
Kansas
Missouri
Nevada
New Mexico
South Carolina
Tennessee
Texas
Utah

Native American Groups

Agua Caliente Tribal Council, CA
All Indian Pueblo Council, NM
Alturas Rancheria, CA
Amah Tribal Band
Augustine Band of Cahuilla Mission, CA
Barona General Business, CA
Battle Mountain Band Council, NV
Benton Paiute Indian Tribe, CA
Berry Creek Rancheria, CA
Big Pine Paiute Tribe, CA
Big Sandy Rancheria, CA
Big Valley Rancheria, CA
Bishop Indian Tribe Council, CA
Blue Lake Rancheria, CA
Bridgeport Indian Colony, CA
Buena Vista Rancheria, CA
Bureau of Indian Affairs
Cabazon Indians of California, CA
Cahuilla Band of Mission Indians, CA
Carson Colony Council, NV
Carson Community Council, NV
Cawtawba Indian Nation, SC
Cedarville Rancheria, CA
Chemehuevi Paiute Tribe, NV
Chemehuevi Paiute Tribal Council, NV
Chicken Ranch Rancheria, CA
Cloverdale Rancheria, CA
Coast Indian Community of the Resighini, CA
Cochiti Pueblo, NM
Colusa Rancheria, CA
Cortina Rancheria, CA
Council of the Te-Moak, NV
Coyote Valley Reservation, CA

Cuyapaipe Band of Mission Indians, CA
Dresslerville Community Council, NV
Dry Creek Rancheria, CA
Duckwater Shoshone Indian Tribe, NV
Elem Indian Colony of Pomo Indians
Elk Valley Rancheria, CA
Elko Band Council, NV
Ely Colony Tribal Council, CA
Fallon Business Council, NV
Fort Independence Paiute Tribe, NV
Fort McDermitt Paiute-Shoshone Tribes, NV
Greenville Rancheria, CA
Grindstone Rancheria, CA
Guidiville Rancheria, CA
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Manchester/Point Arena Rancheria, CA
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Santa Clara Pueblo, NM
Santa Rosa Rancheria, CA
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Western Shoshone National Council, NV
Winnemucca Indian Colony, NV
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Yomba Shoshone Indian Tribe, NV
Ysleta del Sur Pueblo, TX
Yurok Tribe, CA
Zia Pueblo, NM
Zuni Pueblo, NM

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California
- Livermore
- Oakland
- Manteca
- Pleasanton
- Tracy

Georgia
- Atlanta
- Augusta
- Bath
- Blyth
- Evans
- Girard
- Harlem
- Hephzibah
- Keysville
- Martinez
- Millen
- Sardis
- Savannah
- Statesboro
- Thomson
- Waynesboro
- Wrens

Kansas
- Kansas City
- Leawood
- Lenexa
- Merriam
- Mission Hill
- Olathe
- Overland Park
- Prairie Village
- Shawnee

Nevada
- Alamo
- Amargosa Valley
- Ash Springs
- Beatty
- Blue Diamond
- Henderson
- Hiko
- Indian Springs
- Las Vegas
- North Las Vegas
- Pahrump
- Warm Spring

New Mexico
- Albuquerque
- Espanola
- Santa Fe

South Carolina
- Aiken
- Allendale
- Augusta
- Bamberg
- Barnwell
- Batesburg
- Blackville
- Beech Island
- Columbia
- Denmark
- Edgefield
- Estill
- Gaston
- Gloverville
- Graniteville
- Hampton
- Jackson
- Johston
- Leesville
- Monmorenci
- New Ellenton
- North
- North Augusta
- Norway
- Orangeburg
- Owdoms
- Pelion
- Perry
- Salley
- Saluda
- Springfield
- Sycamore
- Trenton
- Vanville
- Wagener
- Windsor
- Williston

Tennessee
- Andersonville
- Alcoa
- Allardt
- Athens
- Bethel
- Blaine
- Briceville
- Caryville
- Clarkrange
- Clinton
- Coalfield
- Corrytown
- Crossville
- Dandridge
- Decatur

Tennessee (Continued)
- Deer Lodge
- Elgin
- Etowah
- Town of Farragut
- Fairfield Glade
- Fairview
- Friendsville
- Gatlinburg
- Grandview
- Greenback
- Harriman
- Halls Crossroads
- Huntsville
- Jacksonboro
- Jamestown
- Jefferson City
- Jellico
- Karns
- Kingston
- Knoxville
- Kodak
- La Follette
- Lake City
- Lancing
- Lenoir City
- Loudon
- Louisville
- Luttrell
- Madisonville
- Maryville
- Mascot
- Maynardville
- Midtown
- New Market
- New Tazwell
- Niota
- Norris
- Oakdale
- Oak Ridge
- Old Washington
- Oliver Springs
- Oneida
- Petros
- Philadelphia
- Pigeon Forge
- Pomona
- Powell
- Rockford
- Rockwood
- Rutledge
- Sevierville
- Sharps Chapel
- Solway
- Speedwell

Tennessee (Continued)
- Spring City
- Strawberry Plains
- Sunbright
- Sweetwater
- Talbot
- Tellico Plains
- Ten Mile
- Townsend
- Washington
- Vonore
- Walland
- Wartburg
- Wildwood

Texas
- Amarillo
- Ashota
- Borger
- Bushland
- Canyon
- Channing
- Clarendon
- Claude
- Cliffside
- Conway
- Dial
- Dawn
- Dumas
- Electric City
- Fritch
- Goodnight
- Groom
- Happy
- Hereford
- Lake Tanglewood
- Paloduro
- Pampa
- Pullman
- Philips
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- Spearman
- Silverton
- Stinnett
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- Vega
- Washburn
- Wildorado

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Local 598 UA	James Morris
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GLOSSARY

Glossary

CHAPTER 9: GLOSSARY

Absorbed dose: The energy imparted to matter by ionizing radiation per unit mass of irradiated material at the place of interest in that material. Expressed in units of radiation absorbed dose or grays, where 1 radiation absorbed dose equals 0.01 gray. Also, see "radiation absorbed dose."

Accident sequence: An initiating event followed by system failures or operator errors, which can result in significant core damage, confinement system failure, and/or radionuclide releases.

Accountable weapon: The number of weapons associated with each missile or aircraft type limited by treaty. This does not include non-strategic nuclear forces, Department of Defense spares or spares needed to replace weapons disassembled by DOE surveillance testing.

Acute exposure: The exposure incurred during and shortly after a radiological release. Generally, the period of acute exposure ends when long-term interdiction is established, as necessary. For convenience, the period of acute exposure is normally assumed to end 1 week after the inception of a radiological accident.

Air pollutant: Any substance in air which could, if in high enough concentration, harm man, other animals, vegetation, or material. Pollutants may include almost any natural or artificial composition of matter capable of being airborne.

Air Quality Control Region (AQCR): Geographic subdivisions of the U.S., designed to deal with pollution on a regional or local level. Some regions span more than one state.

Air quality standards: The level of pollutants in the air prescribed by regulations that may not be exceeded during a specified time in a defined area.

Alpha activity: The emission of alpha particles by fissionable materials (uranium or plutonium).

Alpha particle: A positively charged particle, consisting of two protons and two neutrons, that is emitted during radioactive decay from the nucleus of certain nuclides. It is the least penetrating of the three common types of radiation (alpha, beta, and gamma).

Alpha wastes: Wastes containing radioactive isotopes which decay by producing alpha particles.

Ambient air: The surrounding atmosphere as it exists around people, plants, and structures. Air quality standards are used to provide a measure of the health-related and visual characteristics of the air.

American Indian Religious Freedom Act of 1978: This Act establishes national policy to protect and preserve for Native Americans their inherent right of freedom to believe, express, and exercise their traditional religions, including the rights of access to religious sites, use and possession of sacred objects, and the freedom to worship through traditional ceremonies and rites.

Anadromous Fish Conservation Act: This act seeks to enhance the conservation and development of the anadromous fishery resources of the United States that are subject to depletion from water resources development.

Aquatic biota: The sum total of living organisms within any designated aquatic area.

Aquifer: A saturated geologic unit through which significant quantities of water can migrate under natural hydraulic gradients.

Aquitard: A less-permeable geologic unit in a stratigraphic sequence. The unit is not permeable enough to transmit significant quantities of water. Aquitards separate aquifers.

Archaeological sites (resources): Any location where humans have altered the terrain or discarded artifacts during either prehistoric or historic times.

Artifact: An object produced or shaped by human workmanship of archaeological or historical interest.

As low as reasonably achievable: A concept applied to the quantity of radioactivity released in routine operation of a nuclear system or facility, including "anticipated operational occurrences." It takes into account the state of technology, economics of improvements in relation to benefits to public health and safety, and other societal and economic considerations in relation to the use of nuclear energy in the public interest.

Atmospheric dispersion: The process of air pollutants being dispersed in the atmosphere. This occurs by the wind that carries the pollutants away from their source and by turbulent air motion that results from solar heating of the Earth's surface and air movement over rough terrain and surfaces.

Atomic Energy Act of 1954: This Act was originally enacted in 1946 and amended in 1954. For the purpose of this Programmatic Environmental Impact Statement "...a program for Government control of the possession, use, and production of atomic energy and special nuclear material whether owned by the Government or others, so directed as to make the maximum contribution to the common defense and security and the national welfare, and to provide continued assurance of the Government's ability to enter into and enforce agreements with nations or groups of nations for the control of special nuclear materials and atomic weapons..." (Section 3(c)).

Atomic Energy Commission: A five-member commission, established by the *Atomic Energy Act* of 1946, to supervise nuclear weapons design, development, manufacturing, maintenance, modification, and dismantlement. In 1974, the Atomic Energy Commission was abolished and all functions were transferred to the Nuclear Regulatory Commission and the Administrator of the Energy Research and Development Administration. The Energy Research and Development Administration was later terminated and its functions vested by law in the Administrator were transferred to the Secretary of Energy.

B-25 Package: A container designed for the storage of low level waste.

Background radiation: Ionizing radiation present in the environment from cosmic rays and natural sources in the Earth; background radiation varies considerably with location. Also, see "natural radiation."

Badged worker: A worker equipped with an individual dosimeter who has the potential to be exposed to radiation.

Bald and Golden Eagle Protection Act: This act states that it is unlawful to take, pursue, molest, or disturb the American bald and golden eagle, their nests, or their eggs, anywhere in the United States.

Baseline: A quantitative expression of conditions, costs, schedule, or technical progress to serve as a base or standard for measurement during the performance of an effort; the established plan against which the status of resources and the progress of a project can be measured. For this Programmatic Environmental Impact Statement, the environmental baseline is the site environmental conditions as they are projected to occur in 2005.

Beamlets: Independent laser beams.

BEIR V: Biological Effects of Ionizing Radiation; referring to the fifth in a series of committee reports from the National Research Council.

Beryllium: An extremely lightweight, strong metal used in weapons systems.

Benthic: Plants and animals dwelling at the bottom of oceans, lakes, rivers, and other surface waters.

Best Available Control Technology (BACT): A term used in the *Federal Clean Air Act* that means the most stringent level of air pollutant control considering economics for a specific type of source based on demonstrated technology.

Beta particle: A charged particle emitted from the nucleus of an atom during radioactive decay. A negatively charged beta particle is identical to an electron. A positively charged beta particle is called a positron.

Beyond Evaluation Basis Accident (BEBA): An accident, generally with more severe impacts to onsite personnel and the public than a EBA or DBA, initiated by operational or external causes with an estimated probability of occurrence less than 10^{-6} per year and used for estimating the impacts of a planned new or modified facility and/or process. For those cases where a DBA is defined, these accidents are often referred to as Beyond Design Basis Accidents or Severe Accidents.

Biota (biotic): The plant and animal life of a region.

Boost: The process by which fusion of deuterium-tritium gas inside the pit of a nuclear weapon produces neutrons that increase the fission output of the primary.

Bremsstrahlung: The electromagnetic radiation produced by an accelerated charged particle, usually an electron.

Burial ground: A place for burying unwanted (i.e., radioactive) materials in which the earth acts as a receptacle to prevent the dispersion of wastes in the environment and the escape of radiation.

Burn: Fusion of two light nuclei (usually deuterium and tritium) to form a heavier nucleus (helium) accompanied by the release of neutrons and energy.

Calcination: The process of converting high-level waste to unconsolidated granules or powder. Calcined solid wastes are primarily salts and oxides of metals (heavy metals) and components of high level waste (also called calcining).

Caldera: A large crater formed by the collapse of the central part of a volcano.

Cancer: The name given to a group of diseases characterized by uncontrolled cellular growth with cells having invasive characteristics such that the disease can transfer from one organ to another.

Canned subassembly: The component of a nuclear weapon which contains the secondary uranium and lithium elements.

Capability-based deterrence: Deterrence based on the capability to respond to stockpile reliability and safety problems and to meet new requirements.

Capable fault: A fault that has exhibited one or more of the following characteristics (10 CFR 100, Appendix A):

1. Movement at or near the ground surface at least once within the past 35,000 years or movement of a recurring nature within the past 500,000 years.

2. Macro-seismicity instrumentally determined with records of sufficient precision to demonstrate a direct relationship with the fault.

3. A structural relationship to a capable fault according to characteristics (1) or (2) of this paragraph such that movement on one could be reasonably expected to be accompanied by movement on the other.

Capacity factor: The ratio of the annual average power load of a power plant to its rated capacity.

Carbon adsorption: A unit physiochemical process in which organic and certain inorganic compounds in a liquid stream are absorbed on a bed of activated carbon; used in water or waste purification and chemical processing.

Carbon dioxide: A colorless, odorless, nonpoisonous gas that is a normal component of the ambient air; it is an expiration product of normal plant and animal life.

Carbon monoxide: A colorless, odorless gas that is toxic if breathed in high concentration over a period of time.

Carolina bay: Ovate, intermittently flooded depression of a type occurring on the Coastal Plain from New Jersey to Florida.

Cask (radioactive materials): A container that meets all applicable regulatory requirements for shipping spent nuclear fuel or high-level waste.

Cesium: A silver-white alkali metal. A radioactive isotope of cesium, cesium-137, is a common fission product.

Chemical oxygen demand: A measure of the quantity of chemically oxidizable components present in water.

Chronic exposure: Low-level radiation exposure incurred over a long period of time.

Claystone: A massive sedimentary rock made up largely of clay minerals having the composition of shale, but lacking its fine lamination.

Clean Air Act: This Act mandates and enforces air pollutant emissions standards for stationary sources and motor vehicles.

Clean Air Act Amendments of 1990: Expands the Environmental Protection Agency's enforcement powers and adds restrictions on air toxics, ozone depleting chemicals, stationary and mobile emissions sources, and emissions implicated in rain and global warming.

Clean Water Act of 1972, 1987: This Act regulates the discharge of pollutants from a point source into navigable waters of the United States in compliance with a National Pollution Discharge Elimination System permit as well as regulates discharges to or dredging of wetlands.

Climatology: The science that deals with climates and investigates their phenomena and causes.

Code of Federal Regulations: All Federal regulations in force are published in codified form in the Code of Federal Regulations.

Collective committed effective dose equivalent: The committed effective dose equivalent of radiation for a population.

Combined impact: Depending on the scope of the program concerned, a Programmatic Environmental Impact Statement may address more than one "Purpose and Need," each with its own set of alternatives. These several actions, however, may have common environments. The sum of these impacts with respect to the site concerned are combined impacts, as opposed to cumulative impacts, which incorporate the site-specific impacts of activities not otherwise related to the actions and alternatives in question.

Command disable: A subsystem of command and control features that destroys a weapon's ability to produce a nuclear yield.

Committed dose equivalent: The predicted total dose equivalent to a tissue or organ over a 50-year period after an intake of radionuclide into the body. It does not include external dose contributions. Committed dose equivalent is expressed in units of rem or Sievert. The committed effective dose equivalent is the sum of the committed dose equivalents to various tissues of the body, each multiplied by the appropriate weighting factor.

Common mode failure: A failure or defect affecting an entire class of weapon or weapon component: a particular concern with the enduring stockpile since it contains about seven weapon systems, many of which use components with common design features, or components manufactured using identical or similar processes.

Community (biotic): All plants and animals occupying a specific area under relatively similar conditions.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (or Superfund): This Act provides regulatory framework for remediation of past contamination from hazardous waste. If a site meets the Act's requirements for designation, it is ranked along with other "Superfund" sites and is listed on the National Priorities List. This ranking is the Environmental Protection Agency's way of determining which sites have the highest priority for cleanup.

Comprehensive Test Ban Treaty (CTBT): A proposed treaty prohibiting nuclear tests of all magnitudes.

Computational Modeling: The use of a computer to develop a mathematical model of a complex system or process and to provide conditions for testing it.

Conceptual design: Efforts to develop a project scope that will satisfy program needs; ensure project feasibility and attainable performance levels of the project for congressional consideration; develop project criteria and design parameters for all engineering disciplines; and identify applicable codes and standards, quality assurance requirements, environmental studies, construction materials, space allowances, energy conservation features, health, safety, safeguards, and security requirements and any other features or requirements necessary to describe the project.

Consumptive water use: The difference in the volume of water withdrawn from a body of water and the amount released back into the body of water.

Container: The metal envelope in the waste package that provides the primary containment function of the waste package and is designed to meet the containment requirements of 10 CFR 60.

Conventional weapon: A nonnuclear weapon.

Credible accident: An accident that has a probability of occurrence greater than or equal to one in a million years.

Cretaceous Period: Geologic time making up the end of the Mesozoic Era, dating from approximately 144 million to 66 million years ago.

Criteria pollutants: Six air pollutants for which national ambient air quality standards are established by the Environmental Protection Agency under title I of the *Federal Clean Air Act*: sulfur dioxide, nitrogen oxides, carbon monoxide, ozone, particulate matter (smaller than 10 microns in diameter), and lead.

Critical habitat: Defined in the *Endangered Species Act* of 1973 as "specific areas within the geographical area occupied by [an endangered or threatened] species..., essential to the conservation of the species and which may require special management considerations or protection; and specific areas outside the geographical area occupied by the species... that are essential for the conservation of the species."

Cultural resources: Archaeological sites, architectural features, traditional use areas, and Native American sacred sites or special use areas.

Cumulative impacts: In an Environmental Impact Statement, the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal), private industry, or individuals undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

Curie: A unit of radioactivity equal to 37 billion disintegrations per second; also a quantity of any nuclide or mixture of nuclides having 1 curie of radioactivity.

Decay heat (radioactivity): The heat produced by the decay of certain radionuclides.

Decay (radioactive): The decrease in the amount of any radioactive material with the passage of time, due to the spontaneous transformation of an unstable nuclide into a different nuclide or into a different energy state of the same nuclide; the emission of nuclear radiation (alpha, beta, or gamma radiation) is part of the process.

Decontamination: The actions taken to reduce or remove substances that pose a substantial present or potential hazard to human health or the environment, such as radioactive or chemical contamination from facilities, equipment, or soils by washing, heating, chemical or electrochemical action, mechanical cleaning, or other techniques.

Deflagration: Rapid and powerful self-sustained burning of a propellant or explosive.

Delivery system (carrier): The military "vehicle" (e.g. ballistic or cruise missile, artillery shell, airplane, submarine) by which a nuclear weapon would be delivered; most warheads have been designed for specific delivery systems.

Demilitarization: An irreversible modification or destruction of a weapons component or part of a component to the extent required to prevent use in its original weapon purpose.

Depleted uranium: Uranium whose content of the isotope uranium-235 is less than 0.7 percent, which is the uranium-235 content of naturally occurring uranium.

Deposition: In geology, the laying down of potential rock-forming materials; sedimentation. In atmospheric transport, the settling out on ground and building surfaces of atmospheric aerosols and particles ("dry deposition") or their removal from the air to the ground by precipitation ("wet deposition" or "rainout").

Design laboratory: Department of Energy facilities involved in the design of nuclear weapons.

Deuterium: A nonradioactive isotope of the element hydrogen with one neutron and one proton in the atomic nucleus.

Direct economic effects: The initial increases in output from different sectors of the economy resulting from some new activity within a predefined geographic region.

Direct Effect Multiplier: The total change in regional earnings and employment in all related industries as a result of a one-dollar change in earnings and a one-job change in a given industry.

Direct jobs: The number of workers required at a site to implement an alternative.

Disposition: The ultimate "fate" or end use of a surplus Department of Energy facility following the transfer of the facility to the Office of the Assistant Secretary for Environmental Waste Management.

Dolomite: Calcium magnesium carbonate, a limestone-like mineral.

Dose: The energy imparted to matter by ionizing radiation. The unit of absorbed dose is the rad.

Dose commitment: The dose an organ or tissue would receive during a specified period of time (e.g., 50 to 100 years) as a result of intake (as by ingestion or inhalation) of one or more radionuclides from a defined release, frequently over a year's time.

Dose equivalent: The product of absorbed dose in rad (or gray) and the effect of this type of radiation in tissue and a quality factor. Dose equivalent is expressed in units of rem or Sievert, where 1 rem equals 0.01 Sievert. The dose equivalent to an organ, tissue, or the whole body will be that received from the direct exposure plus the 50-year committed dose equivalent received from the radionuclides taken into the body during the year.

Dosimeter: A small device (instrument) carried by a radiation worker that measures cumulative radiation dose (e.g., film badge or ionization chamber).

Downthrow: The rocks on the side of a fault that have moved downward relative to the rocks on the other side of the fault.

Drainage basin: An aboveground area that supplies the water to a particular stream.

Drawdown: The height difference between the natural water level in a formation and the reduced water level in the formation caused by the withdrawal of groundwater.

Drinking-water standards: The prescribed level of constituents or characteristics in a drinking water supply that cannot be exceeded legally.

Dual use/dual benefit: Projects that have uses in or benefits for the defense sector and the private industry or civilian sector.

Effective dose equivalent: The summation of the products of the dose equivalent received by specified tissues of the body and a tissue-specific weighting factor. This sum is a risk-equivalent value and can be used to estimate the health effects risk of the exposed individual. The tissue-specific weighting factor represents the fraction of the total health risk resulting from uniform whole-body irradiation that would be contributed by that particular tissue. The effective dose equivalent includes the committed effective dose equivalent from internal deposition of radionuclides, and the effective dose equivalent due to penetrating radiation from sources external to the body. Effective dose equivalent is expressed in units of rem (or Sievert).

Effluent: A gas or fluid discharged into the environment.

Emission standards: Legally enforceable limits on the quantities and/or kinds of air contaminants that can be emitted into the atmosphere.

Empirical: Something that is based on actual measurement, observation, or experience rather than on theory.

Endangered species: Defined in the *Endangered Species Act* of 1973 as "any species which is in danger of extinction throughout all or a significant portion of its range."

Endangered Species Act of 1973: This Act requires Federal agencies, with the consultation and assistance of the Secretaries of the Interior and Commerce, to ensure that their actions will not likely jeopardize the continued existence of any endangered or threatened species or adversely affect the habitat of such species.

Enduring stockpile: Weapons types expected to be retained in the smaller stockpile for the foreseeable future.

Energetic material: Generic term for high explosives and propellants.

Enhanced experimental and computational capabilities: Include aboveground experimental capabilities to study technical issues regarding weapons primaries, specifically high-resolution, multiple-time, multiple-view hydrodynamic experiments using simulant material.

Enhanced weapons and materials surveillance technologies: Includes hydrodynamic testing on test units built, when possible, with aged stockpile components (with modified pits using simulant materials) to provide important data on the effects of aging on weapons safety and performance.

Entrainment: The involuntary capture and inclusion of organisms in streams of flowing water, a term often applied to the cooling water systems. The organisms involved may include phyto- and zooplankton, fish eggs and larvae (ichthyoplankton), shellfish larvae, and other forms of aquatic life.

Environment, safety, and health program: In the context of the Department of Energy, encompasses those Department of Energy requirements, activities, and functions in the conduct of all Department of Energy and Department of Energy-controlled operations that are concerned with: impacts to the biosphere; compliance with environmental laws, regulations, and standards controlling air, water, and soil pollution; limiting the risks to the well-being of both operating personnel and the general public to acceptably low levels; and protecting property adequately against accidental loss and damage. Typical activities and functions related to this program include, but are not limited to, environmental protection, occupational safety, fire protection, industrial hygiene, health physics, occupational medicine, and process and facilities safety, nuclear safety, emergency preparedness, quality assurance, and radioactive and hazardous waste management.

Environmental assessment: A written environmental analysis that is prepared pursuant to the *National Environmental Policy Act* to determine whether a Federal action would significantly affect the environment and thus require preparation of a more detailed environmental impact statement. If the action would not significantly affect the environment, then a finding of no significant impact is prepared.

Environmental impact statement: A document required of Federal agencies by the *National Environmental Policy Act* for major proposals significantly affecting the environment. A tool for decision-making, it describes the positive and negative effects of the undertaking and alternative actions.

Environmental justice: The fair treatment of people of all races, cultures, incomes, and educational levels with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment implies that no population of people should be forced to shoulder a disproportionate share of the negative environmental impacts of pollution or environmental hazards due to a lack of political or economic strength.

Environmental survey: A documented, multidisciplined assessment (with sampling and analysis) of a facility to determine environmental conditions and to identify environmental problems requiring corrective action.

Eocene: A geologic epoch early in the Cenozoic Era, dating from approximately 54 to 38 million years ago.

Epicenter: The point on the Earth's surface directly above the focus of an earthquake.

Epidemiology: The science concerned with the study of events that determine and influence the frequency and distribution of disease, injury, and other health-related events and their causes in a defined human population.

Evaluation Basis Accident (EBA): An accident, generally with small impacts to the public, initiated by operational or external causes with an estimated probability of occurrence greater than 10^{-6} per year and used for estimating the impacts of a planned new or modified facility and/or process when a Safety Analysis Report, that would define a Design Basis Accident (DBA), has not been prepared. A DBA is used to establish the performance requirements of structures, systems, and components that are necessary to maintain them in a safe shutdown condition indefinitely or to prevent or mitigate the consequences of the DBA so that the public and onsite personnel are not exposed to radiation in excess of appropriate guideline values.

Explosion (conventional): A chemical reaction or change of state that occurs in an exceedingly short time with the generation of high temperatures and large quantities of gaseous reaction products.

Explosion (nuclear): An explosion for which the energy is produced by a nuclear transformation, either fission or fusion. The term typically implies the release of enormous amounts (kilotons) of energy.

Exposure limit: The level of exposure to a hazardous chemical (set by law or a standard) at which or below which adverse human health effects are not expected to occur:

- Reference dose is the chronic exposure dose (mg or kg per day) for a given hazardous chemical at which or below which adverse human non-cancer health effects are not expected to occur.

- Reference concentration is the chronic exposure concentration (mg/m^3) for a given hazardous chemical at which or below which adverse human non-cancer health effects are not expected to occur.

Fault: A fracture or a zone of fractures within a rock formation along which vertical, horizontal, or transverse slippage has occurred. A normal fault occurs when the hanging wall has been depressed in relation to the footwall. A reverse fault occurs when the hanging wall has been raised in relation to the footwall.

Finding of No Significant Impact: A document by a Federal agency briefly presenting the reasons why an action, not otherwise excluded, will not have a significant effect on the human environment and will not require an environmental impact statement.

Fissile material: Plutonium-239, uranium-233, uranium-235, or any material containing any of the foregoing.

Fission: The splitting of a heavy atomic nucleus into two nuclei of lighter elements, accompanied by the release of energy and generally one or more neutrons. Fission can occur spontaneously or be induced by neutron bombardment.

Fission products: Nuclei formed by the fission of heavy elements (primary fission products); also, the nuclei formed by the decay of the primary fission products, many of which are radioactive.

Fissure: A long and narrow crack in the earth.

Floodplain: The lowlands adjoining inland and coastal waters and relatively flat areas including at a minimum that area inundated by a 1-percent or greater chance flood in any given year. The base floodplain is defined as the 100-year (1.0 percent) floodplain. The critical action floodplain is defined as the 500-year (0.2 percent) floodplain.

Flux: Rate of flow through a unit area. See "neutron flux."

Formation: In geology, the primary unit of formal stratigraphic mapping or description. Most formations possess certain distinctive features.

Fossil: Impression or trace of an animal or plant of past geological ages that has been preserved in the earth's crust.

Fossiliferous: Containing a relatively large number of fossils.

Fugitive emissions: Emissions to the atmosphere from pumps, valves, flanges, seals, and other process points not vented through a stack. Also includes emissions from area sources such as ponds, lagoons, landfills, and piles of stored material.

Fusion: Nuclear reaction in which light nuclei are fused together to form a heavier nucleus, accompanied by the release of immense amounts of energy and fast neutrons.

Fusion ignition: A thermonuclear burn condition created when laser beams ignite and fuse a target containing a mixture of hydrogen isotopes.

Galvin Report: A study conducted for the Department of Energy as a post-Cold War assessment of DOE's ten largest laboratories. The overall objective of the study was to examine options for change within these laboratories and to propose specific alternatives for redirecting the scientific and engineering resources of these instructions toward the economic, environmental, defense, scientific, and energy needs of the Nation.

Gamma rays: High-energy, short-wavelength, electromagnetic radiation accompanying fission and emitted from the nucleus of an atom. Gamma rays are very penetrating and can be stopped only by dense materials (such as lead) or a thick layer of shielding materials.

Gaussian plume: The distribution of material (a plume) in the atmosphere resulting from the release of pollutants from a stack or other source. The distribution of concentrations about the centerline of the plume, which is assumed to decrease as a function of its distance from the source and centerline (Gaussian distribution), depends on the mean wind speed and atmospheric stability.

Genetic effects: The outcome resulting from exposure to mutagenic chemicals or radiation which results in genetic changes in germ line or somatic cells.

- Effects on genetic material in germ line (sex cells) cause trait modifications that can be passed from parents to offspring.
- Effects on genetic material in somatic cells result in tissue or organ modifications (e.g. liver tumors) that do not pass from parents to offspring.

Geologic repository (mined geologic repository): A facility for the disposal of nuclear waste; the waste is isolated by placement in a continuous, stable geologic formation at depths greater than 300 meters.

Geology: The science that deals with the Earth: the materials, processes, environments, and history of the planet, including the rocks and their formation and structure.

Getter: Organic compounds used along with desiccants to control internal environments in nuclear weapons.

Glove box: An airtight box used to work with hazardous material, vented to a closed filtering system, having gloves attached inside of the box to protect the worker.

Groundwater: The supply of water found beneath the Earth's surface, usually in aquifers, which may supply wells and springs.

Half-life (radiological): The time in which half the atoms of a radioactive substance disintegrate to another nuclear form; this varies for specific radioisotopes from millionths of a second to billions of years.

Hazard Index: A summation of the Hazard Quotients for all chemicals now being used at a site and those proposed to be added to yield cumulative levels for a site. A Hazard Index value of 1.0 or less means that no adverse human health effects (non-cancer) are expected to occur.

Hazard quotient: The value used as an assessment of non-cancer associated toxic effects of chemicals, e.g., kidney or liver dysfunction. It is independent of a cancer risk, which is calculated only for those chemicals identified as carcinogens.

Hazard chemical: Under 29 CFR 1910, Subpart Z, "hazardous chemicals" are defined as "any chemical which is a physical hazard or a health hazard." Physical hazards include combustible liquids, compressed gases, explosives, flammables, organic peroxides, oxidizers, pyrophorics, and reactives. A health hazard is any chemical for which there is good evidence that acute or chronic health effects occur in exposed employees. Hazardous chemicals include carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, agents that act on the hematopoietic systm, and agents that damage the lungs, skin, eyes or mucous membranes.

Hazardous material: A material, including a hazardous substance, as defined by 49 CFR 171.8 which poses a risk to health, safety, and property when transported or handled.

Hazardous/toxic waste: Any solid waste (can also be semisolid or liquid, or contain gaseous material) having the characteristics of ignitability, corrosivity, toxicity, or reactivity, defined by the *Resource Con-*

servation and Recovery Act and identified or listed in 40 CFR 261 or by the *Toxic Substances Control Act*.

Heavy metals: Metallic or semimetallic elements of high molecular weight, such as mercury, chromium, cadmium, lead, and arsenic, that are toxic to plants and animals at known concentrations.

High efficiency particulate air filter: A filter used to remove particulates from dry gaseous effluent streams.

High energy pulsed power: A technique used in compressing electrical energy and storing it at high levels and then releasing it to a target in a very short time.

High explosives fabrication: The ability to fabricate any chemical compound or mechanical mixture that, when subjected to heat, impact, fraction, friction, shock, or other suitable initiation stimulus, undergoes a very rapid chemical change with the evolution of large volumes of highly heated gases that exert pressures in the surrounding medium.

High-level waste: The highly radioactive waste material that results from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid waste derived from the liquid. High-level waste contains a combination of transuranic waste and fission products in concentrations requiring permanent isolation.

Highly enriched uranium: Uranium in which the abundance of the isotope uranium-235 is increased well above normal (naturally occurring) levels.

Historic resources: Archaeological sites, architectural structures, and objects produced after the advent of written history dating to the time of the first Euro-American contact in an area.

Holocene: The current epoch of geologic time, which began approximately 10,000 years ago.

HT: Tritiated hydrogen gas which emits a low-energy beta particle and has a half-life of 12.3 years.

Hydraulic gradient: The difference in hydraulic head at two points divided by the distance between two points.

Hydrodynamic test: High-explosive nonnuclear experiment to investigate hydrodynamic aspects of primary function up to mid to late stages of pit implosion.

Hydrodynamics: The study of the motion of a fluid and of the interactions of the fluid with its boundaries, especially in the case of an incompressible inviscid fluid.

Hydrology: The science dealing with the properties, distribution, and circulation of natural water systems.

Hydronuclear experiment: Very low-yield experiment (less than a few pounds of nuclear energy released) to assess primary performance and safety with normal detonation.

Ignition: Self-sustained fusion burn of light nuclei.

Impingement: The process by which aquatic organisms too large to pass through the screens of a water intake structure become caught on the screens and are unable to escape.

Implosion: The sudden inward compression and reduction in volume of fissionable material with ordinary explosives in a nuclear weapon.

Incident-free risk: The radiological or chemical impacts resulting from packages aboard vehicles in normal transport. This includes the radiation or hazardous chemical exposure of specific population groups such as crew, passengers, and bystanders.

Indirect economic effects: Indirect effects result from the need to supply industries experiencing direct economic effects with additional outputs to allow them to increase their production. The additional output from each directly affected industry requires inputs from other industries within a region (i.e., purchases of goods and services). This results in a multiplier effect to show the change in total economic activity resulting from a new activity in a region.

Induced economic effects: The spending of households resulting from direct and indirect economic effects. Increases in output from a new economic activity lead to an increase in household spending throughout the economy as firms increase their labor inputs.

Indirect jobs: Within a regional economic area, jobs generated or lost in related industries as a result of a change in direct employment.

Inertial confinement fusion (ICF): A laser initiated nuclear fusion using the inertial properties of the reactants as a confinement mechanism.

Injection wells: A well that takes water from the surface into the ground, either through gravity or by mechanical means.

Insensitive high explosive: A high explosive that is specifically formulated to be less sensitive to shock and other stimuli that might be encountered in an accident; usually based on the compound TATB (triaminotrinitrobenzene); insensitive high explosives have lower energy densities than conventional high explosives and thus more material is required to produce the same explosive energy.

Interbedded: Occurring between beds or lying in a bed parallel to other beds of a different material.

Interim (permit) status: Period during which treatment, storage, and disposal facilities coming under the *Resource Conservation and Recovery Act* of 1980 are temporarily permitted to operate while awaiting denial or issuance of a permanent permit.

Intrusive pit reuse: A process which involves opening of a pit, modifying internal surfaces and features, and reassembly.

Ion: An atom that has too many or too few electrons, causing it to be chemically active; an electron that is not associated (in orbit) with a nucleus.

Ion exchange: A unit physiochemical process that removes anions and cations, including radionuclides, from liquid streams (usually water) for the purpose of purification or decontamination.

Ionizing radiation: Alpha particles, beta particles, gamma rays, x rays, neutrons, high speed electrons, high speed protons, and other particles or electromagnetic radiation that can displace electrons from atoms or molecules, thereby producing ions.

Isotope: An atom of a chemical element with a specific atomic number and atomic mass. Isotopes of the same element have the same number of protons but different numbers of neutrons and different atomic masses.

Joint test assembly: A nonnuclear test configuration, with diagnostic instrumentation, of a warhead or bomb.

Joule: A metric unit of energy, work, or heat, equivalent to 1 watt-second, 0.737 foot-pound, or 0.239 calories.

Klystron: An electron tube used for the generation of ultrahigh-frequency current.

Lacustrine wetland: Lakes, ponds, and other enclosed open waters at least 8 ha (20 acres) in extent and not dominated by trees, shrubs, and emergent vegetation.

Large release: A release of radioactive material that would result in doses greater than 25 rem to the whole body or 300 rem to the thyroid at 1.6 kilometer from the control perimeter (security fence) of a reactor facility.

Laser: A device that produces a beam of monochromatic (single-color) "light" in which the waves of light are all in phase. This condition creates a beam that has relatively little scattering and has a high concentration of energy per unit area.

Latent fatalities: Fatalities associated with acute and chronic environmental exposures to chemical or radiation.

Limited-lifetime component: A weapon component that decays with age and must be replaced periodically.

Lithic: Pertaining to stone or a stone tool.

Loam: A soil composed of a mixture of clay, silt, sand, and organic matter.

Long-lived radionuclides: Radioactive isotopes with half-lives greater than about 30 years.

Low-level waste: Waste that contains radioactivity but is not classified as high-level waste, transuranic waste, spent nuclear fuel, or "11e(2) by-product material" as defined by DOE Order 5820.2A, *Radioactive Waste Management*. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level waste, provided the concentration of transuranic waste is less than 100 nanocuries per gram. Some low-level waste is considered classified because of the nature of the generating process and/or constituents, because the waste would tell too much about the process.

Manufacturing: see "production".

Maximum contaminant level: The maximum permissible level of a contaminant in water delivered to any user of a public water system. Maximum contaminant levels are enforceable standards.

Maximally exposed individual: A hypothetical person who could potentially receive the maximum dose of radiation or hazardous chemicals.

Megajoule: A unit of heat, work, or energy equal to 1 million joules. See "Joule".

Megawatt: A unit of power equal to 1 million watts. Megawatt thermal is commonly used to define heat produced, while megawatt electric defines electricity produced.

Meteorology: The science dealing with the atmosphere and its phenomena, especially as relating to weather.

Microelectronics: Integrated circuits and electronic devices constructed of individual circuit elements with dimensions of micrometers (10^{-6} m) on a carrier with dimensions of a centimeter (10^{-2}m).

Migration: The natural movement of a material through the air, soil, or groundwater; also, seasonal movement of animals from one area to another.

Migratory Bird Treaty Act: This act states that it is unlawful to pursue, take, attempt to take, capture, possess, or kill any migratory bird, or any part, nest, or egg of any such bird other than permitted activities.

Miller Report: A report subsequently published by SNL as *Stockpile Surveillance Past and Future* (SAND 95-2751) that describes a number of weapons systems that have been in the Nation's stockpile. The report provides historical examples of some of the problems with systems and documents several examples of unanticipated problems that arose following deployment of a weapons system of the stockpile.

Miocene Epoch: Geologic time in the Cenozoic Era dating from 26 to 7 million years ago.

Mix: Mixing of materials, usually with different densities and velocities, that can adversely affect nuclear weapon performance.

Mixed waste: Waste that contains both "hazardous waste" and "radioactive waste" as defined in this glossary.

Mock nuclear material: Material that is nonradioactive and nonfissile but similar in density and other characteristics to nuclear material and is used in place of a weapon's nuclear parts in hydrodynamic experiments and flight tests.

Modified Mercalli intensity: A level on the modified Mercalli scale. A measure of the perceived intensity of earthquake ground shaking with 12 divisions, from I (not felt by people) to XII (damage nearly total).

National Ambient Air Quality Standards: Air quality standards established by the *Clean Air Act*, as amended. The primary National Ambient Air Quality Standards are intended to protect the public health with an adequate margin of safety, and the secondary National Ambient Air Quality Standards are intended to protect the public welfare from any known or anticipated adverse effects of a pollutant.

National Emission Standards for Hazardous Air Pollutants: A set of national emission standards for listed hazardous pollutants emitted from specific classes or categories of new and existing sources. These were implemented in the Clean Air Act Amendments of 1977.

National Environmental Policy Act of 1969: This Act is the basic national charter for the protection of the environment. It requires the preparation of an environmental impact statement for every major Federal action that may significantly affect the quality of the human or natural environment. Its main purpose is to provide environmental information to decision makers and the public so that actions are based on an understanding of the potential environmental consequences of a proposed action and its reasonable alternatives.

National Environmental Research Park: An outdoor laboratory set aside for ecological research to study the environmental impacts of energy developments. National environmental research parks were established by the Department of Energy to provide protected land areas for research and education in the environmental sciences and to demonstrate the environmental compatibility of energy technology development and use.

National Historic Preservation Act of 1966, as amended: This Act provides that property resources with significant national historic value be placed on the National Register of Historic Places. It does not require any permits but, pursuant to Federal code, if a proposed action might impact an historic property resource, it mandates consultation with the proper agencies.

National Pollutant Discharge Elimination System: Federal permitting system required for hazardous effluents regulated through the *Clean Water Act*, as amended.

National Register of Historic Places: A list maintained by the Secretary of the Interior of districts, sites, buildings, structures, and objects of prehistoric or historic local, state, or national significance. The list is expanded as authorized by Section 2(b) of the *Historic Sites Act* of 1935 (16 U.S.C. 462) and Section 101(a)(1)(A) of the *National Historic Preservation Act* of 1966, as amended.

Neutron: An uncharged elementary particle with a mass slightly greater than that of the proton, found in the nucleus of every atom heavier than hydrogen-1; a free neutron is unstable and decays with a half-life of about 13 minutes into an electron and a proton.

Neutron flux: The product of neutron number density and velocity (energy) giving an apparent number of neutrons flowing through a unit area per unit time.

Nitrogen oxides: Refers to the oxides of nitrogen, primarily NO (nitrogen oxide) and NO_2 (nitrogen dioxide). These are produced in the combustion of fossil fuels and can constitute an air pollution problem. When nitrogen dioxide combines with volatile organic compounds, such as ammonia or carbon monoxide, ozone is produced.

Nonattainment area: An air quality control region (or portion thereof) in which the Environmental Protection Agency has determined that ambient air concentrations exceed national ambient air quality standards for one or more criteria pollutants.

Nondestructive evaluation: Test method that does not involve damage to or destruction of the test sample; includes the use of ultrasonics, radiography, magnetic flux, and other techniques.

Nonintrusive modification pit reuse: Process which includes modification to the external surfaces and features of the pit. The pit remains sealed with the possible exception of cutting the pit tube.

Noninvasive imaging: Imaging method that does not damage the test specimen; includes radiography, computed tomography, and other techniques.

Nonnuclear component: Any one of thousands of parts that do not contain radioactive or fissile material that are required in a nuclear weapon.

Nonnuclear fabrication: Ability to fabricate nonnuclear components and perform nonnuclear component surveillance.

Nonproliferation: Preventing the spread of nuclear weapons, nuclear weapon materials, and nuclear weapon technology.

Nonproliferation Treaty: A treaty with the aim of controlling the spread of nuclear weapons technologies, limiting the number of nuclear weapons states and pursuing, in good faith, effective measures relating to the cessation of the nuclear arms race. They treaty does not invoke stockpile reductions by nuclear states, and it does not address actions of nuclear states in maintaining their stockpiles.

Nova: A 10- beam, 100-TW neodymium glass fusion laser facility at Lawrence Livermore National Laboratory that was completed in 1984 and used for inertial confinement fusion target irradiation experiments.

Nuclear assembly: Collective term for the primary, secondary, and radiation case.

Nuclear component: A part of a nuclear weapon that contains fissionable or fusionable material.

Nuclear facility: A facility whose operations involve radioactive materials in such form and quantity that a nuclear hazard potentially exists to the employees or the general public. Included are facilities that: produce, process, or store radioactive liquid or solid waste, fissionable materials, or tritium; conduct separations operations; conduct irradiated materials inspection, fuel fabrication, decontamination, or recovery operations. Incidental use of radioactive materials in a facility operation (e.g.,check sources, radioactive sources, and X-ray machines) does not necessarily require a facility to be included in this definition.

Nuclear grade: Material of a quality adequate for use in a nuclear application.

Nuclear material: Composite term applied to: (1) special nuclear material; (2) source material such as uranium or thorium or ores containing uranium or thorium; and (3) by-product material, which is any radioactive material that is made radioactive by exposure to the radiation incident to the process of producing or using special nuclear material.

Nuclear Posture Review: A report, led by the Department of Defense, which addressed possible changes in U.S. nuclear policy (e.g., deployment status, targeting, force structure) and which recommendations and decisions will likely dictate further changes in the U.S. nuclear weapons program. The nuclear posture review commits the U.S. to maintaining a safe and reliable nuclear deterrent.

Nuclear production: Production operations for components of nuclear weapons that are fabricated from nuclear materials, including plutonium and uranium.

Nuclear reaction: A reaction in which an atomic nucleus is transformed into another isotope of that respective nuclide, or into another element altogether; it is always accompanied by the liberation of either particles or energy.

Nuclear warhead: A warhead that contains fissionable and fusionable material, the nuclear assembly, and nonnuclear components packaged as a deliverable weapon.

Nuclear weapon: The general name given to any weapon in which the explosion results from the energy released by reactions involving atomic nuclei, either fission, fusion, or both.

Nuclear Weapons Complex: The sites supporting the research, development, design, manufacture, testing, assessment, certification and maintenance of the Nation's nuclear weapons and the subsequent dismantlement of retired weapons.

Nuclide: A species of atom characterized by the constitution of its nucleus and hence by the number of protons, the number of neutrons, and the energy content.

Numerical simulation: The use of mathematical algorithms and models of physical processes to calculationally simulate the behavior or performance of a device or complex system.

Obsidian: A black volcanic glass.

Occupational Safety and Health Administration: Oversees and regulates workplace health and safety, created by the *Occupational Safety and Health Act* of 1970.

Offsite: As used in this PEIS, the term denotes a location, facility, or activity occurring outside of the boundary of the entire DOE Complex site (ORR, SRS, Pantex, KCP, SNL, LANL, LLNL, or NTS). At sites which have detached remote locations (e.g., LLNL and Pantex) the term includes these boundaries or a part of the main site.

Onsite: As used in this PEIS, the term denotes a location or activity occurring somewhere within the boundary of the DOE Complex site (ORR, SRS, Pantex, KCP, SNL, LANL, LLNL, or NTS).

Onsite population: Department of Energy and contractor employees who are on duty, and badged onsite visitors.

Operable unit: A discrete action that comprises an incremental step toward comprehensively addressing site problems. This discrete portion of a remedial response manages migration or eliminates or mitigates a release, threat of release, or pathway of exposure. The cleanup of a site can be divided into a number of operable units.

Outfall: The discharge point of a drain, sewer, or pipe as it empties into a body of water.

Ozone: The triatomic form of oxygen; in the stratosphere, ozone protects the Earth from the sun's ultraviolet rays, but in lower levels of the atmosphere ozone is considered an air pollutant.

Packaging: The assembly of components necessary to ensure compliance with Federal regulations. It may consist of one or more receptacles, absorbent materials, spacing structures, thermal insulation, radiation shielding, and devices for cooling or absorbing mechanical shocks. The vehicle tie-down system and auxiliary equipment may be designated as part of the packaging.

Paleontology: The study of fossils.

Paleozoic Era: Geologic time dating from 570 million to 245 million years ago when seed-bearing plants, amphibians, and reptiles first appeared.

Palustrine wetland: Nontidal wetlands dominated by trees, shrubs, and emergent vegetation.

Perched groundwater: A body of groundwater of small lateral dimensions lying above a more extensive aquifer.

Performance: The ability of a nuclear weapon or weapon system to operate in specified manner (e.g., yield, range, accuracy, radiation spectrum) under stated conditions. (Essentially equivalent to reliability.)

Permeability: geology, the ability of rock or soil to transmit a fluid.

Person-rem: The unit of collective radiation dose commitment to a given population; the sum of the individual doses received by a population segment.

Physical setting: The land and water form, vegetation, and structures that compose the landscape.

Physics dealing with weapons primary: Issues related to the reliability and safety of the primary high explosive and plutonium core, which is involved in the reaction up to the point where nuclear criticality is achieved. Without proper primary-stage function, the weapon secondary will not work.

Physics dealing with weapons secondary: Issues related to the implosion of the secondary portion of uranium and lithium, a nuclear reaction that results in the thermonuclear explosion.

Pit: The central core of a nuclear weapon containing plutonium-239 and/or highly enriched uranium that undergoes fission when compressed by high explosives. The pit and the high explosive are known as the primary of a nuclear weapon.

Plasma: An electrically neutral, gaseous mixture of positive and negative ions, sometimes called a fourth state of matter since it behaves differently from solids, liquids, and gases. High-temperature, high-density plasmas are created in nuclear weapons and inertial confinement fusion (ICF) experiments.

Playa: A basin or a closed depression found within a dry environment that may contain water on a seasonal basis.

Pleistocene Epoch: Geologic time that occurred approximately 11,000 to 2 million years ago.

Pliocene Epoch: Geologic time between the Miocene and the Pleistocene epochs approximately 2 to 7 million years ago.

Plume: The elongated pattern of contaminated air or water originating at a point source, such as a smokestack or a hazardous waste disposal site.

Plume immersion: Occurs when an individual is enveloped by a cloud of radioactive gaseous effluent and receives an external radiation dose.

Plutonium: A heavy, radioactive, metallic element with the atomic number 94. It is produced artificially in a reactor by bombardment of uranium with neutrons and is used in the production of nuclear weapons.

Potentiometric surface: An imaginary surface defined by the level that water will rise to in a tightly-cased well.

Pounds per square inch: A measure of pressure; atmospheric pressure is about 14.7 pounds per square inch.

Prehistoric: Predating written history. In North America, also predating contact with Europeans.

Prevention of Significant Deterioration: Regulations established by the 1977 Clean Air Act Amendments to limit increases in criteria air pollutant concentrations above baseline.

Prime farmland: Land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor without intolerable soil erosion, as determined by the Secretary of Agriculture (*Farmland Protection Policy Act* of 1981, 7 CFR 7, paragraph 658).

Probable maximum flood: Flood levels predicted for a scenario having hydrological conditions that maximize the flow of surface waters.

Product realization: The process that converts the nuclear assembly, nonnuclear components, subsystems, and system-level requirements into manufacturable designs and hardware.

Production: Encompasses the fabrication, processing, assembly, and acceptance testing of nuclear weapons and nuclear weapon components, and is interchangeable with the term manufacturing.

Programmatic Environmental Impact Statement (PEIS): A legal document prepared in accordance with the requirements of 102(2)(C) of NEPA which evaluates the environmental impacts of proposed Federal Actions that involve multiple decisions potentially affecting the environment at one or more sites.

Project-specific EIS: A legal document prepared in accordance with the requirements of 102(2)(C) of NEPA which evaluates the environmental impacts of a single action at a single site.

Proliferation: The spread of nuclear weapons and the materials and technologies used to produce them.

Protected area: An area encompassed by physical barriers, subject to access controls, surrounding material access areas, and meeting the standards of DOE Order 5632.1C, *Protection and Control of Safeguards and Security Interests.*

Quality factor: The principal modifying factor that is employed to derive dose equivalent from absorbed dose.

Rad: See "radiation absorbed dose."

Radiation: The particles or electromagnetic energy emitted from the nuclei of radioactive atoms. Some elements are naturally radioactive; others are induced to become radioactive by bombardment in a reactor. Naturally occurring radiation is indistinguishable from induced radiation.

Radiation absorbed dose: The basic unit of absorbed dose equal to the absorption of 0.01 joule per kilogram of absorbing material.

Radioactive waste: Materials from nuclear operations that are radioactive or are contaminated with radioactive materials, and for which use, reuse, or recovery are impractical.

Radioactivity: The spontaneous decay or disintegration of unstable atomic nuclei, accompanied by the emission of radiation.

Radioisotopes: Radioactive nuclides of the same element (same number of protons in their nuclei) that differ in the number of neutrons.

Radionuclide: A radioactive element characterized according to its atomic mass and atomic number which can be man-made or naturally occurring. Radionuclides can have a long life as soil or water pollutants, and are believed to have potentially mutagenic or carcinogenic effects on the human body.

Radon: Gaseous, radioactive element with the atomic number 86 resulting from the radioactive decay of radium. Radon occurs naturally in the environment, and can collect in unventilated enclosed areas, such as basements. Large concentrations of radon can cause lung cancer in humans.

RADTRAN: A computer code combining user-determined meteorological, demographic, transportation, packaging, and material factors with health physics data to calculate the expected radiological consequences and accident risk of transporting radioactive material.

Reasonably Available Control Technology (RACT): The lowest emissions limit that a particular source is capable of meeting by the application of control technology that is reasonably available as well as technologically and economically feasible.

Receiving waters: Rivers, lakes, oceans, or other bodies of water into which wastewaters are discharged.

Recharge: Replenishment of water to an aquifer.

Record of Decision: A document prepared in accordance with the requirements of 40 CFR 1505.2 that provides a concise public record of DOE's decision on a proposed action for which an EIS was prepared. A ROD identifies the alternatives considered in reaching the decision, the environmentally preferable alternative(s), factors balanced by DOE in making the decision, whether all practicable means to avoid or minimize environmental harm have been adopted, and if not, why they were not.

Regional economic area: A geographic area consisting of an economic node and the surrounding counties that are economically related and include the places of work and residences of the labor force. Each regional economic area is defined by the U.S. Bureau of Economic Analysis.

Region of influence (ROI): A site-specific geographic area that includes the counties where approximately 90 percent of the current DOE and/or contractor employees reside.

Reliability: The ability of a nuclear weapon, weapon system, or weapon component to perform its required function under stated conditions for a specified period of time. (Essentially equivalent to performance.)

Rem: See "roentgen equivalent man."

Remediation: The process, or a phase in the process, of rendering radioactive, hazardous, or mixed waste environmentally safe, whether through processing, entombment, or other methods.

Replacement Pit Fabrication: This function includes the fabrication, surveillance, and storage of the primary high explosive and plutonium core of a nuclear weapon.

Replacement Secondary Fabrication: This function includes the fabrication, surveillance, and storage of the secondary uranium and lithium portion of a nuclear weapon.

Resource Conservation and Recovery Act, as amended: The Act that provides "cradle to grave" regulatory program for hazardous waste which established, among other things, a system for managing hazardous waste from its generation until its ultimate disposal.

Retrofit: To furnish (e.g., a weapon) with new parts, equipment, or features not available at the time of manufacture.

Rhyolite: A volcanic rock rich in silica; the volcanic equivalent of granite.

Rightsizing: Denotes the facility modification, rearrangement, and refurbishment necessary to size future weapon manufacturing facilities appropriately for the workload to be accomplished. In general, rightsizing involves reductions in the size of facilities, but not in their capabilities. Rightsizing is not driven by assumptions about future DOE budget levels, but rather is driven by the need to size facilities at the level necessary for long-term workload accomplishment.

Riparian wetlands: Wetlands on or around rivers and streams.

Risk: A quantitative or qualitative expression of possible loss that considers both the probability that a hazard will cause harm and the consequences of that event.

Risk assessment (chemical or radiological): The qualitative and quantitative evaluation performed in an effort to define the risk posed to human health and/or the environment by the presence or potential presence and/or use of specific chemical or radiological materials.

Roentgen: A unit of exposure to ionizing X- or gamma radiation equal to or producing 1 electrostatic unit of charge per cubic centimeter of air. It is approximately equal to 1 rad.

Roentgen equivalent man: The unit of radiation dose for biological absorption: equal to the product of the absorbed dose, in rads, a quality factor which accounts for the variation in biological effectiveness of different types of radiation. Also known as "rem".

Runoff: The portion of rainfall, melted snow, or irrigation water that flows across the ground surface and eventually enters streams.

Safe Drinking Water Act, as amended: This Act protects the quality of public water supplies, water supply and distribution systems, and all sources of drinking water.

Safe secure trailer: A specially designed semi-trailer, pulled by an armored tractor, which is used for the safe, secure transportation of cargo containing nuclear weapons or special nuclear material.

Safety: Minimizing the possibility that a nuclear weapon will be exposed to accidents and preventing the possibility of nuclear yield or plutonium dispersal should there be an accident involving a nuclear weapon.

Safety Analysis Report: A safety document providing a concise but complete description and safety evaluation of a site, design, normal and emergency operation, potential accidents, predicted consequences of such accidents, and the means proposed to prevent such accidents or mitigate their consequences. A safety analysis report is designated as final when it is based on final design information. Otherwise, it is designated as preliminary.

Saltstone: Low radioactivity fraction of high-level waste from the in-tank precipitation process mixed with cement, flyash, and slag to form a concrete block.

Sandstone: A sedimentary rock predominantly containing individual mineral grains visible to the unaided eye.

Sanitary wastes: Wastes generated by normal housekeeping activities, liquid or solid (includes sludge), which are not hazardous or radioactive.

Sanitization: An irreversible modification or destruction of a component or part of a component to the extent required to prevent revealing classified or otherwise controlled information.

Scope: In a document prepared pursuant to the *National Environmental Policy Act* of 1969, the range of actions, alternatives, and impacts to be considered.

Scoping: Involves the solicitation of comments from interested persons, groups, and agencies at public meetings, public workshops, in writing, electronically, or via fax to assist DOE in defining the proposed action, identifying alternatives, and developing preliminary issues to be addressed in an EIS.

Scrubber: An air pollution control device that uses a spray of water or reactant or a dry process to trap pollutants in emissions.

Sealed pit: A nuclear weapon pit that is hermetically closed to protect nuclear materials from the environment. Note: This is the unclassified definition from the *Weapons Program Classification Guide* (CG-W-5). "Pit" is already defined in the glossary.

Secondary: See "weapon secondary."

Security: Minimizing the likelihood of unauthorized access to or loss of custody of a nuclear weapon or weapon system, and ensuring that the weapon can be recovered should unauthorized access or loss of custody occur.

Sedimentation: The settling out of soil and mineral solids from suspension in water.

Seismic: Pertaining to any earth vibration, especially an earthquake.

Seismic zone: An area defined by the Uniform Building Code (1991), designating the amount of damage to be expected as the result of earthquakes. The United States is divided into six zones: (1) Zone 0 - no damage; (2) Zone 1 - minor damage; corresponds to intensities V and VI of the modified Mercalli intensity scale; (3) Zone 2A - moderate damage; corresponds to intensity VII of the modified Mercalli intensity scale (eastern U.S.); (4) Zone 2B - slightly more damage than 2A (western U.S.); (5) Zone 3 - major damage; corresponds to intensity VII and higher of the modified Mercalli intensity scale; (6) Zone 4 - areas within Zone 3 determined by proximity to certain major fault systems.

Seismicity: The tendency for the occurrence of earthquakes.

Self-aware weapon: A stockpile weapon fitted with an integrated network of miniature "smart" sensors (sensing and measuring devices with built-in intelligence capabilities) and self-test features that monitor the weapon's environment (e.g., temperature, moisture, vibration), detect material decomposition products and corrosion, check cable continuity, determine the functionality of weapon subsystems, and alert a central location if any monitored parameters are outside the permitted range.

Severe accident: An accident with a frequency rate of less than 10^{-6} per year that would have more severe consequences than a design-basis accident, in terms of damage to the facility, offsite consequences, or both.

Sewage: The total of organic waste and wastewater generated by an industrial establishment or a community.

Shielding: Any material of obstruction (bulkheads, walls, or other constructions) that absorbs radiation in order to protect personnel or equipment.

Short-lived nuclides: Radioactive isotopes with half-lives no greater than about 30 years (e.g., cesium-137 and strontium-90).

Shrink-swell potential: Refers to the potential for soils to contract while drying and expand after wetting.

Silt: A sedimentary material consisting of fine mineral particles intermediate in size between sand and clay.

Siltstone: A sedimentary rock composed of fine textured minerals.

Simulant material: Materials used to modify a weapon pit to prevent the device from becoming critical.

Site-Wide EIS: A legal document prepared in accordance with the requirements of 102(2)(C) of NEPA which evaluates the environmental impacts of many actions at one large, multiple-facility DOE site. Site-wide EISs are used to support specific decisions.

Source term: The estimated quantities of radionuclides or chemical pollutants released to the environment.

Special nuclear materials: As defined in Section 11 of the *Atomic Energy Act* of 1954, special nuclear material means (1) plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the Nuclear Regulatory Commission determines to be special nuclear material or (2) any material artificially enriched by any of the foregoing.

Standardization (Epidemiology): Techniques used to control the effects of differences (e.g., age) between populations when comparing disease experience. The two main methods are:

- Direct method, in which specific disease rates in the study population are averaged, using as weights the distribution of the comparison population.

- Indirect method, in which the specific disease rates in the comparison population are averaged, using as weights the distribution of the study population.

START I and II: Terms which refer to negotiations between the U.S. and Russia (the former Soviet Union during START I negotiations) aimed at limiting and reducing nuclear arms. START I discussions began in 1982 and eventually led to a ratified treaty in 1988. The START II protocol, which has not been fully ratified, will attempt to further reduce the acceptable levels of nuclear weapons ratified in START I.

Steppe: A semi-arid, grass-covered, and generally treeless plain.

Stockpile assurance: The umbrella term for stockpile management and stockpile stewardship; all the tasks required to ensure that the U.S. has a credible nuclear deterrent.

Stockpile surveillance: Routine and periodic examination, evaluation, and testing of stockpile weapons and weapon components to ensure that they conform to performance specifications and to identify and evaluate the effect of unexpected or age-related requirements.

Strategic reserve: That quantity of plutonium and highly enriched uranium reserved for future weapons use. For the purposes of this PEIS, strategic reserves of plutonium will be in the form of pits, and strategic reserves of highly enriched uranium will be in the form of canned secondary assemblies. Strategic reserves also include limited quantities of plutonium and highly enriched uranium metal maintained as working inventory at DOE laboratories.

Stratigraphy: Division of geology dealing with the definition and description of rocks and soils, especially sedimentary rocks.

Strike: The direction or trend that a structural surface (e.g., a bedding or fault plane) takes as it intersects the horizontal.

Subcritical experiment: A dynamic experiment that involves the use of special nuclear material and does not achieve a condition of criticality (i.e., no self-sustaining nuclear reaction).

Superfund Amendments and Reauthorization Act of 1986: Public Law 99-499 passed in 1986 which amends the *Comprehensive Environmental Response, Compensation and Liability Act* (CERCLA) of 1980. SARA more stringently defines hazardous waste cleanup standards and emphasizes remedies that permanently and significantly reduce the mobility, toxicity, or volume of wastes. Title III of SARA, the *Emergency Planning and Community Right-to-Know Act*, mandates establishment of community emergency planning programs, emergency notification, reporting of chemicals, and emission inventories.

Surface water: Water on the Earth's surface, as distinguished from water in the ground (groundwater).

System integration: The process by which individual components are engineered into a system that meets performance requirements.

Tertiary Period: The first geologic period of the Cenozoic Era, dating from 66 million to about 3 million years ago. During this time, mammals became the dominant life form.

Test readiness: Maintaining the critical technologies, staff skills, and infrastructure to be able to resume nuclear testing if and when mandated by the President.

Thermonuclear: The process by which very high temperatures are used to bring about the fusion of light nuclei, such as deuterium and tritium, with the accompanying release of energy.

Third Thirds waste: The Environmental Protection Agency proposed the Third Thirds Rule, as required by the Hazardous and Solid Waste Amendments of 1984, to establish treatment standards and effective dates for all wastes (including characteristic wastes) for which treatment standards had not yet been promulgated (40 CFR 268.12), including derived-from wastes (i.e., multi-source leachage), and for mixed radioactive/hazardous wastes.

Threatened species: Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Threshold limit values: The recommended concentrations of contaminants workers may be exposed to according to the American Council of Governmental Industrial Hygienists.

Tokamak: A toroidal (doughnut-shaped) chamber for electromagnetic confinement of plasmas, used in fusion-related experiments and research.

Toxic Substances Control Act of 1976: This Act authorizes the Environmental Protection Agency to secure information on all new and existing chemical substances and to control any of these substances determined to cause an unreasonable risk to public health or the environment. This law requires that the health and environmental effects of all new chemicals be reviewed by the Environmental Protection Agency before they are manufactured for commercial purposes.

Transuranic waste: Waste contaminated with alpha-emitting radionuclides with half-lives greater than 20 years and concentrations greater than 100 nanocuries/gram at time of assay.

Tritium: A radioactive isotope of the element hydrogen with two neutrons and one proton. Common symbols for the isotope are H-3 and T.

Unconfined aquifer: A permeable geological unit having the following properties: a water-filled pore space (saturated), the capability to transmit significant quantities of water under ordinary differences in pressure, and an upper water boundary that is at atmospheric pressure.

Unreviewed safety question: A proposed change, test, or experiment is considered to involve an unreviewed safety question if (1) the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety evaluated previously by safety analyses will be significantly increased or (2) a possibility for an accident or malfunction of a different type than any evaluated previously by safety analyses will be created that will result in significant safety consequences.

Unsaturated zone (vadose): A region in a porous medium in which the pore space is not filled with water.

Unusual occurrence: Any unusual or unplanned event that adversely affects or potentially affects the performance, reliability, or safety of a facility.

Uranium: A naturally occuring heavy, silvery-white metallic element (atomic number 92) with many radioactive isotopes. Uranium-235 is most commonly used as a fuel for nuclear fission. Another isotope, uranium-238, can be transformed into fissionable plutonium-239 following its capture of a neutron in a nuclear reactor.

Vitrification: A waste treatment process that uses glass (e.g., borosilicate glass) to encapsulate or immobilize radioactive wastes to prevent them from reacting with the surroundings in disposal sites.

Volatile organic compounds: A broad range of organic compounds, often halogenated, that vaporize at ambient or relatively low temperatures, such as benzene, chloroform, and methyl alcohol.

War Reserve: Operational weapons and materials designated as essential for national security needs.

Warhead: Collective term for the package of nuclear assembly and nonnuclear components that can be mated with a delivery vehicle or carrier to produce a deliverable nuclear weapon.

Waste Isolation Pilot Plant: A facility in southeastern New Mexico being developed as the disposal site for transuranic waste, not yet in operation.

Waste minimization and pollution prevention: An action that economically avoids or reduces the generation of waste and pollution by source reduction, reducing the toxicity of hazardous waste and pollution, improving energy use, or recycling. These actions will be consistent with the general goal of minimizing present and future threats to human health, safety, and the environment.

Water table: Water under the surface of the ground occurs in two zones, an upper unsaturated zone and the deeper saturated zone. The boundary between the two zones is the water table.

Weaponization: Converting the functional requirements for a weapon into integrated systems designs and prototype hardware.

Weapon primary: The crucial subsystem for weapon reliability and safety; the primary contains the main high explosive and the plutonium that comprise the principal safety concerns. Without proper primary-stage function, the secondary will not work.

Weapon secondary: Provides additional explosive energy release; composed of lithium deuteride and other materials. As the secondary implodes, the lithium in the isotopy form lithium-6. is converted to tritium by neutron interactions, and the tritium product in turn undergoes fusion with the deuterium to create the thermonuclear explosion.

Weapons-grade: Fissionable material in which the abundance of fissionable isotopes is high enough that the material is suitable for use in thermonuclear weapons.

Weapons assembly/disassembly: Assembly operations assembles piece parts into subassemblies using joining techniques such as welding, adhesive bonding, and mechanical joining. Disassembly takes retired weapons apart and recycles all materials of value.

Weapons effects: Deals with outputs of nuclear weapons and the associated effects on materials and the environment.

Weapons laboratories: Colloquial term for the three Department of Energy national laboratories—Los Alamos, Lawrence Livermore, and Sandia—that are responsible for the design, development, and stewardship of U.S. nuclear weapons.

Weapon system: Collective term for the nuclear assembly and nonnuclear components, subsytems, and systems that comprise a nuclear weapon.

Weighting factor: Represents the fraction of the total health risk resulting from uniform whole-body irradiation that could be contributed to that particular tissue.

Wetland: Land or areas exhibiting hydric soil conditions, saturated or inundated soil during some portion of the year, and plant species tolerant of such conditions.

Whole-body dose: Dose resulting from the uniform exposure of all organs and tissues in a human body. (Also, see "effective dose equivalent.")

Wind rose: A depiction of wind speed and direction frequency for a given period of time.

Worker year: Measurement of labor requirement equal to 1 full time worker employed for 1 year.

X/Q (Chi/Q): The relative calculated air concentration due to a specific air release; units are (sec/m^3). For example, (Ci/m^3)/(Ci/sec)=(sec/m^3) or (g/m^3)/(g/sec)=(sec/m^3).

Yield: The force in tons of TNT of a nuclear or thermonuclear explosion.

Zero-based stockpile: A nuclear weapons stockpile with zero nuclear weapons and therefore requiring no stockpile management effort.

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CHAPTER 10: INDEX

A Facsimile Report

DOE/EIS-0236
Vol. [illegible]

Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management

Volume II

United States Department of Energy

September 1996

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DOE/EIS-0236
Vol. 2 of 4

Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management

Volume II

United States Department of Energy

September 1996

DOE/EIS-0236
September 1996

COVER SHEET

RESPONSIBLE AGENCY: U.S. Department of Energy

COOPERATING AGENCY: U.S. Environmental Protection Agency

TITLE: Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management (DOE/EIS-0236)

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ABSTRACT: In response to the end of the Cold War and changes in the world's political regimes, the United States is not producing new-design nuclear weapons. Instead, the emphasis of the U.S. nuclear weapons program is on reducing the size of the Nation's nuclear stockpile by dismantling existing nuclear weapons. The Department of Energy (DOE) has been directed by the President and Congress to maintain the safety and reliability of the reduced nuclear weapons stockpile in the absence of underground nuclear testing. In order to fulfill that responsibility, DOE has developed a Stockpile Stewardship and Management Program to provide a single highly integrated technical program for maintaining the continued safety and reliability of the nuclear stockpile. The Stockpile Stewardship and Management PEIS describes and analyzes alternative ways to implement the proposed actions for the Stockpile Stewardship and Management Program.

Stockpile stewardship refers to activities associated with research, design, development and testing of nuclear weapons and the assessment and certification of the safety and reliability. The stockpile stewardship portion of the PEIS evaluates the potential impacts of three proposed facilities: the National Ignition Facility (NIF), the Contained Firing Facility (CFF), and the Atlas Facility. The stockpile stewardship alternatives involving these facilities could affect four sites: Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), Sandia National Laboratories (SNL), and Nevada Test Site (NTS).

Stockpile management refers to activities associated with the production, maintenance, surveillance, refurbishment, and dismantlement of the nuclear weapons stockpile. The stockpile management portion of this PEIS evaluates the potential impacts of carrying out stockpile management alternatives at eight sites: Oak Ridge Reservation (ORR), Savannah River Site (SRS), Kansas City Plant (KCP), Pantex Plant (Pantex), LANL, LLNL, SNL, and NTS. The stockpile management alternatives are assessed for nuclear weapons assembly/disassembly and for fabricating pits, secondaries and cases, high explosives, and nonnuclear components.

The Stockpile Stewardship and Management PEIS also evaluates the No Action alternative of relying on existing facilities and continuing the missions at current sites to achieve both the stockpile stewardship and management missions. The No Action alternative assesses the environmental impacts of the on-going Stockpile Stewardship and Management Program and provides a baseline against which alternatives can be evaluated.

DOE has identified the following preferred alternative for the Stockpile Stewardship and Management Program:

Stockpile Stewardship:

- Construct and operate NIF at LLNL
- Construct and operate CFF at LLNL
- Construct and operate the Atlas Facility at LANL

Stockpile Management:

- Secondary and Case Component Fabrication—downsize the Y-12 Plant at ORR
- Pit Component Fabrication—reestablish capability and appropriate capacity at LANL

- Assembly/Disassembly—downsize at Pantex
- High Explosives Fabrication—downsize at Pantex
- Nonnuclear Component Fabrication—downsize at KCP
- Based on the analyses performed to support this PEIS, the preferred alternatives for strategic reserve storage are as follows: (1) highly enriched uranium strategic reserve storage at Y-12; and (2) plutonium pit strategic reserve storage in Zone 12 at Pantex. The preferred alternatives for strategic reserve storage could change based upon decisions to be made in regard to the *Storage and Disposition of Weapons-Usable Fissile Materials Final PEIS*. Decisions on strategic storage will not be made in the upcoming ROD for the Stockpile Stewardship and Management Program. Storage decisions are not expected to be made until both the *Stockpile Stewardship and Management Final PEIS* and the *Storage and Disposition of Weapons-Usable Fissile Materials Final PEIS* are completed.

The preferred alternative for plutonium-242 oxide at SRS is to transport the material to LANL for storage.

Evaluation of impacts on land resources, site infrastructure, air quality, water resources, geology and soils, biotic resources, cultural and paleontological resources, socioeconomics, waste management, environmental justice, as well as radiological and hazardous chemical impacts during normal operation and accidents to workers and the public are included in the assessment. The PEIS presents unclassified information only. A classified appendix has also been prepared to support the PEIS.

PUBLIC COMMENTS: The public comment period on the Draft PEIS was conducted from March 8, 1996 to May 7, 1996. During the comment period, public hearings were held in Los Alamos, NM; Albuquerque, NM; Las Vegas, NV; Oak Ridge, TN; Kansas City, MO; Livermore, CA; Washington, DC; Amarillo, TX; Santa Fe, NM; and North Augusta, SC. The Draft PEIS was made available through mailings, requests to DOE's Office of Reconfiguration, and at DOE Public Reading Rooms. In preparing the Final PEIS, DOE considered comments received by mail, fax, handed in at hearings, transcribed from messages recorded by telephone, and those transcribed via Internet. In addition, comments and concerns identified during discussions at public hearings were considered.

In response to comments submitted after issuance of the Draft PEIS and due to additional technical details not available at the time of issuance of the Draft, Volumes I, II, and III of the Final PEIS contain revisions and changes. The revisions and changes made since the issuance of the Draft document are indicated by a double underline for minor word changes or by a sidebar in the margin for paragraph or larger changes. In addition, Volume I and each appendix in Volume III provide a unique reference list to enable the reader to further review and research selected topics. Volume IV (Comment Response Document) of the PEIS contains the comments received during public review of the Draft PEIS and the DOE responses to those comments. DOE has public reading rooms near each affected site and in Washington, DC where these referenced documents may be reviewed or obtained for review.

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Acronyms, Abbreviations, and Conversion Charts

ACRONYMS AND ABBREVIATIONS

A/D	assembly/disassembly
AEC	Atomic Energy Commission
AHF	Advanced Hydrotest Facility
AQCR	Air Quality Control Region
ARS	Advanced Radiation Source
BEBA	beyond evaluation basis accident
BEEF	Big Explosives Experimental Facility
BEIR	biological effects of ionizing radiation
CAA	*Clean Air Act*
CEQ	Council on Environmental Quality
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act*
CFF	Contained Firing Facility
CFR	Code of Federal Regulations
Complex	Nuclear Weapons Complex
CTBT	Comprehensive Test Ban Treaty
CWA	*Clean Water Act*
DARHT	Dual Axis Radiographic Hydrodynamic Test (Facility)
D&D	decontamination and decommissioning
DOD	Department of Defense
DOE	Department of Energy
DOT	Department of Transportation
DP	DOE Office of the Assistant Secretary for Defense Programs
EA	environmental assessment
EBA	evaluation basis accident
EIS	environmental impact statement
EM	DOE Office of the Assistant Secretary for Environmental Management
EPA	Environmental Protection Agency
ES&H	environment, safety, and health
FONSI	Finding of No Significant Impact
FXR	Flash X-Ray (Facility)
HAP	hazardous air pollutants
HE	high explosives
HEPA	high efficiency particulate air (filter)
HEPPF	High Explosive Pulsed Power Facility
HEU	highly enriched uranium
HI	hazard index
HLW	high-level waste
HQ	hazard quotient
ICRP	International Commission on Radiological Protection
INEL	Idaho National Engineering Laboratory
IP	implementation plan
ICST	Industrial Complex Short-Term (model)
K-25	K-25 Site, Oak Ridge Reservation
KCP	Kansas City Plant
LANL	Los Alamos National Laboratory
LLNL	Lawrence Livermore National Laboratory
LLW	low-level waste

NAAQS	National Ambient Air Quality Standards
NEPA	*National Environmental Policy Act*
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NIF	National Ignition Facility
NLVF	North Las Vegas Facility
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPR	Nuclear Posture Review
NPT	Non-Proliferation Treaty
NRC	Nuclear Regulatory Commission
NRHP	National Register of Historic Places
NTS	Nevada Test Site
NWSM	Nuclear Weapon Stockpile Memorandum
NWSP	Nuclear Weapon Stockpile Plan
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
OSHA	Occupational Safety and Health Administration
Pantex	Pantex Plant
PBFA II	Particle Beam Fusion Accelerator
PDD	Presidential Decision Directive
PEIS	programmatic environmental impact statement
PHERMEX	Pulsed High Energy Radiation Machine Emitting X-Rays (Facility)
PL	Public Law
R&D	research and development
RCRA	*Resource Conservation and Recovery Act*
RD&T	research, development, and testing
RIMS	Regional Input-Output Modeling System
ROD	Record of Decision
ROI	region of influence
SAR	Safety Analysis Report
SARA	*Superfund Amendments and Reauthorization Act*
SDWA	*Safe Drinking Water Act*
SMR	standardized mortality ratio
SHPO	State Historic Preservation Officer
SNL	Sandia National Laboratories/New Mexico
SRS	Savannah River Site
START	Strategic Arms Reduction Talks
TA	technical area
TLV-TWA	threshold limit value-time weighted average
TRU	transuranic
TSCA	*Toxic Substances Control Act*
TSP	total suspended particulates
USFWS	U.S. Fish and Wildlife Service
VOCs	volatile organic compounds
Y-12	Y-12 Plant, Oak Ridge Reservation
WIPP	Waste Isolation Pilot Plant

CHEMICALS AND UNITS OF MEASURE

Bq	Becquerel
C	Celsius
Ci	curie
CCl_4	carbon tetrachloride
cm	centimeters
CFC	chlorofluorocarbons
CO	carbon monoxide
dB	decibel
dBA	decibel A-weighted
DCE	1, 2-dichloroethylene
F	Fahrenheit
ft	feet
ft^2	square feet
ft^3	cubic feet
ft^3/s	cubic feet per second
g	grams
gal	gallons
GPD	gallons per day
gpm	gallons per minute
GPY	gallons per year
ha	hectares
hr	hour
in	inches
kg	kilograms
km	kilometers
kV	kilovolts
kVA	kilovolt-ampere
kW	kilowatts
kWh	kilowatt hours
L	liters
lb	pounds
Li	lithium
m	meters
m^2	square meters
m^3	cubic meters
m^3/s	cubic meters per second
mCi	millicurie (one-thousandth of a curie)
mCi/ml	millicurie per milliliter
mg	milligram (one-thousandth of a gram)
mg/L	milligrams per liter
MGY	million gallons per year
mi	miles
MLY	million liters per year
mph	miles per hour
mrem	millirem (one-thousandth of a rem)

MVA	megavolt-ampere
MW	megawatt
MWe	megawatt electric
MWh	megawatt hour
MWt	megawatt thermal
nCi	nanocurie (one-billionth of a curie)
nCi/g	nanocuries per gram
NO_2	nitrogen dioxide
NO_X	nitrogen oxides
O_3	ozone
Pb	lead
PCB	polychlorinated biphenyl
pCi	picocurie (one-trillionth of a curie)
pCi/l	picocuries per liter
PM_{10}	particulate matter (less than 10 microns in diameter)
ppb	parts per billion
ppm	parts per million
rem	roentgen equivalent man
SO_2	sulfur dioxide
t	metric tons
TATB	triaminotrinitrobenzene
TCA	1, 1, 1-trichloroethane
TCE	trichloroethylene
TNT	trinitrotoluene
yd^3	cubic yards
yr	year
μCi	microcurie (one-millionth of a curie)
μCi/g	microcuries per gram
μg	microgram (one-millionth of a gram)
μg/kg	micrograms per kilogram
μg/L	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter
μ	micron or micrometer (one-millionth of a meter)

METRIC CONVERSION CHART

To Convert Into Metric			To Convert Out of Metric		
If You Know	**Multiply By**	**To Get**	**If You Know**	**Multiply By**	**To Get**
Length					
inches	2.54	centimeters	centimeters	0.3937	inches
feet	30.48	centimeters	centimeters	0.0328	feet
feet	0.3048	meters	meters	3.281	feet
yards	0.9144	meters	meters	1.0936	yards
miles	1.60934	kilometers	kilometers	0.6214	miles
Area					
square inches	6.4516	square centimeters	square centimeters	0.155	square inches
square feet	0.092903	square meters	square meters	10.7639	square feet
square yards	0.8361	square meters	square meters	1.196	square yards
acres	0.40469	hectares	hectares	2.471	acres
square miles	2.58999	square kilometers	square kilometers	0.3861	square miles
Volume					
fluid ounces	29.574	milliliters	milliliters	0.0338	fluid ounces
gallons	3.7854	liters	liters	0.26417	gallons
cubic feet	0.028317	cubic meters	cubic meters	35.315	cubic feet
cubic yards	0.76455	cubic meters	cubic meters	1.308	cubic yards
Weight					
ounces	28.3495	grams	grams	0.03527	ounces
pounds	0.45360	kilograms	kilograms	2.2046	pounds
short tons	0.90718	metric tons	metric tons	1.1023	short tons
Force					
dynes	0.00001	newtons	newtons	100,000	dynes
Temperature					
Fahrenheit	Subtract 32, then multiply by 5/9ths	Celsius	Celsius	Multiply by 9/5ths, then add 32	Fahrenheit

METRIC PREFIXES

Prefix	Symbol	Multiplication Factor
exa-	E	1 000 000 000 000 000 000 = 10^{18}
peta-	P	1 000 000 000 000 000 = 10^{15}
tera-	T	1 000 000 000 000 = 10^{12}
giga-	G	1 000 000 000 = 10^{9}
mega-	M	1 000 000 = 10^{6}
kilo-	k	1 000 = 10^{3}
hecto-	h	100 = 10^{2}
deka-	da	10 = 10^{1}
deci-	d	0.1 = 10^{-1}
centi-	c	0.01 = 10^{-2}
milli-	m	0.001 = 10^{-3}
micro-	μ	0.000 001 = 10^{-6}
nano-	n	0.000 000 001 = 10^{-9}
pico-	p	0.000 000 000 001 = 10^{-12}
femto-	f	0.000 000 000 000 001 = 10^{-15}
atto-	a	0.000 000 000 000 000 001 = 10^{-18}

APPENDIX A

Appendix A

APPENDIX A: STOCKPILE STEWARDSHIP AND MANAGEMENT FACILITIES

The Nuclear Weapons Complex (Complex) comprises facilities located at eight major U.S. Department of Energy (DOE) sites, distributed over seven states. Summary descriptions of the Complex sites are presented in chapter 3. This appendix provides more detailed information.

The eight DOE sites described in appendix A include the Oak Ridge Reservation (ORR), the Savannah River Site (SRS), the Kansas City Plant (KCP), the Pantex Plant (Pantex), Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), Sandia National Laboratories (SNL), and the Nevada Test Site (NTS). The first section of this appendix provides reference operating assumptions for each of these sites. Information provided includes specific site descriptions, current missions, and environmental regulatory compliance activities associated with ongoing DOE Office of the Assistant Secretary for Defense Programs (DP), and other DOE and non-DOE programs.

Detailed descriptions of the proposed stockpile stewardship projects can be found in the project-specific analyses contained in appendixes I, J, and K for the National Ignition Facility (NIF), Contained Firing Facility (CFF), and Atlas Facility, respectively.

The last section of this appendix provides detailed descriptions of the stockpile management alternatives. Each description includes specific information describing missions, assumptions, functional parameters, expected capabilities, process descriptions, special process requirements, utilities, chemicals used, operational resources, and transportation.

A.1 Reference Operating Assumptions

The reference base for this Programmatic Environmental Impact Statement (PEIS) is No Action, which is defined in chapter 3. Section 3.3 defines No Action for stewardship and section 3.4 defines No Action for management. No Action allows a comparison of stockpile stewardship and management alternatives for the candidate sites against the configuration as it would be expected to operate in 2005 and beyond, not against the current nuclear weapons facility configuration.

No Action assumes that all sites of the Complex would continue their current nuclear weapons-related missions with existing facilities that can comply with environment, safety, and health (ES&H) requirements, and at a production or research level that is consistent with current DOE guidance. The basic nuclear weapons missions assigned to the sites include researching, developing, and testing; maintaining nuclear weapons production and testing capability; processing and storing nuclear materials; operating an extensive transportation safeguards system to assure the safe, secure movement of weapons and strategic quantities of nuclear materials within the continental United States; and cooperating with the Department of Defense (DOD) in responding to nuclear accidents or incidents throughout the world.

Under No Action, the siting and construction of major new stockpile stewardship and management facilities would not occur, there would be no upgrades or modifications to existing facilities other than routine maintenance and repairs, no nuclear weapons missions would be transferred, and future support of the nuclear weapons stockpile would be provided within the confines of the existing Complex capabilities. Some mission requirements for maintenance of the weapons stockpile in the future would not be met under No Action; however, No Action includes those mission requirements as a comparison for the stockpile stewardship and management alternatives. The No Action alternative assumes that weapons Complex sites would continue existing waste management programs which currently support weapons work to meet legal requirements and commitments in formal agreements and would proceed with ongoing cleanup activities related to past weapons work at these sites. Production facilities and support roles at specific sites, however, would be downsized or eliminated in accordance with the reduced workload projected for 2005 and beyond. Facilities that could not comply with requirements would no longer be used.

Detailed reference descriptions of the affected sites follow. These descriptions include discussions of the site location, missions, facility operations, and environmental regulatory compliance. Seismic zone locations of alternative sites are shown in figure A.1–1.

A.1.1 Oak Ridge Reservation

Site Description. ORR consists of approximately 13,980 hectares (ha) (34,545 acres) of Federal-owned lands located directly to the west and south, but within the incorporated city limits of Oak Ridge, TN. The residential section of Oak Ridge forms the northern boundary of the reservation. The Tennessee Valley Authority's Melton Hill and Watts Bar reservoirs on the Clinch and Tennessee Rivers form the eastern, southern, and western boundaries. The city of Oak Ridge and ORR are within the region known as the Great Valley of the Tennessee River, which lies between the Cumberland and Great Smoky Mountains. About 16 kilometers (km) (10 miles [mi]) to the northwest, the Cumberland Mountains rise to an elevation of 914 meters (m) (3,000 feet [ft]) or more, while the Great Smoky Mountains National Park reaches to heights over 2,000 m (6,600 ft) some 113 km (70 mi) to the southeast. The largest city in the area, Knoxville, is located approximately 48 km (30 mi) to the southeast. Land use in the five-county area surrounding ORR varies from the heavily populated and highly developed urban areas around Knoxville to the sparsely populated areas immediately surrounding ORR. The largest single land use for each of the five counties is forestry; the second most common land use is agriculture. The locations of ORR and its principal facilities are shown in figures A.1.1–1 and A.1.1–2.

ORR is a Government-owned, contractor-operated reservation. The prime contractor manages the Y-12 Plant (Y-12), the K-25 site (formerly the Oak Ridge Gaseous Diffusion Plant), the Oak Ridge National Laboratory (ORNL), and most other properties on the reservation. Originally built in the early 1940s for large-scale production of fissionable material for the world's first nuclear weapon, ORR continues to be used today as a research, development, and manufacturing institution.

Y-12 Plant. Y-12 is situated on 328 ha (811 acres), 225 ha (630 acres) of which are enclosed by perimeter security fencing, at the eastern end of ORR in the location known as Bear Creek Valley. The majority of DP activities at ORR are conducted at Y-12. Primary missions include dismantling nuclear weapons components returned from the national arsenal, maintaining nuclear production capability, and providing stockpile support and storage for special nuclear materials. Y-12 also supports other Federal agencies through a Work for Others program. In addition, a technology transfer program has been established to support the U.S. industrial base by applying Y-12 expertise to a wide range of manufacturing problems. All of the current nuclear weapons have components produced at Y-12. The plant itself consists of 494 buildings containing more than 650,000 square meters (m^2) (7,000,000 square feet [ft^2]) of floor space.

Y-12 also provides processing of radioactive source materials and support for other Government agencies. Some 47 buildings containing approximately 140,000 m^2 (1,500,000 ft^2) of floorspace located on Y-12 grounds are utilized by ORNL in support of non-DP missions. ORNL employs some 450 people at Y-12. Also located on the Y-12 site are approximately 20 buildings containing 28,000 m^2 (300,000 ft^2) that house the DOE construction manager, the water plant maintenance contractor for ORR, and several organizations of the Oak Ridge Operations Office. These activities employ 175 people in DOE and 550 people in construction manager organizations.

K-25 Site. K-25 consists of approximately 688 ha (1,700 acres) and is located about 9.6 km (6 mi) northwest of Y-12. The site consists of 250 buildings with approximately 1,130,000 m^2 (12,200,000 ft^2) of floor space. The primary mission of K-25 has been providing enriched uranium for U.S. nuclear weapons and, later, providing uranium toll enrichment services for use in power reactor facilities around the world. Because of a lack of weapons or commercial requirements, the gaseous diffusion process at K-25 was permanently shut down in 1987. Today, K-25 serves as the operations center for environmental restoration and waste management programs. K-25 is also the home of DOE's Center for Environmental Technology and Center for Waste Management. Missions and activities include technology development, technology transfer, engineering technology, uranium enrichment support, and the central functions of business management, engineering, computing, and telecommunications.

Oak Ridge National Laboratory. ORNL is a large multipurpose research institution that consists of approximately 1,174 ha (2,900 acres) located 6.5 km

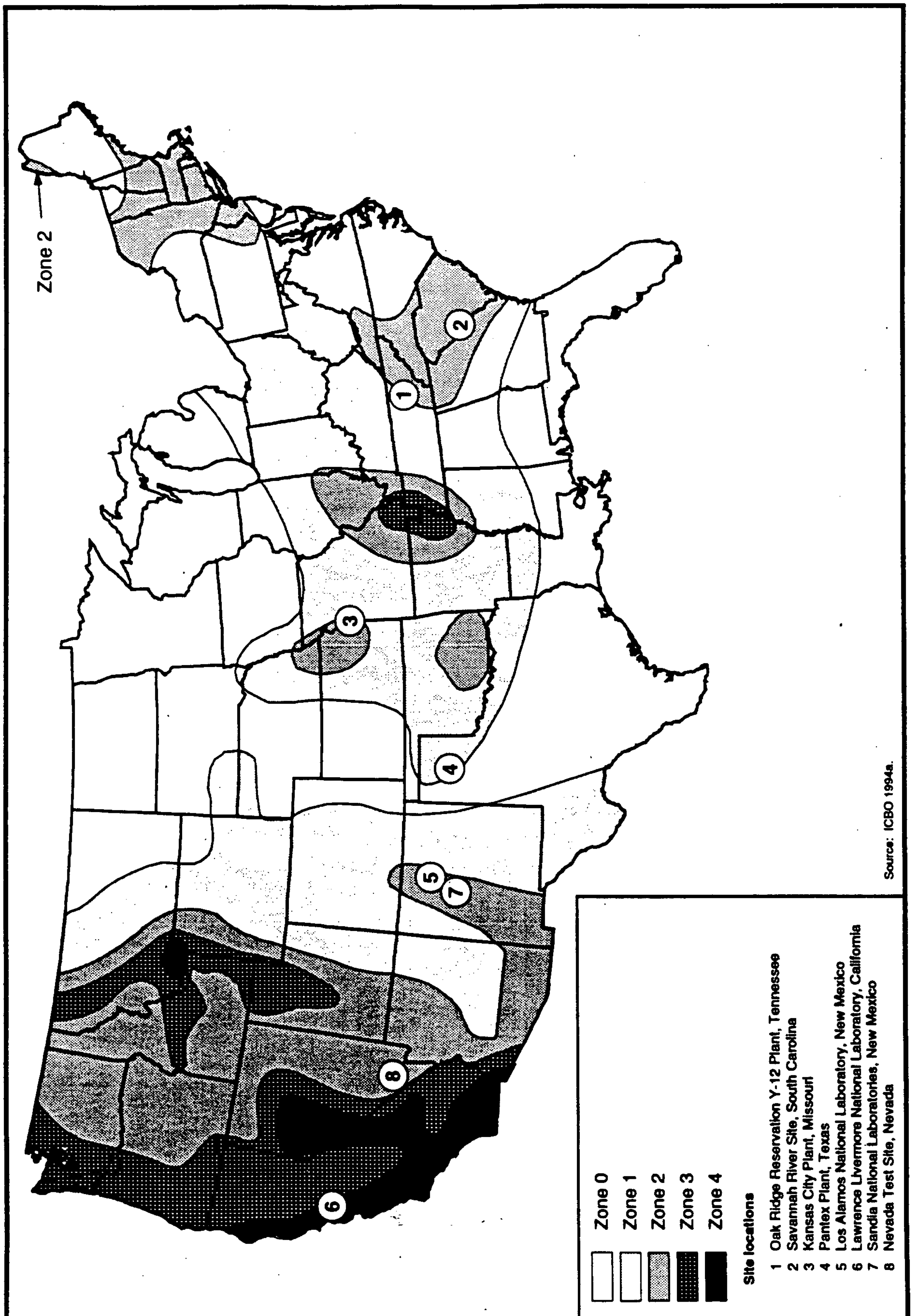

FIGURE A.1–1—*Seismic Zone Locations of Alternative Sites.*

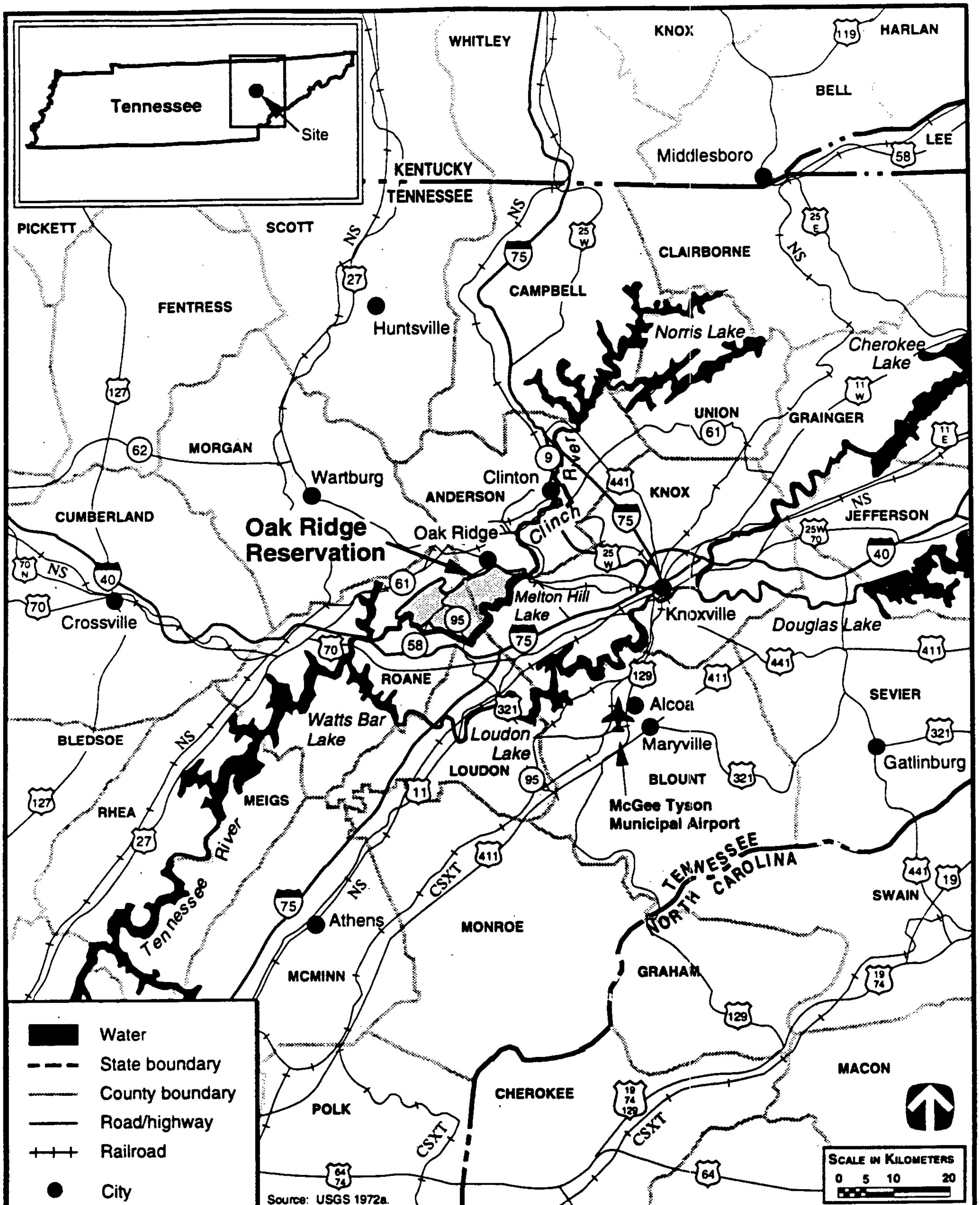

FIGURE A.1.1–1.—*Oak Ridge Reservation, Tennessee, and Region.*

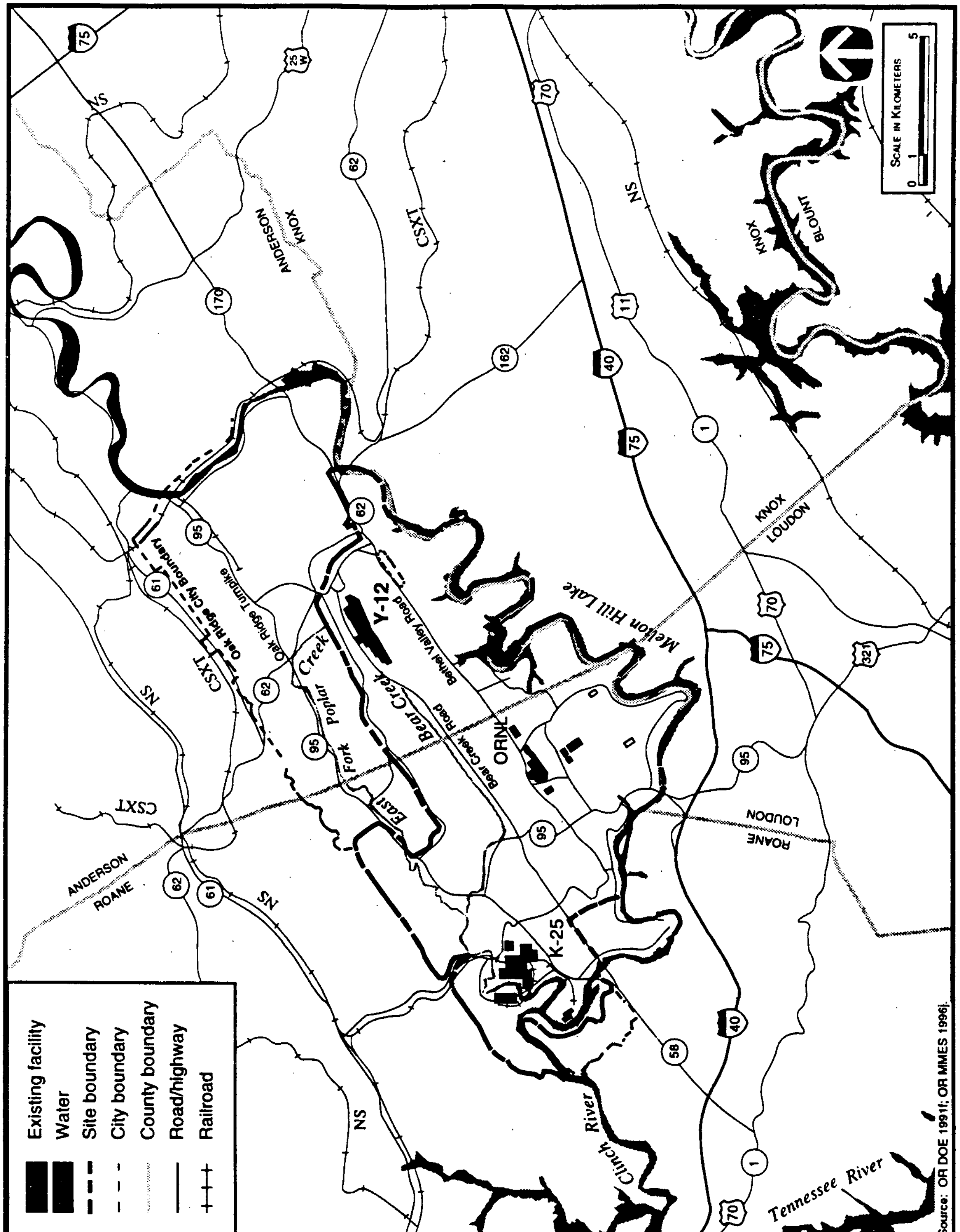

FIGURE A.1.1–2.—*Principal Facilities at Oak Ridge Reservation.*

(4 mi) southwest of Y-12. The site has approximately 240 buildings containing 250,000 m^2 (2,700,000 ft^2) of floor space. Missions and activities include energy production and conservation technologies, physical and life sciences, scientific and technological user facilities, environmental protection and waste management, science and technology transfer, and education.

ORNL programs focus on basic and applied research, technology development, and technology that has been designated important to DOE and the Nation. It also performs work for non-DOE sponsors when such activities complement DOE missions and address significant national or international issues. ORNL facilities include a high-flux nuclear research reactor, chemical pilot plants, research laboratories, radioisotope production laboratories, accelerators, fusion test devices, and support facilities.

The onsite buildings and structures outside the major plant sites consist of the Scarboro Facility, the Central Training Facility, the Transportation Safeguards Division Maintenance Facility, and some ancillary structures. Most physical facilities used by the various plant protection and security groups are within the plant's fenced area; however, the target ranges are outside the fence but within the buffer zones of the main plant areas. Small-arms ranges are located on the eastern end of Y-12 and north of the western end of ORNL.

The offsite buildings and structures consist of the Oak Ridge Operations Office, the DOE Office of Scientific and Technical Information, the Oak Ridge Institute for Science and Education facilities, the American Museum of Science and Energy, the prime contractor's "Townsite" facilities, the National Oceanic and Atmospheric Administration's Atmospheric Turbulence and Diffusion Laboratory, and other buildings. With the exception of the Federal Office Building and space leased from the private sector, all buildings and structures used for DOE functions are situated on DOE-owned land.

The Oak Ridge National Environmental Research Park, established in 1980, consists of 5,500 ha (13,590 acres) on ORR. As one of seven DOE research parks, its purpose is to provide protected land areas for research and education in the environmental sciences and to demonstrate that energy technology development is compatible with a quality environment. There are 53 active environmental sciences research sites consisting of 1,442 ha (3,562 acres) on ORR. In addition, there are 15 inactive sites on 131 ha (323 acres).

The primary missions of the Oak Ridge Institute for Science and Education are to provide educational and research programs in the areas of health, environment, and energy for DOE, other Federal agencies, and private industry. The American Museum of Science and Energy is located at a site contiguous to the campus of Oak Ridge Institute for Science and Education. The museum contains historical displays and exhibits about energy in its various forms, as well as topical matter on the growth of the nuclear power industry.

The National Oceanic and Atmospheric Administration conducts meteorological and atmospheric diffusion research, that is supported by both itself and DOE, at the Atmospheric Turbulence and Diffusion Laboratory and field sites on ORR. This laboratory also provides services to DOE contractors and operates the weather instrument telemetering monitoring system for DOE.

Environmental Regulatory Setting. The policy of ORR is to conduct operations safely and to minimize any adverse impact of operations on the environment, ensuring incorporation of all local and national environmental-protection goals in the daily conduct of business. ORR consists of Y-12, ORNL, and K-25 and most permits and data on releases are reported by individual sites, with Y-12 being the most important site for making decisions in this PEIS. However, some environmental compliance agreements consider ORR to be a single Federal facility.

The Environmental Protection Agency (EPA) has delegated regulatory authority to the State of Tennessee for air, water, solid waste, hazardous waste, and mixed waste. The State of Tennessee and DOE have entered into a 5-year Oversight Agreement that was signed on May 13, 1991. That agreement has been extended for an additional 5 years until June 28, 2001. The purpose of this agreement is to assure Tennessee citizens that their health, safety, and the environment are being protected during ORR operations. The agreement reflects the obligations and agreements between DOE and the state regarding technical and financial support provided by DOE and the state for oversight of these activities. The agreement has provisions for modifications, as appropriate, to address community issues that may arise. The Tennessee Department of Environment and Conservation is the lead state agency for implementation of the agreement. This agency has established a DOE Oversight Division located in the city of Oak Ridge and is staffed with over 50 employees. The Oversight Division routinely visits the three ORR sites to attend formal meetings and briefings, to conduct walk throughs of buildings and grounds, or to conduct observations of site operations to ensure compliance with environmental regulations and DOE orders.

The remainder of this section summarizes the status of Y-12 compliance with the major environmental regulations.

National Environmental Policy Act. DOE finalized the environmental assessment (EA) for the *Proposed Interim Storage of Enriched Uranium Above the Maximum Historical Storage Level at the Y-12 Plant, Oak Ridge, Tennessee,* in September 1994, and issued a Finding of No Significant Impact (FONSI). This EA analyzed the storage of a larger quantity of enriched uranium than historically had been stored at Y-12. In its FONSI, DOE decided to store no more than 500 metric tons (t) (550 short tons [tons]) of highly enriched uranium (HEU) and 7,105.9 t (7,833 tons) of low-enriched uranium at Y-12 on an interim basis until long-term storage and disposition decisions can be made and implemented.

Comprehensive Environmental Response, Compensation, and Liability Act. ORR was placed on the National Priorities List (NPL) on December 21, 1989, making the site subject to the provisions of the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA). As a result, DOE, EPA, and the state developed a Federal Facility Agreement for environmental restoration activities at ORR effective January 1, 1992, to serve as the interagency agreement in accordance with Section 120 of CERCLA. The agreement is intended to integrate the corrective action processes of the *Resource Conservation and Recovery Act* (RCRA) and CERCLA. EPA, DOE, and the state have negotiated the agreement to ensure that the environmental impacts associated with past and present activities at ORR are thoroughly investigated and that appropriate remedial actions or corrective measures are taken.

The Federal Facility Agreement establishes a procedural framework and schedule for developing, implementing, and monitoring response actions at ORR in accordance with CERCLA, RCRA, the *National Environmental Policy Act* (NEPA), and applicable state laws. Response actions under the agreement will achieve comprehensive remediation of releases or threatened releases of hazardous substances, hazardous wastes, pollutants, or contaminants at or from ORR. The agreement coordinates responses and remedial activities necessary to protect human health and the environment and reduces duplication of corrective actions or administrative requirements under CERCLA and RCRA. The three parties to the agreement intend to consolidate the DOE CERCLA response obligations with the corrective action measures required under RCRA permits. The agreement also addresses technical standards for new and existing liquid low-level radioactive waste storage tanks.

Emergency Planning and Community Right-To-Know Act. Sections 311 and 312 of the act require reporting to local officials the inventories of hazardous chemicals and extremely hazardous substances. Y-12 reported inventories in 1993, which included 42 hazardous chemicals and 5 extremely hazardous substances.

Resource Conservation and Recovery Act. The three ORR sites each generate both RCRA hazardous waste and mixed waste. Y-12 conducts storage, treatment, and disposal of hazardous waste under RCRA Part B Permits, and interim-status provisions. The Hazardous and Solid Waste Amendments permit requirements for corrective actions, effective since October 25, 1986, have now been integrated into the Federal Facility Agreement previously mentioned under CERCLA.

Effective June 12, 1992, DOE and EPA completed a Federal Facilities Compliance Agreement to resolve the compliance issue of storing land-banned waste for extended periods. The agreement acknowledges that ORR is currently storing, and will continue to store, mixed waste subject to land disposal restrictions. It contains a compliance schedule that dictates the steps required to bring ORR facilities into compliance with respect to the management of mixed wastes and includes the strategies and plans for treatment of the backlog of land-banned waste.

In May 1991, a moratorium on offsite shipment of hazardous waste to non-DOE sites was placed on

DOE facilities, including those on ORR. The moratorium was established to prevent waste containing any radioactive material from being shipped to a facility that is not licensed to handle it. The moratorium essentially requires all RCRA hazardous waste generated at ORR to be managed as mixed waste until appropriate procedures are developed and approved to ensure that waste streams are free of radioactivity above background levels. Such procedures have been prepared by each of the ORR sites. Y-12 received approval from DOE for four procedures certifying "No Rad Added" to allow offsite shipment of hazardous wastes.

Water quality data from the exit-pathway wells at the east end of Y-12 may indicate that the volatile organic compounds (VOCs) carbon tetrachloride and tetrachloroethane are being transported off ORR through the Maynardville Limestone at depths of 30 to 91 m (100 to 300 ft). The monitoring well is located in a general industrial area, and no drinking water wells have been identified in the area. Property owners in the area have been notified and provided with a status report.

The Federal Facility Compliance Act of 1992. This act is an amendment to RCRA. DOE published the Interim Mixed Waste Inventory Report in April 1993, annual updates, and periodic updates describing its inventory of mixed wastes and treatment capabilities. ORR prepared and submitted to the state in October 1993 a conceptual site treatment plan for ORR. In accordance with the *Federal Facility Compliance Act*, a Commissioner's Order issued on September 26, 1995, by the State of Tennessee, to become effective on October 2, 1995, included the Site-Specific Treatment Plan for Mixed Waste at ORR. This order allows ORR to store existing quantities of mixed waste and requires DOE to comply with a site treatment plan. The site treatment plan contains milestones and target dates for DOE to characterize and treat its inventory of mixed waste.

Clean Water Act. National Pollutant and Discharge Elimination System (NPDES) permits are required for each ORR facility. The Y-12 NPDES permit was issued April 28, 1995, and encompasses about 150 active point-source discharges requiring compliance monitoring. The new NPDES permit covers stormwater discharges, as well as point source discharges. The number of permitted-outfalls continues to decline as the outfalls are consolidated or eliminated, or as changes in implementation occur at the site. Through monitoring of discharges, DOE can demonstrate that Y-12 has achieved an NPDES permit compliance rate in 1993 of more than 99 percent.

Sanitary wastewater from Y-12 is discharged to the city of Oak Ridge under an industrial pretreatment permit. The Y-12 sanitary sewer upgrade project is an example of DOE corrective actions to achieve and maintain the Y-12 sanitary sewer collection system in regulatory compliance with the city of Oak Ridge sanitary sewer use ordinance and pretreatment permit. As part of the upgrade, a new monitoring station was completed in July 1994 and allows for more accurate monitoring of the sanitary sewage discharges by Y-12.

Activities are underway to reduce discharges of pollutants to surface waters of ORR. For example, two dechlorination systems were installed in late 1992 at key Y-12 outfalls on East Fork Poplar Creek to help control discharges of chlorine from noncontact cooling water systems and to help to eliminate chronic fish kills in the upper reaches of the creek. Additional efforts relating to reducing nonpoint-source pollutants to surface streams and cleaning up mercury pollution in the East Fork Poplar Creek are being implemented.

On January 17, 1992, Friends of the Earth, a nonprofit corporation, filed a lawsuit against DOE in Federal District Court in Knoxville, TN. The lawsuit alleged that DOE violated the NPDES permits because discharges of certain quantities of various pollutants into tributaries of the Clinch River exceeded the allowable discharge limits of the NPDES permits. Friends of the Earth filed a motion for summary judgment in October 1992, and DOE filed a cross-motion for denial of summary judgment in January 1993. Both motions are pending before the court. A second lawsuit was filed in Federal District Court by the Friends of the Earth in October 1995, alleging NPDES monitoring and reporting violations. This lawsuit is also pending.

Safe Drinking Water Act. The systems that supply drinking water to ORR are DOE-owned; therefore, ORR must comply with all Federal, state, and local requirements regarding the provision of safe drinking water. Section 1447 of the act mandates such compliance for each Federal agency having jurisdiction over a Federal-owned or Federal-maintained public water system. Y-12 receives water from a DOE-owned water treatment facility located northeast of Y-12. The Y-12 system is designated as a "nontransient, noncommunity" water distribution system and is subject to the Tennessee Regulations for Public Water Systems and Drinking Water Quality. These regulations allow distribution systems that do not perform water treatment to use the records sent to the state by the water-treatment facility from which water is received to demonstrate compliance with requirements.

Clean Air Act. Authority for enforcement of the act is shared between the state, for nonradioactive emission sources, and EPA, for radioactive emission sources. *Clean Air Act* (CAA) compliance is an integral part of the state air permit program which has issued air permits for construction and operating sources to all three ORR sites. Each site complies with Federal clean air regulations in addition to the State of Tennessee air-permit conditions. Major sources are appropriately permitted, and documentation of compliance is developed. All major emission sources are permitted by the state and are operating in compliance with those permits as of December 31, 1993. Y-12 has 94 active air permits covering 400 air emission points, and currently has about 290 documented exempt minor sources and about 350 exempt minor emission points.

ORR is also in full compliance with the requirements as set forth in 40 *Code of Federal Regulations* (CFR) 61, Subpart H (National Emission Standards for Emissions of Radionuclides Other than Radon from DOE Facilities), for sampling significant radionuclide emission points. Continuous emissions monitoring is performed at the K-25 incinerator and at 74 potential radiological exhaust stacks serving uranium-processing areas at Y-12. The stacks are equipped with continuous stack samplers, because these stacks are judged to have the potential to emit uranium emissions that could contribute greater than 0.1 mrem per year effective dose equivalent to an offsite individual. EPA certified that ORR had completed all of the actions required by the *May 1992 Federal Facility Compliance Agreement for Clean Air Act* (ORR Rad-NESHAP) and was considered to be in compliance with the National Emissions Standards for Hazardous Air Pollutants (NESHAP) regulations. A subsequent inspection in September 1993 confirmed such compliance.

Y-12 is also subject to an NESHAP rule for machining beryllium and currently monitors four stacks that serve beryllium machining and handling areas to demonstrate compliance with the 10 grams per day emission limit. The total beryllium emitted from Y-12 in 1993 was less than 1 gram.

Toxic Substances Control Act. The *Toxic Substances Control Act* (TSCA) requires polychlorinated biphenyl (PCB) wastes to be disposed of within 1 year from the date the PCBs are removed from service. Because of a lack of available disposal avenues, radioactive wastes contaminated with PCBs are stored at ORR sites for periods exceeding 1 year. Unauthorized uses and storage of PCBs are covered under the equipment-specific agreements with EPA or the Uranium-Enrichment PCB Federal Facilities Compliance Agreement, signed February 20, 1992. This agreement between DOE and EPA provides a vehicle for resolution of PCB issues only at K-25. The K-25 incinerator is the only facility in the Nation permitted to incinerate RCRA, PCB, and radioactive waste. This agreement allows K-25 to store such wastes generated by K-25 for periods exceeding one year.

Radioactive wastes contaminated with PCBs older than 1 year are generated by other ORR facilities, particularly Y-12, and also are stored at K-25. Several compliance issues exist at Y-12, because the Federal Facilities Compliance Agreement does not include PCB storage at Y-12. Therefore, discussions are continuing with EPA towards a new agreement that would include Y-12 and ORNL, as well as K-25. The new agreement is tentatively entitled the Oak Ridge Reservation PCB Federal Facilities Compliance Agreement. Storage concerns addressed under the existing agreement for K-25 would be included in the proposed Federal Facilities Compliance Agreement for the entire ORR. The earliest anticipated date for issuance of the PCB Federal Facility Compliance Agreement is in 1996.

Federal Insecticide, Fungicide, and Rodenticide Act. The three ORR sites maintain procedures for the storage and application of pesticides. Individuals responsible for the application of materials regulated by the *Federal Insecticide, Fungicide, and Rodenticide Act* are certified through the University of Tennessee Department of Agriculture. Safrotin®, used for the control of roaches, is the only restricted-use pesticide used at Y-12. No violations were identified during the 1993 *Federal Insecticide, Fungicide, and Rodenticide Act* inspection.

A.1.2 Savannah River Site

Site Description. SRS, 19 km (12 mi) south of Aiken, SC, and approximately 26 km (16 mi) southeast of Augusta, GA, occupies 80,130 ha (198,000 acres) of land. Established in 1950, SRS has been involved for more than 40 years in tritium operations and other nuclear material production. Today, the site contains 15 major production, service, research, and development areas, not all of which are in operation at this time. The locations of SRS and its principal facilities are shown in figures A.1.2–1 and A.1.2–2.

The developed areas of the site account for less than 5 percent of the land use and more than 99 percent of the total capital investment. There are more than 3,000 facilities at SRS, including 740 buildings, with approximately 511,000 m^2 (5.5 million ft^2) of floor area.

Major nuclear facilities at SRS include fuel and target fabrication facilities, nuclear material production reactors, chemical separations plants, a uranium fuel processing area, liquid high level waste (HLW) tank farms, a waste vitrification facility, and the Savannah River Technology Center. SRS is in the process of stabilizing and storing various forms of plutonium. This effort, supported by the *F-Canyon Plutonium Solutions Environmental Impact Statement* (DOE/EIS-0219) and the ROD (FR 9824), converts this material to plutonium metal. The process in FB-Line began in November 1995 and the conversion process in F-Canyon was completed in April 1996. The metal product will be stored temporarily in one of the F-Area vaults (FB-Line, 235-F or 247-F). Tritium recycling facilities at SRS empty tritium from expired reservoirs, purify it to eliminate the helium decay product, and fill replacement reservoirs with specification tritium for nuclear stockpile weapons. Filled reservoirs are delivered to Pantex for weapons assembly, or directly to DOD as replacements for expired reservoirs. Historically, DOE has produced tritium at SRS, but has not produced any since 1988.

Tritium recycling operations will continue with the replacement tritium facility conducting the majority of these operations. As part of the nonnuclear consolidation, SRS received some of the tritium processing functions formerly performed at the Mound Plant in Miamisburg, OH.

The current missions at SRS are shown in table 3.2.3–1. These activities can be categorized as DP, Office of Environmental Management (EM), nuclear energy, and other activities.

Defense Program Activities. In the past, the SRS complex produced nuclear materials for DP. This complex consists of five reactors (the C-, K-, L-, P-, and R-Reactors) in addition to a fuel and target fabrication plant, two target and spent nuclear fuel chemical separations plants, a tritium-target processing facility, a heavy-water rework facility, and waste management facilities. The K-Reactor (the last operational reactor) was put into cold standby status in 1992 with no planned provision for restart. SRS is still conducting tritium recycling operations in support of stockpile requirements using tritium recovered from retired weapons as the tritium supply source. Based on the record of decision (ROD) for tritium supply and recycling, issued in December 1995, SRS will continue to perform tritium recycling operations and would be the site for accelerator production of tritium if that technology were selected in the future. In addition, SRS would be the site for a tritium extraction facility to support the commercial reactor option of supplying tritium.

Other Department of Energy Activities. EM is pursuing a 30-year plan to achieve full compliance with all applicable laws, regulations, and agreements; treat, store, and dispose of existing wastes; reduce generation of new wastes; cleanup inactive waste sites; remediate contaminated groundwater; and dispose of surplus facilities.

The Savannah River Technology Center provides technical support to all DOE operations at SRS. In this role, it provides process engineering development to reduce costs, waste generation, and radiation exposure. SRS continues to provide plutonium-238 required to support space programs and has an expanding mission to transfer unique technologies developed at the site to industry. SRS is also an active participant in the Strategic Environmental Research and Development Program formulated to develop technologies to mitigate environmental hazards at DOD and DOE sites.

Non-Department of Energy Activities. There are several facilities and operations at SRS that deal mainly with the ecological elements of the site. These are the Savannah River Forest Station, the

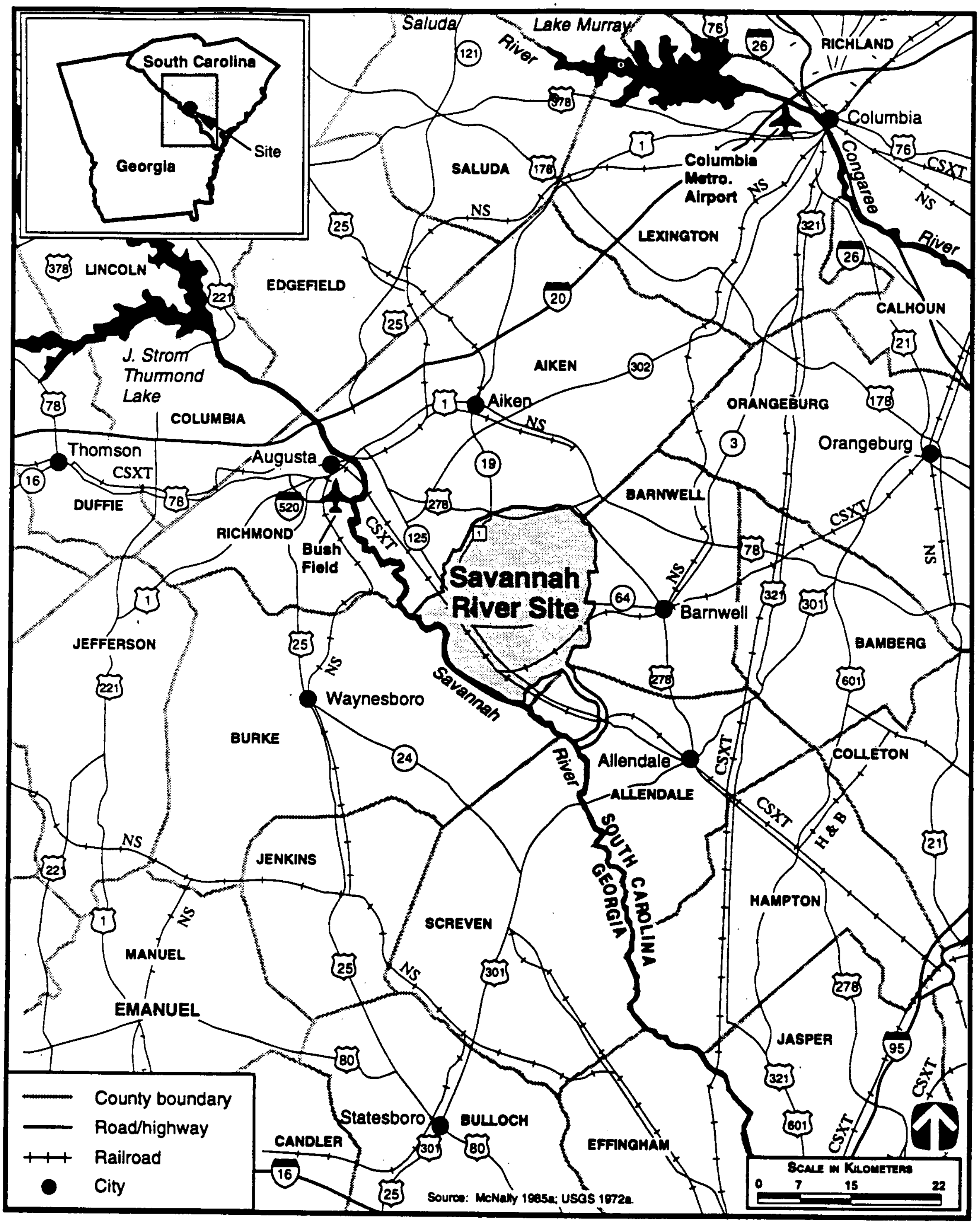

FIGURE A.1.2–1.—*Savannah River Site, South Carolina, and Region.*

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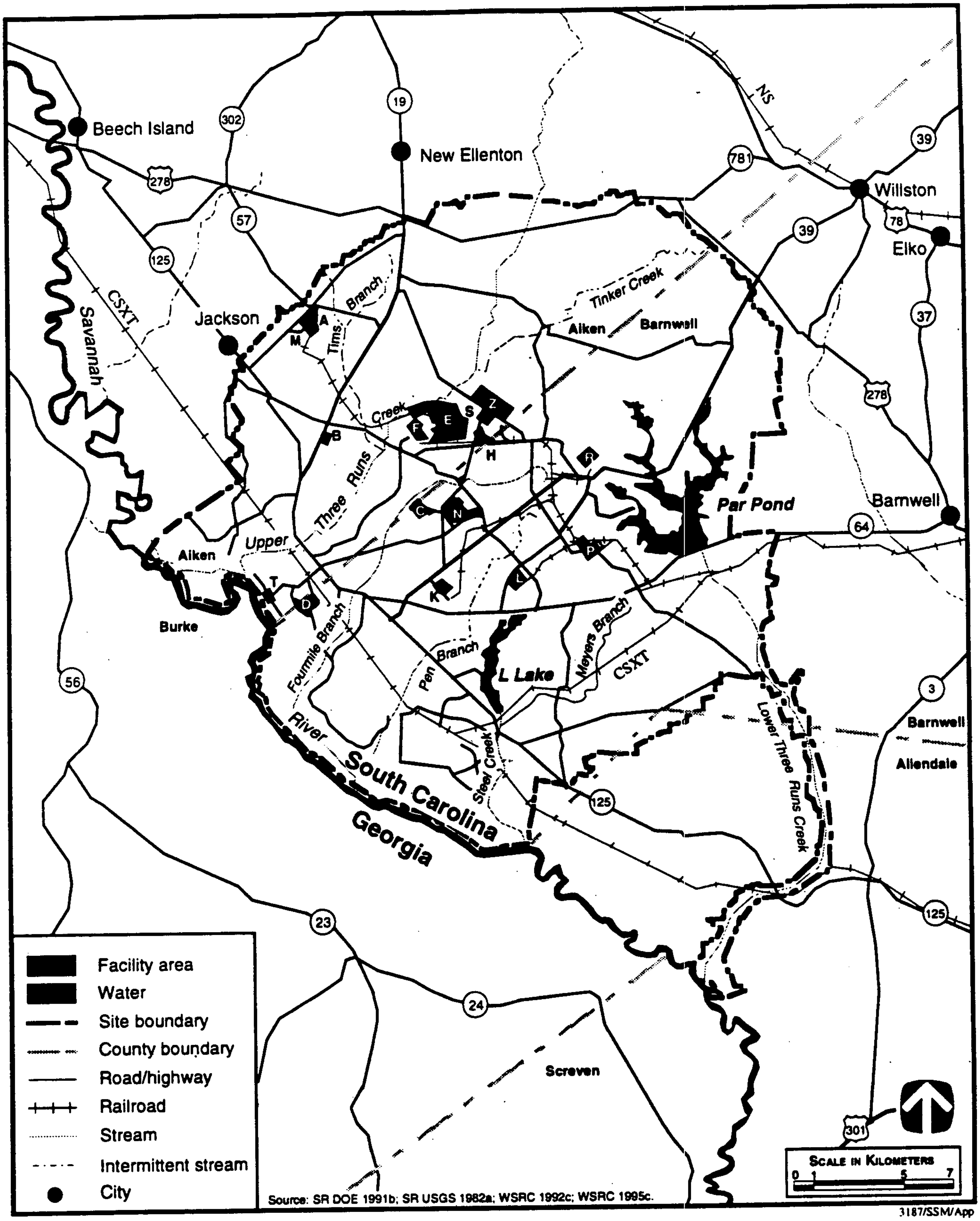

FIGURE A.1.2–2.—*Principal Facility Areas at Savannah River Site.*

Savannah River Ecology Laboratory, the South Carolina Wildlife and Marine Resources Department, the Institute of Archaeology and Anthropology, and the Soil Conservation Service.

Environmental Regulatory Setting. SRS had 544 construction and operating permits in 1993 that specified operating levels for each permitted source (WSRC 1994d:32). Completion of construction in progress and continued operation of permitted facilities are essential to overall SRS operations. Therefore, DOE emphasizes compliance with the terms of these permits as well as with applicable Federal and State of South Carolina environmental regulations and DOE orders related to environmental protection. SRS employed over 1,000 people devoted full-time to protecting the environment through environmental activities in 1993 while accomplishing SRS missions (WSRC 1994d:15). The remainder of this section summarizes the status of SRS compliance with the major environmental regulations.

National Environmental Policy Act. DOE has numerous NEPA documents affecting SRS proposed actions which are in various stages of completion as SRS complies with the requirements of NEPA and Council on Environmental Quality (CEQ) regulations. For example, DOE published the *Savannah River Site Waste Management Final Environmental Impact Statement* (DOE/EIS-0217) in July 1995, which recommended the moderate waste treatment configuration. This configuration would provide a balanced mix of technologies that includes extensive treatment of those waste types that have the greatest potential to adversely affect humans or the environment because of their mobility or toxicity if left untreated, or that would remain dangerously radioactive far into the future. It would provide less extensive treatment of wastes that do not pose great threats to humans or the environment, or that will not remain dangerously radioactive far into the future.

Comprehensive Environmental Response, Compensation, and Liability Act. EPA placed SRS on the NPL effective December 21, 1989. DOE, the South Carolina Department of Health and Environmental Control, and EPA signed a Federal Facility Agreement effective August 16, 1993, to coordinate CERCLA cleanups at SRS, as required by Section 120 of CERCLA. Since the initial listing of the NPL in 1989, SRS has conducted both CERCLA and RCRA cleanup activities under the framework established in the draft Federal Facility Agreement. The comprehensive remediation of SRS will continue as directed by the Federal Facility Agreement currently in place.

Emergency Planning and Community Right-To-Know Act. Each year SRS completes a section 312 annual Tier II inventory report for all hazardous chemicals present at the site in excess of specified quantities and submits it to the South Carolina Department of Health and Environmental Control and to local emergency planning organizations in Aiken, Allendale, and Barnwell Counties, South Carolina. SRS also files an annual toxic release inventory report with EPA based on calculated chemical releases to the environment, which reports aggregate quantities for each regulated chemical that exceeds established threshold amounts. SRS reported eight chemicals to EPA in 1992, with releases totaling 34,820 kilograms (kg) (76,763 pounds [lb]) (WSRC 1994d:19). Changes in facility operating status will lead to changes in chemical inventories and uses of toxic chemicals; the hazardous chemical inventory and toxic release inventory reports will reflect these changes.

Resource Conservation and Recovery Act. The SRS hazardous waste permit was issued in 1987 and modified in 1992. The permit covers storage of wastes at four buildings, treatment at the Consolidated Incineration Facility, and maintenance and groundwater remediation at three closed waste units. Other waste management facilities at SRS are presently operating under interim status. SRS has submitted to the South Carolina Department of Health and Environmental Control a permit application covering the facilities' activities, under which they can continue to operate in conformance with regulatory requirements while applications are reviewed by the regulatory agencies and a final permit decision is issued.

The Federal Facility Compliance Act of 1992. This act is an amendment to RCRA. Westinghouse Savannah River Company submitted a mixed waste inventory report January 13, 1993, and DOE published the complex-wide report, *US DOE Interim Mixed Waste Inventory Reports*, on April 12, 1993. DOE provided this report, and annual and periodic updates since, to state governors and to regulatory agencies in states that host DOE sites, describing its inventory of mixed wastes and treatment capabilities.

To meet requirements established by this act, SRS prepared and submitted a *Proposed Site Treatment Plan* (WSRC-TR-94-0608, May 1995) that sets forth options for treating mixed wastes currently in storage at SRS or that will be generated there over the next 5 years.

Clean Air Act. The air quality control construction permit for the Consolidated Incineration Facility was granted by the South Carolina Department of Health and Environmental Control on November 25, 1992. Emergency power diesel generators are covered under this permit. The M-Area Vendor Treatment facility emergency diesel generator is exempt from permitting requirements because of its limited capacity and expected use. A permitting exemption has been granted for the emergency diesel generator at the replacement HLW evaporator. The SRS NESHAP radionuclide program continues to change to incorporate sampling, monitoring, and dose assessment practices that meet or exceed the requirements of 40 CFR 61, Subpart H. SRS is currently in compliance with CAA requirements.

Clean Water Act. The South Carolina Department of Health and Environmental Control has issued *Clean Water Act* (CWA) permits for the F- and H-Area Tank Farms, Defense Waste Processing Facility, Z-Area Saltstone Facility, replacement HLW evaporator, F- and H-Area Effluent Treatment facilities, and M-Area Liquid Effluent Treatment Facility. Certain discharges from the outfalls at these facilities have been approved. DOE has submitted an industrial wastewater treatment permit application for the M-Area Vendor Treatment Facility. SRS is currently in compliance with CWA requirements.

Safe Drinking Water Act. SRS continues to work toward upgrading the 13 major treatment/distribution systems through which SRS provides drinking water to its employees. The State of South Carolina recommended that SRS consolidate 11 of the 13 major site drinking water systems into three systems. Work is in progress to implement this consolidation. Westinghouse Savannah River Company obtained a construction permit for the water line extension that will serve the Consolidated Incineration Facility.

Toxic Substances Control Act. Disposal of PCBs from SRS is conducted at EPA-approved disposal facilities within the regulatory timeframe. SRS has some PCBs which were radioactively contaminated during a spill in 1978. The act calls for annual disposal of PCB waste, but there is insufficient capacity for disposal of radioactive PCB waste offsite. These radioactive PCB materials are stored onsite in a facility that meets storage requirements for up to 1 year. SRS continues to seek disposal technologies and facilities that can handle radioactive PCB waste.

A.1.3 Kansas City Plant

Site Description. KCP is situated on approximately 57 ha (141 acres) of the 121-ha (300-acre) Bannister Federal Complex located within incorporated city limits 19 km (12 mi) south of the downtown center of Kansas City, MO. The plant shares the Bannister Federal Complex site with other Federal agencies: the General Services Administration, the Department of Defense Finance and Accounting Service, the Federal Aviation Administration, the National Archives and Records Center, and the Internal Revenue Service, among others. The locations of the Bannister Federal Complex and its major facilities are shown in figures A.1.3–1 and A.1.3–2.

KCP currently contains approximately 297,000 m^2 (3.2 million ft^2) of floor space with approximately 82 percent located within the large Federal office and industrial building that dominates the site. KCP and the rest of the Bannister Federal Complex are completely developed with limited open space. No residential structures are within the Bannister Federal Complex. Kansas City has zoned the Bannister Federal Complex, including KCP, as heavy industrial.

KCP is a Government-owned, contractor-operated facility that produces and procures nonnuclear electrical, electronic, electromechanical, mechanical, plastic, and nonfissionable metal components for the DOE nuclear weapons program. In 1992, there were 4,473 people employed at KCP. Site employment is expected to decrease to approximately 3,900 by the year 2000 (KCP 1995a:1). KCP's primary missions are shown in table 3.2.4–1.

DP activities comprise the vast majority of operations at KCP. The nuclear weapons-related operations at KCP are production and maintenance of electrical, mechanical, and plastic products. KCP does not process special nuclear materials but does have a health physics program consistent with indus-

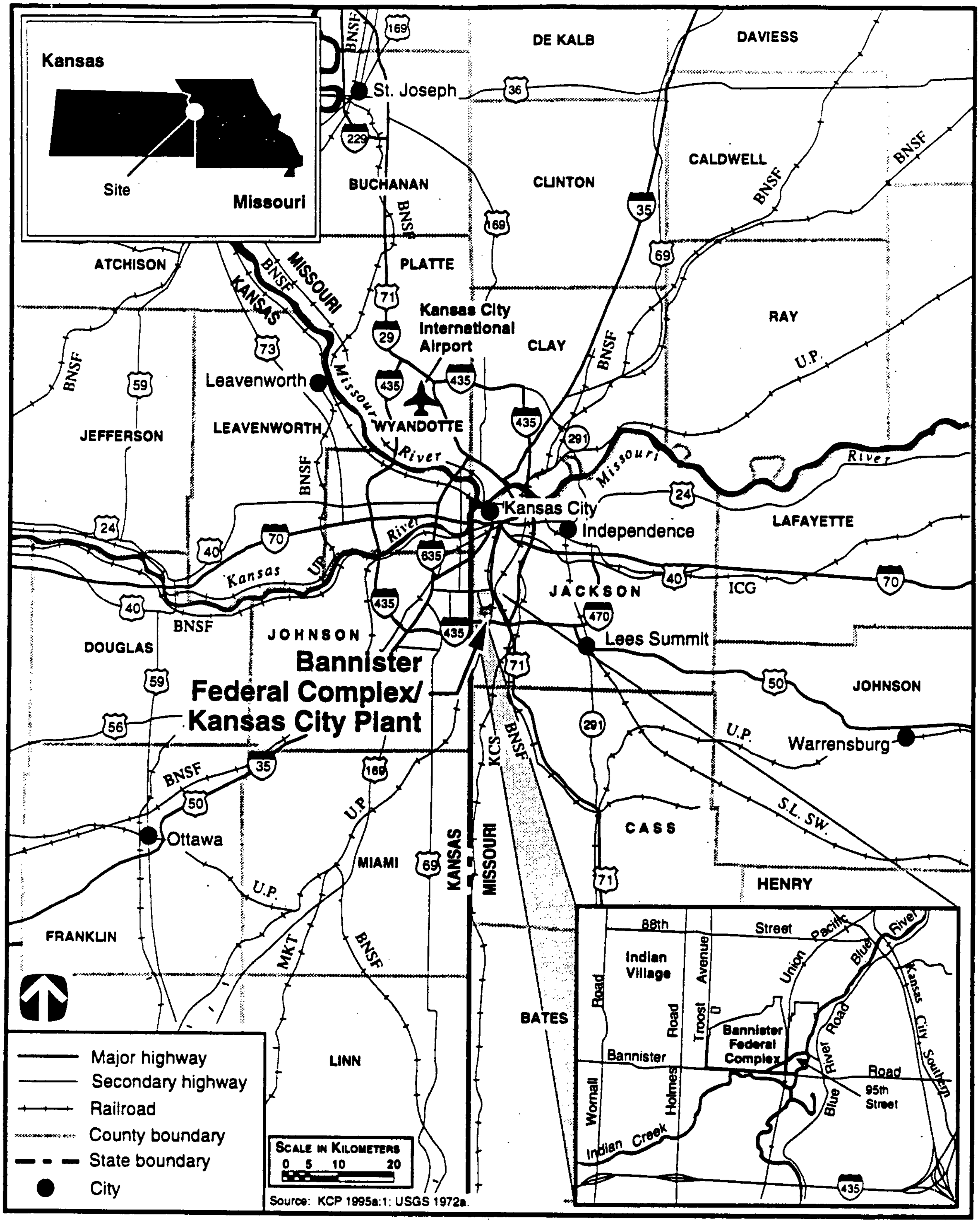

FIGURE A.1.3–1.—*Bannister Federal Complex/Kansas City Plant, Missouri, and Region.*

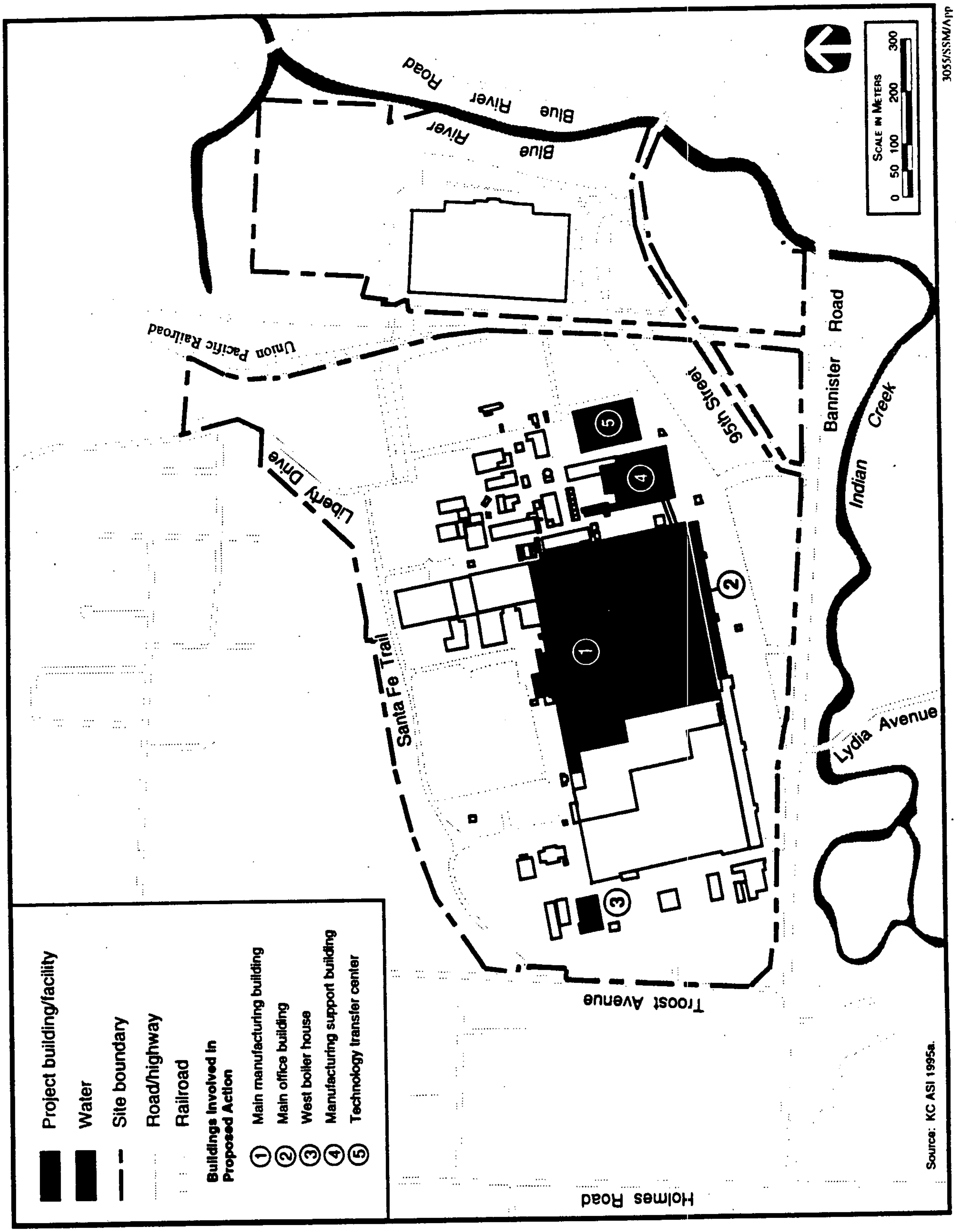

FIGURE A.1.3–2.—*Principal Facilities at the Bannister Federal Complex/Kansas City Plant.*

trial radiography and electrical manufacturing. The following is a brief description of KCP mission activities.

Squib Valve Assembly. Pyrotechnic devices that provide valving functions for various nuclear weapons systems are manufactured. Their assembly requires handling Class 1.4 explosives in a static-free environment using fixture-assisted assembly techniques.

Hybrid Microcircuit Assembly. Hybrid microcircuit resistor/conductor networks using alumina oxide substrates with thin-film or thick-film technologies for radars, programmers, timers, and fire sets are manufactured. Their assembly includes attaching electrical components to these networks. This product's assembly requires a Class 10,000 clean room with temperature and humidity controls.

Hybrid Microcircuit Assembly for Joint Test Assemblies. Hybrid microcircuits that consist of an insulating substrate, such as alumina, that contains a thin or thick resistor/conductor network interconnected with active (transistors and integrated circuits) and passive (resistors and capacitors) components that are enclosed in a metal or ceramic package are manufactured.

Microminiature Electrical Assembly. Hybrid microcircuits (semi-conductors packaged in ceramic, leadless chip carriers, transistor outline headers, or kovar [alloy of nickel, cobalt, and iron] flatpacks) are constructed. These products perform several electronic functions in weapons systems such as switches, radars, programmers, fire sets, clocks, and telemetry.

Telemetry Assembly. Telemetry assemblies, neutron detectors, and test component firing systems are manufactured. The telemetry assemblies and neutron detectors provide warhead scoring data in flight tests as part of the joint test assembly. The test component firing systems are high energy transfer systems manufactured for use in underground testing at NTS.

Radar Assembly. Radars used in weapons fuzing systems for bombs and warheads are manufactured. Included in this product line are antenna assemblies that can be an integral part of a radar fuze assembly or a separate component used in the fuzing system. Facility requirements include controlled humidity environment, solvent cleaning stations, and electrostatic control.

Timers, Programmers, and Trajectory Sensing Signal Generators. Trajectory sensing signal generators (electronic assemblies that accept environmental data, verify correctness of that data, and produce predetermined and sequenced output functions for the weapon) are manufactured. The trajectory sensing signal generator product is part of the weapon's nuclear safety system. The primary function is to help ensure that accidental detonation caused by abnormal thermal and shock environments does not occur.

Test Equipment Design and Fabrication. Custom designed and fabricated test equipment able to accept products produced internally and by vendors is produced. This function is capable of performing electrical and mechanical design, producing definition drawings, developing computer software, and fabricating the necessary hardware.

Cellular Silicone and Filled Elastomers. Cellular silicone cushions that are used as filler to cushion components and to allow for thermal expansion are produced.

Foam Molding. Structural foam supports using urethane foam materials are produced.

Syntactic Foam Molding and Plastics Machining. Foam molding that is capable of withstanding higher operating temperatures than conventional foam molding is produced. These products are made using high temperature resins and microspheres, which are sintered in a high temperature oven. Facility requirements include an environmentally controlled (temperature and moisture) plastics machining facility, because of the physical requirements of plastic products.

Laminates and Desiccants. Aluminum silicate desiccant powders and resins used to provide a dry environment in sealed nuclear assemblies and fiber-reinforced plastic laminates are produced.

Noncryptographic Coded Switch Assembly. Electronic devices using hybrid microcircuits and magnetic core memory used to permit the controlled use of nuclear weapons upon proper authorization and to prevent unauthorized use are manufactured.

Strong Link Switch Assembly. Complex electromechanical safety devices used in all modern weapons programs are manufactured. Facility requirements include clean rooms for switch assembly and testing.

Fire Set Assembly. High-voltage circuitry firing systems capable of supplying the energy required to initiate a weapon system are manufactured. Energy is derived from low-voltage battery power and is converted by this system to high voltage and stored until an initiating signal is received. Components include capacitors, inductors, hybrid microcircuits, flat cable and flex circuit technologies, and switches.

Composite Structures. Fiber-reinforced molding resins are manufactured.

Stockpile Support. Components and subsystems removed from the stockpile for reuse, systems testing, or component cycle testing are evaluated. No unique processes, materials, or technologies are used for stockpile support.

Category F Permissive Action Link Electronics Assembly. Electronic assemblies that are part of the nuclear surety system are manufactured.

Special Products-Special Electronics Assembly. This is a restricted access area where electronic products with special security requirements are manufactured.

Cryptographic Coded Switch Assembly. A Permissive Action Link Switch Adapter, an electronic device designed to provide an "electrical block" to the arming switch of the weapon, is assembled. The Permissive Action Link Switch Adapter utilizes both thin- and thick-film hybrid microcircuit technology and is packaged in a foam plastic housing.

T-Gear Containing Cryptographic Keying Material. Cryptographic keying material used to code and recode Permissive Action Link Switch Adapter devices in weapons is manufactured. The presence of these codes prevents unauthorized access to weapons.

MK5 Arming, Fuzing, and Firing Set Assembly. Arming, fuzing, and firing assemblies are assembled. This assembly incorporates a radar, a programmer, an accelerometer, a decelerometer, thermal batteries, a fire set, a contact fuze, and a force balance integrating accelerometer.

B83 Weapon Subassembly. Electronic and mechanical structures are assembled and placed in a case structure with environmental protection. Assemblies provide distance, timing, velocity sensing, velocity control, and electrical power for weapon assemblies.

Machining Technology. This activity provides a wide variety of traditional and nontraditional metal-removing processes, including conventional and numerically controlled turning, milling, drilling, boring, and grinding processes.

Other Mechanical Technology. This activity provides support for mechanical product manufacturing including sheet metal hydroforming, fire edge blanking, punch pressing, riveting, laser marking, threaded insert installation, and manual assembly operations.

Plastics Technology. A wide range of polyurethane foam components, epoxy encapsulants, and modified commercial products for the Complex are manufactured.

Electrical/Electronic Fabrication and Assembly Technology. Printed wiring assemblies used in weapon timers, programmers, trajectory sensing devices, and various other electrical and electronic components are fabricated.

Secondary Support Areas. This activity provides support functions that service nearly all product lines, including a broad range of standard industrial processes (e.g., plating, painting, heat treating, and welding), some of which are uniquely tailored to meet special weapon requirements.

Environmental Regulatory Setting. KCP has a monitoring system in place to ensure continuity of operations and protection of the environment. Soil, surface and groundwater, and air media are regularly sampled and analyzed for various potential pollutants as a part of the ongoing environmental monitoring programs. The monitoring system includes over 163 monitoring wells, 5 sampling points at the ultraviolet/ozone system, 3 ambient air monitoring stations, and sampling results from 4 outfalls, 9 surface water sites, and 1 sanitary discharge. The remainder of this section summarizes the status of KCP's compliance with the major environmental regulations.

National Environmental Policy Act. There are no other major Federal actions under consideration that require NEPA studies and that would affect the plant.

Emergency Planning and Community Right-To-Know Act. The plant prepared and submitted to EPA an annual Toxic Chemical Release Inventory Form (EPA Form R) for 1993 as required under Section 313 of this act.

Resource Conservation and Recovery Act. DOE and EPA signed a Corrective Action Administrative Order on Consent under Section 3008(h) of RCRA on June 23, 1989. The intent of the order is to provide an agreed-upon method of effecting environmental remediation involving solid waste management units at the plant. While the consent order is with EPA, the Missouri Department of Natural Resources maintains RCRA authority over the KCP groundwater monitoring program. Groundwater monitoring has revealed chlorinated solvent contamination, particularly trichloroethylene, in at least three onsite plumes. The city of Kansas City, MO, regulates the discharge permit for the groundwater treatment unit, which is treating the groundwater plumes to preclude release of the contaminant into surface waters offsite.

Comprehensive Environmental Response, Compensation, and Liability Act. KCP is not regulated under this act for any required remediation. Remediation is presently regulated by the provisions of the RCRA Corrective Action Administrative Order on Consent.

Clean Air Act. Overall plant operations are regulated by an annual Air Operating Permit issued by Kansas City, MO. Results of radionuclide monitoring indicate that no radionuclides are present in quantities exceeding background levels. The plant is also in compliance with air pollution requirements for non-radiological air emissions. The plant is working proactively with the city to better define the requirements necessary to obtain the city's approval before constructing a new or modifying an existing source of air pollution, as well as to streamline reporting needs with respect to plant air emissions.

Clean Water Act. Sanitary and industrial wastewater discharges from the plant go into the Publicly Owned Treatment Works and are regulated by Discharge Permit #74; city ordinances administered by the Kansas City, MO, Water and Pollution Control Department; and EPA Pretreatment Standards for the Metal-Finishing Category (40 CFR 433.17). KCP stormwater effluents are regulated by NPDES Permit #MO 0004863, issued by the Missouri Department of Natural Resources.

Safe Drinking Water Act. The drinking water system at the plant meets all conditions for exclusion listed in 40 CFR 141.3, which implements this act. Therefore, the plant does not operate a public water system which is covered by this act.

Toxic Substances Control Act. KCP maintains compliance with the requirements of this act.

Federal Insecticide, Fungicide, and Rodenticide Act. The plant maintains compliance with this act and related state statutes concerning use of pesticides.

A.1.4 Pantex Plant

Site Description. Pantex is located in the panhandle of Texas, in Carson County. It is about 27 km (17 mi) northeast of downtown Amarillo and 64 km (40 mi) southwest of Pampa. The plant is located on a portion of the former Pantex Army Ordnance Plant. Pantex was constructed in the first half of the 1940s by the U.S. Army for the production of conventional ordnance. At the end of World War II, the plant was deactivated and the property eventually reverted to the War Assets Administration. In 1949, the entire installation was sold to Texas Technological College (now Texas Technological University, commonly called Texas Tech) for 1 dollar. The land was to be used for experimental farming, but was subject to recall under the National Security Clause. Following an extensive survey of World War II ordnance plants, Pantex was chosen in 1951 by the Atomic Energy Commission for expansion of its nuclear weapons assembly facilities. The Army Ordnance Corps reclaimed the site for the Atomic Energy Commission and contracted a civilian contractor to rehabilitate it.

DOE owns approximately 3,683 ha (9,100 acres) at Pantex. Just over 809 ha (2,000 acres) of the DOE-owned property are used for industrial operations at Pantex excluding the Burning Ground, firing sites, and other outlying areas. The Burning Ground and firing sites occupy approximately 198 ha (489 acres). Remaining DOE-owned land serves DOE safety and security purposes. DOE also owns a detached piece of property called Pantex Lake, approximately 4 km (2.5 mi) northeast of the main plant site. This property, comprising 436 ha (1,077 acres), includes the playa lake wetland itself which occupies approximately 138 ha (340 acres). Currently, no Government industrial operations are conducted at the Pantex Lake property. The location of Pantex is shown in figure A.1.4–1.

As of April 1995, approximately 2,599 ha (6,421 acres) of DOE-owned land were being used by Texas Tech for agricultural purposes through a service agreement. The DOE-owned acreage used for agricultural purposes is variable and subject to periodic changes. Adjacent to the 3,683 ha (9,100 acres) owned by DOE, approximately 2,347 ha (5,800 acres) are leased from Texas Tech. DOE use of these lands is primarily for safety and security buffer areas. DOE also leases a small facility at the Amarillo International Airport for its own transportation use.

Pantex industrial operations are conducted for DOE by a management and operating contractor, the U.S. Army Corps of Engineers, and SNL. Seventy-six km (47 mi) of roads exist within Pantex boundaries. A spur of the Burlington Northern Santa Fe Railroad, formerly Atchison Topeka and Santa Fe Railroad, extends through the leased land into the DOE-owned property on the southwest area of the plant site. There are 27 km (17 mi) of railroad tracks within the site boundaries.

Historically, the Pantex site was divided into functional areas commonly called zones. Some maps may still show where the old functional areas were located. The main functional areas are Zone 12, which is the fabrication, assembly/disassembly (A/D), and technical/administrative support area; Zone 11, which is the high explosives (HE) development area; Zone 10, which is an excess property storage site; and Zone 4, which is the weapon/HE magazines and pit storage area. There are other supporting activities in other zones. The locations of Pantex zones are shown in figure A.1.4–2.

All the land within a 5-km (3-mi) radius of the plant site is used for agricultural purposes, either farming or grazing. Approximately 2,000 people live within 8 km (5 mi) of the outside boundary of Pantex. A significant population concentration occurs southwest of the Pantex facility near the Amarillo International Airport and includes the Texas State Technical Institute and the Highland Park Village. Highland Park Village consists of 500 single- and multi-family housing units (duplexes) with an occupancy rate averaging about 90 percent. Approximately 100 students are housed in a Texas State Technical Institute student dormitory.

Plant operation includes direct and support manufacturing operations, management and administrative services, protective services, and maintenance and utilities. Current missions at Pantex are shown in table 3.2.5–1.

Most operations at Pantex are DP activities. The plant's primary role today is the dismantlement, including removal of the fissile material, of retired U.S. nuclear weapons being returned to DOE from DOD. Other activities include certain maintenance and surveillance activities of the remaining nuclear weapons stockpile, modification and assembly of existing nuclear weapons systems, and production of HE components for nuclear weapons. DOE also conducts quality evaluation of weapons, quality assurance testing of weapons components, and research and development (R&D) activities supporting nuclear weapons at the plant. The principal operations performed at Pantex are the dismantlement of retired nuclear weapons; assembly of nuclear weapons from components received from other DOE facilities; fabrication of chemical HE components for nuclear weapons; operation of chemical HE synthesis, and characterization surveillance testing and disposal of chemical HE; and maintenance, modification, repair, and testing of nuclear weapons components. Weapons dismantlement, assembly, and stockpile surveillance activities involve handling significant quantities of sealed nuclear components, (pits, secondaries, tritium reservoirs), as well as a variety of nonradioactive toxic chemicals. Brief descriptions of the above mission activities follow.

New production is defined as the final assembly of a new nuclear weapon to be added to the stockpile. Pantex receives weapons components and other materials from throughout the Complex. The first step in the new production process is mating the HE main charge subassemblies with the special nuclear materials, which takes place within an assembly cell. Assembly bays house the remainder of the assembly process. This is where the nuclear subassembly produced in the assembly cell is built into a complete weapon. After final assembly, weapons assembled at

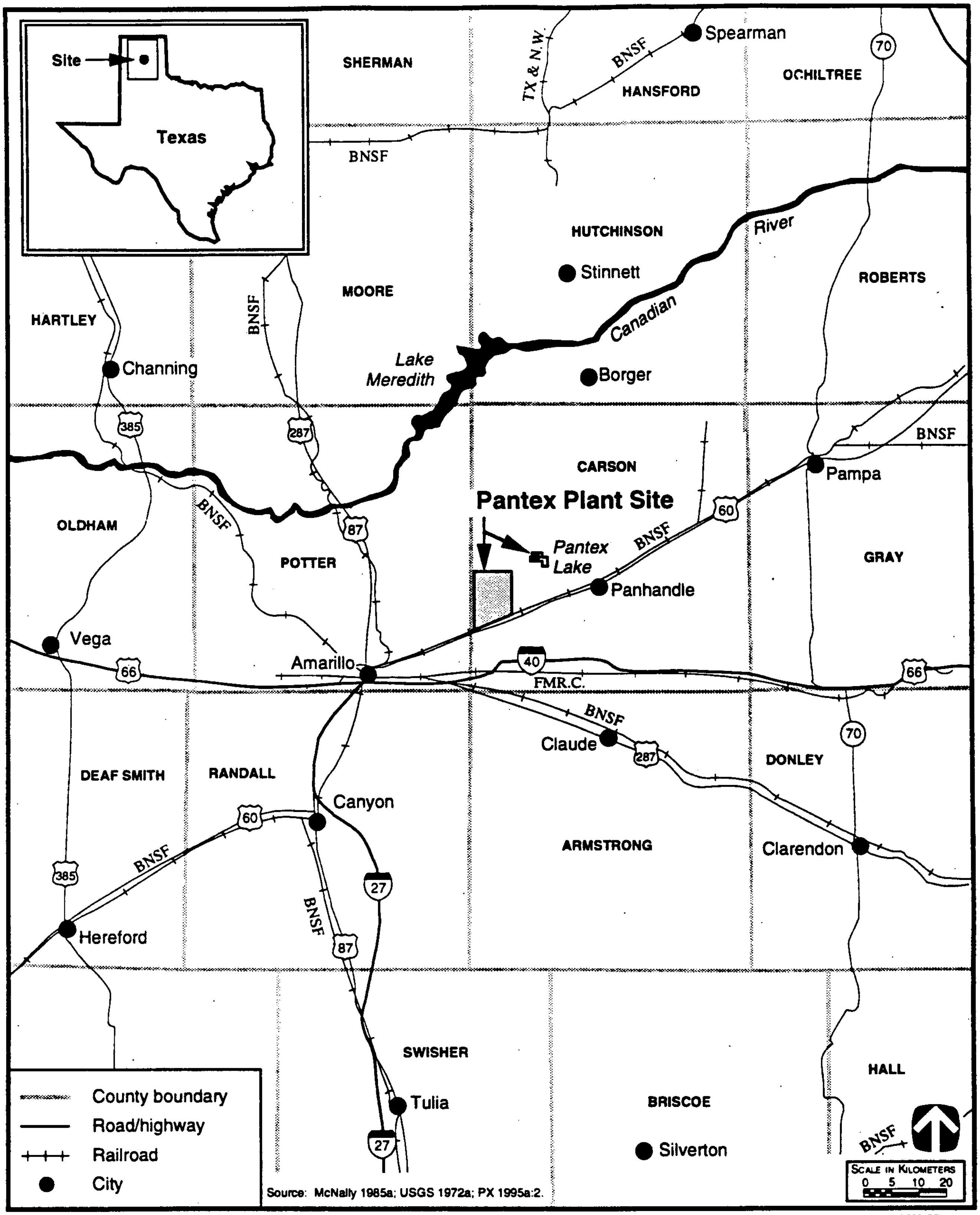

FIGURE A.1.4–1.—*Pantex Plant, Texas, and Region.*

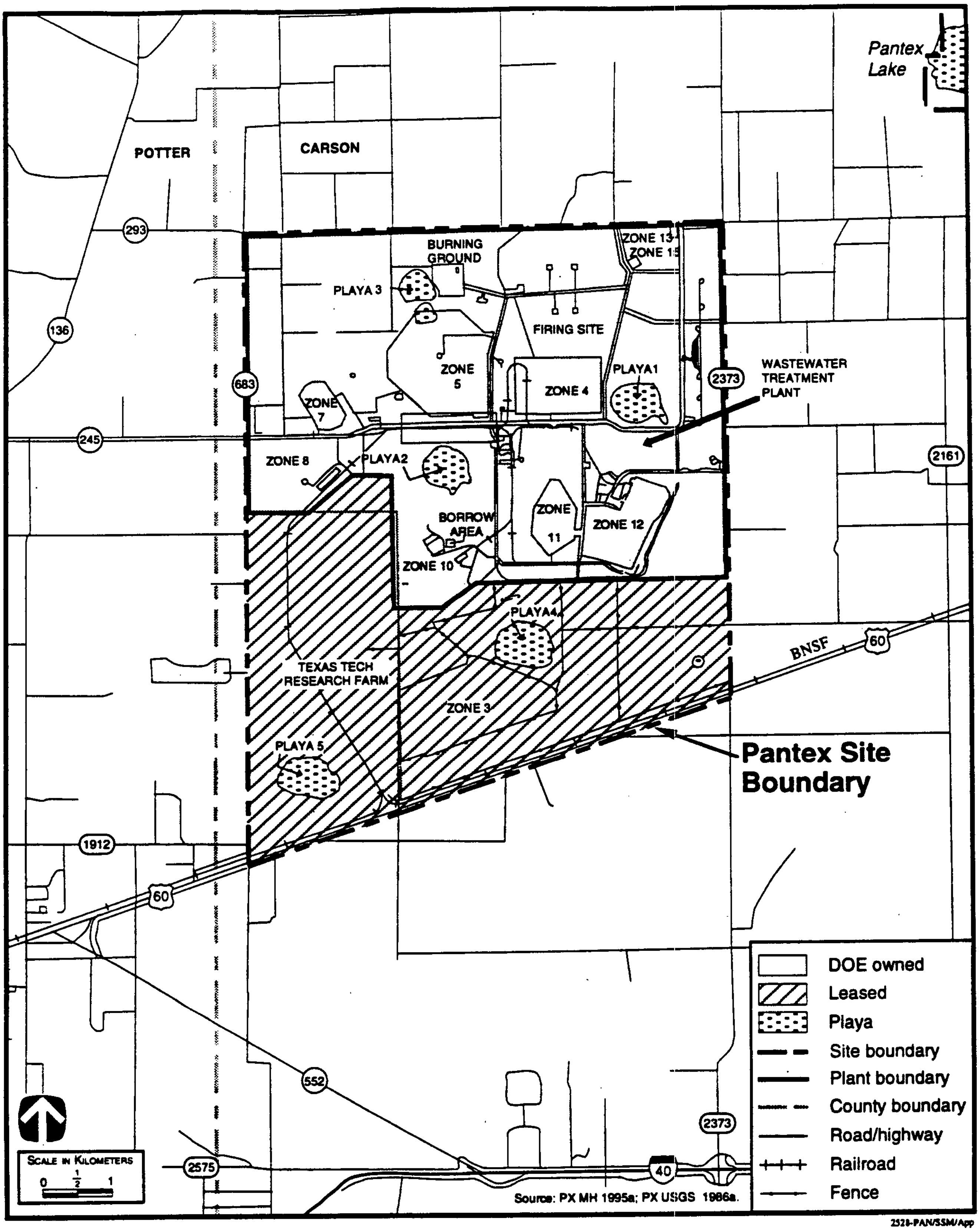

FIGURE A.1.4–2.—*Principal Facilities and Zones at Pantex Plant.*

Pantex are shipped either to other facilities within the Complex or to military facilities. Dismantlement of retired weapons is basically a reversal of the assembly process. All parts must then be properly disposed or stored.

The tasks of modification, maintenance, and repair involve disassembly of a stockpiled nuclear weapon so that one or more components can be repaired, replaced, or modified. After replacing the components, the weapon is reassembled and returned to the stockpile.

HE component production includes manufacturing main charge subassemblies and mock components for use in weapon test assemblies, manufacturing small HE components, producing a variety of explosive materials from chemical reactants and commercially produced explosives, and evaluating explosive materials and components through a variety of analytical, mechanical, and explosive tests.

Pantex performs many quality assurance evaluation activities on both new and stockpiled nuclear weapons. These tests involve disassembly of weapons, laboratory testing of various components, and rebuilding weapons for shipment back to the stockpile. Five evaluations are performed at Pantex: new material laboratory testing, new material flight testing, stockpile laboratory testing, stockpile flight testing, and accelerated environmental aging and materials compatibility testing. These evaluations are outlined below:

- New Material Laboratory Testing—disassembly of a randomly selected, newly produced weapon before it is shipped to the stockpile. Various components are subjected to either destructive or nondestructive tests. After testing, the weapon is rebuilt and shipped to the stockpile.

- New Material Flight Testing—similar to new material laboratory testing. Weapons are selected at random before delivery to the stockpile and assembled into a nonnuclear, explosive joint test assembly for flight testing. These assemblies are tested by DOD aboard aircraft and missiles to verify the functioning of components under in-flight conditions. After the test flight, the joint test assembly is returned to Pantex for further examination when possible.

- Stockpile Laboratory Testing—similar to new material laboratory testing, but stockpile laboratory testing is performed on units randomly selected from the stockpile.

- Stockpile Flight Testing—similar to new material laboratory flight testing, but stockpile flight testing is performed on weapons randomly selected from the stockpile.

- Accelerated Environmental Aging and Materials Compatibility—determines the effects of aging on the integrity of weapons systems over time. These tests involve subjecting newly produced units to an artificial aging process or to environmental stresses to determine whether or not they retain their chemical and physical properties, and to ensure that they will react in a predictable manner after an extended period of time.

Also, some testing is performed at the Gas Analysis Laboratory, which evaluates samples taken from accelerated aging units, material compatibility tests, development activities, material certification tests, and production operations.

In addition to the principal efforts associated with weapons A/D, Pantex provides development support and services to the weapons laboratories and to other government entities.

Pantex contains a number of facilities that stage (temporarily store) weapons components that are destined either for the assembly cells or for shipment to other DOE facilities. Staging procedures may involve the leak testing of staging containers, inventories to verify the number and contents of containers, and unpacking and repacking to physically verify and test contents.

Environmental Regulatory Setting. Pantex conducts operations in compliance with all applicable environmental regulations and statutes and with the requirements of the various permits issued to the plant. The Texas Natural Resources Conservation

Commission has state authority for developing and enforcing regulations and standards for air, water, and waste management. EPA has delegated regulatory authority to the State of Texas for air and solid and hazardous waste. As of December 31, 1994, Pantex is in compliance with the major environmental laws and regulations, with no regulatory enforcement actions or lawsuits pending. The remainder of this section summarizes the status of Pantex compliance with the major environmental regulations.

National Environmental Policy Act. DOE finalized the EA for the *Interim Storage of Plutonium Components* and issued a FONSI in January 1994. This EA analyzed the storage of a larger number of pits for a longer interim period than previously stored. In its FONSI, DOE decided to store no more than 12,000 plutonium pits at Pantex. In May 1994, DOE published a Notice of Intent (NOI) to prepare a new site-wide environmental impact statement (EIS) for *The Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components.* This Site-Wide EIS incorporates several actions that were ongoing at the onset of this EIS. The draft EIS was issued in March 1996.

Comprehensive Environmental Response, Compensation, and Liability Act. On May 31, 1994, EPA placed Pantex on the NPL effective June 30, 1994 (59 FR 27989) as a Superfund site. As a result, Pantex is subject to the provisions of CERCLA enforcement and is required to develop a Federal Facility Agreement. In August 1994, DOE began discussions with EPA and the State of Texas on this agreement to perform response and remediation activities, pursuant to CERCLA and the National Contingency Plan requirements and consistent with corrective actions currently being performed under RCRA. On December 14, 1994, Pantex hosted a meeting of Federal and state trustees who are responsible for assessing damages for injury to, destruction of, and loss of natural resources. Trustees are continuing to participate in the Natural Resource Damage Assessment process under section 107 of CERCLA.

Emergency Planning and Community Right-To-Know Act. No Toxic Chemical Release Inventory Form (EPA Form R) for 1993 was required under Section 313 of this act, because no reportable substances were released at levels above threshold values. However, in accordance with the Agreement in Principle with the State of Texas that was effective July 31, 1990, DOE provides the state with a chemical and radiological contaminant inventory and assessment of the plant.

Resource Conservation and Recovery Act. Pantex is defined as a large-quantity generator and has both permitted and interim-status storage and treatment facilities. Pantex manages some solid wastes under Texas Solid Waste Disposal Act Hazardous Waste Permit Number HW-50284, which includes a corrective action section. Under interim permit status, Pantex also operates thermal treatment units for processing explosives. Hazardous wastes generated at Pantex include, but are not limited to, solvent-contaminated wastewater and spent organic solvents that are contaminated with explosives. These wastes are either managed onsite by storage and limited treatment or shipped offsite for treatment and disposal at permitted treatment, storage, and disposal facilities.

All of the routinely generated radioactive waste from Pantex operations is low-level radioactive waste. This waste is generated in small quantities from weapons A/D and consists primarily of materials contaminated with depleted uranium or tritium. Low-level radioactive waste is temporarily stored onsite until it is shipped to NTS. Pantex manages mixed waste in accordance with the Pantex Plant *Federal Facility Compliance Act* Compliance Plan, while pursuing commercial treatment capability (see plan below).

The Federal Facility Compliance Act of 1992. This act is an amendment to RCRA. DOE published the Interim Mixed Waste Inventory Report in April 1993, annual updates, and periodic updates since, describing its inventory of mixed wastes and treatment capabilities. Pantex prepared and submitted the Pantex Plant *Federal Facility Compliance Act* Compliance Plan to provide mixed waste treatment capability for all mixed waste streams in accordance with the *Federal Facility Compliance Act.* This plan was approved by the Texas Natural Resources Conservation Commission and adopted through an Agreed Order on September 27, 1995. The Agreed Order, signed by the state on October 2, 1995, requires implementation of this plan.

Clean Water Act. EPA issued Pantex a draft wastewater NPDES permit on December 31, 1994.

Actions to finalize the draft permit are progressing. Pantex has a stormwater NPDES permit pending, having resubmitted its permit application on August 24, 1994, and submitted NOI, on September 29, 1994. Pantex also has a wastewater no-discharge permit (Number 02296). On April 1, 1993, the state issued a draft permit based on DOE's May 1992 application to change the permit from a no-discharge to a discharge permit. Such a change requires public hearings and the process is continuing.

Safe Drinking Water Act. The plant water supply meets all required primary and secondary drinking water standards and operational and maintenance regulations. A state inspection on October 4, 1994, confirmed that the system is being operated and maintained in compliance with Texas statutes and regulations.

Clean Air Act. Most Federal requirements are implemented in Texas under the *Texas Clean Air Act.* Pantex Plant has permits and standard exemptions issued by EPA and the Texas Natural Resource Conservation Commission. In 1994, Pantex reviewed activities conducted in all buildings to determine their compliance with 40 CFR 61 Subpart A (General Provisions) and Subpart H (Emissions of Radionuclides Other than Radon from DOE Facilities). All buildings were in compliance. At the Burning Ground explosive weapons components, explosive contaminated materials, and explosive waste are thermally treated. The Burning Ground operates under a written Grant of Authority from the State of Texas for its air emissions and under RCRA interim status for its waste management activities. In 1990, Pantex applied to the state to modify its Permit for Industrial Solid Waste Management Site, to include the Burning Ground. The hearing process on the permit modification is continuing.

Toxic Substances Control Act. Pantex is managing PCBs, asbestos, and chemicals in compliance with applicable regulations. For example, waste materials contaminated with PCBs are shipped offsite to permitted facilities for treatment and disposal. As of December 3, 1994, all equipment and parts used at Pantex that contain PCBs have concentrations of less than 50 parts per million (ppm).

Federal Insecticide, Fungicide, and Rodenticide Act. Compliance with this act and several related state statutes, such as the *Texas Pesticide Control Act,* allows agricultural production on the arable land surrounding the plant. Pesticides are applied by state-licensed personnel who ensure the health and safety of workers and protect the integrity of the environment from potential adverse impacts of agricultural chemicals applications.

A.1.5 Los Alamos National Laboratory

Site Description. LANL is located in north-central New Mexico adjacent to the town of Los Alamos (see figure A.1.5–1). It is about 96 km (60 mi) north-northeast of Albuquerque and 40 km (25 mi) northwest of Santa Fe. The area is dominated by the Jemez Mountains to the west and the Sangre de Cristo Mountains to the east. These two ranges flank the Rio Grande Valley, which roughly bisects the state from north to south. LANL is located on the Pajarito Plateau, a volcanic shelf on the eastern slope of the Jemez Mountains, at an approximate elevation of 1,900 to 2,400 m (6,230 to 7,870 ft). Erosion has cut the Pajarito Plateau into a number of steeply sloped, deeply eroded drainage canyons and isolated finger-like mesas that fan out from the west to the east. The laboratory occupies approximately 11,300 ha (28,000 acres); 1,400 ha (3,500 acres) lie in Santa Fe County with the remainder in Los Alamos County.

LANL is divided into 74 Technical Areas (TAs) of which 30 are currently active (see figure A.1.5–2). TA-3 is located on South Mesa and is the main or core area where approximately half of the personnel are located. This area serves as the central technical, administrative, and physical support facility for LANL. It also provides space for experimental, theoretical, and computational sciences. From the core area, four roads connect to the other lab areas. The northern-most road crosses the Los Alamos Canyon and connects with the town of Los Alamos, the airport, medical center, and the Tritium System Test Assembly Facility. The road also provides access down the canyon to a nonoperating research reactor and to the facilities for engineering design of weapons components. The East Jemez Road runs east to the Los Alamos Meson physics facility, a general construction support area, a trailer park, a county landfill, and guard facilities, including a firing range.

From TA-3, Pajarito Road runs southeast to White Rock, the only other housing area near LANL. The TAs in this corridor are used predominantly for

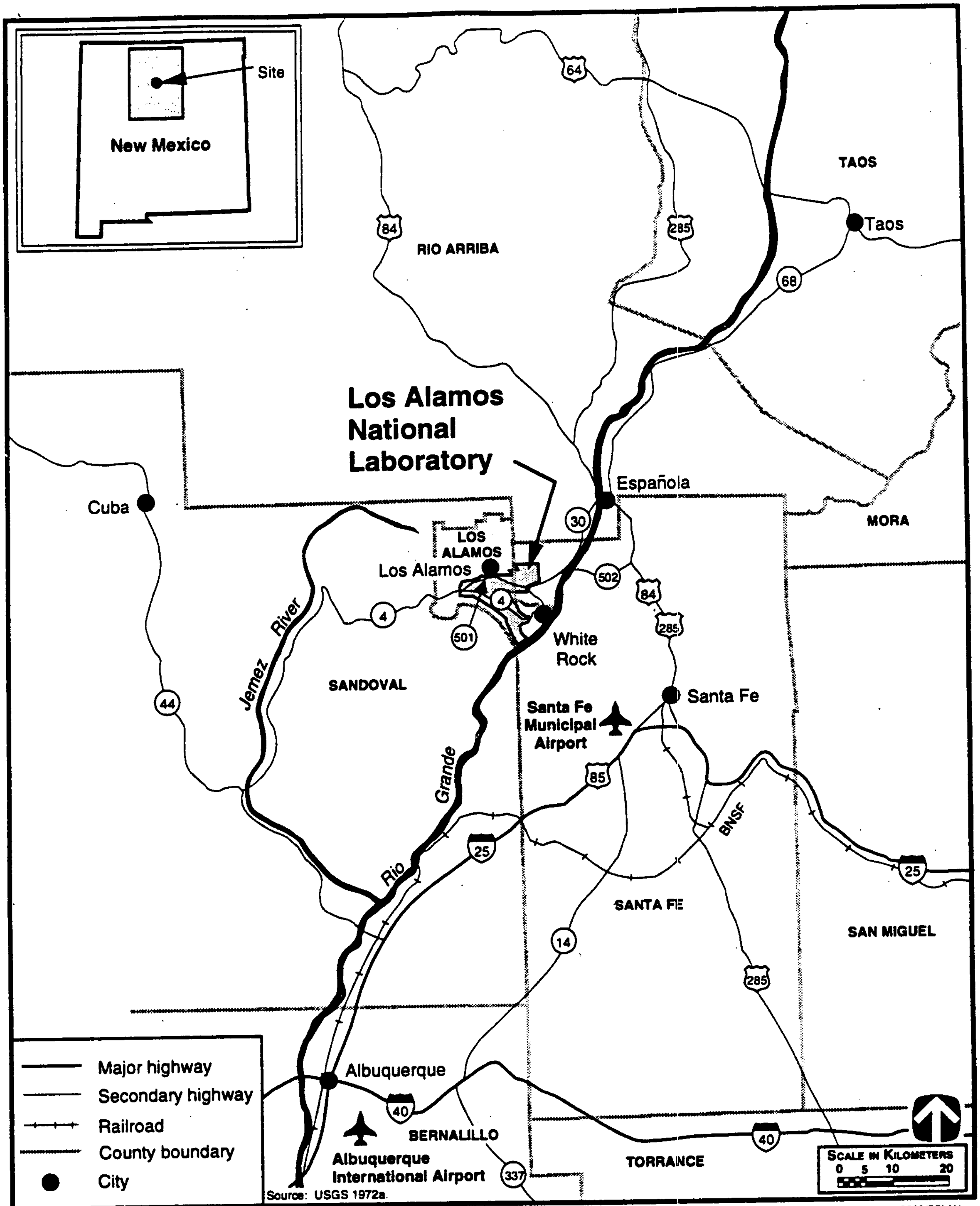

FIGURE A.1.5–1.—*Los Alamos National Laboratory, New Mexico, and Region.*

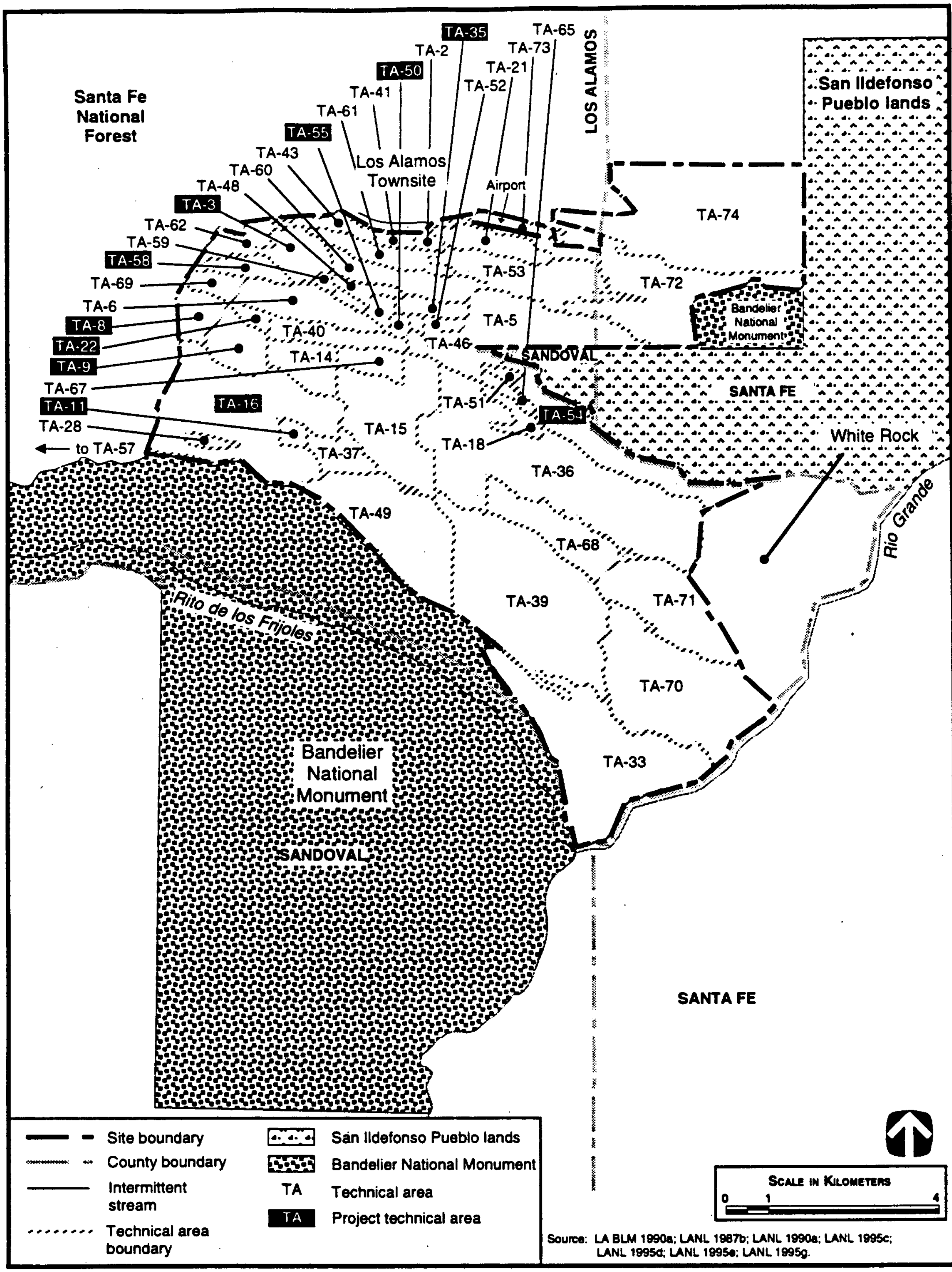

FIGURE A.1.5–2.—*Technical Areas at Los Alamos National Laboratory.*

nuclear materials R&D, fusion and laser R&D, waste management, and other multiuse experimental sciences. The special nuclear materials, radiochemistry, plutonium processing, and waste management facilities are located in this corridor.

From the core area, West Jemez Road runs south along the western boundary of LANL. This West Jemez Corridor sits atop five mesas. TA-16, one of the larger areas, is dedicated to HE research and research, development, and testing (RD&T). Functions at this site include engineering design, prototype manufacturing, processing, and environmental testing of nuclear warhead systems. Ten other TAs located in this corridor are used extensively by the Dynamic Testing Division. The Aboveground Experiments Division and Design Engineering Divisions also have facilities at TAs within this corridor.

Developed land accounts for approximately 5 percent of the LANL area, 580 of 11,300 ha (1,440 of 28,000 acres). Within this developed area lie 2,318 buildings totaling 756,000 m^2 (8.14 million ft^2). The breakout of this space is as follows: 18 percent for offices, 12 percent for laboratories, 8 percent for heavy experimental facilities, 14 percent for storage, 33 percent for various service facilities, and the remainder for all other uses. Approximately 93 percent of the personnel and square footage are located within 38 of the TAs. About 415 buildings have floor space that exceeds 190 m^2 (2,000 ft^2) and they account for 89 percent of the lab's total floor space. Of these buildings, 152 exceed 930 m^2 (10,000 ft^2) and comprise 75 percent of the total space. The average size of the remaining (approximately 1,903) buildings is 60 m^2 (650 ft^2); half of these buildings are either temporary or transitional. Forty-one percent of all the buildings at LANL are permanent. Of the major buildings (larger than 190 m^2), 73 percent of the total square footage was built prior to 1980.

Current missions at LANL are shown in table 3.2.6–1. A complete description of current facility operations can be found in the Los Alamos National Laboratory Institutional Plan. The major DP facilities located at LANL are shown in table A.1.5–1. In addition to the facilities included in this table, DOE operates various smaller facilities related to the ongoing Stockpile Stewardship and Management Program. Many of these have been subject to recent NEPA reviews, but are not included here because they would be considered minor facilities in relation to the entire Stockpile Stewardship and Management Program.

Environmental Regulatory Setting. It is the policy of LANL that operations be performed in a manner that protects the environment and addresses compliance with applicable Federal and state environmental protection regulations. The New Mexico Environment Department has state authority for developing regulations and standards for air, water, and hazardous and mixed waste management.

The remainder of this section summarizes the status of LANL compliance with the major environmental regulations.

National Environmental Policy Act. The current LANL Site-Wide EIS was published in 1979. Since the new LANL Site-Wide EIS is under preparation, any EA that proceeds ahead of the Site-Wide EIS was either identified in the NOI (60 FR 25697) of May 12, 1996, or must qualify as an interim action. The Site-Wide Draft EIS is expected to be released to the public in early February 1997 with the Site-Wide Final EIS to be issued in late August 1997.

Comprehensive Environmental Response, Compensation, and Liability Act. LANL is not on EPA's NPL; therefore, cleanup from past operations is covered not by CERCLA, but by other regulations, principally RCRA.

Resource Conservation and Recovery Act. The state was granted authorization by EPA to regulate control of hazardous waste under RCRA on January 25, 1985, and mixed waste on July 25, 1990. LANL is a large-quantity generator under RCRA and operates under both interim status provisions and a New Mexico Environment Department permit. Applications for mixed waste storage and treatment at LANL were submitted to the state prior to 1992 and are under interim status provisions.

The state conducts annual RCRA audits of generator locations and treatment, storage, and disposal facilities throughout the LANL facilities. On January 28, 1993, the state issued two Compliance Orders listing a total of 24 alleged violations, including violations involving the management of mixed waste, deficiencies related to general waste management require-

TABLE A.1.5–1.—*Major Defense Program Facilities Located at Los Alamos National Laboratory* [Page 1 of 2]

Facility	Function
Chemistry and Metallurgy Research (CMR) Building (TA-3)	Nuclear materials analytical chemistry, R&D, and storage, control and accountability
Main Shops Complex (TA-3)	Nonnuclear and uranium component manufacturing
Sigma Complex (TA-3)	Nonnuclear beryllium and pit support component fabrication, uranium process development and component production, and materials R&D
Nondestructive Testing Facilities Anchor Sites (TA-8)	Radiography, acoustics, and holography
High Explosives Operations, Anchor East (TA-9)	HE storage, characterization, safety and R&D, and pilot scale HE synthesis and formulation
Environmental Testing Facilities, K-Site (TA-11)	Vibration, impact, dynamic testing, and thermal testing
High Explosives Operations, Q-Site (TA-14)	HE testing and disposal
Hydrodynamic Testing Facilities, Pulsed High Energy Radiation Machine Emitting X-Rays (PHERMEX), Dual Axis Radiographic Hydrodynamic Test (DARHT) Facility, Firing Site R-306, and other facilities (TA-15)	Hydrodynamic testing, dynamic experiments, and HE testing
Weapons Engineering Tritium Facility (WETF), S-Site (TA-16)	Tritium processing and recovery, tritium R&D, tritium reservoir loading and surveillance, and fusion and neutron tube target loading
Explosives Facilities, S-Site (TA-16)	Large scale HE formulation, synthesis, casting, pressing, machining, assembly, inspection, packaging, treatment, storage, transportation, and disposal
Los Alamos Critical Experiment Facility (LACEF) (TA-18)	Nuclear criticality studies in design, construction, research, development, and application; nuclear material storage control and accountability
Tritium Operations (TA-21)	Neutron tube target loading and tritium R&D
Detonator Facility (TA-22)	Detonation R&D and high power detonator production
Target Fabrication Facility (TA-35)	Inertial confinement fusion target fabrication, physical and chemical vapor deposition component production and process development, material science R&D, and calorimetry
Trident Laser Facility and other facilities (TA-35)	Inertial confinement fusion experiments and high energy density weapons physics
Pegasus-II Facility and other facilities (TA-35)	Pulsed power capacitor bank, high energy density weapons physics experiments, hydrodynamic experiments, and dynamic material properties research, and pulsed power research
Kappa Site (TA-36)	HE and nonnuclear ordnance testing
Ancho Canyon (TA-39)	Explosively driven pulsed power experiments and development, dynamic experiments, and HE testing
DF Site (TA-40)	Detonation science and HE testing, and detonator development and surveillance
Radiochemistry (TA-48)	Radiochemistry, radiochemistry R&D, isotope production, waste management technology development, and isotope separation
Los Alamos Neutron Science Center (LANSCE) Complex (TA-53)	Neutron spallation sources; neutron research for materials science, stockpile stewardship research and development; nuclear and accelerator research and development; tritium production research and development; research on sub-atomic particles and particle physics, atomic physics, neutrinos, and the chemistry of sub-atomic interactions; isotope production; and radio frequency power sources, high-power microwaves, and free electron lasers studies

TABLE A.1.5–1.—*Major Defense Program Facilities Located at Los Alamos National Laboratory* [Page 2 of 2]

Facility	Function
Plutonium Facilities (TA-55)	Nuclear material processing and recovery, plutonium R&D, plutonium component fabrication and surveillance, processing of plutonium-238 to produce heat sources, fabrication of ceramic-based and other reactor fuels, nuclear material R&D, and nuclear material storage, control, and accountability

Note: HE - high explosives; R&D - research and development; TA - technical area.
Source: LANL 1995t.

ments, and deficiencies that could adversely affect human health and the environment if not addressed in a timely manner. Negotiations between DOE and the state resulted in a civil penalty of $700,000. All of the deficiencies relating to the general waste management requirements were corrected within 30 days.

The Environmental Restoration Project Office at LANL provides oversight for the closure of several solid waste management units which are subject to the corrective action requirements and closure provisions of the Hazardous and Solid Waste Amendments under RCRA. The state has regulatory authority for closure of these sites. During 1992, LANL and the state were in the process of developing a permit application to initiate the construction of a mixed waste storage and disposal facility for the disposal of mixed waste generated by the site remediation processes. LANL halted all construction efforts for the mixed waste storage and disposal facility in 1995.

LANL operates a controlled air incinerator that was permitted in November 1989 for the treatment of hazardous waste. The facility was placed on standby in 1992 for upgrades. The controlled air incinerator will be closed under RCRA and TSCA by the end of 1996.

The Federal Facility Compliance Act of 1992. This Act is an amendment to RCRA. DOE published the *Interim Mixed Waste Inventory Report* in April 1993 and has published annual updates and periodic updates since, describing its inventory of mixed wastes and treatment capabilities. The New Mexico Environment Department issued a Compliance Order in October 1995 directing DOE to implement the LANL Site Treatment Plan for Mixed Waste. This order terminates the Federal Facilities Compliance Agreement between DOE and EPA concerning land disposal restricted wastes.

Clean Water Act. The NPDES permit for LANL regulates discharges from 9 wastewater treatment facilities and 130 industrial outfalls. During 1992, compliance for sanitary and industrial discharges was 99.6 percent and 99.0 percent, respectively. Two NOIs for stormwater discharges were submitted on October 1, 1992, for the Lagoon Elimination Project and the Los Alamos Integrated Communication System. An additional NOI was submitted on September 29, 1992, for stormwater discharges associated with industrial activities.

Safe Drinking Water Act. LANL maintains compliance with *Safe Drinking Water Act* (SDWA) standards for its public water systems.

Clean Air Act. The New Mexico State Implementation Plan incorporates requirements of the act including the 1990 CAA Amendments, NESHAP, National Ambient Air Quality Standards, and New Source Performance Standards. The state administers these Federal and state requirements through a series of Air Quality Control Regulations. During 1991, two open burn permits were issued to LANL for the burning of scrap wood from experiments and the burning of jet fuel for ordnance testing.

LANL operated 36 continuous emissions monitoring stations in 1992 to sample air discharges for radioactive releases. While no radionuclide concentrations were detected which would pose an environmental or health problem, EPA issued a Notice of Noncompliance on November 23, 1992, following an audit of LANL's NESHAP program in August 1992. The notice stated that LANL emissions exceeded the 10 mrem/yr effective dose equivalent standard during the 1990 reporting period. As a result of two Notices of Noncompliance issued to DOE by EPA Region 6 on November 27, 1991, and November 23, 1992, DOE and EPA entered into negotiations to achieve compliance with NESHAPs. The negotiations resulted in a Federal Facilities Compliance Agreement being signed on June 13, 1996, which requires that compliance with Subpart H be achieved by August 15, 1996.

Toxic Substances Control Act. This act regulates PCB use and storage at LANL. In compliance with TSCA regulations, equipment and materials containing PCBs greater than, or equal to, 50 ppm are removed and shipped offsite to permitted treatment and disposal facilities or disposed of at TA-54, Area G (only applied to solids containing 50 to 499 ppm of PCBs). No deficiencies were noted following an EPA inspection during the summer of 1993.

Federal Insecticide, Fungicide, and Rodenticide Act. In addition to this act, LANL is regulated by the *New Mexico Pest Control Act* which regulates pesticide use, storage, and certifications. Annual inspections to assess compliance with this act are conducted by the state.

A.1.6 Lawrence Livermore National Laboratory

Site Description. LLNL is located in southern Alameda County, CA, approximately 64 km (40 mi) east of San Francisco. The LLNL complex consists of a main site east of the city of Livermore (Livermore Site), several leased properties near the Livermore Site, and a more remote site (Site 300) in the Altamont Hills, 27 km (17 mi) southeast of the Livermore Site (see figures A.1.6–1 and A.1.6–2).

The Livermore Site occupies a 332-ha (821-acre) area in the southeast portion of the Livermore Valley. The valley is about 26-km (16-mi) long (east-west) and 11- to 16-km (7- to 10-mi) wide (north-south). Hills ranging in elevation from 300 to 600 m (1,000 to 2,000 ft) surround the Livermore Valley. These hills are predominantly open space devoted to agriculture and recreation uses.

Onsite land use includes offices, laboratory buildings, support facilities (e.g., cafeterias, storage areas, maintenance yards, facilities for waste treatment and groundwater treatment, security, and a fire station), roadways, parking areas, and landscaping. A 150 m (500 ft) wide security buffer zone lies along the northern and western borders of the site.

The Livermore Site has approximately 550,000 m^2 (5.9 million ft^2) of facilities that include existing space and areas under construction. This space is distributed among approximately 600 buildings, over 300 are temporary structures. Temporary facilities (trailers, modular buildings, and World War II buildings) constitute 30 percent of the occupied space and house approximately 51 percent of the total laboratory office population. Approximately 53 percent of the permanent facilities are more than 20 years old; 40 percent are more than 30 years old.

East of the laboratory is agricultural property with a few scattered rural residents. A branch of the California Aqueduct, the South Bay Aqueduct, traverses land east of the lab in a north-south direction. To the north lies a light industrial park, a line of the Union Pacific Railroad, and Interstate 580. Residential areas of low to medium density and the city of Livermore extend to the west. Immediately south of the Livermore site is the SNL site at Livermore. Farther south, and southwest, the land is cultivated for vineyards.

Site 300 is an HE test site occupying 2,800 ha (7,000 acres) of largely undeveloped steep ridges and canyons about 29 km (18 mi) southeast of Livermore in the sparsely populated Altamont Hills of the Diablo Range. Elevations vary from a low of 150 m (500 ft) along Corral Hollow Creek on the southern boundary to 520 m (1,700 ft) above mean sea level in the northwest portions of the site. Slopes range from 8 to greater than 45 degrees.

Site 300 consists of two remote firing areas supported by a chemistry processing area and an administrative support area at the site entrance. The site also includes a number of storage magazines. Major buildings include the firing complex, the advanced test accelerator, the dynamic test complex, disassembly complex, and drop tower test areas. Other facilities include police and fire department, badge office, HE storage, warehouse, medical, cafeteria, and other service facilities. There are approximately 31,700 m^2 (341,000 ft^2) of facilities, including four trailers.

While the majority of the land surrounding Site 300 is agricultural (primarily for grazing cattle and sheep), two other defense-related research and testing facilities are in the area. A facility adjacent to Site 300 on the east and a similar facility approxi-

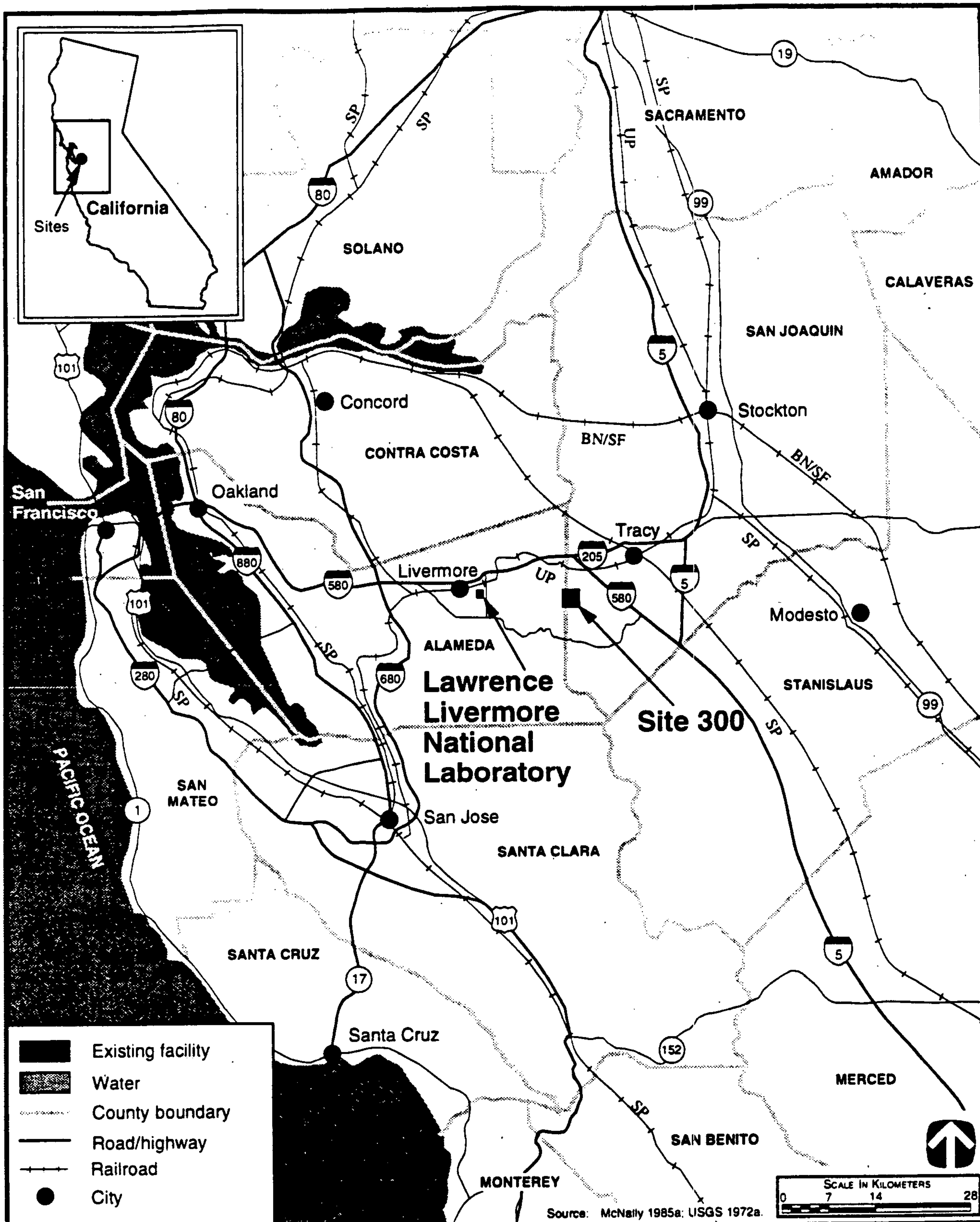

FIGURE A.1.6–1.—*Lawrence Livermore National Laboratory, Livermore Site and Site 300, California, and Region.*

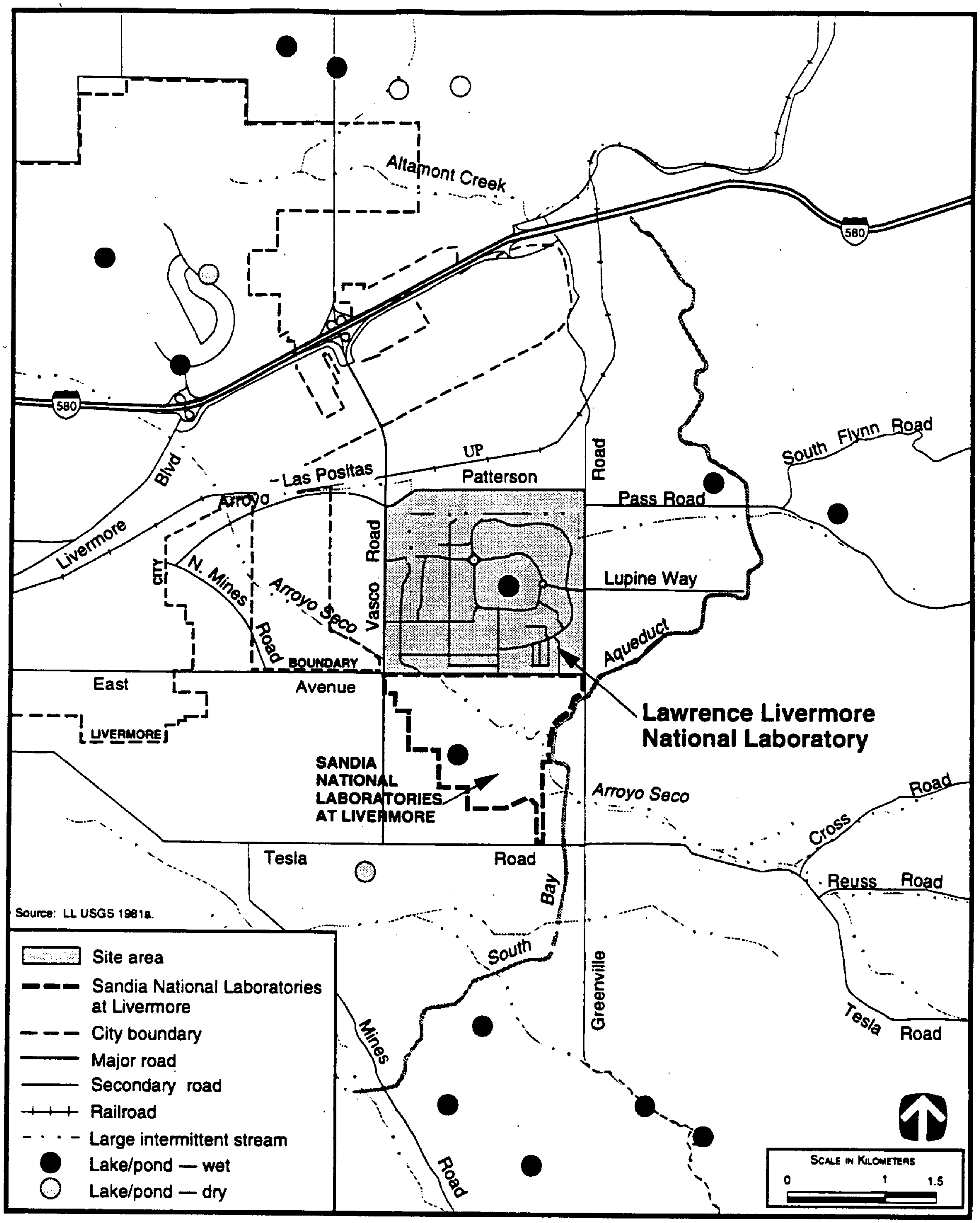

FIGURE A.1.6–2.—*Lawrence Livermore National Laboratory, Livermore Site, and Vicinity.*

mately 1 km (0.6 mi) to the south both conduct HE tests.

South of the western portion of Site 300 is the Carnegie State Vehicular Recreation Area which is for the exclusive use of off-highway vehicles. The nearest urban area is the city of Tracy, approximately 13 km (8 mi) northeast of Site 300. Several rural residences, however, are much closer to the site. Power-generating wind turbines occupy the land northwest of the site.

Current missions at LLNL are shown in table 3.2.7–1. A complete description of current facility operations can be found in the Lawrence Livermore National Laboratory Site Institutional Plan. The major DP facilities located at LLNL are shown in table A.1.6–1.

Environmental Regulatory Setting. It is the policy of LLNL to protect the environment and ensure that operations are conducted in accordance with applicable laws and regulations that have been enacted to protect the environment. With some minor exceptions, the State of California has regulatory authority for air, water, solid waste, hazardous waste, and mixed waste as administered through a variety of state and local agencies. The remainder of this appendix section summarizes the status of LLNL compliance with the major environmental regulations.

National Environmental Policy Act. During 1994, two EAs for proposed projects were initiated by LLNL. The *Draft Environmental Assessment for the Mixed Waste Management Facility* addressed the potential impacts from construction and operations of a facility that will demonstrate potential technologies for treating DOE mixed waste on a pilot scale. Based on the results of this research, certain technologies may be adopted later by DOE for treatment of mixed wastes throughout DOE's facilities. DOE is currently reviewing this Draft EA.

The Draft EA for the Site 300 Explosives Waste Treatment Facility addressed the potential impacts of constructing and operating up-to-date replacement facilities for treating explosives wastes and explosives-contaminated wastes at Site 300. DOE is currently reviewing this Draft EA.

The *California Environmental Quality Act* (California Public Resources Code Sections 21000 et seq.) establishes state policy for protecting environmental quality. The goals of the *California Environmental Quality Act* are achieved by requiring local and state agencies to assess the potential environmental impacts of proposed actions for which they may have a decisionmaking role. This is done through the preparation of an initial study, which leads to issuance of a negative declaration or a requirement to prepare an Environmental Impact Report. An Environmental

TABLE A.1.6–1.—*Major Defense Program Facilities at Lawrence Livermore National Laboratory*

Facility	Functions
Microfabrication Laboratory, Bldg. 153	Microelectronics fabrication
High Explosives Application Facility (HEAF), Bldg. 191	High explosives research with modern diagnostic and testing equipment
High Pressure - High Temperature Laboratory, Bldg. 232	High pressure - high temperature thermodynamic and materials properties experiments
Hydrogen Research Facility, Bldg. 331	Inertial confinement, fusion-directed, experimental work with isotopes of hydrogen gas, metal hydrides in contained beds, and small amounts of experimental metal hydrides and tritium-labeled compounds
Plutonium Facility, Bldg. 332	Testing plutonium-bearing engineering assemblies, developing and demonstrating improved plutonium fabrication techniques, and fundamental and applied research in plutonium metallurgy
High Pressure Laboratory, Bldg. 343	Tests and experiments with high pressure systems
Inertial Confinement Fusion Laser Facility, Bldg. 391	Nova laser, high-energy-density physics
Hydrodynamic Test Facilities with Flash X-Ray Facility at Site 300	Hydrodynamic and explosives testing with gamma-ray implosion imagery and other diagnostics

Source: LLNL 1995o.

Impact Report may also be prepared directly for projects that may have significant environmental impacts. No Initial Study or Environmental Impact Report documents were prepared by the University of California in 1994 on proposed projects for which the university was the decisionmaking or lead agency.

Comprehensive Environmental Response, Compensation, and Liability Act. Both the Livermore Site and Site 300 are listed on the EPA's NPL. The Livermore site was placed on the NPL in 1987, and LLNL's groundwater project complies with provisions specified in a 1988 Federal Facility Compliance Agreement entered into by EPA, DOE, the California Department of Toxic Substances Control, and the San Francisco Bay Regional Water Quality Control Board. The ROD was issued by EPA in 1992. Remedial investigations and treatment operations are ongoing.

Groundwater investigations began at Site 300 in 1981. The site was placed on the NPL in 1990. In June 1992, DOE negotiated a Federal Facility Agreement with EPA and the state that describes the groundwater and soil investigations to be conducted and specifies the reporting dates. Since June 1992, Site 300 investigations and remedial actions have been conducted under the joint oversight of EPA, Central Valley Regional Water Quality Control Board, and the Department of Toxic Substances Control under the authority of a Federal Facility Agreement.

Emergency Planning and Community Right-To-Know Act. In compliance with this act, LLNL implemented a computerized chemical tracking system called ChemTrack. The system allows for improved emergency response planning and complete inventory information, as well as improved overall chemical management.

Resource Conservation and Recovery Act. RCRA-regulated operations at LLNL's Livermore Site are managed under Interim Status Standards as administered by the California Department of Toxic Substances Control. A Part B Permit application has been submitted and describes storage and treatment operations at five facilities located in and near Buildings 233, 419, 514, 612, and 693. An additional new storage and treatment facility known as the Decontamination and Waste Treatment Facility would include construction of five new buildings for waste management operations to be located in the vicinity of Building 693. The Decontamination and Waste Treatment Facility would replace the majority of existing waste management facilities located in Areas 612 and 514.

At Site 300, LLNL operates a Part B-permitted container storage unit (Building 883) for management of hazardous waste. This facility permit is currently undergoing renewal. Explosives wastes are burned at an open burn facility near Building 829 under terms of a compliance order until a new thermal treatment unit can be designed, permitted, and constructed at which time the Building 829 facility will close. Part B Permit applications have all been submitted to the California Department of Toxic Substances Control for a new explosives storage facility and a new open burn/open detonation facility.

The Department of Toxic Substance Control conducted its annual audit of generator locations throughout the Livermore Site from June 22 to 25, 1993, and on July 14, 1993. Seventeen alleged violations were reported August 6, 1993. Site 300 was inspected February 16 and 17, 1993, and November 15 and 16, 1993. In each case, three violations were noted. Appropriate actions were taken at both sites to correct the violations.

The Building 829 Open Burn Facility thermally treats HE waste. The facility operates in accordance with interim status standard and the terms of a September 1993 compliance order. Design and permitting activities are currently in progress to build a new waste treatment facility at Building 845 to eliminate the need for the Building 829 Open Burn Facility. Another new facility has been proposed for Site 300, and a Part B Permit application has been submitted. The facility is an explosives waste storage facility that augments the storage capability at Building 883 by providing a separate dedicated facility to store explosives waste.

Federal Facility Compliance Act of 1992. Mixed wastes are generated and managed by LLNL operations in accordance with requirements of the *Federal Facility Compliance Act.* Existing and proposed management practices have been identified in the proposed site treatment plan submitted in April 1995. DOE is negotiating terms of a compliance agreement with the California Department of Toxic Substances Control.

Clean Water Act. This act is administered by the California Resources Board and regional and local agencies. Routine discharges to ground and surface waters resulting from the groundwater investigation and remediation activities at the Livermore Site are subject to permits issued by the San Francisco Bay Regional Water Quality Control Board. Stormwater associated with industrial activities is discharged under a Wastewater Discharge Permit issued by the Livermore Water Reclamation Plant. Site 300 holds water discharge requirements and NPDES permits issued by the Central Valley Regional Water Quality Control Board. These pertain to discharges associated with cooling towers and groundwater remediation work. Site 300 permits are also in effect for closed landfills and operation of an explosives rinsewater surface impoundment system.

Safe Drinking Water Act. LLNL maintains compliance with SDWA standards for its public water systems.

Clean Air Act. This act is enforced by the California Air Resources Board and local districts. The Livermore Site complies with the Bay Area Air Quality Management District rules and regulations. Site 300 is subject to rules enforced by the San Joaquin Valley Unified Air Pollution Control District. LLNL holds over 200 permits for air pollution sources and control equipment that are renewed on an annual basis.

Radionuclide emissions are regulated under NESHAPs, which is administered by EPA. In April 1994, EPA notified DOE and LLNL that all requirements of the August 1993 Federal Facilities Compliance Agreement had been met and that LLNL had satisfactorily demonstrated compliance.

Toxic Substances Control Act. LLNL regulates PCBs and asbestos in compliance with TSCA regulations. LLNL submits annual PCB reports to EPA. Asbestos wastes are reported in the hazardous waste report.

A.1.7 Sandia National Laboratories

Site Description. SNL is headquartered in Bernalillo County at the foot of the Manzano Mountains adjacent to Albuquerque, NM. At their nearest points, SNL facilities are 4.0 km (2.5 mi) south of Interstate 40 and 10.5 km (6.5 mi) east of downtown Albuquerque. The facilities are surrounded by Kirtland Air Force Base, with co-use agreements on some U.S. Air Force property. An area of the Manzano Mountains east of Kirtland Air Force Base has been withdrawn from the U.S. Forest Service for the exclusive use of the Air Force and DOE. The location of SNL and its principal facilities are shown in figures A.1.7–1 and A.1.7–2.

The laboratory is situated on the 30,562-ha (75,520-acre) Kirtland Air Force Base military reservation. Kirtland Air Force Base is located on two broad mesas bisected by the Tijeras Arroyo, an east/west canyon. These mesas are bounded by the Manzano Mountains (Cibola National Forest) to the east and the Rio Grande to the west. Elevations range from 1,500 m (4,921 ft) at the Rio Grande to 3,255 m (10,680 ft) at Sandia Crest, which is in the Sandia Mountains adjacent to Albuquerque.

Albuquerque, the largest population center in Bernalillo County, and also the closest population center to Kirtland Air Force Base, is located slightly north of the base. The 1990 census figures show an Albuquerque population of 384,736. The Isleta Indian Pueblo, which borders Kirtland Air Force Base on the south, is the next nearest population center with a 1990 census of 2,953. An estimated total population of 578,313 people live within an 80-km (50-mi) radius of Kirtland Air Force Base. This includes permanent residents of Kirtland Air Force Base living in the base housing areas. Current missions at SNL are shown in table 3.2.8–1. A description of facility operations can be found in the Sandia National Laboratories Site Institutional Plan. The major DP facilities located at SNL are shown in table A.1.7–1.

The majority of activities at SNL are DP activities. SNL facilities are located in five technical areas and several additional test areas. There are approximately 560 major buildings totaling over 370,000 m^2 (4 million ft^2) located in these areas. Each area has its own distinctive operations and is described in the following paragraphs.

Technical Area I has the largest employee population (approximately 5,000) and is dedicated primarily to three activities: the design, research, and development of weapons systems; limited production of weapons system components; and energy programs. Technical Area I includes the main library, offices, laboratories, and shops used by administrative and

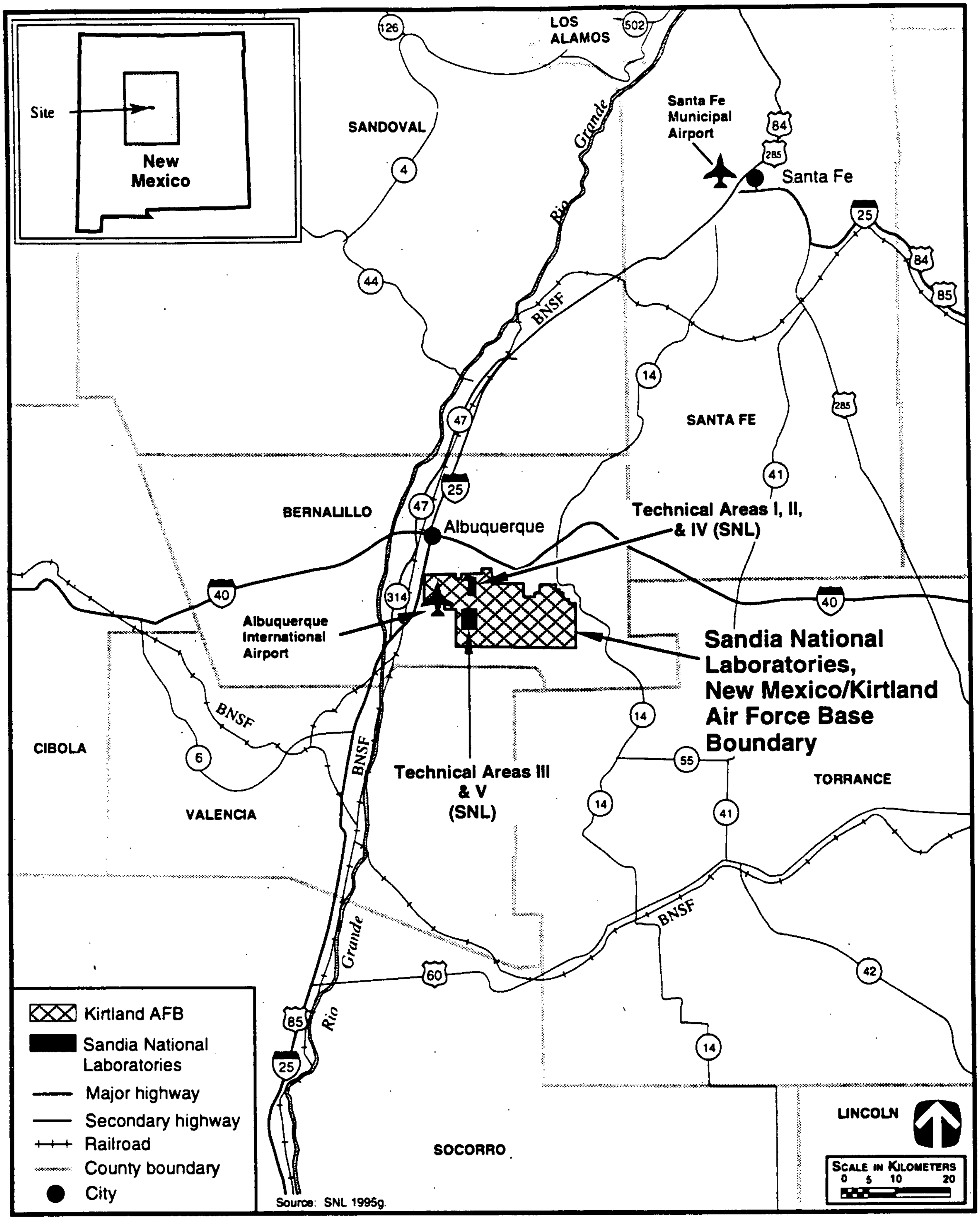

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FIGURE A.1.7–1.—*Sandia National Laboratories, New Mexico, and Region.*

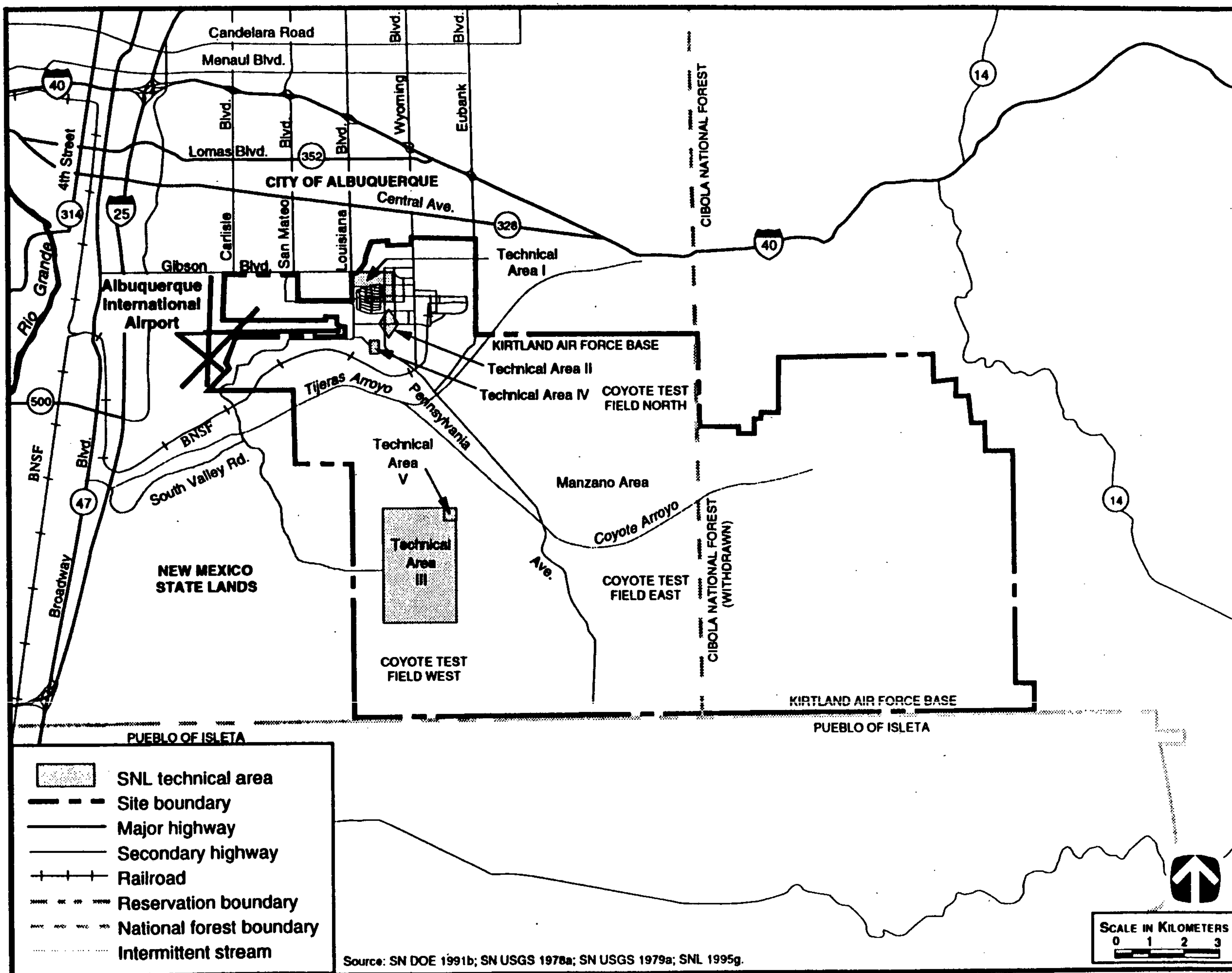

FIGURE A.1.7–2.—*Location of Technical Areas I Through V at Sandia National Laboratories, New Mexico.*

TABLE A.1.7–1.—*Major Defense Program Facilities Located at Sandia National Laboratories*

Facility	Function
Lurance Canyon Burn Site and Explosive, Electro-Explosive, and Aerial Cable Test Facilities (Coyote Test Field)	Weapons component testing in simulated accident scenarios and constrained rocket testing
Neutron Generator Facility, Wind Turbine, Environmental Test Laboratories, and Chemical, Ion, and Laser Physics Laboratories, Integrated Materials Research Laboratory, Micro Electronics Laboratory, Robotics, Manufacturing Science and Engineering Laboratory, Advanced Manufacturing Processes Laboratory, Primary Standards Laboratory, Lightning Test Laboratory, A/D Laboratory (Technical Area I)	Design, test, and manufacture of neutron generator components and weapon systems supporting R&D and production; structural analysis in high fatigue environments and material properties research
Explosives Component Facility, Device Development and Testing Facilities, and Environmental Testing Laboratories (Technical Area II)	Design, test, and manufacture of low power detonators, initiators, and timers for weapons subsystems
Dynamic Shock, Airgun Test and Reentry Burn-Up Test Facilities, Drop Tower, and Molten Core Laboratory (Technical Area III)	Extreme environmental testing, product acceptance qualification testing, material properties determination, and melting and casting process research
Particle Beam Fusion Accelerator (PBFA) High-Energy Radiation Megavolt Electron Source (HERMES) III Accelerator, Saturn Accelerator (Technical Area IV)	High energy gamma ray testing of electronic components for survivability; pulse power and weapon physics R&D; short pulse gamma and x-ray test facility for weapons component radiation testing
Hot Cell Facility, Annular Core Research Reactor, Sandia Pulse Reactor III, Gamma Irradiation Facility (Technical Area V)	Research and surveillance test facility for highly radioactive materials and products; high power pulse or steady state neutron and gamma ray radiation simulation environment for weapons component testing; steady state gamma ray testing of electronic systems and subsystems

Source: SNL 1995i.

technical staff; two small accelerators; a foundry; a steam plant; and an emergency diesel generator plant.

Technical Area II is a small area used for explosives testing. Techniques for measuring fractures in geologic strata are developed at this facility. Also located in Technical Area II are an inactive low-level radioactive waste disposal site, a small radioactive material decontamination and storage facility (Building 906), and a storage facility designed to temporarily hold PCB-contaminated materials to be transported to an EPA-licensed disposal facility. The inactive low-level waste (LLW) disposal site has not been used for over 20 years. Most Technical Area II activities have been transferred to the Explosive Components Facility, a new facility intended to replace Technical Area II. This facility will integrate many of the existing Technical Area II activities, as well as some remote testing activities currently performed in other test areas.

Technical Area III is located adjacent to and south of Technical Area V, 8 km (5 mi) south of Technical Area I. It comprises 20 test facilities that include extensive environmental test facilities (such as sled tracks, centrifuges, and a radiant heat facility). Other facilities in Technical Area III include a paper incinerator, an inactive LLW and mixed waste disposal site, and a melting and solidification laboratory. The inactive radioactive waste disposal site in Technical Area III consists of two adjoining fenced areas that occupy 0.6 ha (1.5 acres). One area was used for LLW disposal in seven shallow trenches. The second area was used for disposal of classified LLW in 37 pits. LLW consisted primarily of tritium-contaminated materials. Three additional pits located in the classified waste disposal area were used exclusively for natural and depleted uranium waste disposal. The site is currently used as an interim storage facility for radioactive and mixed wastes.

An inactive hazardous-waste disposal and storage site is also located near the southern boundary of Technical Area III. This facility has not been used for disposal of hazardous wastes since November 7, 1985. It was used as an interim hazardous waste storage area from 1985 to 1988. A closure plan and post-closure permit application were prepared in May 1988. The newer hazardous waste repackaging and storage building, located south of Technical Area I, has been in use since 1988.

Technical Area IV consists of several inertial-confinement fusion research and pulsed-power research facilities. One large accelerator, the Particle-Beam Fusion Accelerator-II, was completed in 1985. A large accelerator facility, the Simulation Technology Laboratory, houses seven pulsed-power accelerators. Several of these accelerators have been transferred from Technical Area V.

Technical Area V houses two research reactors in two reactor facilities, an intense gamma irradiation facility (using cobalt-60 and cesium-137), and a hot cell facility. The two research reactor facilities in Technical Area V are small and quite dissimilar: the Sandia Pulsed Reactor is an unreflected, unmoderated assembly of enriched uranium, and the Annular Core Research Reactor consists of an annular core of 226 fuel elements in an open water tank.

There are also test areas outside the five Technical Areas. These areas are located south of Technical Area III and in canyons on the west side of the Manzano Mountains. Coyote Canyon and Thunder Range are two examples of such areas.

Depleted uranium was used in the past for explosive testing in these remote areas. The test areas were surveyed following each test and contaminated materials were collected and disposed of in accordance with DOE requirements. Environmental monitoring is done as necessary. Operations in these areas are administratively controlled to avoid uranium contamination to public areas beyond the confines of Kirtland Air Force Base.

Electricity is supplied to SNL and much of southeast Albuquerque through the Public Service Company of New Mexico's switching station on Eubank Boulevard. Voltage is stepped down through transformers to 46 kilovolt (kV) for distribution through four feeders. Feeder 1 serves Technical Areas II through V and outlying areas, Feeder 2 serves the Radiant Heat Facility in Technical Area III, and Feeders 3 and 4 supply Technical Area I.

Kirtland Air Force Base is responsible for the overall natural gas system. The distribution system in technical areas I, II, and IV is owned by DOE and operated by SNL. Natural gas is purchased from Kirtland Air Force Base, which buys it commercially. Fuel is stored in Technical Area I for refueling remote-site tanks and for emergency supply to the steam plant. The steam plant in Technical Area I supplies steam both to that area and to Kirtland Air Force Base for space heating, hot water converters, absorption chillers, and processes.

Responsibility for water storage and transmission rests with Kirtland Air Force Base, with SNL handling distribution only to its own facilities. Remote test areas in Coyote Canyon have water trucked to them.

SNL is responsible for the sewage collection system in its technical areas and in Coyote Test Field, while Kirtland Air Force Base is responsible for the base-wide system. SNL contains over 24 km (15 mi) of sewer lines interconnected with Kirtland Air Force Base. Technical Areas I and IV are tied into the Kirtland Air Force Base system, while Technical Areas II, III, and V and Coyote Test Field have septic tanks and sewage lagoons independent of the main system.

Environmental Regulatory Setting. SNL strives to comply with environmental and other requirements established by Federal, state, and local statutes and regulations, executive orders, and DOE orders. The New Mexico Environment Department has state authority for developing regulations and standards for water, and hazardous and mixed waste management. The Albuquerque/Bernalillo County Air Quality Control Board has authority for developing regulations and standards for air. The remainder of this section summarizes the status of SNL compliance with the major environmental regulations.

National Environmental Policy Act. During 1994, SNL NEPA compliance activities focused on developing the SNL NEPA program and baseline information and fulfilling commitments made in the *Final Action Plan to Tiger Team.* SNL initiated the preparation of 15 EAs during 1994. FONSIs were issued for the neutron generator/switch tube prototyping relocation on April 8, 1994; general-purpose heat source safety verification testing on February 15, 1995; and the construction and occupancy of the Robotic Manufacturing Science and Engineering Laboratory on April 13, 1994.

Comprehensive Environmental Response, Compensation, and Liability Act. Based on the Preliminary Assessment/Site Inspection conducted in 1988, EPA concluded that none of SNL's inactive waste sites qualified for the EPA's list of high-priority cleanups. Therefore, this act does not govern waste site cleanup, but RCRA does. During 1994, SNL had two reportable quantity chemical releases. Lead was released during a scheduled rocket motor firing and transformer oil leaked from an oil storage system and escaped from the system's secondary containment.

Resource Conservation and Recovery Act. The New Mexico Environment Department was granted authorization to regulate control of hazardous waste under RCRA by EPA on January 25, 1985, and mixed waste on July 25, 1990. SNL, which operates an onsite permitted treatment facility, is defined by RCRA as a large-quantity generator. During 1994, 86,369 kg (190,400 lb) of RCRA-regulated hazardous waste was managed by SNL. On May 12, 1994, DOE transmitted a Class I permit modification of the RCRA storage permit to the New Mexico Environment Department, allowing SNL to receive offsite generated wastes. SNL also operates a Thermal Treatment Facility that was permitted in November 1994 for the treatment of residual explosives.

The New Mexico Environment Department conducts annual RCRA audits of the SNL Hazardous Waste Management Facility and generator locations throughout SNL facilities. On October 7, 1994, the New Mexico Environment Department issued a Compliance Order listing 17 alleged violations, including open containers of hazardous waste, labeling errors, and incomplete training. Five of the violations were dropped following negotiations between SNL and the New Mexico Environment Department, and a civil penalty of $9,240,000 was proposed in January 1995. All of the remaining issues have been corrected.

As identified by the Environmental Restoration Project, potential release sites are being evaluated and corrected. At SNL's inactive Chemical Waste Landfill, concentrations of trichloroethylene slightly above the EPA's drinking water standards were discovered in groundwater 150 m (500 ft) beneath the site. A corrective action plan, entitled *The Chemical Waste Landfill Final Closure Plan and Postclosure Permit Application*, was approved by the New Mexico Environment Department in May 1993. Sites at which assessment efforts continued during 1994 include the Mixed Waste Landfill, Technical Area II, the Liquid Waste Disposal System, Tijeras Arroyo, and also at the Kauai Test Facility in Hawaii.

The Federal Facility Compliance Act of 1992. In accordance with the *Federal Facility Compliance Act* enacted in October 1992, SNL submitted a complete inventory of its mixed waste in November 1993 for the Final Mixed Waste Inventory Report. Additionally, SNL submitted the Conceptual Site Treatment Plan (Phase I) for SNL mixed waste issued in October 1993 and the Draft Site Treatment Plan (Phase II) issued in August 1994 to the New Mexico Environment Department. In December 1994, the Proposed Site Treatment Plan (Phase III), including a revised mixed waste inventory through September 1994 and preferred treatment options in accordance with the DOE/AL Mixed Waste Treatment Plan (April 1994), were submitted to the New Mexico Environment Department.

Clean Water Act. SNL submitted an NPDES permit application on October 1, 1992, for its industrial discharge. Two NOIs to discharge for construction of stormwater discharges were submitted on January 24, 1994, for construction of the Technology Support Center, and on September 19, 1994, for construction of the Robotic Manufacturing Science and Engineering Laboratory. SNL has six wastewater discharge permits from the city of Albuquerque.

Safe Drinking Water Act. SNL maintains compliance with SDWA standards for its public water systems.

Clean Air Act. SNL is regulated by the 1990 CAA amendments and by local regulations, including air quality control regulations, which are administered by the Albuquerque/Bernalillo County Air Quality Control Board. In 1994, 15 open burn permits were issued to SNL by the city of Albuquerque. Permits were issued for operations at the Luance Canyon Burn Site, the Thermal Treatment Facility, the Coyote Test Field, and the Fire Extinguisher Training

Site. All other existing permits were issued by either the city of Albuquerque or EPA. In early 1995, SNL conducted an inventory of hazardous chemical usage. The inventory included radionuclides, ozone-depleting substances, and chemicals listed in *Superfund Amendments and Reauthorization Act*, Section 313, Toxic Chemical List.

In January 1994, SNL began an ambient air surveillance program which included one criteria pollutant monitoring station, seven particulate matter monitoring stations, and four VOC monitoring locations. No exceedances or violations were detected in 1994.

Toxic Substances Control Act. SNL regulates PCBs and asbestos in compliance with TSCA regulations. Electrical distribution equipment containing greater than, or equal to, 50 ppm are being removed and shipped offsite to permitted treatment and disposal facilities. A total of 49 items, having PCB concentrations over 50 ppm, remained in service as of December 31, 1994. SNL operates two programs for the management of asbestos. The Facilities Asbestos Program manages the abatement of floor tiles and insulation. The Non-Facilities Asbestos Program handles nonfacilities items that may contain asbestos such as gloves, fume hoods, and ovens.

Federal Insecticide, Fungicide, and Rodenticide Act. EPA-registered pesticides are applied by EPA-certified applicators. Records including pesticide types and quantities and Material Safety Data Sheets are retained by SNL.

A.1.8 Nevada Test Site

Site Description. NTS is located in Nye County, NV, and encompasses approximately 351,000 ha (867,000 acres). It varies in width from 45 to 56 km (28 to 35 mi) east to west and in length from 64 to 88 km (40 to 55 mi) north to south. To the north, east, and west, the rugged, mountainous, and undeveloped Federal-owned land masses of the Nellis Air Force Range provide a buffer zone, varying from 24- to 104-km (15- to 65-mi) wide, between the test areas and public lands. The Bureau of Land Management manages the land that borders the southern and southwestern boundaries. U.S. Highway 95 and the town of Amargosa Valley are also to the south. The southeast corner of NTS is about 104 km (65 mi) northwest of Las Vegas. Locations of NTS and its principal facilities and testing areas are shown in figures A.1.8–1 and A.1.8–2.

NTS is unique in that it is a large open area with tightly controlled access and with adequate infrastructure to handle and run tests with hazardous or radioactive materials. Approximately 25 percent of NTS is undeveloped or provides buffer zones for ongoing programs and projects. Facility expansions are possible within all areas and encroachment from land development is not a concern.

NTS is divided into numbered test areas to simplify the distribution, use, and control of resources. The main entrance and the Desert Rock Airstrip are at the southeast corner of the site (Area 22). Mercury Base Camp is adjacent in Area 23 and provides administrative operations and general support. Offices for DOE, DOD, the Defense Nuclear Agency, LLNL, LANL, SNL, and all of the supporting contractors of these organizations are located in this area. Dormitory, cafeteria, recreation, and transportation facilities are located here.

North of Mercury is Frenchman Flat (Area 5), a historic area because of the atmospheric nuclear tests conducted there. Just north of Frenchman Flat is Area 6. The Control Point One Complex, which provides control over and execution of nuclear detonations at NTS, is located here, as is a new work-camp for construction and craft support. A shallow, usually dry-lake bed, Yucca Lake, is also in this area. Farther north is the broad valley of Yucca Flat, site of many of the more recent nuclear tests (Areas 1, 2, 3, 4, 7, 9, and 10). At the northern edge of this flat at the base of Rainier Mesa is the center of DOD/Defense Nuclear Agency activities (Area 12). The Area 12 Camp, which is closed, provided logistic, service, and administration facilities that, in busier times, supported the northern part of NTS. The Area 12 Camp provided ready access to the Defense Nuclear Agency tunnels mined into the face of Rainier Mesa. In the northwest section of NTS is Pahute Mesa. Pahute Mesa's geology allows its use for testing nuclear devices with larger yields (Areas 19 and 20).

Due to its large size, the perimeter of NTS is not completely fenced; however, roving security guards patrol the test site. Security and hazardous areas are fenced and some areas are protected with armed guards and electronic security measures. Capital

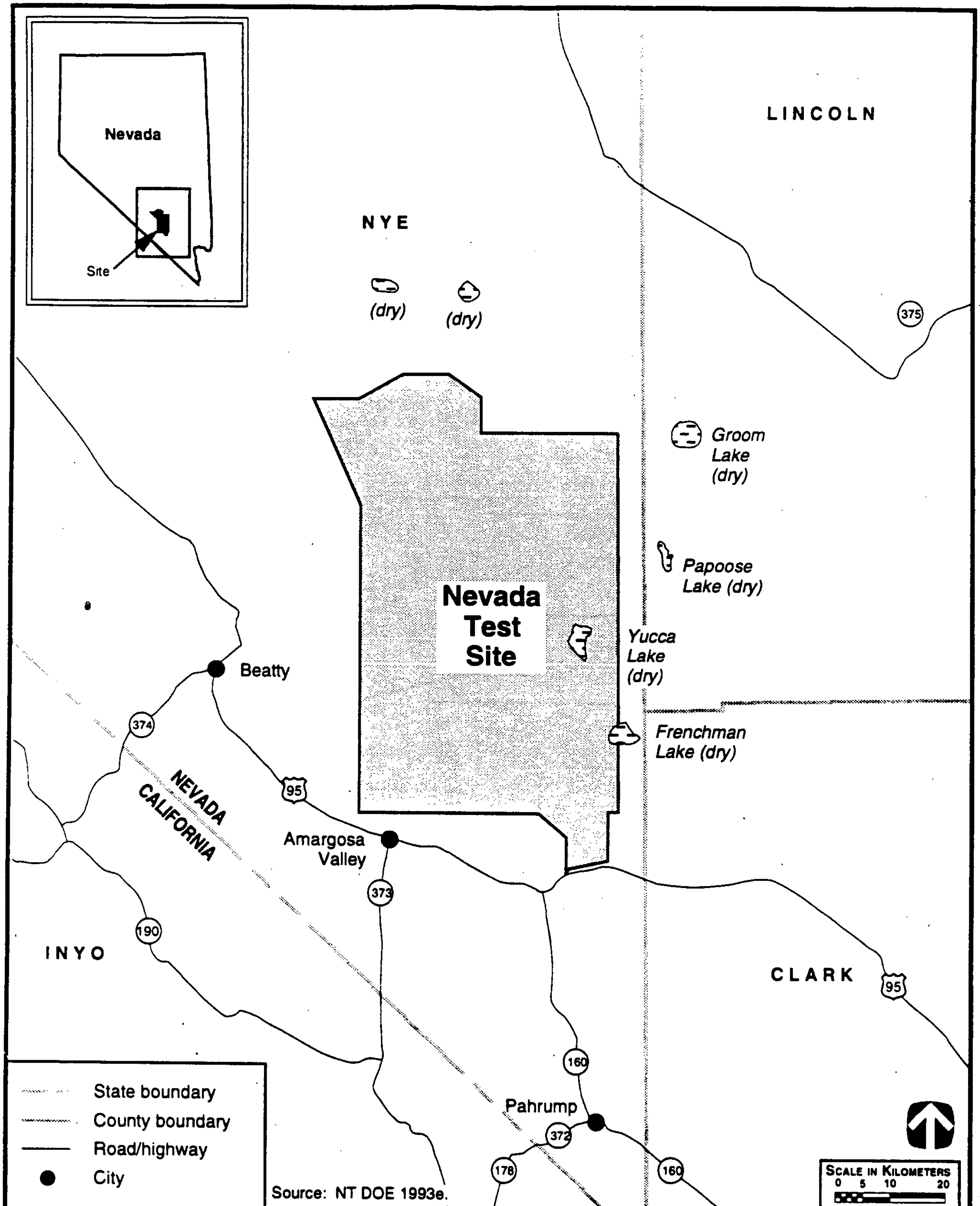

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FIGURE A.1.8–1.—*Nevada Test Site, Nevada, and Region.*

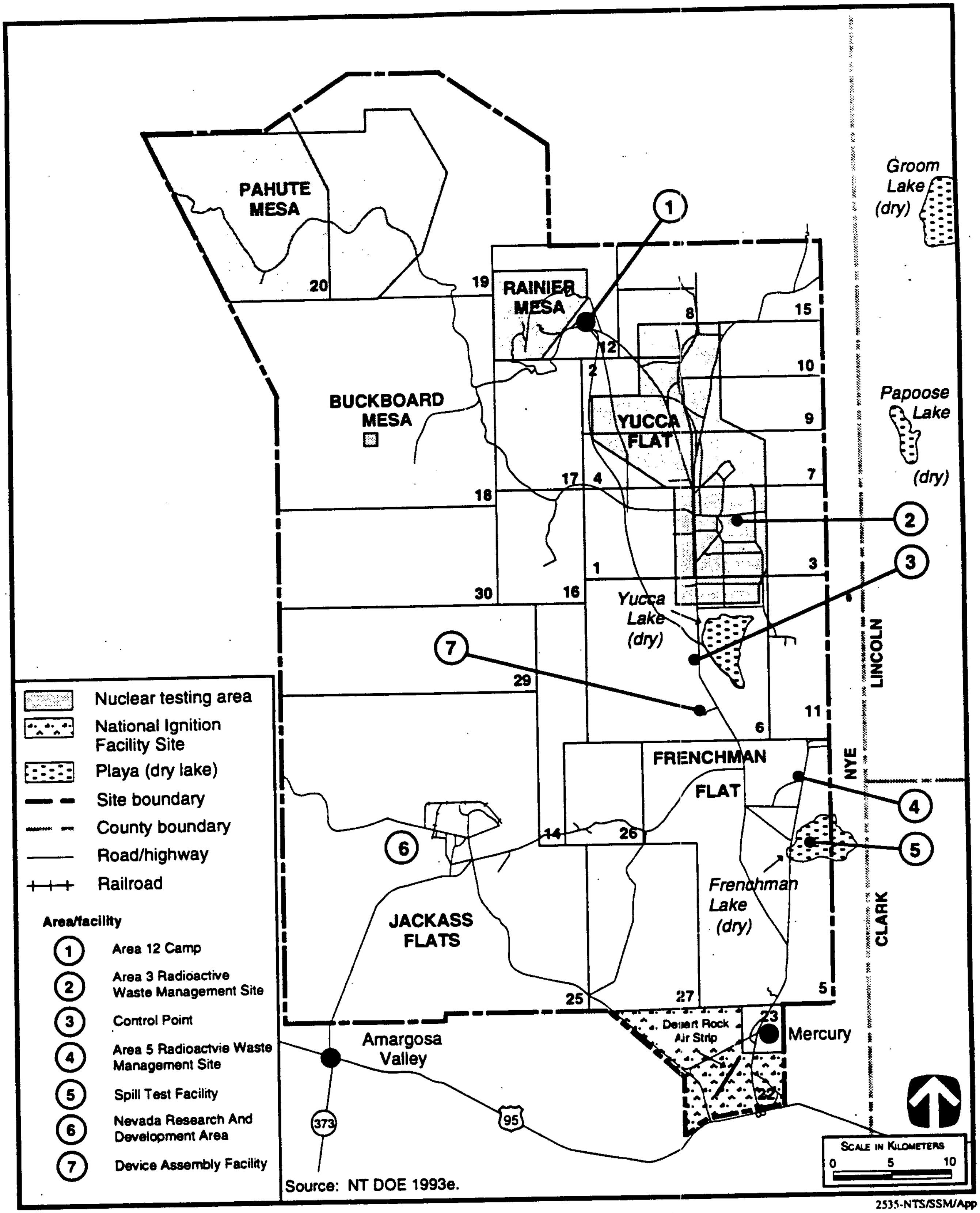


FIGURE A.1.8–2.—*Principal Facilities and Testing Areas at Nevada Test Site.*

assets at NTS include about 1,200 buildings with 8,000 units of installed equipment, approximately 640 km (400 mi) of primary and secondary surfaced roads, and 480 km (300 mi) of unsurfaced roads.

The NTS water system consists of many wells, pumps, booster pumps, and many sumps, reservoirs, chlorinator water softeners, and 160 km (100 mi) of supply and distribution lines. This water system has an average weekly production of 40 million liters (L) (10.5 million gallons [gal]). Total well capacity is 21,670 liters per minute [lpm] (5,752 gallons per minute [gpm]). Twelve wells supply water for domestic use on NTS.

Electrical power to NTS is supplied by Nevada Power Company and Valley Electric Association transmission lines. Both transmission lines are rated at 138 kV. The Nevada Power Company line is approximately 96 km (60 mi) long and ties into the NTS transmission system near Mercury. The Valley Electric Association line is more than 160 km (100 mi) long. It runs from the Amargosa Valley substation and ties into the NTS transmission system at Jackass Flats substation. This system (the Nevada Power Company/Valley Electric Association transmission lines) is capable of providing 45 megawatt electric (MWe) based on a single contingency failure. NTS has over 1,120 km (700 mi) of overhead and underground transmission and distribution power lines. NTS also uses a small amount of liquid fuel. Table 4.9.2.2–1 shows the annual usage of resources. Current missions at NTS are shown in table 3.2.9–1. The major DP facilities located at NTS are shown in table A.1.8–1.

In December 1950, President Truman established the Nevada Proving Grounds (forerunner to NTS) as the Nation's on-continent nuclear weapons testing area. The first nuclear test at NTS occurred on January 27, 1951. At that time, the nuclear weapons program was administered by the Atomic Energy Commission (AEC), Albuquerque Operations Office. AEC employees were sent to the Nevada Proving Grounds for the duration of a test series and then returned to Albuquerque. As tests became more frequent during the 1960s, the AEC created the Las Vegas-based Nevada Operations Office, which officially opened on March 6, 1962, and has since administered NTS operations. Approximately 40 percent of the total Nevada Operations Office budget for fiscal year 1992 was for DP activities.

Desert Rock Air Strip is located southwest of Mercury. The airstrip has, in busier times, provided scheduled air service by DOE aircraft between NTS and LLNL, LANL, and SNL, for access by researchers and testing personnel. Currently, it is used only for high priority shipments.

Construction of the only major new facility, the Device Assembly Facility, is essentially complete; however, existing facilities are modified on an as-needed basis. Drilled holes for groundwater monitoring are always in the process of being selected, designed, and developed. A waste management facility is being considered for handling transuranic (TRU) waste from DOE facilities; this and the Solar Power Production Facility are the only major non-DP facilities anticipated for NTS.

TABLE A.1.8–1.—*Major Defense Program Facilities at Nevada Test Site*

Facility	Functions
Device Assembly Facility (DAF)	Assembly of nuclear test devices
Lyner Facility	Underground subcritical testing, dynamic experiments with special nuclear materials
Area 27, Critical Assembly Facilities	Assembly bays, storage magazines, and radiography buildings maintained for use as an alternative to the Device Assembly Facility
Able Site	Maintained for resumption of testing pending Device Assembly Facility operations, and for operations involving HE and special nuclear materials
Baker Site	HE operations and staging
Big Explosive Experimental Facility (BEEF)	Conventional HE testing

Source: NT DOE 1996c; NTS 1996a:1.

Defense Program Activities. Historically, most of the work carried out onsite has been related to DP activities. Since it was established in December 1950, NTS has been the principal testing location for the Nation's nuclear weapons program. As of September 30, 1992, the United States had conducted 1,054 nuclear tests, 928 of which were on NTS and 828 of which were underground. Underground testing was controlled at the Area 6 Control Point One. This facility contains the technical, managerial, and safety infrastructure to control the site.

As has previously been noted, since the *U.S. Nuclear Testing Moratorium Act* went into effect in early October 1992, no nuclear tests have been conducted by the United States. On the day immediately following China's October 4, 1993 nuclear test, President Clinton issued a directive to DOE to continue to maintain indefinitely a state of readiness for possible resumption of U.S. testing. Other aspects of stockpile stewardship activities at NTS include treaty-compliant and permitted HE tests, subcritical dynamic experiments, and hydrodynamic tests.

The Device Assembly Facility is the only new major facility for DP activities at NTS. This 9,290 m^2 (100,000 ft^2) facility was authorized in 1984. It is physically located just south of Control Point One. It will combine and centralize most functions and facilities of the existing device assembly area. The Device Assembly Facility will enable LLNL and LANL to conduct multiple operations with HE and nuclear devices simultaneously. All aspects of the operation will be handled in this one facility because its multiple processing areas include assembly cells, assembly bays, high bays, radiographic facilities, special nuclear materials laboratories, HE staging, special nuclear materials staging, shipping and receiving areas, and associated administrative and support areas. In addition, the facility will provide for increased overall security and permit easier entrance and exit for the workers during hazardous operations. Special nuclear materials will not be manufactured or machined at this facility; only the device A/D and material storage/staging functions would be handled here.

The Nevada Operations Office has been delegated the lead Federal role in maintaining the capability to respond to certain kinds of national emergencies. It will provide the leadership when a Federal Radiological Monitoring and Assessment Center is established. Additionally, a team of highly trained DOE and contractor radiological specialists known as the Nuclear Emergency Search Team trains, tests equipment for search and detection, and stores equipment for rapid deployment under the auspices of the Nevada Operations Office. It can be mobilized in case of accidents involving radioactive materials or a terrorist threat involving nuclear weapons.

Other Department of Energy Activities. Although the principal activity at NTS is testing nuclear devices, DOE is also involved in a number of other activities. These activities include liquefied gaseous fuels spill testing, solar technology demonstration, radioactive and mixed waste disposal, and the Yucca Mountain characterization programs. NTS has also been designated a DOE National Environmental Research Park.

The Spill Test Facility in Area 5 was completed in 1986. It is operated on a fee basis for commercial users as a basic research tool for studying the dynamics of accidental releases of hazardous materials and to evaluate the effectiveness of various foams and fire retardants in accidents involving chemicals and hazardous materials. Test facility personnel discharge a measured volume of hazardous test fluid at a controlled rate onto a surface specially prepared to meet the test requirements and record close-in and downwind meteorological data and gaseous concentration levels.

NTS is a proposed site for a program sponsored by DOE for a Solar Enterprise Zone. As part of this program, a 100 MWe solar power plant is proposed to be built at NTS. The power from this plant would support Government needs in the area, and the remainder would be sold to the commercial grid. This size plant can be supported with the existing transmission lines at NTS. There is also potential to expand the solar power capability at NTS to approximately 500 MWe in the future; however, this expansion would require substantial infrastructure upgrades including new transmission lines. The first 100 MWe plant is expected to be in place and generating by the 2005 No Action timeframe.

NTS also operates radioactive waste disposal facilities. The Radioactive Waste Management Site, located in Area 5, accepts LLW materials that were generated in the Nation's DP activities. This 37-ha (92-acre) facility consists of trenches and pits for burying LLW and aboveground storage for TRU waste awaiting transfer to the Waste Isolation Pilot Plant (WIPP). Also located at the Area 5 Radioactive Waste Management Site are Greater Confinement Disposal Units, which consist of 3 m (10 ft) in diameter partially cased shafts that are 37 m (120 ft) deep. These units were used for disposing of waste not suited for shallow land burial because of high exposure and potential for migration into biopathways. Management in charge of Greater Confinement Disposal is considering using different disposal configurations (other than boreholes). Nonradioactive hazardous wastes are also accumulated at the Area 5 Radioactive Waste Management Site awaiting shipment to offsite treatment and disposal facilities. In Area 3, the Radioactive Waste Management Site uses surface subsidence craters (that were formed by underground nuclear tests) for the emplacing and burying of LLW in bulk form (such as debris collected from atmospheric nuclear test locations).

The Yucca Mountain Site is located along the western boundary of NTS. It is being considered by DOE for the disposal of spent power-reactor fuel and vitrified HLW, the latter resulting principally from DP activities. The Yucca Mountain Site Characterization Project staff reports directly to DOE's Office of Civilian Radioactive Waste Management; however, because it has elements based on NTS, the Nevada Operations Office provides some administrative and operational support services to the project.

Recently, NTS has been designated as a DOE National Environmental Research Park with a purpose of consolidating previous ecological reports, filling in a significant gap in the existing DOE research park network, and providing a unique opportunity for research in the arid desert environment. This not only enables NTS scientists to link into the existing ParkNet computerized data system, but also makes the extensive accumulation of environmental research collected over the history of NTS available to students and scientists throughout the world. NTS's location in the transition zone between the Southern and Northern Basin and Range Ecological Regions, and its inclusion of vast undisturbed areas of mountain ridges, closed basins, and diverse ecological communities makes it particularly valuable.

Non-Department of Energy Activities. The most significant NTS activity involving non-DOE organizations has been the Defense Nuclear Agency's Nuclear Testing Facility. Congressional legislation (the *Hatfield Amendment*), however, limited nuclear testing to those tests that support the safety and reliability of the U.S. nuclear stockpile. This may preclude further Defense Nuclear Agency nuclear tests, which are done to support research into nuclear weapons effects.

Defense Nuclear Agency nuclear tests occurred in horizontal tunnels mined beneath Rainier Mesa. The nuclear devices for these tests were designed, built, funded, controlled, and executed by the Office of Defense Programs. The Defense Nuclear Agency's nuclear testing provided the database and design information for both nuclear effects and survivability. Nuclear weapons-effects were studied for all U.S. tactical and strategic weapons systems that were required to operate in a nuclear warfare environment. These tests played a major role in maintaining high confidence in the nuclear stockpile and nuclear-capable weapons systems. The weapons-effects tests were conducted to study a number of nuclear effects including x-ray, gamma-ray, neutron, stress (thermal, electrical, and mechanical), electromagnetic pulse, airblast, ground and water shock propagation, and temperature effects. These tests assessed both weapons effects and the survivability of military systems in a nuclear environment.

Area 25 has been used for a variety of purposes, including U.S. Army ballistic research using depleted uranium and transporter testing for the proposed mobile MX missile. Various military exercises and training activities are also conducted in and around Area 25.

The Desert Research Institute, EPA, the University of Utah, and the Nevada Operations Office operate the Community Radiation Monitoring Program. This program provides the community surrounding NTS with an increased understanding of its activities and the natural radiation environment.

Other activities have been and will likely continue to be carried out for other Federal departments and agencies. Representatives from EPA, the U.S. Geological Survey, and the National Oceanic and Atmospheric Administration are onsite to assist and monitor conditions.

Environmental Regulatory Setting. The State of Nevada has regulatory authority for air, water, solid waste, and hazardous waste. A Memorandum of Understanding between DOE and the state covers required notifications whenever there might be radiological releases from NTS. DOE and the state also signed an Agreement in Principle in October 1990 to provide DOE funding to Nevada for oversight of environmental activities at NTS, including environmental restoration activities. The Agreement in Principle provides the understanding between and commitment of both parties regarding DOE's provision of technical and financial support to the state in return for environmental oversight and monitoring.

The remainder of this section summarizes the status of NTS compliance with the major environmental regulations.

National Environmental Policy Act. The site-wide EIS for NTS and offsite locations in the state of Nevada examines existing and potential impacts to the environment that have resulted, or could result, from current and future DOE operations in southern Nevada. The EIS analyzes the impacts from DOE programs at the following sites: NTS, the Tonopah Test Range, portions of the Nellis Air Force Range Complex, the Central Nevada Test Area, and the Project Shoal Area. These programs include ongoing activities for the stewardship of the national nuclear weapons stockpile, management of radioactive waste, and environmental restoration. Also examined in the EIS are newer programs, such as the proposed Solar Enterprise Zone sites at NTS, Dry Lake Valley, Eldorado Valley, and Coyote Spring Valley.

Comprehensive Environmental Response, Compensation, and Liability Act. NTS has soils contaminated by plutonium and other radioactive materials as a result of past testing operations. EPA is in the process of ranking NTS according to the Hazard Ranking System based on the preliminary assessment/site investigation reports prepared in 1988. Concurrently, the state is negotiating a Federal Facility Agreement with DOE for environmental restoration, including restoration mixed waste. Nevada has taken this action pursuant to the state's corrective actions regulations to negotiate a formal cleanup agreement with DOE rather than waiting for EPA to list NTS on the NPL under provisions of CERCLA. If an agreement between the state and DOE is signed, it is unlikely that EPA will further pursue ranking NTS.

Emergency Planning and Community Right-To-Know Act. The State of Nevada combines the reporting requirements of Section 312, Tier II Report with the information requirements for the Nevada State Fire Marshall Division Uniform Fire Code Materials Report. NTS reports to the State of Nevada information on 28 chemicals in 36 areas which were above the reporting threshold. In addition, the State of Nevada *Chemical Catastrophe Prevention Act* of 1992 requires the registration of highly hazardous substances above predetermined thresholds.

Resource Conservation and Recovery Act. DOE received a permit for the Explosive Ordnance Disposal Unit and the Hazardous Waste Storage Unit in May 1995. RCRA Corrective Action is included in the permit for these two facilities. The Environmental Restoration Program under Corrective Action activities will be the major contributor to the generation of mixed waste.

As provided in the June 23, 1992, Settlement Agreement for Mixed TRU waste, NTS is allowed to continue to operate the Area 5 Radioactive Waste Management Site TRU Waste Storage Pad in accordance with 40 CFR, Part 265, Subpart I. The agreement also requires that DOE submit a report documenting why the current inventory of mixed TRU cannot be removed until WIPP becomes operational and on the progress DOE is making to certify the stored TRU waste to WIPP Waste Acceptance Criteria. In January 1994, a Mutual Consent agreement was established between DOE and the state allowing DOE to use the available storage capacity on the TRU Waste Storage Pad for the storage of onsite generated low-level mixed waste that cannot be disposed because the waste does not meet the RCRA standards of treatment for land disposal. The Mutual Consent Agreement was amended in June 1995 to allow for all mixed waste generated by DOE within the State of Nevada to be stored at the TRU waste storage pad.

NTS is registered as a hazardous waste generator (ID no. NV3890090001) and is routinely inspected by the Nevada Division of Environmental Protection. There were no Findings of Alleged Violation identified from the RCRA Annual Compliance Evaluation conducted at NTS near the end of 1993 because NTS is conducting RCRA operations in compliance and had corrected previous RCRA findings; unresolved findings have been incorporated as part of the enforceable agreements between DOE and the state.

The Federal Facility Compliance Act of 1992. This act is an amendment to RCRA. DOE published the Interim Mixed Waste Inventory Report in April 1993, annual updates, and periodic updates since, describing its inventory of mixed wastes and treatment capabilities. A Site Treatment Plan was issued in October 1995 and its provisions will be incorporated into the Consent Order being negotiated between the state and DOE.

Clean Air Act. There are no criteria pollutant or prevention of significant deterioration monitoring requirements for NTS operations. However, NTS does comply with other requirements established by the CAA, State of Nevada air quality controls, radionuclide monitoring, and air permit compliance. As of December 31, 1993, NTS operations are in full compliance with standards of 40 CFR 61, Subpart H (National Emissions Standards for Emissions of Radionuclides Other than Radon from DOE Facilities). NTS air quality permits limit particulate emissions to 20 percent opacity. Seven permitted equipment/processes, such as weapons event stemming operations, have been identified as routinely exceeding the 20 percent opacity requirement. NTS requested an independent study of fugitive dust emissions from permitted equipment and from surface disturbance operations to identify means of improving NTS air quality emissions. Recommendations were either instituted or equivalent changes were made to improve overall NTS air quality emissions. Chlorofluorocarbon recycling equipment is in place at all NTS service and maintenance centers. Freon is recovered and reused, eliminating ozone-depleting substance emissions into the atmosphere almost completely.

Clean Water Act. Wastewater discharges at NTS facilities are not regulated under NPDES permits because all such discharges are to onsite sewage lagoons. Discharges to these lagoons are permitted under the *Nevada Water Pollution Control Act.* Monitoring and reporting requirements are typically included under local permit requirements. Wastewater monitoring at NTS is required for sampling wastewater influents to sewage lagoons and containment ponds. The sewage lagoons are in compliance and are routinely inspected by State of Nevada personnel. DOE has requested a formal determination by the state concerning the regulatory situation of NTS reference stormwater requirements based on both Standard Industrial Code usage and whether waters of the United States exist on NTS. The Nevada Division of Environmental Protection must determine if requirements under Federal stormwater discharge regulations are relevant to NTS. This determination is still pending.

Safe Drinking Water Act. Compliance with this act primarily addresses the quality of potable water supplies at NTS as determined through the sampling and monitoring requirements for drinking water systems. The State of Nevada has enacted and enforces SDWA regulations and also regulates daily system operations. DOE developed an operations and maintenance plan to address standard operating procedures for water system operations at NTS. The State of Nevada classifies NTS water system as requiring a Grade II Water System Operator Certification. NTS provides such a certified operator. To meet requirements under the state health regulations, potable water distribution systems at NTS are monitored for residual chlorine content, coliform bacteria, VOCs, inorganic compounds, and other water quality standards. Drinking water systems are in compliance with standards.

Toxic Substances Control Act. State of Nevada regulations that implement this act require submission of an annual report which describes the quantity and status of PCBs and PCB-contaminated equipments as well as shipments of PCBs and PCB-contaminated items from NTS to an EPA-approved disposal facility. NTS is managing PCBs, asbestos, and chemicals in compliance with applicable regulations.

Federal Insecticide, Fungicide, and Rodenticide Act. Pesticide usage includes insecticides, herbicides, and rodenticides. Records are maintained on all pesticides used for at least 3 years. All applicators are provided the opportunity to receive state-sponsored training materials.

North Las Vegas Facility. This is a 32-ha (80-acre) site within the Las Vegas urban area. The site is positioned along Losee Road which runs parallel to and is a short distance west of Interstate 15. It is a quarter mi (0.4 km) north of Carey Avenue and 1 mi (1.6 km) south of Cheyenne Avenue in the city of North Las Vegas. It is bordered on the north, south, and east by general industrial zoning. The western border is adjacent to Commerce Street, which separates the site from fully developed single-family residential zoned property. Electrical power is supplied to the site by the Nevada Power Company, and natural gas is supplied by Southwest Gas Corporation. The city of North Las Vegas supplies the water and sanitary sewer services. The site consists of office and warehouse buildings with one large high bay and a tower as well as a large paved area for trailers. Mechanical and technical support functions associated with the underground test program were performed at this site. LLNL, LANL, and SNL used the North Las Vegas Facility (NLVF) to prepare, assemble, and test the instrumentation rack and canister assembly prior to deployment to NTS for testing operations.

NLVF, although considered an adjunct to NTS, must independently comply with many of the basic environmental requirements just as NTS does. DOE operations at NLVF have environmental requirements similar to the requirements of other 32-ha (80-acre) sites in the city of North Las Vegas.

A.2 STOCKPILE STEWARDSHIP PROJECT DESCRIPTIONS

The stockpile stewardship projects considered in this PEIS are the proposed NIF, the proposed CFF, and the proposed Atlas Facility. Detailed project-specific analyses of these alternatives are contained in appendixes I, J, and K, respectively.

A.3 Stockpile Management Project Descriptions

A.3.1 Weapons Assembly/Disassembly

Weapons A/D is a key element of the DOE stockpile management responsibility. This function provides the capability to: dismantle retired weapons; assemble HE, nuclear components, and nonnuclear components into nuclear weapons; repair and modify weapons; perform weapons surveillance; and store strategic reserves of nuclear components (pits and secondaries).

Weapons A/D consists of five main functions:

- Weapon assembly
- Weapon disassembly
- Joint test assembly and post-mortem
- Test bed A/D
- Storage of plutonium and HEU strategic reserves

The functions, as described in the following subsections, would vary between weapon programs. The plant must have the capability to vary production operations and quality assurance tests to meet the special needs of each program.

Weapons contain special nuclear material. Operations involving special nuclear material must be conducted within a critical assembly area. Weapons, joint test assemblies, and test beds contain HE and explosive detonators; therefore, operations involving these must be conducted in facilities designed for explosives operations.

Weapon Assembly. Weapon assembly is performed to produce a new weapon, to rebuild a weapon that has been disassembled for surveillance, or for modification or replacement of components. The assembly steps for a rebuild are the same as for a new build, except that the starting point varies, depending on the extent of disassembly.

Weapon assembly requires approximately 2,000 steps to combine hundreds of parts and subassemblies to form a weapon. The process is labor-intensive and includes many verification and quality control steps. Prior to the start of the assembly process, several bays would be configured with special tooling required for the specific weapons operations. As the assembly progresses, partially assembled weapons may be moved in series from bay to bay. At several points during assembly, the weapon would be moved from assembly bays to special purpose bays. These special purpose bays would be permanently configured with nonprogram specific equipment for performing verification or inspection operations, such as radiography inspection, leak testing, and mass properties determination.

Complete weapon assembly would be accomplished in three stages: physics package (also known as nuclear explosive package) assembly, mechanical weapon assembly, and ultimate user package assembly. The weapon assembly function is shown in figure A.3.1–1, and each stage is described below. Weapon parts would be unpackaged, cleaned, verified and, in some cases, tested prior to assembly.

Physics package assembly entails bonding or mating the main charge subassemblies to a nuclear pit and then enclosing this subassembly in a case along with other components. Prior to assembly, gamma spectrometry would be used to verify the authenticity of the nuclear components. The pit would also be leak-tested and weighed. After the physics package is cased, tests would be performed to ensure electrical continuity, and a radiographic inspection would be conducted to ensure that the internal subassemblies are correctly aligned.

When the main charge is made from conventional HE, the physics package assembly must be conducted in a specialized structure called an assembly cell. An assembly cell is designed to minimize the release of radioactive material in the event that the conventional HE detonates. After the physics package is cased, the potential for detonation is greatly reduced, and the physics package may be moved to an assembly bay. The physics package for a weapon using an insensitive HE main charge can be assembled in a bay. The completed physics package then continues to mechanical weapon assembly.

Mechanical weapon assembly entails placing the physics package in a warhead case and installing

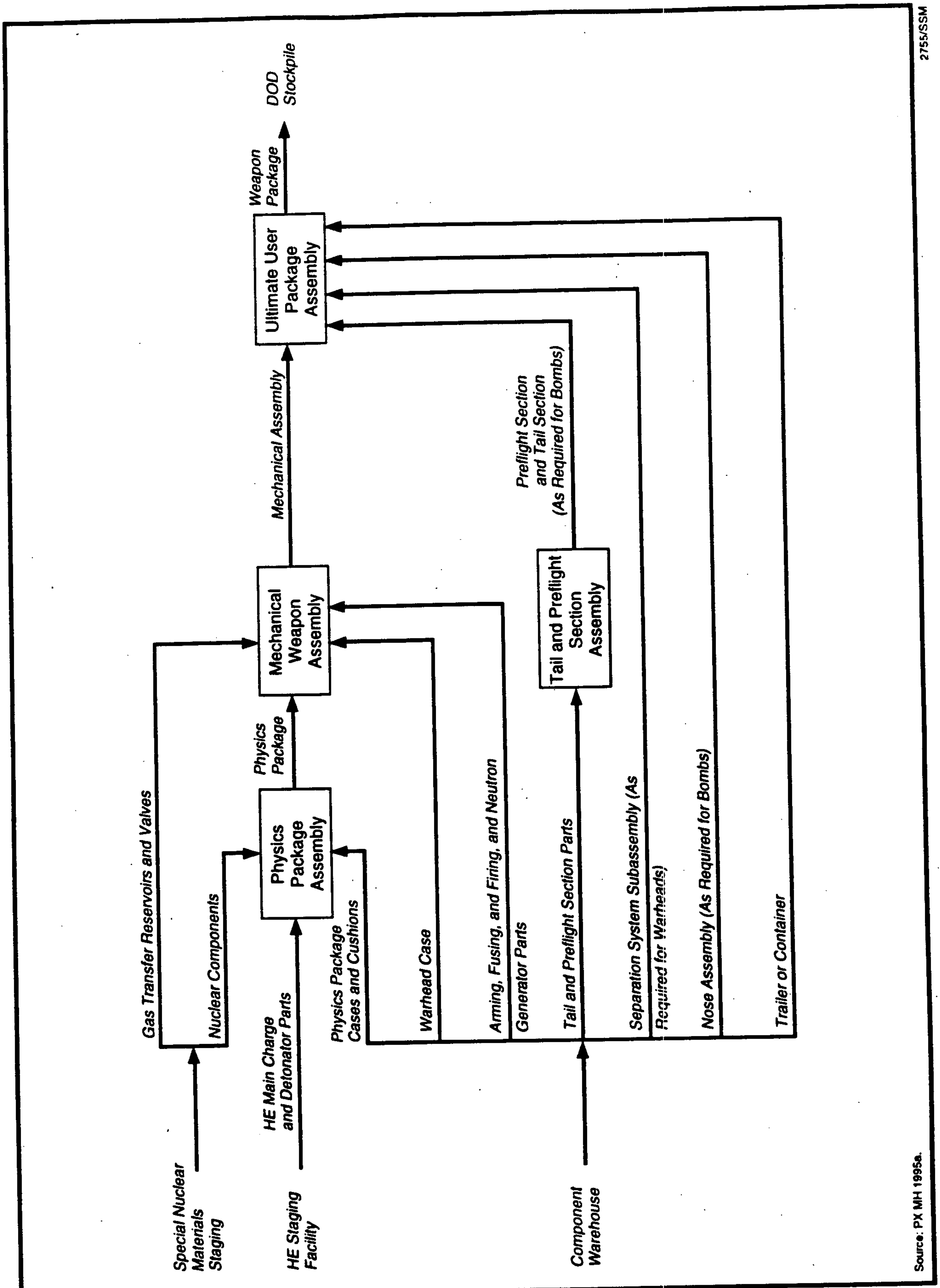


FIGURE A.3.1-1.—*Weapons Assembly Function.*

components for the arming, fuzing, and firing systems; the neutron generator; and the gas transfer system. At prescribed points during the assembly process, electrical testing and gas transfer system pressure testing would be conducted to verify proper installation. The completed mechanical package would be leak-tested, backfilled with a specified gas atmosphere, inspected with radiography, and subjected to mass properties testing. Leak-testing would ensure that the weapon case is properly sealed. Radiographic inspection would be used for verification of the weapon system. Mass properties testing measures the center of gravity and moments and products of inertia to ensure proper flying characteristics. The final stage of the mechanical weapon assembly is the user package assembly.

Ultimate user package assembly involves installing some additional components and packaging the weapon for shipment. This operation varies, depending on whether the mechanical assembly is used in a bomb or a warhead. For bombs, components such as the tail, nose, and/or preflight sections would be added. Tail and preflight sections would be preassembled prior to installation. The completed bomb would be loaded onto a trailer (roadable) for shipment. Warheads may have a separation subassembly installed and the completed warheads would be loaded into containers for shipment. The ultimate user assembly would be moved to the weapon staging area for shipment to DOD via safe secure trailer.

Weapon Disassembly. Weapon disassembly is performed to dismantle, modify, or evaluate a weapon. The operations conducted for each type of disassembly are similar, but the extent of the disassembly and procedures vary.

Dismantlement Disassembly. The weapon would be disassembled down to subassemblies and components that are suitable to be shipped to the originators, that facilitate recertification of usable parts, or that facilitate sanitization and demilitarization of unusable parts.

Modification (Retrofit) Disassembly. A weapon requiring modification would be disassembled to the extent necessary to gain access to the components requiring replacement. The disassembly procedures are intended to maximize reuse of parts.

Stockpile Evaluation Disassembly. The evaluations and tests required would be defined by the design laboratories. The extent of disassembly depends on which components require testing. Procedures include additional testing, and typically call for removing components in connected groups to facilitate further testing in test beds or joint test assemblies.

The weapon disassembly process is similar to the reverse of the assembly process and would be accomplished in three stages: ultimate user package disassembly, mechanical weapon disassembly, and physics package disassembly. Many of the facilities used for various disassembly and testing operations are the same facilities used for weapon assembly. The weapon disassembly function is shown in figure A.3.1–2, and each stage is described below.

Ultimate user package disassembly begins by performing a series of verification steps to ensure that the weapon is in a safe condition and that internal components are intact. The steps include tritium monitoring, electrical safing system test, gamma spectrometry safeguards verification, and a radiographic safing system verification. Bombs would be removed from trailers, and mechanical assemblies would be separated from the tail and nose sections. Warheads would be removed from ultimate user containers and then mechanical assemblies would be separated, as required, from separation subassemblies.

Mechanical weapon disassembly also begins with a series of tests. These tests include an internal atmosphere test check, a radiographic inspection, and a tritium pressure leak test. Evaluation of disassemblies may also require vacuum chamber leak test and mass property testing. The mechanical weapon disassembly entails removing the components for arming, fuzing, and firing systems; neutron generators; the gas transfer system; and the outer weapon case. The remaining physics package is further disassembled. The physics package may require a radiographic inspection for an evaluation disassembly.

Physics package disassembly would be accomplished by opening the case, removing the HE/pit subassembly and other components, and then separating the HE main charge from the nuclear pit. As

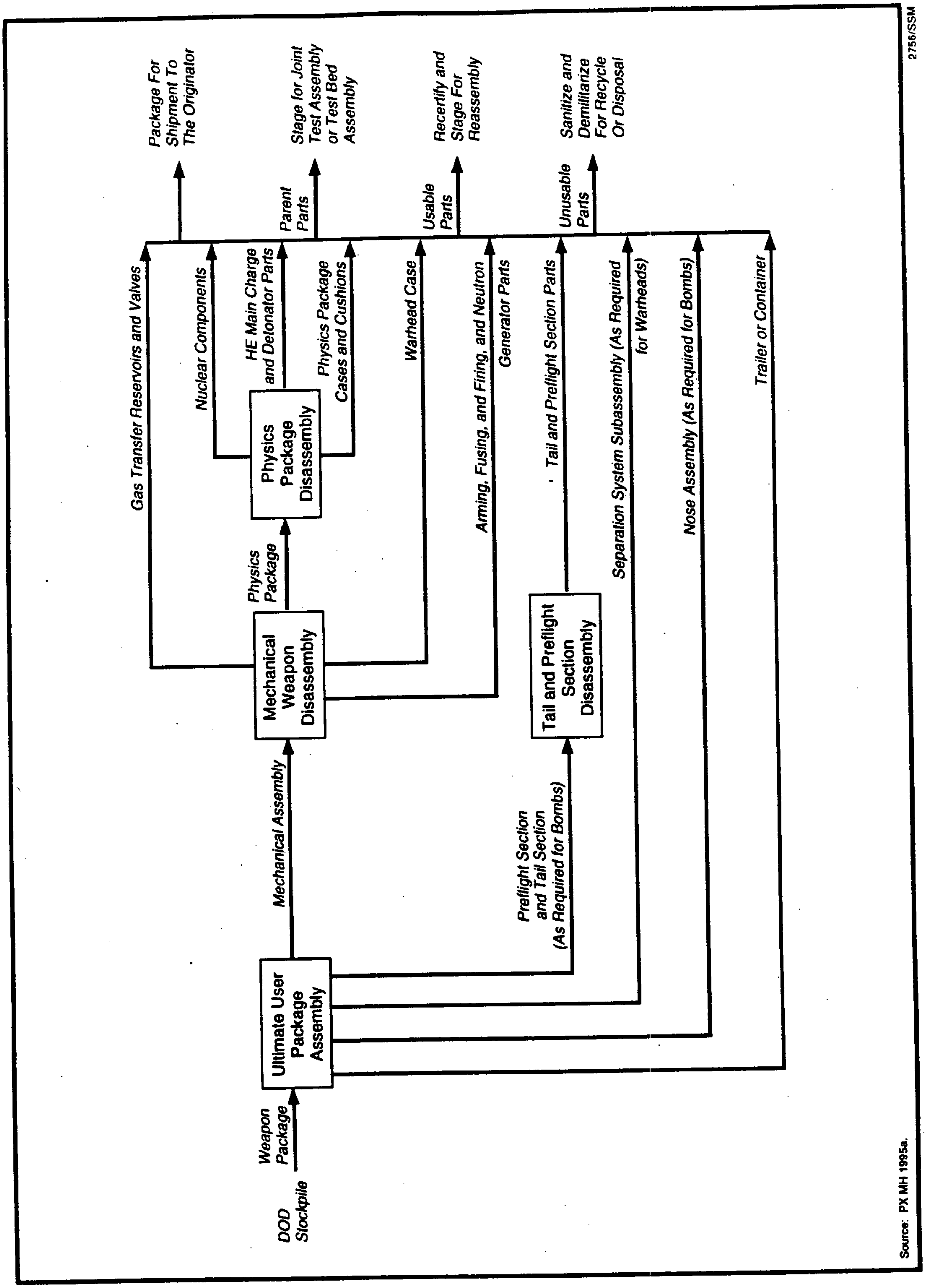


FIGURE A.3.1–2.—*Weapons Disassembly Function.*

described for weapon assembly, the physics package disassembly must be performed in a cell if the main charge is conventional HE.

The balance of the weapon disassembly function involves processing various weapons parts. These parts may be disassembled further on site or left intact. Parts may be recertified and staged for reassembly, shipped to the originating site for evaluation or disposition, or processed as residual material in the waste management process. Selected components may be assembled in a test bed or the bulk of the components may be used in a joint test assembly.

Joint Test Assembly and Post Mortem. As part of the ongoing stockpile evaluation program, weapons are randomly selected from the stockpile or new production inventory for conversion to joint test assemblies. A joint test assembly is a nuclear explosive-like assembly (mock weapon) that will be test flown by DOD. A joint test assembly generally contains most of the original weapon parts, except for the nuclear components and main charge subassemblies. A joint test assembly also contains telemetry components to monitor joint test assembly performance during flight, mock materials to simulate the size and weight of missing components, and witness plates to verify that energetic actuators performed as expected.

A process flow diagram of the joint test assembly support function is shown in figure A.3.1–3. Assembly of a joint test assembly is similar to weapon assembly, but some components are different. The physics package equivalent for a joint test assembly is called joint test subassembly. A high degree of quality control is required due to the high cost of the complex test.

After the flight test, joint test assemblies for bomb programs are generally recovered and returned for post-mortem disassembly and evaluation. Joint test assemblies for warhead programs are recovered if possible and returned for evaluation. The parts obtained from disassembly are processed for disposal. The procedures for joint test assembly are similar to those for a weapon disassembly, except that additional measures are taken to contain residues produced by the energetic actuators. The parts obtained from disassembly may be recertified and staged for reassembly, shipped to the originating site for evaluation or disposition, or processed in the waste management facility.

Joint test A/D operations, as well as the special evaluations such as radiography gamma spectrometry and leak-testing required for joint test assemblies, are performed in the same bays and special purpose bays used to conduct weapon assembly and disassembly operations.

Test Bed for Assembly and Disassembly. A test bed is an apparatus used for bench testing weapon systems, subsystems, and components. It is composed of parts removed from a weapon in evaluation disassembly and an explosive box. The explosive box contains the blast and fragments from the small explosive charges which detonate as the weapons systems are tested. The weapon parts are generally from the arming, fuzing, and firing systems and include antennas, radio frequency lines, radar, programmers, fire sets, detonator cables, and permissive action links. Prior to testing, some test beds are exposed to temperature extremes in environmental conditioning ovens. The testing is conducted at fully instrumentated test stations that can simulate deployment temperatures.

The test bed support function is shown in figure A.3.1–4 and is described below. Test bed assembly entails constructing the explosive box and parent part assembly and mounting these items on the test fixture. The explosive box is manufactured by enclosing explosive or electro-explosive components in an explosive barricade containing a fill material to damp the detonations. The explosive box may also contain a fiber optic sensing system to monitor the actuation timing. The parent parts assembly is composed of the removed weapon parts. The explosive box may also contain parent parts.

Optional Storage of Plutonium and Highly Enriched Uranium Strategic Reserves. Storage of the plutonium strategic reserve could occur at the weapons A/D Facility (as shown in figure A.3.1–5). If Y-12 is selected as the site for the secondary fabrication mission, HEU strategic reserve storage would remain at ORR. If Y-12 is not selected, then the HEU strategic reserve could also be stored at the weapons A/D Facility. The strategic storage of plutonium and HEU provides cased pits and canned subassemblies for replacement in the enduring stockpile and for use

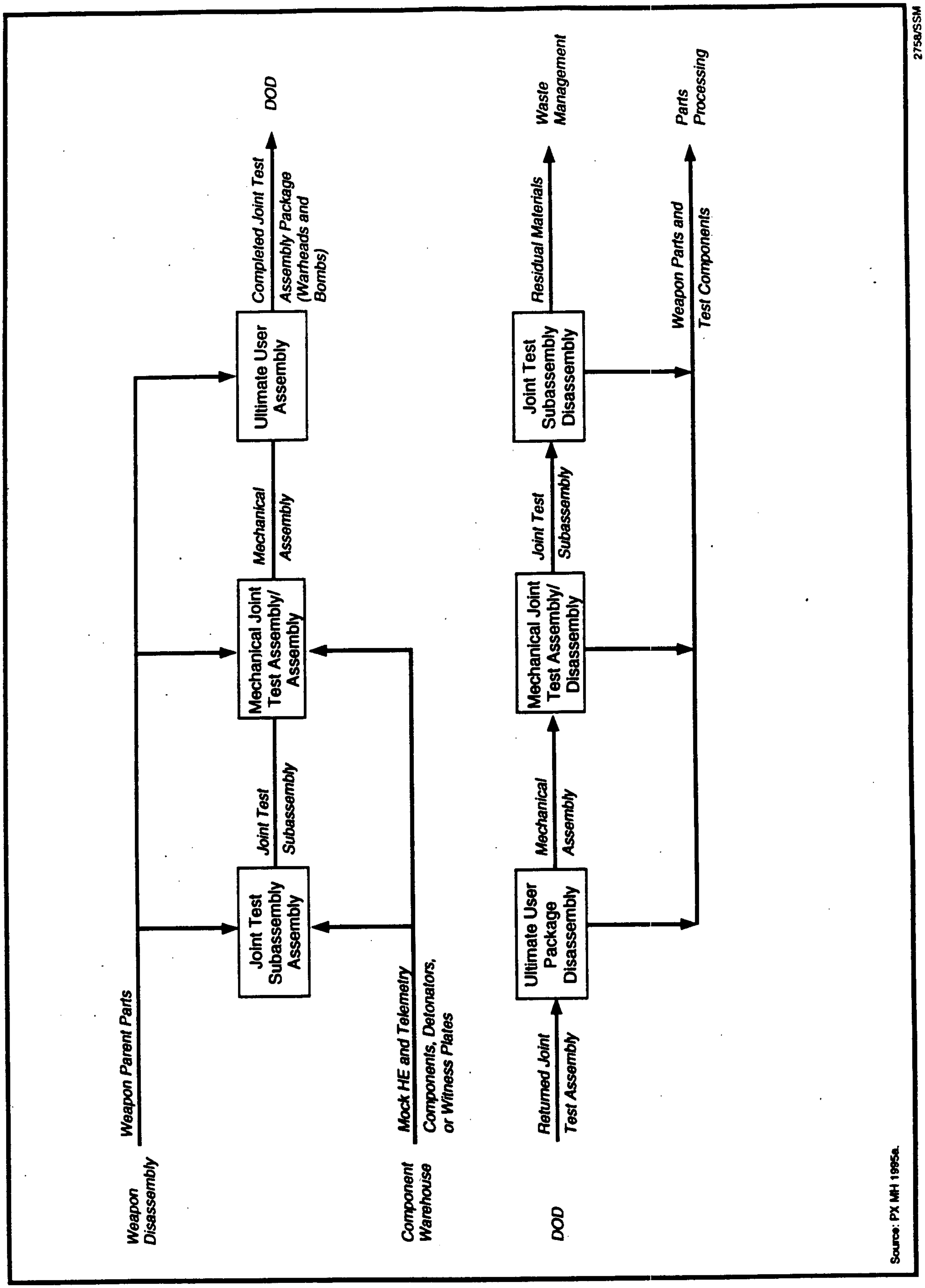


FIGURE A.3.1–3.—*Joint Test Assembly Support Function.*

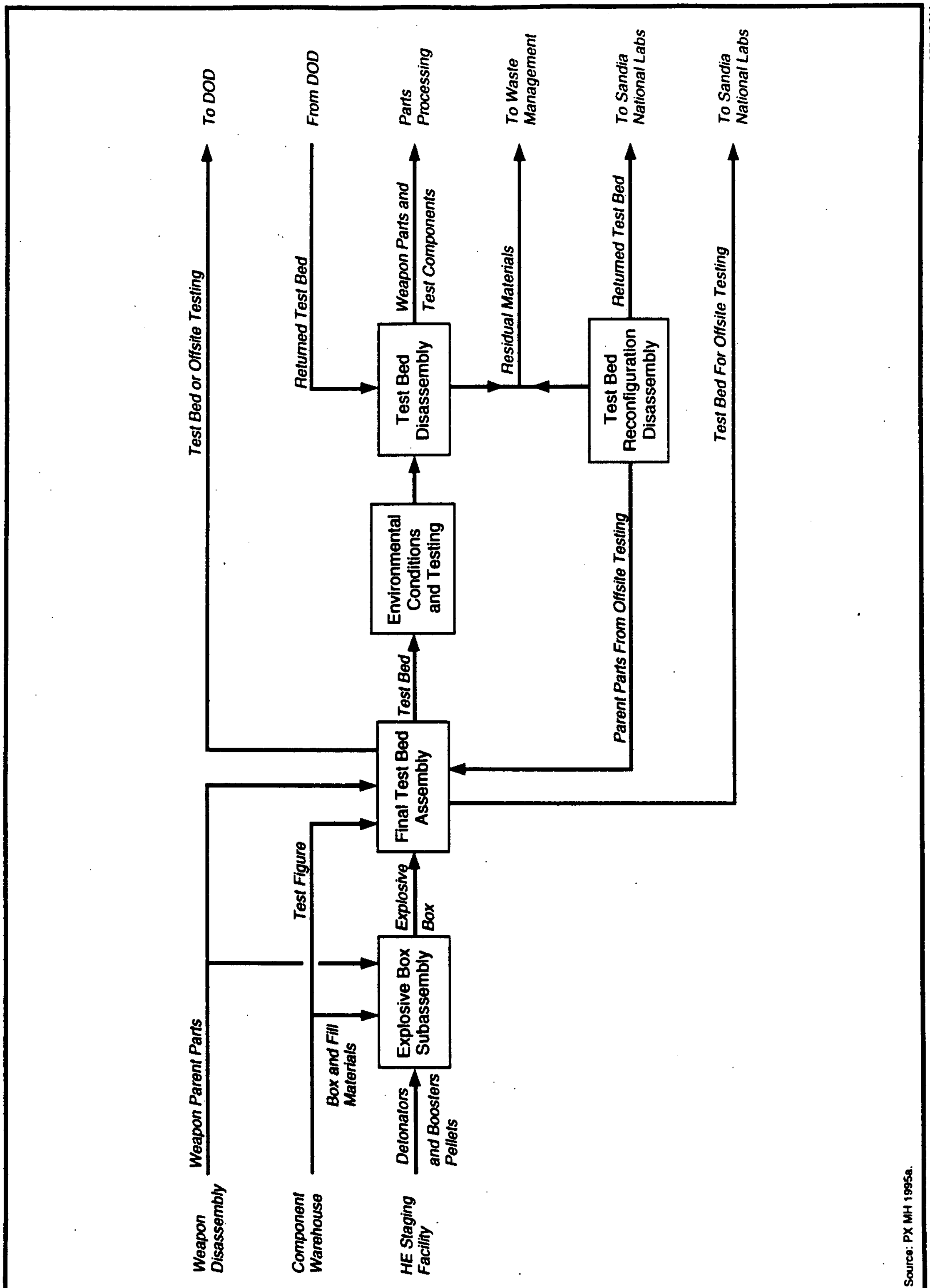


FIGURE A.3.1–4.—Test Bed Support Function.

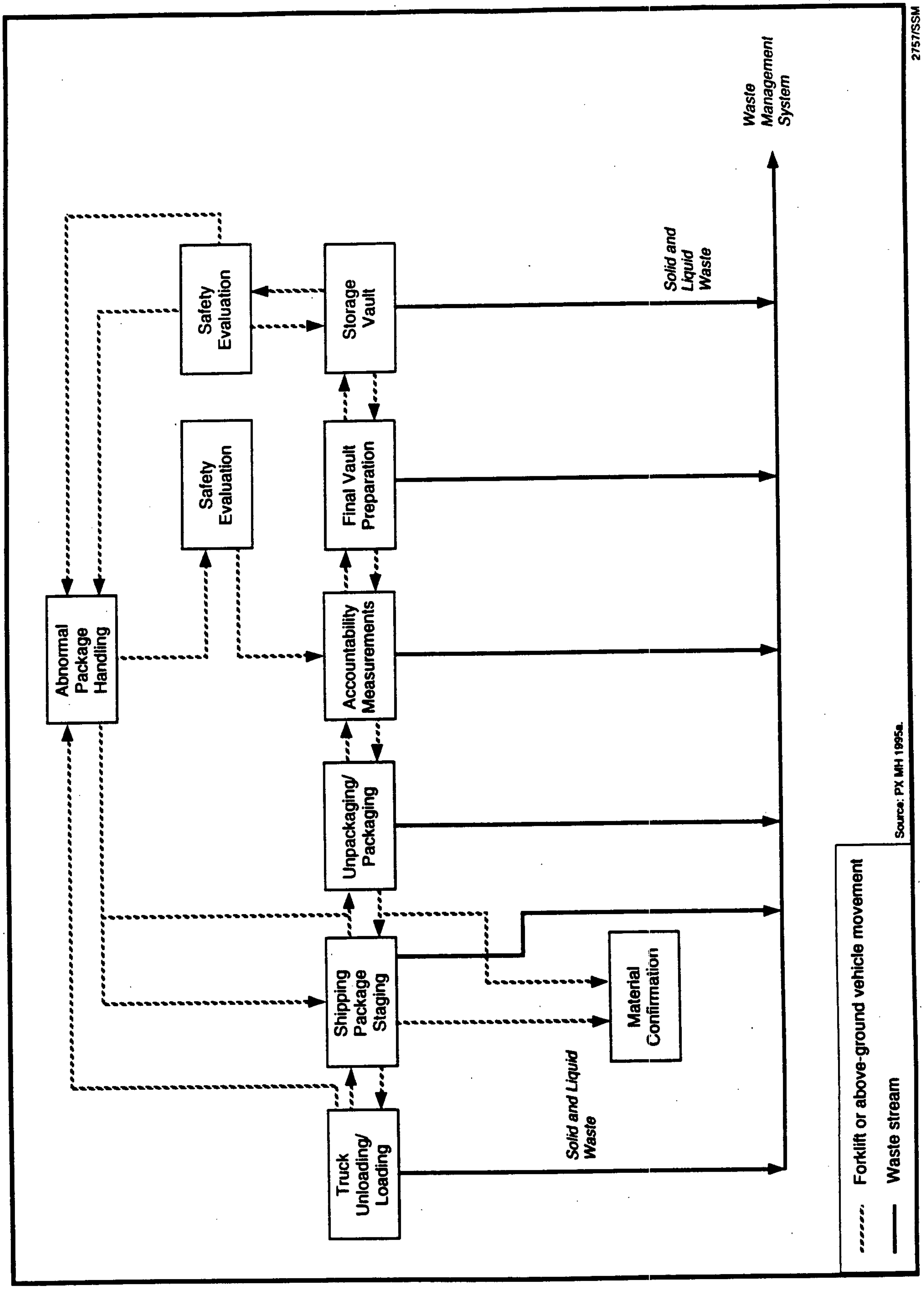


FIGURE A.3.1–5.—*Storage of Plutonium and Highly Enriched Uranium Strategic Reserve.*

as feedstock for nuclear fabrication. The quantities associated with the storage are identified in classified documents. If the responsibility for strategic storage is transferred to the Office of Materials Disposition, then consolidated storage could be at one of five sites being considered in the Storage and Disposition PEIS.

The weapons A/D process constructs a weapon from approximately 200 parts and subassemblies. Assembly feeds include main charge subassemblies from the HE fabrication plant, special nuclear material components, weapon parts and subassemblies, electrical components, and hardware. A joint test assembly has approximately the same number of parts as a weapon. Feeds include most of the weapon parts removed from an evaluation weapon disassembly, telemetry components, mock HE and special nuclear material components, and witness plates. Test bed feeds include selected weapon parts removed from an evaluation disassembly, small explosive parts, the explosive box, the test fixture, electrical components, and hardware. The feeds for disassembly operations include nuclear weapons, joint test assemblies, and test beds.

A.3.1.1 *Downsize at Pantex Plant*

Pantex is the existing A/D site for the U.S. nuclear weapons stockpile. To efficiently meet the workload established by DOE for fiscal year 2004 and beyond, operations would be consolidated into the facilities that exist at Pantex. No new facility construction is required to accomplish the consolidation of the A/D mission. Changes would only be required to allow the relocation and modification of some functions into the newer facilities and the upgrade of some infrastructure systems.

The five main functions for A/D operations discussed in section A.3.1 would be downsized and consolidated at Pantex. The site plans for the consolidated A/D operations at Pantex are shown in figures A.3.1.1–1 and A.3.1.1–2. The drawings depict the arrangement of plant buildings and site support areas for Pantex. Four types of security access areas exist at Pantex: material access area, protected area, limited area, and property protection area. Operations involving special nuclear material must be performed within a material access area. The material access area and some facilities supporting material access area operations are located in the protected area. The protected area is secured with a double fence and intruder detection systems. The protected area and operations involving classified materials and information are contained within a limited area. The property protection area surrounds the limited area and includes a buffer zone. Weapons A/D operations are performed within the material access area within Zone 12.

The downsizing and consolidation of A/D operations would enable Pantex to utilize existing structures. Consideration has been given to optimizing operations, as well as maximizing the use of facilities, in the downsizing analysis. No new construction would be required at Pantex to accomplish the reduced weapons A/D mission. Pantex has 59 A/D bays, of which only 31 bays are required to meet the A/D workload. Therefore, functions that reside in older facilities (not economically or technically feasible to upgrade) would be relocated to modern, heavy-type construction facilities.

All facilities at Pantex were built in compliance with design codes and standards in effect at the time of design and construction. At the time of any major modification, facilities were upgraded commensurate with codes and standards at the time of the modification. Where applicable, facilities were built to specific regional design criteria.

Structures containing explosives are generally constructed with steel-reinforced concrete and are designed to mitigate the effects of an accidental explosion. The resulting facility design typically consists of a number of separate operating bays that could vent to an unoccupied area should a detonation occur. Structures that do not require concrete construction due to the presence of special nuclear materials or HE are generally constructed of steel, although portions of these buildings may be concrete. Most facilities include support areas for offices; break rooms; rest rooms; electrical heating, ventilation, and air conditioning equipment; maintenance; and in-process staging of materials, components, tooling, and supplies. Many production and laboratory facilities also include vacuum systems.

Key facilities required to meet the mission of the A/D downsized and consolidated operations are listed in

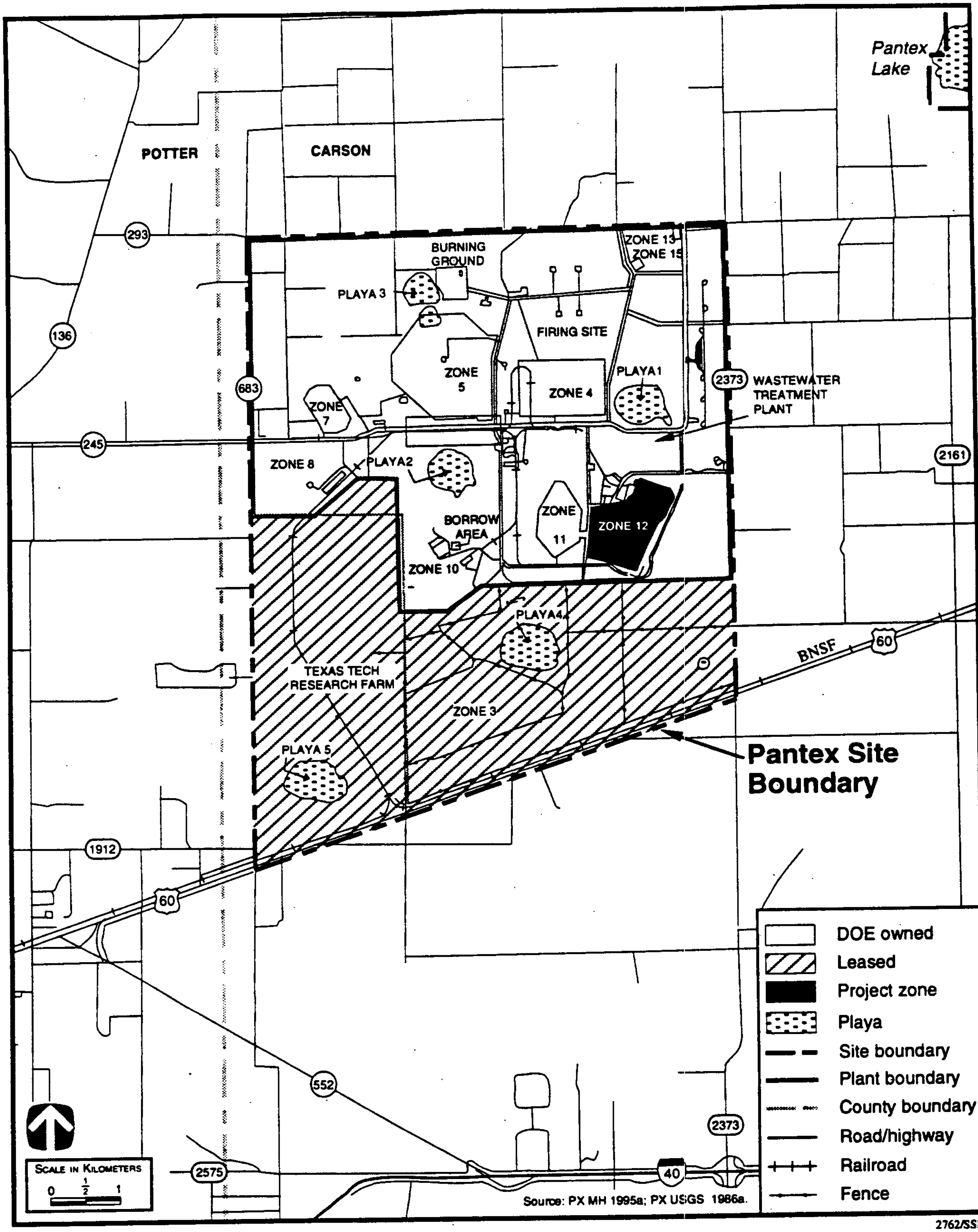


FIGURE A.3.1.1–1.—*Weapons Assembly and Disassembly Zones at Pantex Plant.*

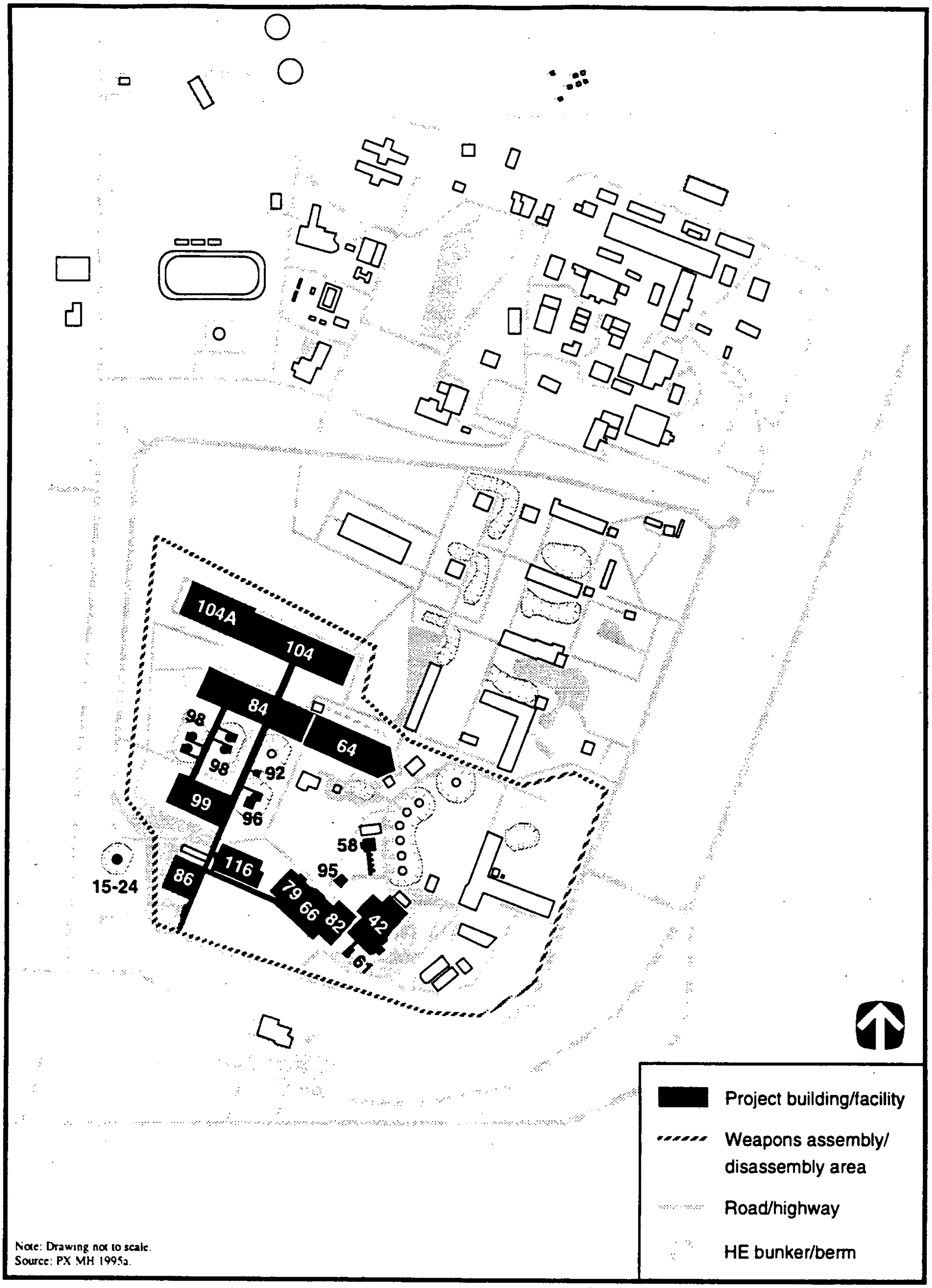


FIGURE A.3.1.1–2.—*Weapons Assembly/Disassembly Site Plan at Pantex Plant (Zone 12).*

table A.3.1.1–1. A brief description of key facilities follows.

Assembly Bays. Assembly bays are used to manually assemble or disassemble nuclear weapons. Weapon assembly requires approximately 2,000 steps to combine hundreds of parts and subassemblies to form a weapon. The process is labor-intensive and includes many verification and quality control steps. Prior to assembly, several bays are configured with special tooling required for assembly of a specific weapon. As assembly progresses, partially assembled weapons move in series from bay to bay. The physics package for a weapons program using a conventional HE main charge must be assembled in an assembly cell. The weapon disassembly process is conceptually the reverse of the assembly process, although tooling used and testing required will vary. High fidelity joint test assemblies (those containing explosives and/or special nuclear material) are also assembled and disassembled in bays.

Pantex has several A/D bay facilities; however, only 31 bays in Buildings 12-084, 12-099, and 12-104 are required. Each bay includes an area to perform assembly operations, staging areas for tooling and weapon parts, and a mechanical room for heating, ventilation, and air conditioning equipment and controls.

Assembly Cells. Assembly cells are designed to support the manual assembly or disassembly of a physics package for weapon programs using a conventional HE main charge. Physics package assembly involves mating explosive and nuclear components and sealing these components in a metal case. Assembly cells are designed to mitigate the release of radioactive material in the event that conventional HE detonates. After the physics package is cased, the potential for a detonation is greatly reduced and the physics package may be moved to an assembly bay. Assembly in a cell is not required for a physics package using an insensitive HE main charge.

Each cell includes an area to perform assembly operations; staging areas for special nuclear material, tooling, and weapon parts; and a mechanical room for heating, ventilation, and air conditioning equipment and controls. Prior to the start of the assembly process, an assembly cell is configured with special tooling to facilitate the assembly or disassembly of a specific weapon program. Pantex has 13 assembly cells; however, only 4 of the assembly cells (three in Building 12-098 and the 12-96 cell) are required.

Special Purpose Bays. Special purpose bays are similar to assembly bays, but special purpose bays are permanently configured with special equipment to perform general testing or assembly operations. As with assembly bays, special purpose bays are grouped and share some common support areas. The functions performed in these bays are described in the following sections.

Test Bed Assembly/Disassembly. Test beds and training units are assembled and disassembled in part of Building 12-086. Training units are nuclear-explosive-like assemblies that are used for training Pantex and DOE personnel to build, repair, maintain, and handle nuclear weapons. The facility contains a number of universal assembly bays which are configured with program-specific tooling. No modifications are required in this facility to support test bed functions.

Nondestructive Evaluation. Linear accelerator, computed tomography, and x-ray radiography are performed in part of Building 12-104A. These functions are used to inspect components, assemblies, and complete weapons to confirm proper configuration. Ultrasonic testing detects voids in the material used to bond close fitting parts. Acoustic emissions testing detects flaws in material. Radiometric inspection identifies the types of encased radioactive materials. No modifications are required in this facility to support the downsizing of Pantex.

Environmental/Physical Properties Testing. A portion of Building 12-084 is used to perform nondestructive testing of weapon components. Weapon components are subjected to mechanical and thermal shock to simulate deployment conditions. Mechanical conditioning tests include vibration, hostile shock, mini-air gun shock, and steady-state acceleration shock. Environmental chambers are used to simulate temperature extremes and thermal shock conditions. Equipment would be relocated from other areas of the plant into Building 12-084 to support this function.

TABLE A.3.1.1–1.—*Pantex Plant Downsized and Consolidated Weapons Assembly/Disassembly Facility Data* [Page 1 of 2]

Building Number	Description	Type of Construction	Gross Area (m^2)	Footprint Area (m^2)	Security Access Area	Number of Levels	Special Material
12-008	Commercially procured weapon material	Steel	56	56	Limited area	1	None
12-042	Tester and tooling storage	Steel	4,404	4,404	Material access area	1	None
12-042 A/B/C/ D/F	Weapons evaluation testing	Steel/concrete	2,044	2,044	Material access area	1	HE
12-053/E	Metrology lab	Concrete	474	474	Material access area	1	None
12-058	HE component staging	Concrete	242	242	Material access area	1	HE
12-059/E	Commercially procured weapon material/chemical lab	Steel	771	771	Limited area	1	None
12-061	Component warehouse	Steel	2,230	2,230	Material access area	1	None
12-079	Component warehouse	Steel	2,666	2,666	Material access area	1	None
12-082	Special nuclear material container refurbishment/component tech acceptance	Concrete	632	632	Material access area	1	None
12-084	17 assembly/disassembly bays, 1 pit laser bay, 1 nondestructive evaluation environmental bay, metallurgical evaluation	Concrete	10,675	10,675	Material access area	1	HE/special nuclear material
12-086	Test bed assembly, electronic testing, gas lab, metrology lab	Concrete	4,479	3,627	Material access area	2	HE
12-092	Component packaging	Steel	88	88	Material access area	1	HE
12-095	Explosives Class C staging	Concrete	244	244	Material access area	1	HE
12-096	1 assembly/disassembly cell	Concrete	731	731	Material access area	1	HE/special nuclear material
12-098/E	3 assembly/disassembly bays, passive action link code activated process	Concrete	3,192	3,192	Material access area	1	HE/special nuclear material

TABLE A.3.1.1–1.—*Pantex Plant Downsized and Consolidated Weapons Assembly/Disassembly Facility Data* [Page 2 of 2]

Building Number	Description	Type of Construction	Gross Area (m^2)	Footprint Area (m^2)	Security Access Area	Number of Levels	Special Material
12-099	3 assembly/disassembly bays, weapon staging	Concrete	5,639	5,639	Material access area	1	HE/special nuclear material
12-104	11 assembly/disassembly bays	Concrete	7,917	7,917	Material access area	1	HE/special nuclear material
12-104A	Paint, mass properties, separations testing, accelerated aging, 2 staging bays, 1 vacuum chamber and purge backfill bay, 1 x-ray bay, 1 computed tomography, 1 linear accelerator bay	Concrete	6,503	6,503	Material access area	1	HE/special nuclear material
12-104P	Generator buildings	Steel	NA	NA	Material access area	1	None
12-116	Special nuclear material component staging, AT-400A processing	Concrete	4,274	4,274	Material access area	1	Special nuclear material
12-117	Special nuclear material loading dock	Steel	576	576	Material access area	1	None
Total			63,233				

Note: NA - not applicable.
Source: PX MH 1995a.

Leak Detection and Backfill. Leak rate tests are performed in one bay of Building 12-104A with vacuum chambers (or fixtures) on all outgoing nuclear weapons and on units returned from the field to ensure that the weapon case is properly sealed and correct internal atmosphere is maintained. Backfill involves filling the inside of the weapon case with a specific gas. This operation is performed following completion of a leak rate test and an evacuation step. No modifications are required in this facility to support the downsizing of Pantex.

Mass Properties Determination. Mass properties are critical for ensuring proper flight characteristics of a weapon. Products of inertia and lateral center of gravity are determined with remotely operated dynamic balancing machines. Center of gravity and moments of inertia are determined with a special machine. Modifications are required in one bay of Building 12-104A to allow existing equipment to be relocated to support this function.

Painting and Body Work. Weapons and weapon components, joint test assemblies, containers, and trailers are painted, repainted, or touched-up in a portion of Building 12-104A. Old paint is removed with sandblasting or chemical stripping. Minor dents in nonweapon components are straightened. No modifications are required to support this function.

Accelerated Aging. Accelerated environmental aging is conducted to simulate the aging process on newly produced weapons and weapon components in a portion of Building 12-104A. For these tests, weapons or materials are placed in an environmental chamber and subjected to thermal cycling above and below ambient temperatures for an extended period, typically from 1 to 2 years. Gas samples are taken from the weapon and analyzed in the gas laboratory. The accelerated aging chamber consumes a significant amount of electrical power. After aging, weapons are disassembled and evaluated. No facility modifications are required to support this function.

Separations Systems Testing. Selected reentry body separation subassemblies are tested in a portion of Building 12-104A to provide data for evaluating release assembly hardware and associated installation procedures and for measuring service-related deterioration of the release assembly system. Facility modifications are required to allow the existing equipment to be relocated and operate in this area.

Special Nuclear Material Container Refurbishment. Containers used to ship radioactive components are reverified annually in a portion of Building 12-082. The structural integrity of containers is verified through leak tests, visual inspection, and maintenance. No modifications are required in Building 12-082 to support this function.

Pit Laser Sampling. A gas sample is taken for selected weapon system pits to determine the internal atmosphere type, percentage, and pressure. Pit laser sampling occurs in a bay in Building 12-084. No modifications are required in this facility.

AT-400A Processing. Pits are robotically packaged into the AT-400A, a hermetically sealed container. The AT-400A container meets requirements for long-term storage and shipping of pit items. This activity would occur in a portion of Building 12-116. The AT-400A robotics processing equipment and required modifications to Building 12-116 to accept this activity are included in the Pantex No Action alternative.

Component Packaging. Packaging of selected reaccepted weapon components occurs in Building 12-092, a special access area. No modifications are required in this facility.

Component Technical Acceptance. Components are reaccepted for assembly using a variety of inspection/verification techniques. This activity will occur in Building 12-082. No modifications are required to support this function.

Weapons Evaluation Testing Laboratory. Weapon system, subsystem, and component tests are conducted in Building 12-042 A/B/C/D/F by SNL personnel. Numerous fully instrumentated test stations are provided for heating, cooling, and test firing the tests beds. A cryogenic carbon dioxide system is used for cooling these units during testing. Environmental conditioning ovens and centrifuges are also provided for testing components under deployment conditions. No modifications are required in this facility.

Metrology Laboratory. Buildings 12-086 and 12-053 are used for metrology functions within the material access area. Instruments and testers for weapon assembly operations are calibrated here. Some areas within these facilities require tight heating, ventilation, and air conditioning temperature control to ±0.3 °C (±0.5 °F). Modifications are required in Building 12-086 to allow existing equipment to be relocated.

Gas Laboratory. Gas analyses are performed in Building 12-086 and are used to evaluate samples from accelerated aging tests and production operations. Information from these analyses provides data related to the internal atmosphere of weapons and effects of weapon material aging by measuring outgassing products. The three basic techniques used are gas fractionation, gas chromatography, and mass spectrometry. Facility modifications are required for this function which would relocate existing equipment into Building 12-086.

Weapon Material Testing Laboratory. A laboratory for testing and accepting commercially procured weapon material is located in Buildings 12-008 and 12-059. No modifications are required for these facilities.

Tooling/Tester Storage. Precision tools, instruments, testers, and special equipment for A/D operations are stored in Building 12-042. Generic assembly bays and cells are configured with program-specific tooling at the beginning of a production run. Tooling storage would contain tools for assembly, disassembly, and evaluation operations for all the weapon programs in the enduring stockpile. This function would be relocated from another facility into Building 12-042.

Weapon Staging. A portion of Building 12-099 is used for staging nuclear weapons awaiting transportation to and from DOD facilities. No facility modifications are required to accommodate weapons staging.

Special Nuclear Material Component Staging. The special nuclear material staging facilities, Buildings 12-116 and a loading area 12-117, are designed to ship, receive, and stage special nuclear material. The facilities include segregated staging bays and inspection equipment.

Inert Component/Container Warehouses. Buildings 12-058, 12-061, 12-079, and 12-095 are used for storing, repackaging, and distributing inert weapon components, materials, and containers for Pantex. HE components to support A/D are staged in Building 12-058. Weapons and special nuclear material are staged in other buildings. These facilities include storage racks, a loading dock, and areas designed for packaging and unpackaging and shipping and receiving. No modifications are required in these facilities.

Strategic Reserves Storage. The plutonium and HEU strategic reserves would be stored in Area 12.

Requirements for Construction and Operation. Downsizing and consolidating A/D operations at Pantex would require approximately 0.2 ha (0.4 acres) of land for construction material laydown. There would be no associated disturbed land area involved with downsizing of operations at Pantex. Materials and resources consumed during the 3-year construction period are listed in table A.3.1.1–2. The principal source of air emissions during construction would be fugitive dust from site preparation and construction activities and exhaust from construction equipment and vehicles. Annual emissions during a peak construction year are presented in table A.3.1.1–3.

The number of workers required during each construction year is presented in table A.3.1.1–4.

The weapon A/D process requires the following utilities: electricity, plant air for operating pneumatic tools and hoists, instrument air for radiation monitors, steam for heating test beds in environmental conditioning ovens, cryogenic carbon dioxide for cooling test bed test stations, and water for operating vacuum pumps. Utilities consumed during surge operation can be found in table A.3.1.1–5.

Chemicals consumed during operation primarily include water treatment chemicals, materials for facility equipment and vehicle maintenance, and bottled gases. Annual estimated chemical use during surge operations is listed in table A.3.1.1–6.

Emissions. Emissions result from plant boiler operation and cleaning operations that use solvents. Releases would be limited to what is possible, using best available control technology. Emissions for the

TABLE A.3.1.1–2.—*Pantex Plant Downsizing and Consolidating Weapons Assembly/Disassembly Construction Materials/Resources*

Material/Resource	Total Consumption	Peak Demand[a]
Electricity	609 MWh	4 MWe
Water (L)	1,400,000	
Concrete (m^3)	840	
Steel (t)	15	
Liquid fuel and lube oil (L)	28,800	
Industrial gases (m^3)[b]	600	

[a] Peak demand for electricity is the maximum rate. Peak demand for water is the average daily consumption during a 1-year period with construction activity.

[b] Cubic meters measured at standard temperature and pressure.

Source: PX MH 1995a.

TABLE A.3.1.1–3.—*Pantex Plant Downsizing and Consolidating Weapons Assembly/Disassembly Construction Emissions*

Pollutant	Quantity (t)
Sulfur dioxide	0.04
Nitrogen oxides	0.46
Volatile organic compounds	0.23
Carbon monoxide	1.26
Particulate matter	0.19
Total suspended particulates	0.46

Source: PX MH 1995a.

downsizing and consolidating alternative A/D surge operations are shown in table A.3.1.1–7.

Radiological release for A/D operations are limited to uranium isotopes and tritium. These releases are the result of assembly and disassembly operations, as well as waste operations. Extremely small releases of plutonium (near background) are possible.

Weapons Assembly Transportation. As illustrated in figure A.3.1.1–3, the two major types of radiological hazardous materials that would be transported to Pantex include special nuclear material components and HE components. Special nuclear material would be shipped in safe secure trailers. Upon arrival at the site, a safe secure trailer would proceed directly to the weapon staging facility. Movement of explosive components would be performed by trucks and battery-powered vehicles specifically designed for this purpose. The quantity of HE (conventional and insensitive) transported onsite by these trucks would be strictly limited.

TABLE A.3.1.1–4.—*Pantex Plant Downsizing and Consolidating Weapons Assembly/Disassembly Construction Workers*

Employees	Year 1	Year 2	Year 3	Total
Craftworkers				
Carpenter	1	7	2	10
Concrete mason	1	5	1	7
Electrician	0	6	5	11
Iron worker	1	8	1	10
Laborer	2	6	2	10
Millwright	0	2	1	3
Operator	0	3	1	4
Sheet metal worker	0	7	2	9
Pipe fitter	0	5	3	8
Sprinkler fitter	0	5	1	6
Teamster	1	3	1	5
Other craftworkers	0	4	3	7
Total Craftworkers	6	61	23	90
Construction management and support staff	1	6	2	9
Total Employment	7	67	25	99

Source: PX MH 1995a.

TABLE A.3.1.1–5.—*Pantex Plant Downsizing and Consolidating Weapons Assembly/Disassembly Surge Operation Annual Utility Requirements*

Utility	Consumption	Peak Demand
Electricity	43,000 MWh	10 MWe
Liquid fuel (L)	740,000	
Natural gas (m^3)	7,150,000	
Water (L)	196,000,000	

Source: PX MH 1995a.

TABLE A.3.1.1–6.—*Pantex Plant Downsizing and Consolidating Weapons Assembly/Disassembly Surge Operation Annual Chemical Requirements*

Chemical	Quantity (kg)
Acetone	227
Argon	8,165
Carbon dioxide	49,896
Circlene FG 20	635
Clepox 143	635
Degreaser	680
Desiccants	454
Dispersant	290
Dry air	771
Eco-Star	2,858
Ethyl acetate	544
Ethyl alcohol	227
Fixer and replenisher	1,497
Glass beads	408
Glass cleaner	1,452
Helium	1,769
Heptane	318
Hydraulic/lubricating oil	29,030
Inorganic proprietary	2,722
Joint compound	1,179
Micro liquid lab cleaner	363
Mild steel metal	5,897
Molecular sieve	1,043
Neutrasorb acid neutralizer	272
Nitrogen	3,629
Paint	16,330
Planisol-M concentrate	363
Polyalkylene and ethylene glycol	240
Potassium hydroxide	408
Siliconized ammonium phosphate base	590
Sodium chloride	34,020
Solksorb solvent absorbent	1,769
Specialty gas mixtures	1,542
Stainless steel metal	2,268
Sulfuric acid	363
TISAB with CDTA	862
Water treatment chemicals[a]	11,340

[a] Chlorine, sodium sulfite, sodium sulfate, sulfuric acid, poly electroly, and phosphoric acid.

Source: PX MH 1995a.

All major weapon assembly work would be performed in assembly bays and cells. Special nuclear material would be transferred from staging areas by battery-powered vehicles travelling on ramps. After final assembly and inspection, weapons would be transferred to the weapon staging facility on ramps. Weapons would then be shipped offsite by safe secure trailer.

TABLE A.3.1.1–7.—*Pantex Plant Downsizing and Consolidating Weapons Assembly/Disassembly Surge Operation Annual Emissions*

Pollutant	Quantity (t)
Ammonia	<0.001
Carbon monoxide	5.4
1,2-Dichloroethane	<0.001
Nitrogen oxides	21.3
Particulate matter	0.8
Sulfur dioxide	<0.001
1,1,1-Trichloroethane	0.44
2,2,4-Trimethyl-1,3-Pentane diolbutyrate	<0.001
Volatile organic compounds	11.3

Source: PX MH 1995a; PX 1996e:1.

Small quantities of low-level, mixed, and hazardous wastes generated during assembly of nuclear weapons would be collected, packaged, and transported by electric car to local accumulation sites and then by truck to a low-level staging area near the waste management facility. The wastes would be transferred by truck for offsite disposal.

Weapons Disassembly Transportation. As illustrated in figure A.3.1.1–4, returning weapons would be delivered in safe secure trailers. After a security inspection, weapons would be unloaded and temporarily stored in the same weapons staging area used for outgoing assembled weapons. Individual weapons would be transported to an assembly bay or cell by a battery-powered vehicle travelling on a ramp. After disassembly, the various special nuclear material components would be transported by battery-powered vehicles to staging areas for subsequent shipment offsite. HE components would be transported by electric vehicle to the HE staging area for subsequent transportation to the HE fabrication plant. Waste would be collected, transported, and disposed of in a manner similar to that described for weapons assembly.

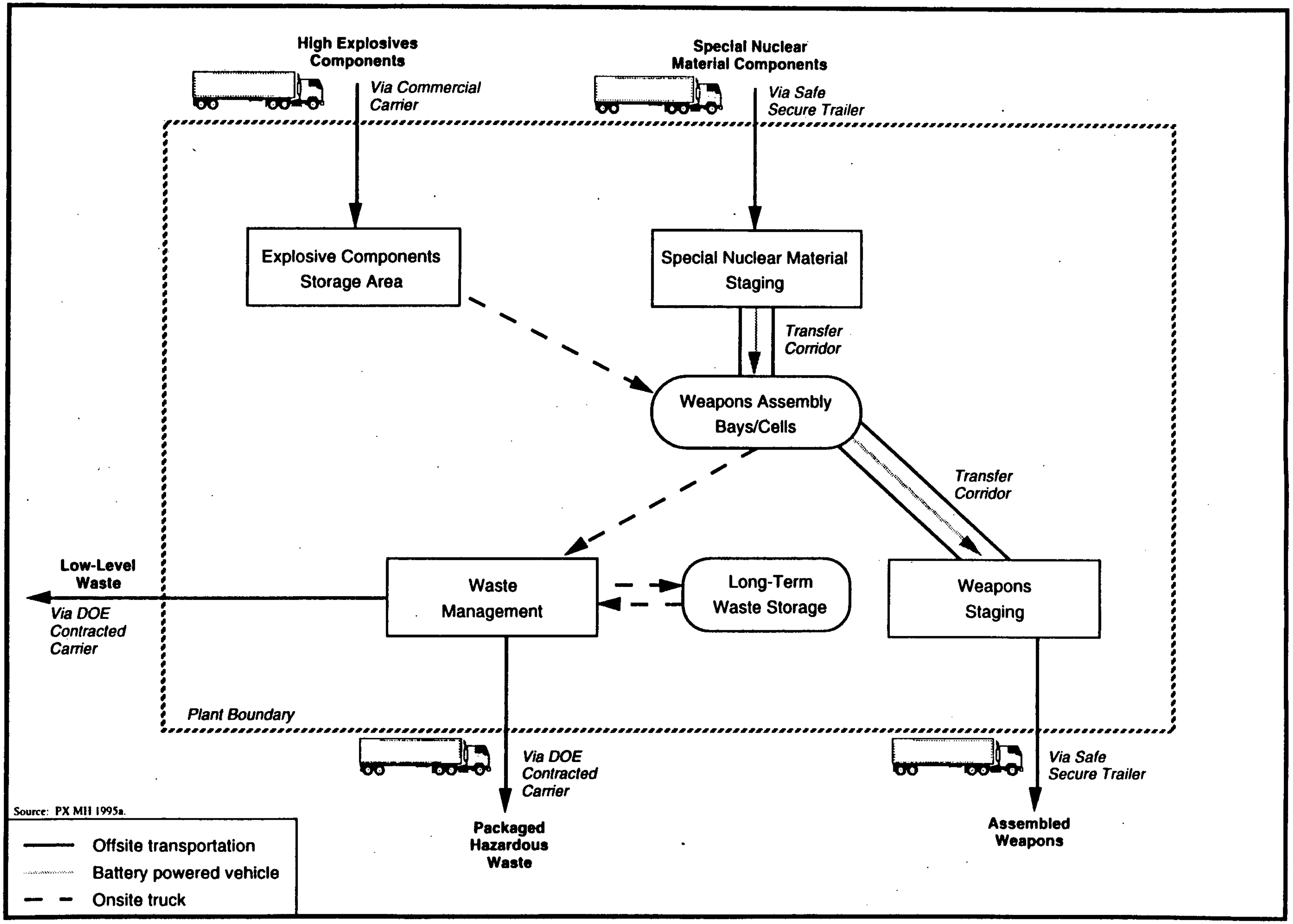


FIGURE A.3.1.1–3.—*Weapons Assembly Transportation Diagram at Pantex Plant.*

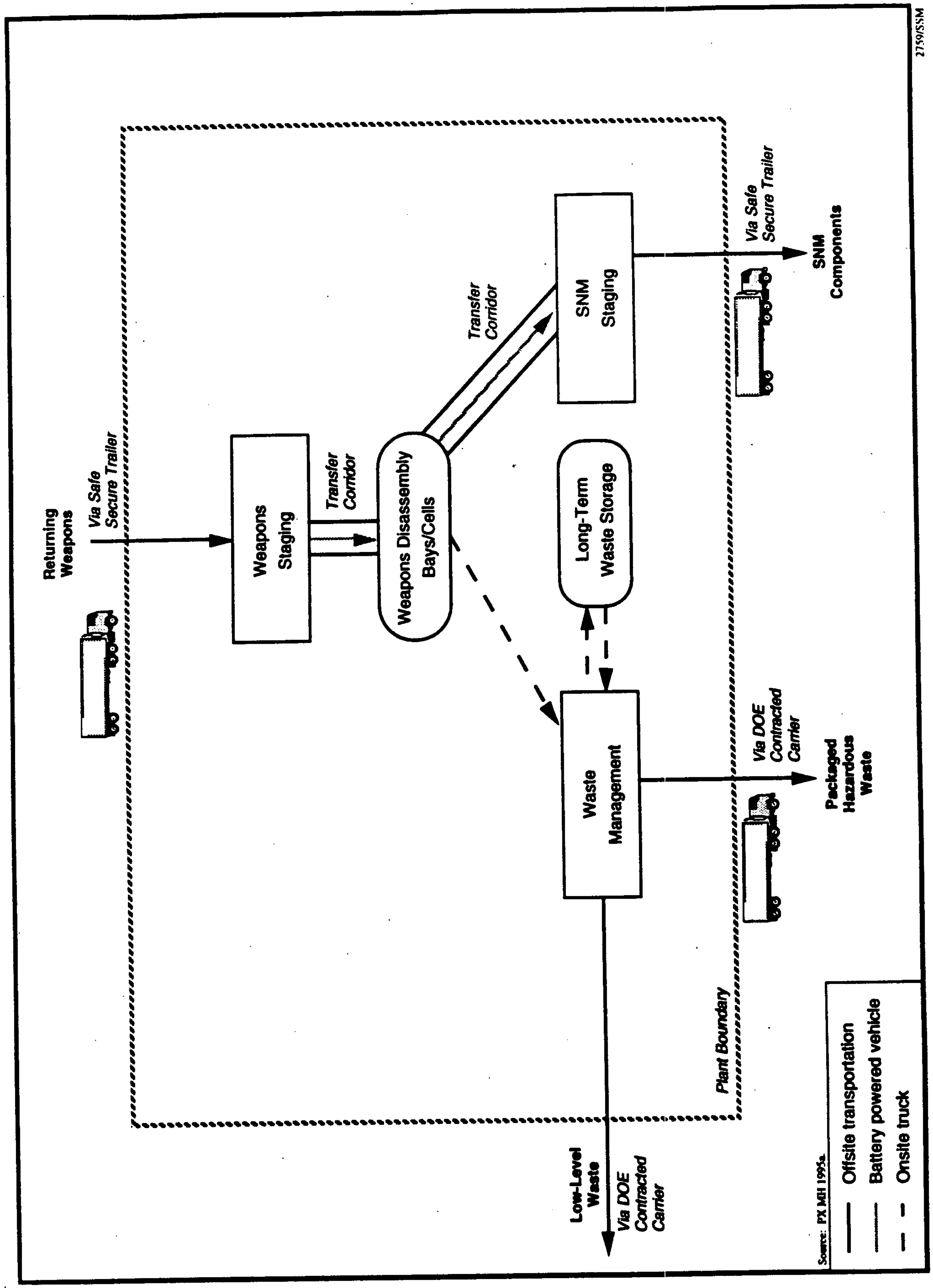


FIGURE A.3.1.1–4.—*Weapons Disassembly Transportation Diagram at Pantex Plant.*

Waste Management. Pantex waste management is described in detail in appendix section H.2.4. The liquid and solid nonhazardous wastes generated over a 3-year period would include concrete and steel construction waste materials and sanitary wastewater. The steel construction waste would be recycled as scrap material before completing construction. The remaining nonhazardous wastes generated during construction would be disposed of as part of the construction project by the contractor. Wastewater would be used for soil compaction and dust control or processed through the Pantex sanitary wastewater system. Wood, paper, and metal wastes would be shipped offsite to a commercial contractor for recycling. Hazardous wastes generated during construction would consist of such materials as waste adhesives, oils, cleaning fluids, solvents, and coatings. Hazardous waste would be packaged in Department of Transportation (DOT)-approved containers and shipped offsite to commercial RCRA-permitted treatment, storage, and disposal facilities. No radioactive waste would be generated during construction.

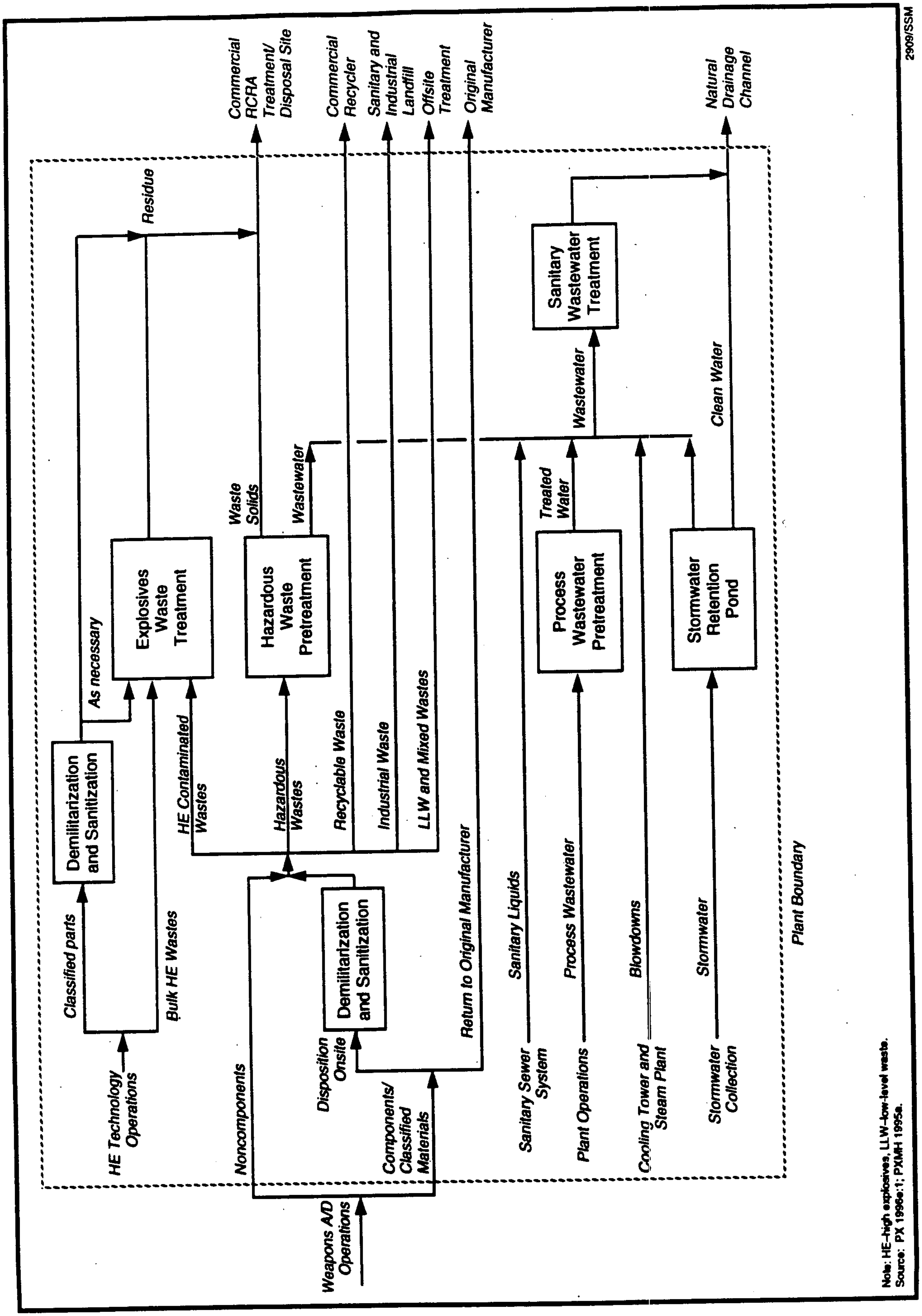
The project design incorporates waste minimization and pollution prevention. Segregation of activities that generate radioactive and hazardous wastes would be employed, where possible, to avoid the generation of mixed wastes. Where applicable, treatment to separate radioactive and nonradioactive components would be performed to reduce the volume of mixed wastes and provide for cost-effective disposal or recycle. To facilitate waste minimization, where possible, nonhazardous materials would be substituted for those materials that contribute to the generation of hazardous or mixed waste. Production processes would be configured, with minimization of waste production given high priority. Material from the waste streams would be treated to facilitate disposal as nonhazardous wastes, where possible. Future D&D considerations have also been incorporated into the design.

Table A.3.1.1–8 presents the estimated annual waste volumes from the A/D and pit recertification, requalification, and reuse facility during construction and surge operations. Solid and liquid waste streams are routed to the waste management system. Figure A.3.1.1–5 depicts the waste management system. Solid wastes would be characterized and segregated into LLW, hazardous, and mixed wastes, then treated to a form suitable for disposal or storage within the facility. Liquid wastes would be treated onsite to

TABLE A.3.1.1–8.—*Pantex Plant Weapons Assembly/Disassembly Waste Volumes*

Category	Annual Average Volume Generated from Construction (m^3)	Annual Volume Generated from Surge Operations (m^3)	Annual Volume Effluent from Surge Operations (m^3)
Low-Level			
Liquid	None	0.06	None
Solid	None	21[a]	10[b]
Mixed Low-Level			
Liquid	None	0.06	0.06
Solid	None	Minimal	Minimal
Hazardous			
Liquid	None	2	2
Solid	0.25	0.05	0.05
Nonhazardous (Sanitary)			
Liquid	315	141,000	141,000
Solid	5[c]	340	170[d]
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	Included in sanitary
Solid	Included in sanitary	Included in sanitary	Included in sanitary

[a] Includes 9.2 m^3 generated from A/D operations and 11.3 m^3 generated from pit reuse operations.
[b] Assumes 2/3 of solid LLW is compactible by a factor of 4:1 and the liquid LLW is solidified by a factor of 2:1.
[c] Includes 4.6 m^3 of concrete and 0.6 t (0.7 tons) of steel. Volume estimate made by using 0.127 m^3/t for density of steel.
[d] Assumes 2/3 of solid is compactible by a factor of 4:1.
Source: PX 1995a:6; PX DOE 1995k; PX MH 1995a.



Note: HE–high explosives, LLW–low-level waste.
Source: PX 1996e:1; PXMH 1995a.

FIGURE A.3.1.1–5.—*Component Disposition and Waste Management Block Flow Diagram.*

reduce hazardous and toxic elements before discharge or transport. All fire-sprinkler water discharged in process areas is contained and treated as process wastewater, when required.

Low-Level Waste. LLW generated from the recertification, requalification, and reuse operations would consist of tubes removed from the pits, personnel protective equipment, glove box gloves, filters, cleaning materials, and disposal supplies. Small amounts of LLW would be generated by A/D operations and would consist primarily of sanitized and demilitarized weapon parts, test residue, compacted wipes, rubber gloves, and vacuum filters. Compactible LLW would be processed at the solid waste compaction facility. Compactible and noncompactible waste would then be shipped to NTS or a commercial vendor for disposal. Liquid LLW, consisting of solvents used in cleaning operations, would be solidified prior to packaging.

Mixed Low-Level Waste. Pit recertification, requalification, and reuse operations would not generate any mixed LLW. Small amounts of mixed LLW would be generated from operation of the A/D facility and would consist primarily of sanitized and demilitarized weapons parts, test residue, compacted wipes, rubber gloves, and vacuum filters. Mixed waste would be stored onsite in RCRA-permitted facilities and shipped to an offsite commercial facility for processing. Liquid mixed waste would be managed in accordance with the Pantex Site Treatment Plan.

Hazardous Waste. Liquid hazardous wastes would be generated from solvents from cleaning operations and residue from painting and bonding operations, as well as sanitized and demilitarized parts. The cleaning solvents selected would be from a list of nonhalogenated solvents. Hazardous liquids would be sent to one of three onsite wastewater treatment facilities. The treated nonhazardous effluent would be discharged in accordance with NPDES permits. Hazardous effluents would be packaged and shipped offsite to a RCRA-permitted treatment, storage, and disposal facility.

Solid hazardous wastes would be generated from nonradioactive materials such as wipes contaminated with oils, lubricants, and cleaning solvents that are used for equipment outside the main processing units. All HE and HE-contaminated substances would be returned to the HE fabrication site. All hazardous solid waste would be shipped to a RCRA-permitted facility for disposal.

Nonhazardous (Sanitary) Waste. Sewage wastewater and process wastewater would be treated in the sanitary wastewater treatment facility. Most of the treated effluent would be recycled for use in the cooling tower and other processes. Excess effluent would flow into a lagoon which then either evaporates or leaches into the ground. The sludge and other nonrecyclable, nonhazardous solid sanitary and industrial wastes would be compacted and shipped to the city of Amarillo landfill for disposal.

Nonhazardous (Other) Waste. Small amounts of classified nonhazardous waste would be generated from operation of the A/D facility. This waste would be demilitarized and sanitized before disposal in a permitted landfill.

A.3.1.2 *Relocate to Nevada Test Site*

All functions described in section A.3.1 would be relocated to NTS in this alternative. Figure A.3.1.2–1 shows the location of NTS facilities. The proposed A/D plant site plan is shown in figures A.3.1.2–2 and A.3.1.2–3. The size, number, and arrangement of the plant building and support areas are conceptual and may change significantly as design progresses. The site plans are included to convey general layout information only.

The existing Device Assembly Facility would form the cornerstone of the A/D plant. All plant facilities located within the material access area either occupy existing buildings inside the Device Assembly Facility or are located in hardened new construction connected to the Device Assembly Facility. All plant facilities located within the limited area at the plant site (adjacent to the Device Assembly Facility) would be new construction.

Key facilities required to meet the mission of the A/D operations at NTS are listed in table A.3.1.2–1. The following sections describe the key facilities in more detail.

Assembly Cells. Four existing assembly cells in the Device Assembly Facility would support the manual A/D of a physics package. A fifth available cell

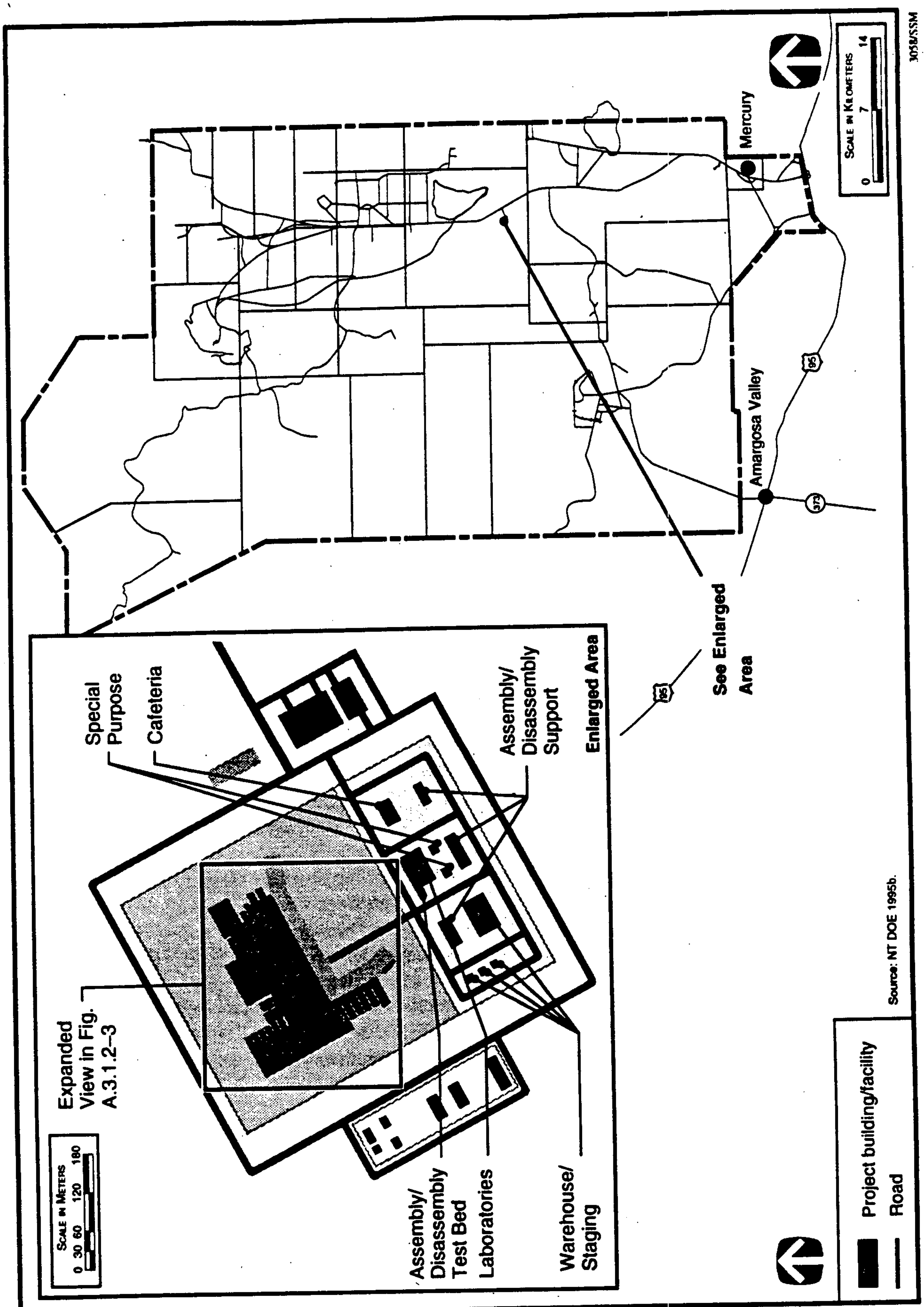


Figure A.3.1.2–1.—*Location of Facilities at Nevada Test Site.*

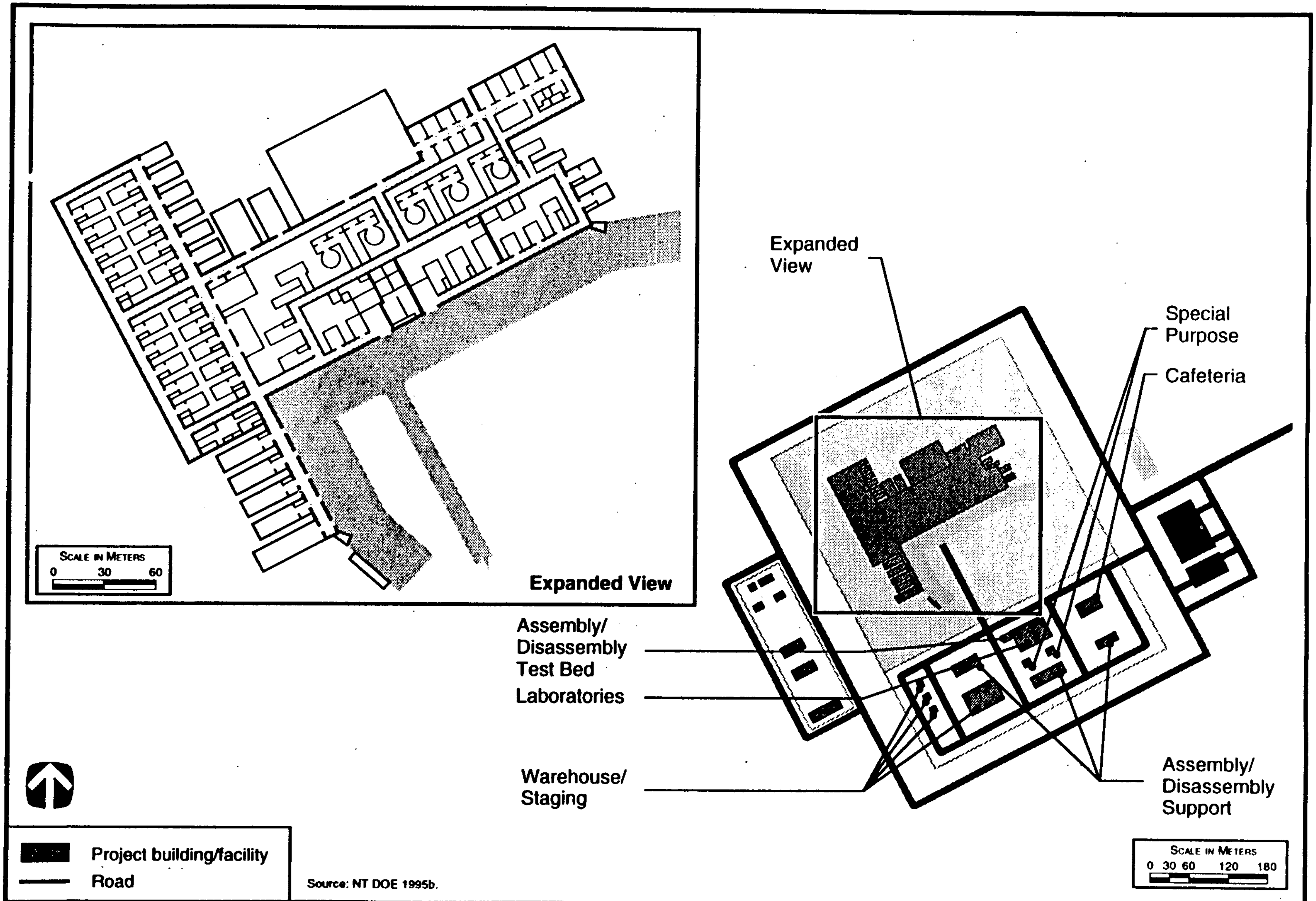


FIGURE A.3.1.2–2.—*Weapons Assembly/Disassembly Site Plan for Nevada Test Site.*

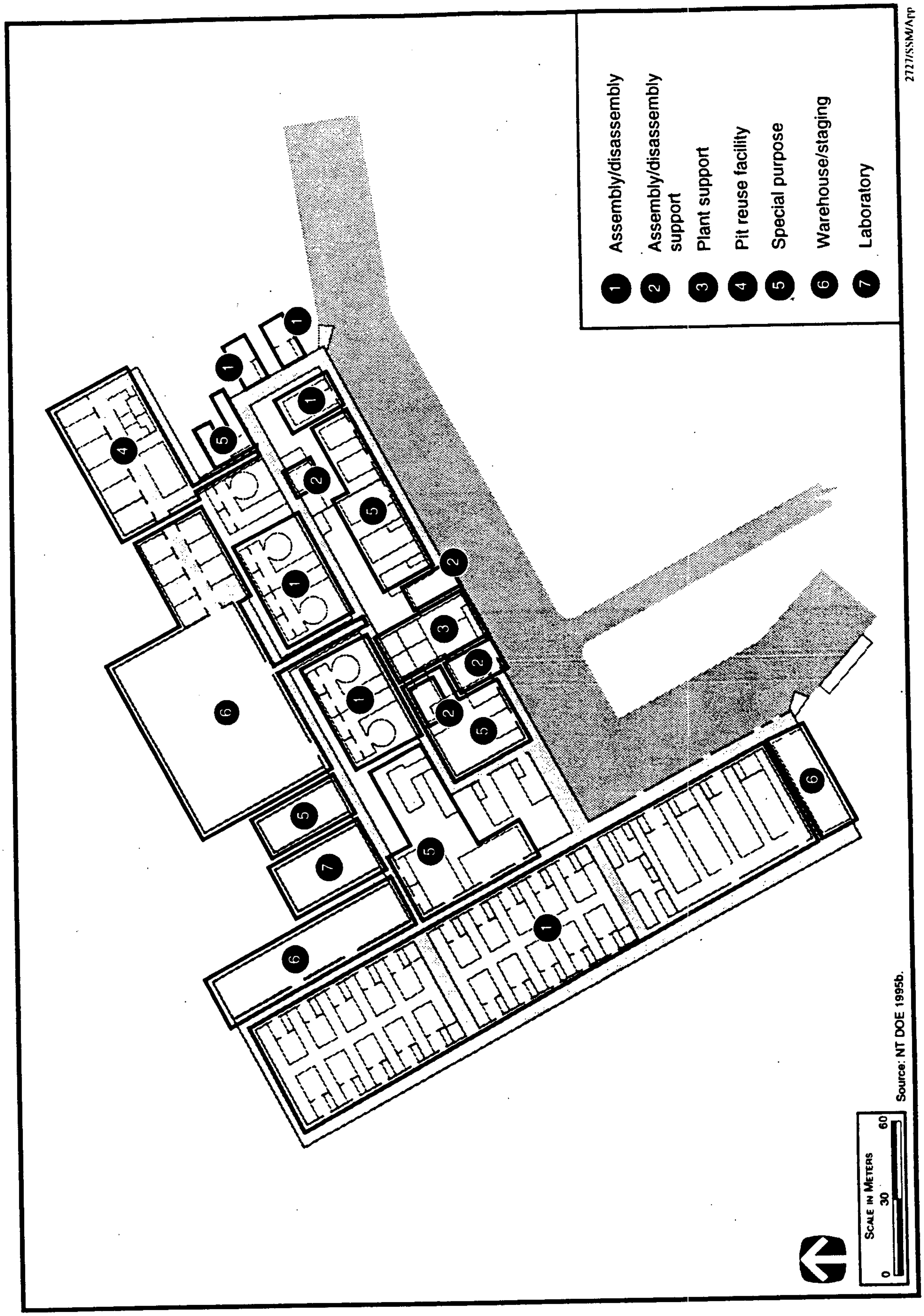


Figure A.3.1.2–3.—*Weapons Assembly/Disassembly Site Plan (Expanded View) for Nevada Test Site.*

TABLE A.3.1.2–1.—*Nevada Test Site Weapons Assembly/Disassembly Facility Data* [Page 1 of 2]

Building Number	Function	New or Existing	Location	Gross Area (m^2)	Construction Type	Number of Floors
Assembly/Disassembly						
DAF 301-304	Physics package cells	Existing	Material access area	1,732	Hardened concrete	1
DAF 341, 343, 345	Mechanical bays	Existing	Material access area	624	Hardened concrete	2
M01-M24	Mechanical bays	New	Material access area	6,044	Hardened concrete	2
L01	Test bed	New	Limited area	186	Steel	1
Laboratories						
23-700	Gas analysis lab	Existing	Area 23	828	Steel	1
L02	Weapons evaluation testing lab	New	Limited area	2,415	Steel	1
23-725	Metrology lab	Existing	Area 23	1,353	Steel	1
M51	Metrology lab	New	Material access area	557	Hardened concrete	1
23-190	Commercially procured material testing/staging	Existing	Area 23	701	Concrete	1
Warehousing/Staging						
L03	HE components	New	Limited area	279	Hardened concrete	1
23-160	Inert components/containers	New	Area 23	4,682	Steel	1
L04	Tooling/testers	New	Limited area	2,323	Steel	1
M26-M31	Weapons staging	New	Material access area	836	Hardened concrete	1
Special Purpose						
M32	Pit laser sampling	New	Material access area	46	Hardened concrete	1
M33	Accelerated aging	New	Material access area	372	Hardened concrete	1
L05	Special nuclear material container refurbishment/verification	New	Limited area	139	Steel	1
DAF 351, 353	AT-400 processing	Existing	Material access area	426	Hardened concrete	1
DAF 494	Mass properties	Existing	Material access area	118	Hardened concrete	1
DAF 492	Separations testing	Existing	Material access area	118	Hardened concrete	1
DAF 310	Vacuum chambers	Existing	Material access area	215	Hardened concrete	1
L06	Paint	New	Limited area	111	Steel	1
DAF 491	Permissive action link capability	Existing	Material access area	213	Hardened concrete	1
M34	Purge/backfill	New	Material access area	46	Hardened concrete	1
DAF 493	Component packaging	Existing	Material access area	118	Hardened concrete	1

TABLE A.3.1.2–1.—*Nevada Test Site Weapons Assembly/Disassembly Facility Data* [Page 2 of 2]

Building Number	Function	New or Existing	Location	Gross Area (m^2)	Construction Type	Number of Floors
Special Purpose (Continued)						
DAF 495	Component technical acceptance	Existing	Material access area	118	Hardened concrete	1
DAF 331, 332	Nondestructive evaluation	Existing	Material access area	744	Hardened concrete	1
M35	Nondestructive evaluation	New	Material access area	325	Hardened concrete	1
M52	Electronic testing	New	Material access area	325	Hardened concrete	1

Source: NT DOE 1995b.

would be held in reserve for test devices or expanded use if necessary. Each cell (standard Pantex design) includes an area to perform assembly operations, staging areas for special nuclear materials and weapon parts, and a mechanical room for heating, ventilation, and air conditioning equipment controls.

Assembly Bays. A new assembly bay facility would be constructed adjacent and connected to the Device Assembly Facility. This facility would contain 24 assembly bays; 20 of standard Pantex design and four with extended operational areas. Three additional bays of standard Pantex design are provided in the existing Device Assembly Facility. All assembly bays would be separated by a minimum of 4.1 m (13.6 ft) of earth fill for explosive blast shock mitigation. Each bay would include an area or areas to perform assembly operations, staging areas for tooling and weapon parts, and a second floor mechanical room for heating, ventilation, and air conditioning equipment and controls. Two additional assembly bays are held in reserve within the existing Device Assembly Facility for device assembly operations or expanded use, if required.

Test Bed. A new nonhardened facility would be constructed within the limited area, adjacent to the Device Assembly Facility for test bed fabrication. This facility would contain universal assembly bays configured with program-specific tooling.

Laboratories

Gas Analysis. Gas analysis would be performed in an existing nonhardened building in Area 23. This building would be configured with laboratory facilities equipped to provide analysis by gas fractionation, gas chromatography, and mass spectrometry.

Weapons Evaluation Testing. A new nonhardened facility would be constructed within the limited area, adjacent to the Device Assembly Facility for weapons evaluation testing. This facility would contain a number of fully instrumented test stations to provide for heating, cooling, and test firing the test beds. A cryogenic system would be used for the cooling of these units during testing. Environmental conditioning ovens and centrifuges would be provided for the testing of components under deployment conditions.

Metrology. Metrology laboratory facilities would be located in an existing nonhardened building in Area 23 and in a new hardened building within the material access area, connected to the existing Device Assembly Facility. These facilities would be equipped to calibrate instruments and testers used in weapon assembly operations. A class 1000 clean room with heating, ventilation, and air conditioning temperature control to $\pm$ 2.8 ^{o}C ($\pm$ 5 ^{o}F) would be added to these buildings.

Commercially Procured Material Testing/Staging. An existing building located in Area 23 would be used to test and stage commercially procured materials used in the assembly process. This building would have both receiving and staging areas and a room equipped for performing standard material tests.

Special Purpose Bays

Pit Laser Sampling. A new hardened building would be constructed within the material access area, connected to the Device Assembly Facility, to perform laser sampling of pits.

Accelerated Aging. A new hardened building would be constructed within the material access area, connected to the Device Assembly Facility, to simulate accelerated environmental aging of newly produced weapons and weapon components. This building would contain five environmental chambers to provide thermal cycling above and below ambient temperatures for an extended period of time.

Special Nuclear Materials Container Refurbishment/Verification. A new building would be constructed within the limited area, adjacent to the Device Assembly Facility, to refurbish and verify processing of special nuclear material containers.

AT-400A Processing. Two existing hardened bays within the Device Assembly Facility would be used for AT-400A processing.

Mass Properties. Mass properties determination would be performed in an existing hardened bay within the Device Assembly Facility. This building would be equipped with remotely operated dynamic balancing machines to determine products of inertia and lateral center of gravity and a center of gravity and moments of inertia machine.

Separations Testing. An existing hardened bay in the Device Assembly Facility would be used for separations testing. This bay would be equipped to test selected reentry body subassemblies, measurements of service-related deterioration of the release assembly system, and for acquisition of data associated with the evaluation of release assembly hardware.

Vacuum Chambers. Two vacuum chambers would be installed in an existing hardened building in the Device Assembly Facility to perform leak rates on all outgoing weapons or on weapons returned from the field.

Paint. A new nonhardened building would be constructed within the limited area, adjacent to the Device Assembly Facility, to paint, repaint, or touch-up weapons, weapon components, and containers.

Purge/Backfill. A new hardened building would be constructed within the material access area, connected to the Device Assembly Facility, to conduct purge and backfill operations. This building would be equipped to either purge or fill the inside of the weapon case with a specific gas.

Component Packaging/Technical Acceptance. Component packaging and technical acceptance operations would be conducted in two existing hardened Device Assembly Facilities.

Nondestructive Evaluation. Explosive components would be inspected by linear accelerator, medium x ray, and computed tomography within the existing two radiography buildings in the Device Assembly Facility. Other weapon and component testing would be conducted in a new hardened building located within the material access area, connected to the Device Assembly Facility. This building would contain equipment to support mechanical conditioning tests including vibration, hostile shock, mini air-gun shock, and steady-state acceleration shock.

Electronic Testing. Electronic testing of weapon components would be conducted in a new hardened building located within the material access area, connected to the Device Assembly Facility.

Warehousing/Staging

High Explosives Components. Three new hardened bunkers would be constructed within the limited area, adjacent to the Device Assembly Facility, for the storage of HE components. These bunkers would be bermed and would provide a safe separation distance to all other occupied facilities at the plant site.

Special Nuclear Materials Components. A new hardened building would be constructed within the material access area, connected to the Device Assembly Facility, to stage and store special nuclear material components. This building would contain segregated staging bays and inspection equipment and would utilize the existing safe secure trailer loading dock within the Device Assembly Facility for secure receiving of special nuclear material components.

Inert Components/Containers Shipping and Receiving. An existing building located in Area 23 would be used to ship, receive, and store inert weapon components. This facility would include storage racks, a loading dock, and areas designed for packaging and unpackaging.

Tooling/Testers. A new nonhardened building would be constructed within the limited area, adjacent to the existing Device Assembly Facility, to control the storage of precision tools, instruments, testers, and special equipment used in A/D operations. Segregated storage areas would be provided for all specific tooling requirements supporting weapons programs in the enduring stockpile.

Weapons. Six new hardened bays would be constructed within the material access area, connected to the Device Assembly Facility, for the interim staging of a maximum of 100 weapon units. This facility would have a dedicated safe secure trailer dock for shipping and receiving weapons.

Strategic Plutonium/Canned Subassembly Storage. The strategic Plutonium/Canned Subassembly Storage Facility would consist of new hardened construction within the material access area connected to the existing Device Assembly Facility.

Weapons A/D facilities construction would take 6 years to complete. Materials and resources consumed during the entire construction period are listed in table A.3.1.2–2.

The principal sources of air emissions during A/D facility construction would be fugitive dust from land clearing, site preparation, excavation, and other construction activities, and exhaust from construction equipment and vehicles. The annual emissions generated during a 1-year period with peak construction activity are shown in table A.3.1.2–3.

TABLE A.3.1.2–2.—*Nevada Test Site Weapons Assembly/Disassembly Construction Materials/Resources Requirements*

Material/Resource	Total Consumption	Peak Demand[a]
Electricity	38,000 MWh	5 MWe
Water	98,400,000 L	94,600 L/day
Concrete (m^3)	75,000	
Steel (t)	16,300	
Liquid fuel and lube oil (L)	3,030,000	
Industrial gases (m^3)[b]	65,100	

[a] Peak demand for electricity is the maximum rate. Peak demand for water is the average daily consumption during a 1-year period with peak construction activity.

[b] Cubic meters measured at standard temperature and pressure.

Source: NT DOE 1995b.

TABLE A.3.1.2–3.—*Nevada Test Site Weapons Assembly/Disassembly Construction Emissions*

Pollutant	Quantity (t)
Sulfur dioxide	1.8
Nitrogen dioxide	24
Volatile organic compounds	7.3
Carbon monoxide	36
Particulate matter	13.6
Total suspended particulates	31

Source: NT DOE 1995b.

The number of craftworkers, as well as construction management and support staff, required during each year of construction, are presented in table A.3.1.2–4.

The utilities consumed during operation include electric power, liquid fuels, and water. Annual utility consumption rates and peak electric power rates for surge operation are shown in table A.3.1.2–5.

The chemicals and materials consumed during operation primarily include water treating chemicals, reactants and solvents for explosives formulation and synthesis, explosive powders, materials for facility equipment and vehicle maintenance, metals for manufacturing tooling, and bottled gases. Annual surge operation material consumption is listed in table A.3.1.2–6.

Emissions. Gaseous environmental releases result from operation of the thermal treatment unit for nonradioactive HE contaminated waste and mixed HE contaminated waste. Emissions will also result from plant boiler operation, cleaning operations using solvents, and small scale synthesis operations. The thermal treatment units would be designed and operated to attain and maintain temperatures that result in the destruction of hazardous constituents and hazardous particulates that will be trapped in filters. The releases will be limited to what is possible using the best available control technology. The annual emissions for the A/D facility surge operations are shown in table A.3.1.2–7.

Waste Management. NTS waste management is described in detail in appendix section H.2.8. The liquid and solid nonhazardous wastes generated during the 6-year construction period would include concrete and steel construction waste materials and sanitary wastewater. The steel construction waste would be recycled as scrap material before completing construction. The remaining nonhazardous wastes generated during construction would be disposed of as part of the construction project by the contractor. Uncontaminated wastewater would be used for soil compaction and dust control, and excavated soil would be used for grading and site preparation. Wood, paper, and metal wastes would be shipped offsite to a commercial contractor for recycling. Hazardous wastes generated during construction would consist of such materials as waste adhesives, oils, cleaning fluids, solvents, and coatings. Hazardous waste would be packaged in DOT-approved containers and shipped offsite to commercial RCRA-permitted treatment, storage, and disposal facilities. No radioactive waste would be generated during construction.

The project design incorporates waste minimization and pollution prevention. Segregation of activities that generate radioactive and hazardous wastes would be employed, where possible, to avoid the generation of mixed wastes. Where applicable, treatment to separate radioactive and nonradioactive components would be performed to reduce the

TABLE A.3.1.2–4.—Nevada Test Site Weapons Assembly/Disassembly Construction Workers

Employees	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
Craftworkers							
Carpenter	61	117	115	63	41	36	433
Concrete mason	8	15	10	2	2	4	41
Electrician	24	27	53	90	96	55	345
Iron worker	30	75	67	23	16	16	227
Laborer	38	62	52	20	17	20	209
Millwright	3	7	10	20	19	7	66
Operator	10	23	29	22	18	9	111
Sheet metal worker	5	14	29	29	14	5	96
Pipe fitter	15	32	75	82	78	32	314
Sprinkler fitter	3	8	16	16	7	3	53
Teamster	3	6	7	7	6	3	32
Other craftworkers	4	8	15	24	20	6	77
Total Craftworkers	204	394	478	398	334	196	2,004
Construction staff[a]	29	59	73	61	51	30	302
Management and support staff[b]	44	91	111	92	78	46	462
Total Employment	277	544	662	550	463	272	2,768

[a] Construction staff includes temporary construction facilities, construction services, and field staff.
[b] Management and support staff include all construction personnel and an allowance for DOE site personnel, field and vendor inspection services, construction management, and engineering support during construction.
Source: NT DOE 1995b.

TABLE A.3.1.2–5.—Nevada Test Site Weapons Assembly/Disassembly Facility Surge Operation Annual Utility Requirements

Utility	Consumption	Peak Demand[a]
Electricity	45,000 MWh	7 MWe
Liquid fuel (L)	432,000	
Natural gas (m^3)	3,680,000	
Water (L)	98,400,000	

[a] Peak demand is the maximum rate expected during any time.
Source: NT DOE 1995b; NTS 1995a:2.

volume of mixed wastes and provide for cost effective disposal or recycle. To facilitate waste minimization, where possible, nonhazardous materials would be substituted for those materials which contribute to the generation of hazardous or mixed waste. Production processes would be configured with minimization of waste production given high priority. Material from the waste streams would be treated to facilitate disposal as nonhazardous wastes, where possible. Future D&D considerations have also been incorporated into the design.

TABLE A.3.1.2–6.—Nevada Test Site Weapons Assembly/Disassembly Facility Surge Operation Annual Chemical Requirements [Page 1 of 2]

Chemical	Quantity (kg)
Acetone	64
Acetonitrile	64
Aluminum metal	499
Argon	8,165
Brass metal	50
Carbon dioxide	49,896
Circlene FG 20	227
Clepox 143	227
Copper/copper oxide wire	295
Copper metal	136
Degreaser	227
Dispersant	68
Dry air	771
Eco-Star	726
Electrode/probe solutions	59
Ethyl alcohol	59
Fixer/replenisher	454

TABLE A.3.1.2–6.—*Nevada Test Site Weapons Assembly/Disassembly Facility Surge Operation Annual Chemical Requirements* [Page 2 of 2]

Chemical	Quantity (kg)
Glass cleaner	454
Glass beads	136
Helium	1,769
Heptane	113
Hydraulic/lubricating oil	8,165
Hydrochloric acid	68
Joint compound	363
Kimwipes	1,134
Lead metal	136
Micro liquid lab cleaner	113
Mild steel metal	1,814
Molecular sieve	295
Neutrasorb acid neutralizer	68
Nitrogen	3,629
Paint	4,536
Planisol-M concentrate	113
Polyalkylene and ethylene glycol	68
Potassium hydroxide	113
Siliconized ammonium phosphate base	181
Sodium hydroxide	113
Solksorb solvent absorbent	499
Specialty gas mixtures	1,542
Stainless steel metal	612
Sulfuric acid	113
Tetrahydrofuran	4,990
TISAB and CDTA	250
Toluene	68
Water treating chemicals	2,268

Source: NT DOE 1995b; NTS 1995a:3.

TABLE A.3.1.2–7.—*Nevada Test Site Weapons Assembly/Disassembly Facility Surge Operation Annual Emissions*

Pollutant	Quantity (t)
Carbon monoxide	0.007
Nitrogen dioxide	0.907
Particulate matter	0.00227
Sulfur dioxide	0.907

Source: NT DOE 1995b; NTS 1995a:3.

Table A.3.1.2–8 presents the estimated annual waste volumes from the A/D and pit reuse facility during construction and surge operations. Liquid and solid waste streams are routed to the waste management system. Solid wastes would be characterized and segregated into LLW, hazardous and mixed wastes, then treated to a form suitable for disposal or storage within the facility. Liquid wastes would be treated onsite to reduce hazardous and toxic and radioactive elements before discharge or transport. All fire-sprinkler water discharged in process areas is contained and treated as process wastewater, when required.

Low-Level Waste. LLW generated from reuse operations would consist of tubes removed from the pits, personnel protective equipment, glove boxes, filters, cleaning materials, and disposal supplies. Small amounts of LLW would be generated by A/D operations and would consist primarily of sanitized and demilitarized weapon parts, test residue, compacted wipes, rubber gloves, and vacuum filters. Bulk waste would be disposed of in Area 3, and packaged waste would be disposed of in Area 5, employing standard shallow land burial techniques.

Mixed Low-Level Waste. Pit reuse operations would not generate any mixed LLW. Small amounts of mixed LLW would be generated from operation of the A/D facility and would consist primarily of sanitized and demilitarized weapon parts, test residue, compacted wipes, rubber gloves, and vacuum filters. Mixed LLW would be stored in an onsite RCRA-permitted storage facility until treatment in accordance with the site treatment plan that was developed to comply with the *Federal Facility Compliance Act* of 1992.

Hazardous Waste. Liquid hazardous wastes would be generated from solvents from cleaning operations and residue from painting and bonding operations. The cleaning solvents selected would be from a list of nonhalogenated solvents. Solid hazardous wastes would be generated from nonradioactive materials, such as wipes contaminated with oils, lubricants, and cleaning solvents that are used for equipment outside the main processing units. Hazardous wastes would be collected in DOT-approved containers and sent to an onsite hazardous waste storage area. The hazardous waste storage area would provide a 90-day staging capacity prior to shipment to an offsite com-

TABLE A.3.1.2–8.—*Nevada Test Site Weapons Assembly/Disassembly Facility Waste Volumes*

Category	Annual Average Volume Generated from Construction (m^3)	Annual Volume Generated from Surge Operations (m^3)	Annual Volume Effluent from Surge Operations (m^3)
Low-Level			
Liquid	None	0.06	None
Solid	None	30[a]	15[b]
Mixed Low-Level			
Liquid	None	None	None
Solid	None	2	2
Hazardous			
Liquid	None	6	6
Solid	5	0.05	0.05
Nonhazardous (Sanitary)			
Liquid	6,670	53,000	53,000
Solid	260[c]	100	50[d]
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	Included in sanitary
Solid	Included in sanitary	Included in sanitary	Included in sanitary

[a] Includes 18.3 m^3 generated from A/D operations and 11.3 m^3 generated from pit reuse operations.
[b] Assumes 2/3 of solid LLW is compactible by a factor of 4:1 and the liquid LLW is solidified by a factor of 2:1.
[c] Includes 255 m^3 of concrete and 39 t (43 tons) of steel. Volume estimate made by using 0.127 m^3/t for density of steel.
[d] Assumes 2/3 of solid is compactible by a factor of 4:1.
Source: NT DOE 1995b; NT DOE 1995f; NTS 1995a:2; NTS 1995a:3; PX DOE 1995k.

mercial RCRA-permitted treatment, storage, and disposal facility, using DOT-certified transporters.

Nonhazardous (Sanitary) Waste. Sewage wastewater and process wastewater would be treated using a series of facultative lagoons and evaporation ponds and disposed of in septic tanks, sumps, or ponds. Solid wastes are disposed of in landfills at various locations on the site.

Nonhazardous (Other) Waste. Small amounts of classified nonhazardous waste would be generated from operation of the A/D facility. These wastes would be sanitized and disposed of per site practice.

A.3.2 Secondary and Case Fabrication

This alternative involves those activities required to support the production and maintenance of the secondaries and case components of the nuclear weapons physics package as follows:

- Providing secondary materials
- Processing materials
- Fabricating parts and components
- Assembling and disassembling secondary components
- Performing quality evaluations of secondary assemblies
- Providing safe secure storage of secondary material and products

Functional capabilities required to perform these activities include operations to physically and chemically process, machine, inspect, assemble, certify, disassemble, and store secondary materials. Management of wastes generated from these operations is also required. The fabrication of secondaries and cases can be subdivided into the following major material production processes: uranium, lithium, and nonnuclear/special materials. The following typical process descriptions are provided to illustrate the functional activities and operations associated with each of the major production processes. These processes are based on traditional secondary and case fabrication methods and represent upper bounds to the types and number of processes that would be continued in the downsized and reconfigured Complex. Alternative sites for performing secondary and case fabrication are Y-12, LANL, and LLNL. The site-specific descriptions provided in sections A.3.2.1 to A.3.2.3 are based on more streamlined and less unit operations than described in this section. When comparing data between site alternatives, it is important to note that there are differences in the facility designs. The Y-12 alternative considers all the necessary support facilities to conduct the missions, not just the production and storage facilities. The LANL and LLNL alternatives only consider the incremental changes for operating the production facilities. The actual production footprint size of each alternative is almost identical; however, the production capacities vary between site alternatives. For example, base case, multiple-shift capacities at Y-12 and LANL are about 150 units, whereas at LLNL the equivalent production capability would be about 50 units. This creates significant differences in some of the data.

Process Descriptions

Uranium. The uranium process provides finished uranium parts and products. The operations are capable of all uranium handling and processing functions, from raw materials handling to finished parts manufacturing. In addition, uranium storage areas need to be provided for storage of in-process uranium materials and, at ORR only, for the HEU strategic reserve. In the event secondary and case fabrication is phased out at ORR and performed at LANL or LLNL, the storage of the HEU strategic reserve would be addressed at the weapons A/D site (i.e., Pantex or NTS).

The production of uranium parts and products involves casting or wrought processing; metalworking; machining, inspection, and certification; chemical recovery; assembly, disassembly, and quality evaluation; and in-process storage. The products from casting or wrought processing are billets and cast parts that feed directly to machining and metalworking. Billets are cropped and cast parts are delugged before they are sent to the next operation. The input to casting consists of retired weapons parts, metal buttons from storage, and recycled scrap metal from metalworking and machining. A casting charge is made up and processed in a critically safe configuration in a vacuum induction furnace. Scrap metal and machine turnings are degreased, cleaned, and briquetted before direct recycle.

Metalworking prepares a wrought product as feed for machining. Cropped billets from casting are preheated in a salt bath, rolled into a sheet, annealed in a salt bath, blanked, and pressed. The blanking operations are a major source of recycled metal for casting. Formed parts are cleaned, debrimmed, and machined.

Both formed and cast blanks are machined to finished dimensions and inspected. Scrap metal and machine turnings are returned to casting for cleanup and reuse.

Miscellaneous solids are sent to the chemical recovery systems for treatment to recycle the material back to metal buttons. Product inspections and certification is accomplished with coordinate measuring machines, optical gaging, high-energy x-ray radiography, ultrasonic and dye penetrant flaw-inspection methodology, plating thickness gaging, and mechanical properties testing.

Uranium chemical recovery receives feed from virtually all areas in the process. The major feeds are residuals from casting, impure metal chips from machining, and a miscellaneous array of combustibles from all areas. The feeds are incinerated and processed in a head-end treatment consisting of acid dissolution, leaching, and feed preparation for solvent extraction. The feed solution is processed through primary extraction by which it is purified, concentrated by evaporation, and purified further by secondary extraction. The resulting solution is converted to oxide, then to uranium tetrafluoride, and then to uranium metal buttons. Secondary residues are returned to the head-end treatment. Finished metal is returned to casting for reuse.

Assembly operations assemble piece parts into subassemblies using joining techniques such as welding, adhesive bonding, and mechanical joining. Disassembly takes retired weapons apart and recycles all materials of value. The quality evaluation function receives weapons from the stockpile for disassembly, evaluation, and lifecycle testing. Shipping containers for weapons parts and subassemblies are certified and refurbished as part of the A/D process.

Uranium storage includes storage vaults for in-process uranium materials, which includes buttons and other scrap materials directly recycled, as well as semi-finished and finished components. The vaults at ORR are also for the strategic reserve, which includes assembled secondaries and HEU metal castings.

Lithium. The lithium process provides finished lithium hydride and deuteride parts. Primary functional elements of this process include powder production and forming, finishing and inspection, and deuterium production. These systems are briefly described below.

The lithium hydride and deuteride from storage, recycled weapons parts, and manufacturing scrap are broken, crushed, and ground to produce powder. The powder is loaded into molds and cold isostatically pressed to form solid blanks.

The blanks are unloaded from the molds and placed into vacuum furnaces where they are outgassed by heating under vacuum. After cooling, the outgassed blanks are loaded into form-fitting bags, heated, and then warm pressed. After being warm pressed, the blanks are cooled to room temperature and removed from the bags. The fully dense machining blanks that result from forming operations are radiographed to detect any high-density inclusions. Powder production, mold loading, and radiography are all performed in dry glove boxes to minimize reaction of the lithium hydride and deuteride with moisture in the atmosphere. Mold unloading, furnace loading and unloading, and bag loading and unloading are all conducted in an inert glove box. The lithium hydride or deuteride is handled outside inert-atmosphere glove boxes only when it is sealed in a mold or bag.

The blanks from forming operations are machined to final shapes and dimensions on lathes using single-point machining methods in finishing operations. Most machine dust is collected for direct recycle salvage operations. The finished part weight and dimensions are inspected using certified balances and contour measuring machines. All machining and inspection activities are conducted in dry glove boxes to minimize any reaction with moisture in the atmosphere. Certified parts receive a final vacuum outgassing treatment before final assembly.

Deuterium is required for many of the products and will be stored for future use. Deuterium oxide, or heavy water, is electrolytically reduced. The resulting deuterium is compressed and stored for use. The compressed deuterium gas is used to reconvert the lithium metal to deuteride in the final step of wet chemistry if needed.

Lithium wet chemistry can be used to pre-produce lithium hydride and deuteride to meet production requirements for many decades. The principal function of wet chemistry is to purify lithium hydride and deuteride by removing oxygen and other trace elements. The principal feeds to this system are retired weapon components from the disassembly operation, machine dust, powder, and killed parts from other operations. Purification is accomplished by transforming the lithium hydride and deuteride through a chemical dissolution process; then the solution is evaporated and crystallized. The crystals are then reduced to lithium metal and impurities are removed. The lithium metal is then reconverted to lithium hydride and deuteride by combining it with hydrogen or deuterium gas. The resulting lithium hydride and deuteride billet, sealed in a thin stainless-steel can, is transferred to lithium storage.

The production of lithium hydride and deuteride components creates a considerable amount of scrap that must be recycled to recover the lithium and deuterium. Much of the machine dust, unacceptable formed parts, machined parts that fail inspection, and stockpile returned parts are directly recycled. Salvage operations typically process material that is too impure to be recycled. Salvage operations primarily involve washing and chemical recovery. Items that require washing include machining tools and fixtures, filters used throughout the processes, and sample bottles. Oil-soaked lithium hydride and deuteride blanks from the powder-forming operations are also prepared for storage. Solutions from the purification and wash operations, including mop and dike water streams, are neutralized, filtered, crystallized, and sent to storage or waste disposal.

Long-term storage is required for chemicals and pre-produced lithium hydride and deuteride billets. Interim storage is to be provided for lithium hydride and deuteride components from disassembly or retired weapons and rejected components from forming and finishing operations.

Special Materials. Special materials such as diallyl-phthalate are required to support the lithium processes. Diallyl-phthalate based molding compound is formed into near-net-shape blanks that are later machined to finished parts. The primary forming operation is compression or transfer molding, which is followed by a drying and final curing step.

Nonnuclear. The nonnuclear process is responsible for producing certain weapon components composed of nonnuclear materials and for providing the uranium and lithium processes with specialized material and support services. Many types of materials are processed to provide a diverse product line consisting of both nonnuclear metal components and tooling and a variety of polymer-based items. The principal manufacturing technologies employed are hydroforming, hydrostatic forming, rolling, forging, heat treating, welding, machining, cold/hot isostatic pressing, grinding, winding, casting, plating, molding, and coating.

The nonnuclear process handles several product streams, which are described briefly in the following paragraphs.

Several types of urethane foams are required to be produced. The urethane components and blowing agents are pumped into molds and allowed to expand to fill the mold. After curing, the foam moldings are ejected and trimmed to final shape.

Steel and aluminum are construction materials for both components and support tooling, making this a relatively high throughput product line. The usual fabrication route for both materials is rough machining, heat treatment, and finish machining.

Operations to produce stainless steel cans consist of blanking, followed by hydroforming and hydrostatic forming with subsequent machining and heat treatment. Ultrasonic cleaning is required before heat treatment to ensure cleanliness for welding, which completes the assembly.

Ceramic finished parts are finished from blanks or procured. Procured parts are inspected and certified prior to final assembly.

Polyvinyl chloride is formed into bags and castings and also applied as a coating. Items to be coated are dipped into a tank of curable, plasticized polyvinyl chloride formulation, whereas castings are produced by transferring the polyvinyl chloride liquid into a mold. All items are heat cured.

A.3.2.1 *Downsize at Oak Ridge Reservation*

Y-12 has performed the secondary and case fabrication mission in the Complex for over 40 years. This mission includes the production of materials and components for thermonuclear weapons secondary assemblies and the associated functions such as depleted uranium for radiation cases and other miscellaneous materials for other applications. Figure A.3.2.1–1 shows the location of Y-12 at ORR.

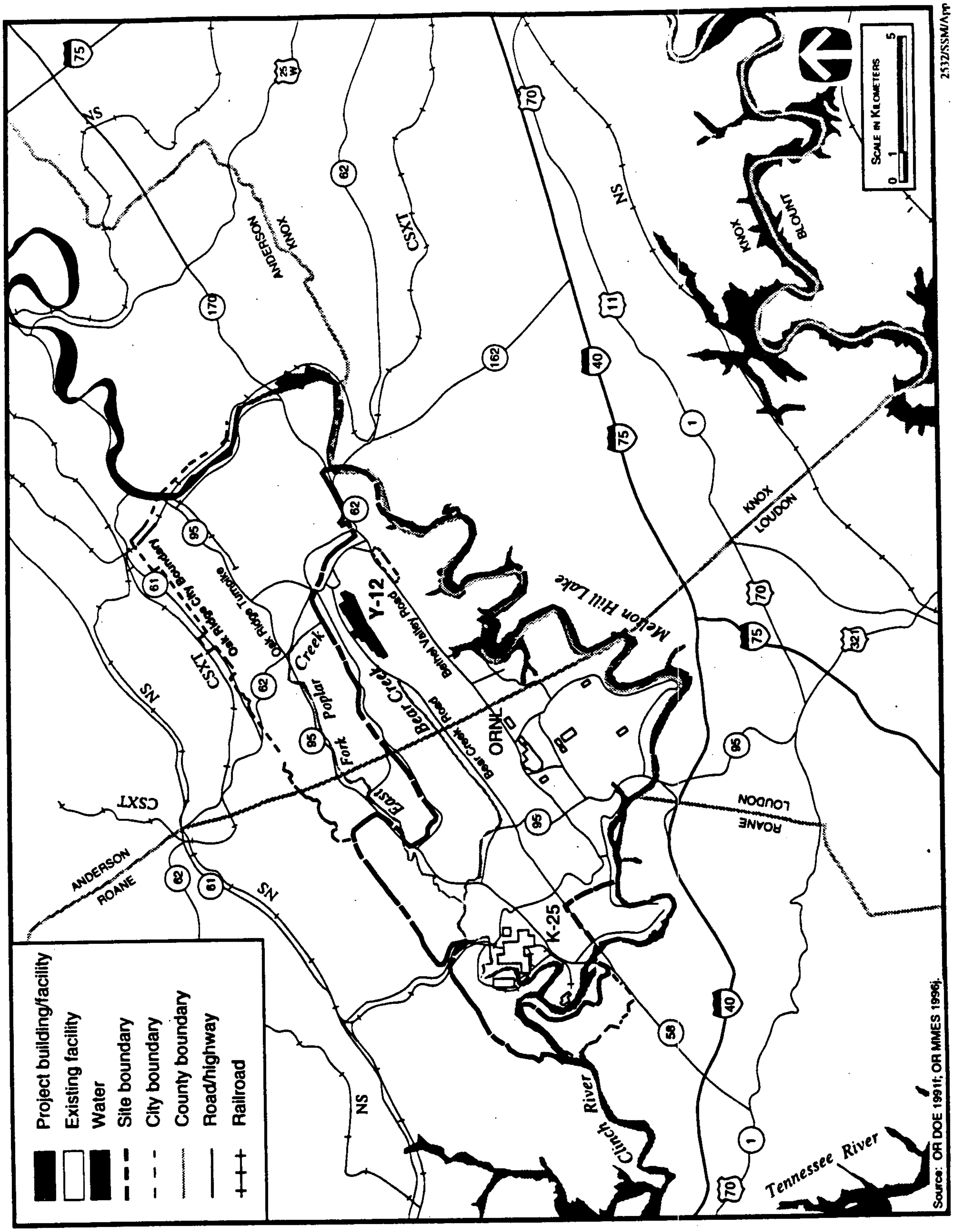


FIGURE A.3.2.1–1.—*Secondary and Case Fabrication Area at Oak Ridge Reservation.*

The Y-12 secondary and case fabrication mission requires approximately 30 ha (75 acres) of the existing 328-ha (811-acre) Y-12 site. This, unlike the LANL and LLNL alternatives, includes significant area for support facilities. There would be no new developed land outside the currently existing Y-12 boundary. Land for construction laydown and warehousing would be minimal and would use existing Y-12 developed areas; construction parking requirements, about 0.8 ha (2 acres), can be satisfied by existing unused parking facilities.

The Y-12 complex consists of an array of production and support facilities. The physical configuration for the Y-12 secondary and case fabrication mission consists of five main production buildings, one shared production facility, and a number of office, utility, and changehouse facilities.

During the past 12 years, major restoration projects (such as Production Capability Restoration, Utility System Restoration, and the Capability Assurance Program) have brought the infrastructure supporting this facility up to current standards and should allow the use of these facilities for up to an additional 40 years. Figure A.3.2.1–2 is a plot plan of Y-12 showing these main and shared facilities.

The secondary and case fabrication mission would be located in the following Y-12 production buildings: 9996, 9212, 9215, 9201-5N, 9204-2E, 9204-2 (isostatic press), 9720-19, and 9998. The secondary and case fabrication mission footprint comprises 61,800 m^2 (665,000 ft^2) of total DP area including a production footprint of 21,840 m^2 (235,000 ft^2). The total proposed footprint includes all DP functions: production, storage, maintenance, dedicated utilities, and administration. Buildings 9204-2 and 9201-5W would be placed in cold standby to enable reactivation in the event of unforeseen additional capacity demands. Activation of these buildings would require separate NEPA evaluation.

The following production buildings would be used to support the Stockpile Stewardship and Management Program.

Building 9212

- E-wing—Enriched uranium casting and storage would continue in this area. All but two of the west line casters would be placed in standby as would one auxiliary caster. Adjacent to E-wing is the process area for enriched uranium metal recovery, which would be operated by programs other than DP or placed in cold standby.

- A2-wing—This wing would be used as now configured for depleted uranium and binary operations.

- Equipment for metal production from uranium oxide would be held in cold standby.

Building 9998

- Foundry—The staging area and six furnaces would be used.

- H2-Area—This area would contain all of the enriched uranium machining and the associated dimensional inspection. The existing storage area would remain, and G3-Area would be used for ceramic machining and other special materials.

- F-Area—This area would be used in its current configuration for depleted uranium binary and nonnuclear metalworking with the 3,175 t (3,500 ton) press added.

Building 9215

- M-wing—This area would be used for enriched uranium storage.

- O-wing—Enriched uranium rolling and forming would be performed in this area.

- P-wing—This area would continue to be used for hydroforming and would house the can shop, relocated from Building 9210-1.

- N-wing—The third mill area would continue to function as the depleted and alloyed uranium rolling and blanking operation.

FIGURE A.3.2.1-2.—*Secondary and Case Fabrication and Materials Management Areas Plot Plan at the Y-12 Plant.*

Building 9996

- This building would be used as a laydown and tool storage area for the equipment now in service in the Building 9212-A2 Area and the F-Area of Building 9998.

Building 9204-2

- The largest isostatic press would continue to be used for the lithium forming operation. This press is in a self-contained small section of Building 9204-2 that would be sealed. The remainder of Building 9204-2 would be placed in cold standby.

Building 9201-5N

- This building houses machine tools and other preparation and plating equipment dedicated to the production of depleted uranium/binary alloy/nonnuclear components.

Building 9201-5W

- This building would be placed in cold standby.

Building 9720-19

- The rubber curing shop is located in this facility. This area would not be modified or its function altered.

Building 9204-2E

- This building would be modified to be used for lithium forming and machining. It would continue to function as the assembly facility, a testing (nondestructive testing) facility, and for storage.

No new facilities are required at Y-12 to support the secondary and case fabrication mission. Table A.3.2.1–1 summarizes key facility data, such as plant functions, nuclear materials present, building square footage, number of floors in the building, and type of construction.

Construction. Modification of Y-12 facilities to support the secondary and case fabrication mission would require 6 years to complete. The materials and resources that would be consumed during this period are summarized in table A.3.2.1–2. Emissions generated during construction are provided in table A.3.2.1–3. The principal sources of airborne emissions from construction are fugitive dust, construction activities, and exhaust from construction equipment and vehicles. Construction employment for the Y-12 Secondary and Case Fabrication Facility modification is shown in table A.3.2.1–4.

Operations. The secondary and case fabrication mission processes require the following utilities during operations: electricity, diesel fuel, natural gas, coal, air (compressed, dehumidified, and breathing), water (demineralized, fire, potable, plant, and cooling tower), and steam. Table A.3.2.1–5 presents the estimated utilities consumed during surge operation of the Y-12 secondary and case fabrication facilities. Chemicals consumed during secondary and case fabrication surge operations are summarized in table A.3.2.1–6.

Emissions. The contaminated and potentially contaminated zones within the plant facilities that handle uranium materials have high efficiency particulate air (HEPA) filtered ventilation systems that exhaust to the atmosphere. Some exhausts are provided with liquid scrubbing prior to HEPA filtration to remove chemical vapors such as nitric acid. The annual emissions for surge operation of the Y-12 secondary and case fabrication mission are shown in table A.3.2.1–7.

Employment. Y-12 generally operates with one shift per day, 5 days per week, except for some utility systems and security functions that operate continuously. Surge capacity would be accommodated by operating multiple shifts. The employment during surge operation for the secondary and case fabrication mission is summarized in table A.3.2.1–8. The data presented includes employees from the management and operating contractor, support organizations, and DOE.

Approximately 20 percent of the dosimeter badged population at Y-12 routinely work inside the radiological area (uranium handling areas). Based on current design definition, 20 percent is also assumed

TABLE A.3.2.1–1.—*Y-12 Plant Secondary and Case Fabrication Facility Data*

Building Number	Upgraded Uranium/Lithium Plant Function	Upgraded Uranium/Lithium Facility Usage (percent)	Nuclear Materials Present	Total Size (m^2)	Number of Floors	Type of Construction[a]
9103	Communication/support	10		6,780	3	B-1
9117	Communication/support	10		1,810	1	A-5
9119	Administration/support	100		6,660	4	B-5
9201-5N	Uranium/nonnuclear	85	Uranium	7,480	2	B-2
9204-2E	Uranium	85	Uranium	14,050	3	B-1
	Lithium	10	Lithium			
	Maintenance/support	5				
9212[b]	Uranium	40	Uranium	28,930	3	B-2
9215	Uranium	90	Uranium	14,590	3	B-2
	Nonnuclear	10				
9401-3	Steam plant support	10		3,130	3	B-4
9404-2	Compressed air/support	40		430	1	B-2
9706-2	Emergency Operations Center	20		2,040	2	A-2
	Medical/support	20				
9710-2	Fire station	10		1,760	1	B-2
9710-3	Security/support	60		3,820	4	B-3
9711-5	Cafeteria/support	10		5,360	2	B-1
9723-31	Changehouse/support	50		2,710	2	B-3
9995	Plant laboratory			7,810	2	B-3
	Uranium	6	Uranium			
	Lithium	3	Lithium			
	Nonnuclear	1				
9996	Uranium	100	Uranium	3,110	2	B-3
9998	Uranium	70	Uranium	12,740	2	B-3
	Nonnuclear	20				

[a] Building construction key:
Single story building with: A-1 wood frame, A-2 masonry bearing walls with wood roof framing, A-3 masonry bearing walls with structural steel roof stem, A-4 masonry bearing walls with precast concrete roof system, and A-5 prefabricated metal building with metal wall panels.
Mu ry building with: B-1 reinforced concrete structure with masonry walls, B-2 rei ed concrete and structural steel with masonry walls, B-3 structural steel skeleto h ma walls, B-4 structural steel skeleton with cement-asbestos wall panels, and B-5 ural steel skeleton with metal wall panels.

TABLE A.3.2.1–2.—*Y-12 Plant Secondary and Case Fabrication Construction Materials/Resources Requirements*

Material/Resource	Total Consumption	Peak Demand[a]
Concrete (m^3)	100	
Electricity (MWh)	2.7	0.2 MWe
Industrial gases[b] (m^3)	300	
Liquid petrochemicals (L)	10,000	
Steel (t)	20	
Water (L)	2,000,000	

[a] Peak demand is the maximum rate expected.
[b] Cubic meters measured at standard temperature and pressure.
Source: OR MMES 1996j; ORR 1995a:3; ORR 1995a:4.

TABLE A.3.2.1–3.—*Y-12 Plant Secondary and Case Fabrication Construction Emissions*

Pollutant	Quantity (t)
Carbon monoxide	2.4
Nitrogen oxides	0.8
Particulate matter	0.6
Sulfur dioxide	0.1
Total suspended particles	1.0
Volatile organic compounds	1.2

Source: OR MMES 1996j.

TABLE A.3.2.1–4.—*Y-12 Plant Secondary and Case Fabrication Construction Workers*

Employees	97	98	99	00	01	02	Total[a]
Craftworkers							
Carpenter	0.4	0.4	0.4	0.4	0.4	0	2
Concrete mason	0.2	0.2	0.2	0.2	0.2	0	1
Electrician	1	1	1	1	0.5	0.5	5
Iron worker	2	2	2	2	2	2	12
Laborer	1	1	2	1	1	1	7
Millwright		0.5	0.5	0.5	0.5		2
Operator	0.5	0.5	0.5	0.5	0.5	0.5	3
Other craftworkers	0.2	0.2	0.2	0.2	0.2		1
Pipe fitter	0.5	0.5	0.5	0.5	0.5	0.5	3
Sheet metal worker	0.4	0.4	0.4	0.4	0.4		2
Sprinkler fitter							0
Teamster	0.3	0.3	0.3	0.4	0.4	0.3	2
Total Craftworkers	6.5	7.0	8.0	7.1	6.6	4.8	40
Construction management and support staff	5.2	5.6	6.4	5.7	5.3	3.8	32
Total Employment	11.7	12.6	14.4	12.8	11.9	8.6	72

[a] Full-time equivalent.
Source: OR MMES 1996j; ORR 1995a:3; ORR 1995a:4.

TABLE A.3.2.1–5.—*Y-12 Plant Secondary and Case Fabrication Surge Operation Annual Utility Requirements*

Utility	Consumption	Peak Demand[a]
Coal (t)	500	
Diesel fuel (L)	250,000	
Electricity	118,000 MWh	19.0 MWe
Natural gas[b] (m^3)	17,000,000	
Raw water (L)	1,510,000,000	

[a] Peak demand is the maximum rate expected during any hour.
[b] Cubic meters measured at standard temperature and pressure.
Source: OR MMES 1996j; ORR 1995a:3; ORR 1995a:4.

TABLE A.3.2.1–6.—*Y-12 Plant Secondary and Case Fabrication Surge Operation Annual Chemical Requirements*

Chemical	Quantity (kg)
Solid Chemicals	
Aluminum trihydride	3,000
Barium nitrate	15
Borax	15
Calcium hydroxide	30,000
Calcium nitrate	150
Calcium oxide	150
Curing agent	4
Diatomaceous earth	2,500
Epoxy resin	10
Erbium oxide	75
Ferric sulfate	7,500
Graphite	2,000
Lithium carbonate	1,200
Magnesium sulfate	100
Methylene diphenyl diisocyanate	100
Nickel compounds	75
Polycure	75
Potassium carbonate	3,000
PVC plastisol	1,500
Silicon carbide	40
Sodium bicarbonate	75
Sodium carbonate	450
Sodium molybdate dihydrate	5
Sodium nitrate	1,500
Sodium potassium	3
Trisodium phosphate	250

TABLE A.3.2.1–6.—*Y-12 Plant Secondary and Case Fabrication Surge Operation Annual Chemical Requirements*—Continued

Chemical	Quantity (kg)
Tungsten carbide	1
Yttria	150
Zirconium oxide	180
Liquid Chemicals	
Acetic acid	15
Acetone	8
Acetonitrile	150
Anisol	200
Corrosion inhibitor	800
Diamond paste	1
Diesel fuel	75,000
Ethanol	1,000
Gasoline	110,000
Hydraulic oil	3,000
Hydrogen peroxide	750
M-pyrol	50
Methanol	2,500
Micro/oakite detergent	12
Mineral oil	1,500
Mold release	7.5
Nitric acid	1,000
Nitrogen tetroxide	150
Oxalic acid	2
Petroleum oils (lubricants)	1,500
Potassium chloride	15
Propylene glycol	150
Pump oil	3
PVC primer	2
Solvent 140	750
Toluene 2,4-diisocyanate	100
1,1,1-Trichloroethane	800
Gaseous Chemicals	
Ammonia, anhydrous	7.5
Argon	1,400,000
Carbon dioxide	30,000
Chlorine	75
Freon or equal (cleaning)	750
Helium	6,000
Hydrogen	1,500
Nitrogen	5,000,000
Oxygen	50,000

Note: PVC- polyvinyl chloride.
Source: OR MMES 1996j; ORR 1995a:4.

TABLE A.3.2.1–7.—*Y-12 Plant Secondary and Case Fabrication Surge Operation Annual Emissions*

Pollutant	Quantity (t)
Carbon monoxide	7.4
Chlorine	0.15
Hydrogen chloride	4.8
Methyl alcohol	14
Nitric acid	7.1
Nitrogen oxides	195
Ozone	0.07
Particulate matter	0.5
Pressing lubricant	0.3
Sulfuric acid	1.8
Sulfur dioxide	80
Total suspended particles	10
Volatile organic compounds	1.2
Radiological Isotope	**Estimated Release**
Uranium-235 (microcuries)	420
Uranium-238 (microcuries)	1,490

Source: OR MMES 1996j; ORR 1995a:4.

for the Y-12 secondary and case fabrication mission. Therefore, it is estimated that 174 of the badged employees would be at risk of radiological exposure as shown in table A.3.2.1–8. In addition, on a nonroutine basis, a small fraction of badged visitors may enter the radiological area.

TABLE A.3.2.1–8.—*Y-12 Plant Secondary and Case Fabrication Surge Operation Workers*

Labor Category	Number of Employees	Risk of Radiological Exposure
Craftworkers	131	61
Laborers	8	—
Officials and managers	88	7
Office and clerical	95	—
Operatives	93	43
Professionals	284	35
Service workers	584	—
Technicians	93	28
Total Employees	1,376	174

Source: OR MMES 1996j; ORR 1995a:4.

Waste Management. The solid and liquid nonhazardous wastes generated during modification activities would include concrete and steel construction waste materials and sanitary wastewater. The steel waste would be recycled as scrap material before completing construction. The remaining nonhazardous wastes generated during construction would be disposed of by the construction contractor. Uncontaminated wastewater would be managed per site practice. Wood, paper, and metal wastes would be shipped offsite to a commercial contractor for recycling. Hazardous wastes would be packaged in DOT-approved containers and shipped offsite to commercial RCRA-permitted treatment, storage, and disposal facilities. A small amount of solid LLW consisting of contaminated steel and concrete would be generated. This waste would be placed in an appropriate container and shipped to an approved LLW disposal facility.

The project design considers and incorporates waste minimization and pollution prevention. Production processes would be configured with minimization of waste production given high priority. Future D&D considerations have also been incorporated into the design.

Table A.3.2.1–9 presents the estimated annual waste volumes from the secondary and case fabrication facilities during modifications and surge operations. Solid and liquid waste streams are routed to the waste management system. Figures A.3.2.1–3 through A.3.2.1–6 depict the waste management system. Solid wastes would be characterized and segregated into low-level, hazardous, and mixed wastes, then treated to a form suitable for disposal or storage within the facility. Liquid wastes would be treated onsite to reduce hazardous/toxic and radioactive elements before discharge or transport. All fire-sprinkler water discharged in process areas would be contained and treated as process wastewater, when required.

Spent Nuclear Fuel. The Secondary and Case Fabrication Facility would not generate any spent nuclear fuel.

Transuranic Waste. The Secondary and Case Fabrication Facility would not generate any TRU wastes.

TABLE A.3.2.1–9.—*Y-12 Plant Secondary and Case Fabrication Waste Volumes*

Category	Annual Average Volume Generated from Construction (m^3)	Annual Volume Generated from Surge Operations (m^3)	Annual Volume Effluent from Surge Operations (m^3)
Low-Level			
Liquid	None	320	None
Solid	8	1,120[a]	570[b]
Mixed Low-Level			
Liquid	None	3,400	3,400
Solid	1	92[c]	92
Hazardous			
Liquid	None	Included in mixed	Included in mixed
Solid	2	Included in mixed	Included in mixed
Nonhazardous (Sanitary)			
Liquid	27	320,000	319,400[d]
Solid	30[e]	13,500[f]	7,670[g]
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	Included in sanitary
Solid	2	10,000[h]	Included in sanitary

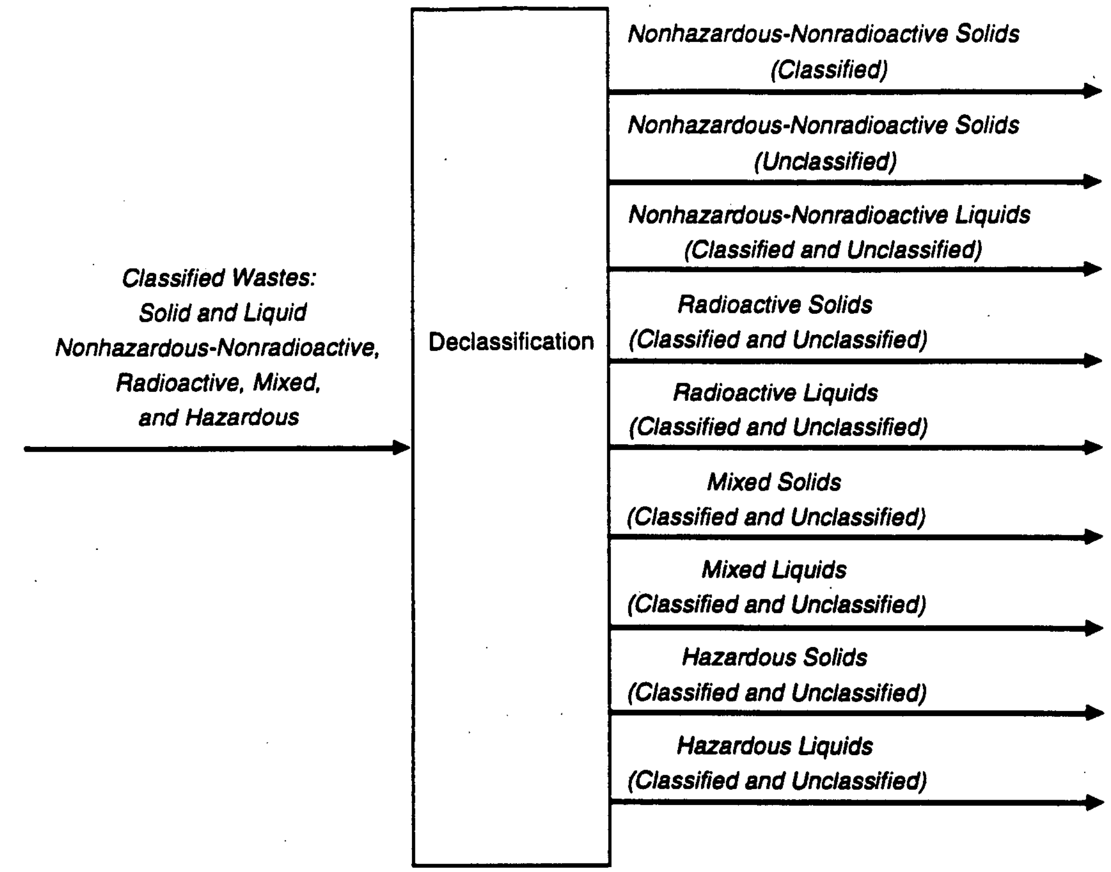
[a] Includes 10 m^3 of classified waste, 40 drums depleted uranium ash from chip oxidation (one 55 gal drum = 0.2 m^3), and 1,100 m^3 of unclassified waste.
[b] Assumes 100:1 wastewater to sludge ratio for the treatment of liquid LLW followed by 2:1 for solidification. Assumes 2/3 of LLW is compactible by a factor of 4:1. LLW in drums is not compactible.
[c] Includes 2 m^3 of classified waste and 90 m^3 of unclassified waste.
[d] Y-12 only pretreats industrial wastewater prior to discharge to the city of Oak Ridge Municipal Sanitary Sewer System.
[e] Includes 3.4 m^3 of concrete and 4.1 t of steel.
[f] Includes 5 m^3 of classified waste.
[g] Assumes 2/3 of solid is compactible by a factor of 4:1.
[h] Recyclable wastes.
Source: OR MMES 1996j; ORR 1995a:4.

Low-Level Waste. LLW would be generated by operation of the Secondary and Case Fabrication Facility and would consist primarily of depleted uranium oxide in drums and contaminated scrap metal, air filters, and HEPA filters. Approximately 10 percent of all LLW generated would currently be suitable for disposal onsite. The remaining waste would be packaged for offsite treatment and disposal at the waste feed preparation facility and stored at K-25, pending disposal at an approved disposal facility. Scrap metal would be sent offsite for smelting into shielding blocks for DOE use.

Mixed Low-Level Waste. Mixed LLW would be generated from operation of the Secondary and Case Fabrication Facility and would consist primarily of ash and sludge immobilized in grout, compacted gloves, and wipes. Mixed LLW would be collected in DOT-approved containers and sent to an onsite hazardous waste accumulation area. Waste suitable for incineration would be sent to the K-25 TSCA incinerator. After compaction, if appropriate, the remaining solid wastes would be packaged and stored onsite awaiting disposal by an offsite commercial vendor.

Hazardous Waste. These materials are included in the mixed LLW.

Nonhazardous (Sanitary) Waste. Sewage wastewater would be discharged directly to the Oak Ridge Municipal Wastewater Treatment System sewer system. Process wastewater would be treated in the sanitary wastewater treatment facilities and discharged through permitted NPDES outfalls. Sludge would be stored onsite, pending treatment by a com-



Source: OR MMES 1996j.

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FIGURE A.3.2.1–3.—*Waste Management Process—Declassification.*

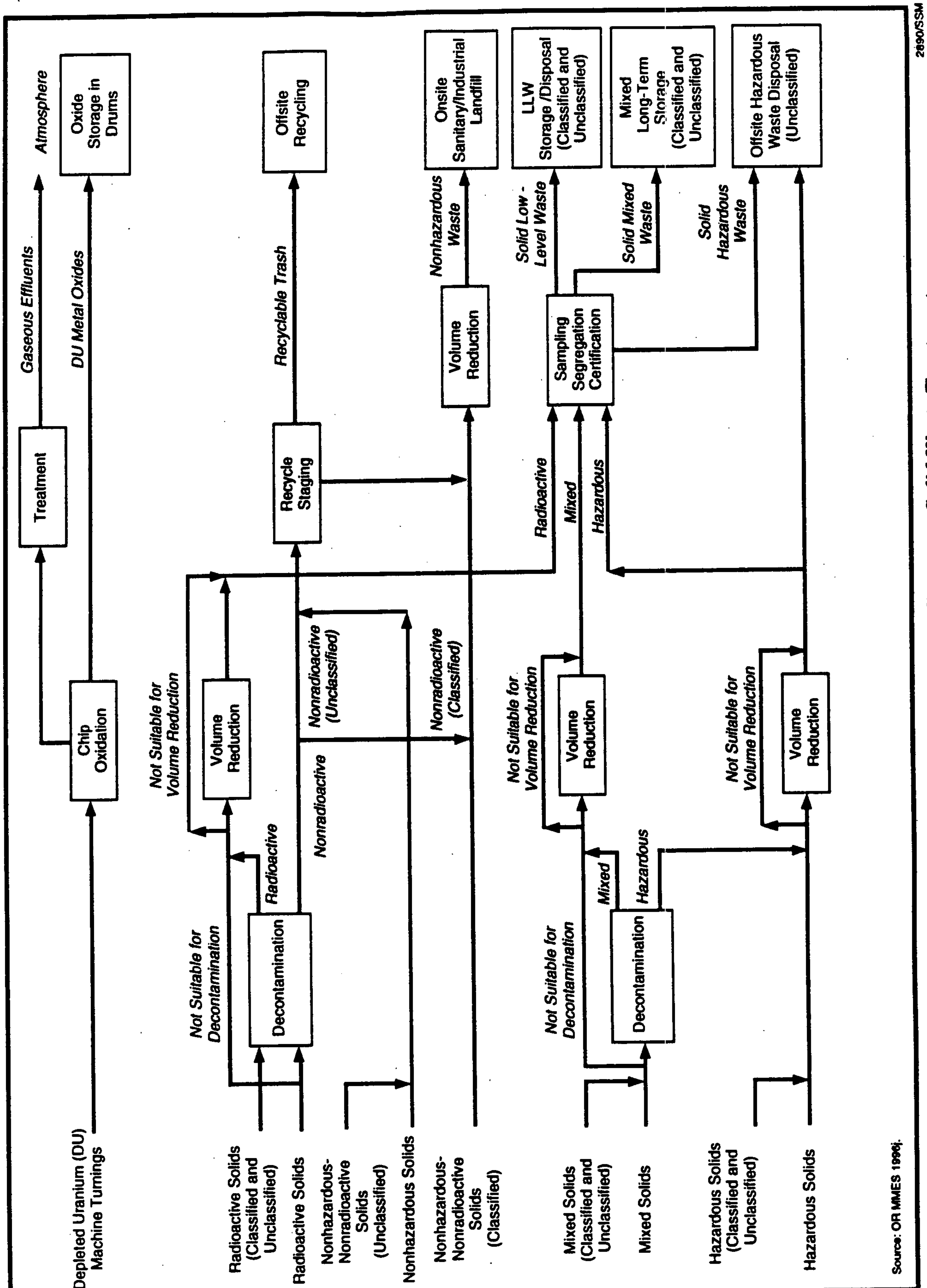

FIGURE A.3.2.1–4.—*Waste Management Process—Solid Waste Treatment.*

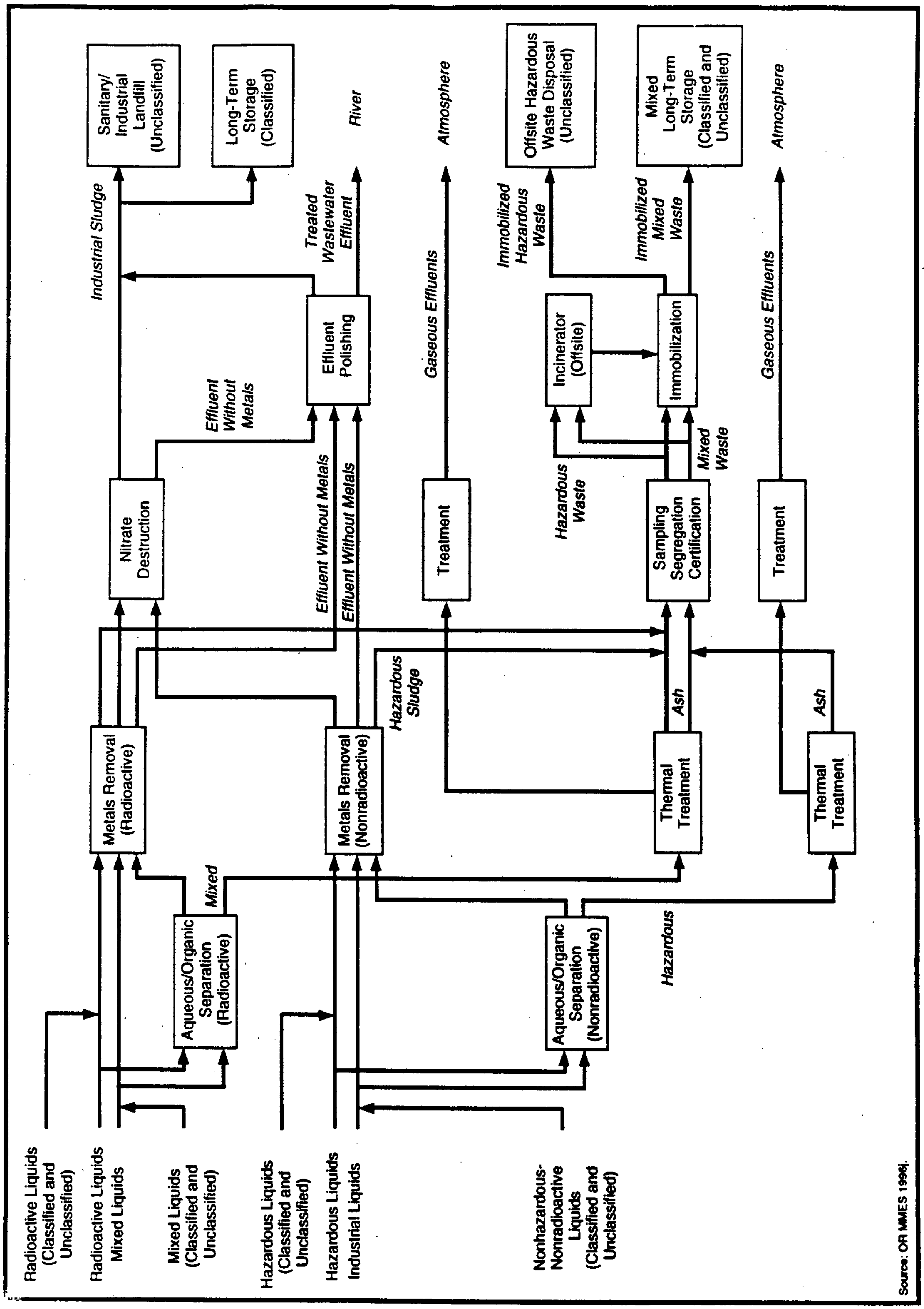

FIGURE A.3.2.1–5.—*Waste Management Process—Process Wastewater Treatment and Waste Thermal Treatment.*

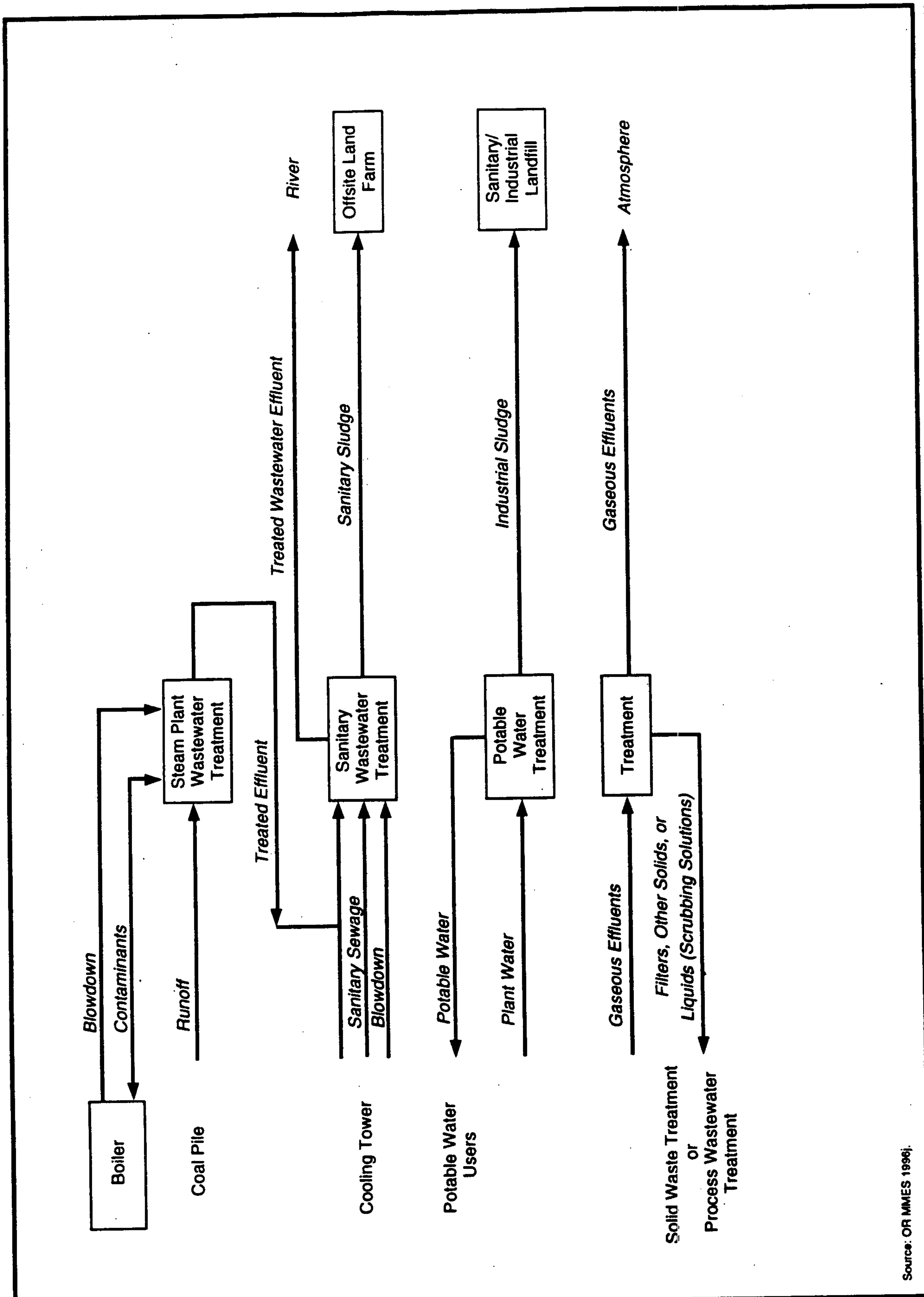

FIGURE A.3.2.1–6.—*Waste Management Process—Utility Sludges and Gaseous Effluents.*

mercial vendor. Nonhazardous solid wastes including small amounts of classified nonhazardous waste would be generated from operation of the Secondary and Case Fabrication Facility and disposed of in a State of Tennessee permitted Class II landfill.

Nonhazardous (Other) Waste. Nonrecyclable (other) wastes would be disposed of in a permitted landfill or discharged through permitted NPDES outfalls.

A.3.2.2 *Relocate to Los Alamos National Laboratory*

LANL secondary and case fabrication facilities would include all of the functional operations required to physically and chemically process, machine, inspect, assemble, certify, and disassemble secondary materials to produce canned subassemblies and radiation case components for the nuclear weapons physics package.

The secondary and case fabrication facilities would occupy 21,739 m^2 (234,000 ft^2) of floor space inside existing structures within their current footprint of 1.1 ha (2.7 acres). Additional land area for the construction of new buildings would not be required. A nominal area would be required for equipment staging, material laydown, and parking during the modifications of these facilities.

Facility Description. Secondary and case fabrication would utilize existing facilities within the boundaries of TAs -3, -8, -50, -54, and -55 (figure A.3.2.2–1). Facilities within each of these technical areas include the TA-3 Sigma Complex (SM-35, SM-66, and SM-141), the TA-3 Chemistry and Metallurgy Research building (SM-29), the TA-3 main machine shop (SM-39 and SM-102), the TA-8 Nondestructive Evaluation Facility (Buildings 22 and 23), the TA-55 Nuclear Material Storage Facility for overflow capacity, the TA-50 Liquid Radioactive Waste Treatment Facility, and the TA-54 Solid Radioactive Waste Treatment Area.

The flow of fissile material would be contained within the Chemistry and Metallurgy Research building (SM-29). Manufacturing operations would take their feeds from both incoming stockpile returns and the chemical recovery process. Components from manufacturing would be sent back out for assembly. Low-equity waste (graphite, booties, and machining fluids) would be sent back to waste management for processing, storage, and disposal. Recoverable quantities of fissile material would be reprocessed in chemical recovery and returned as feed stock to manufacturing.

Figure A.3.2.2–2 shows the major structures located in TA-3. The buildings shown on this plot plan for use in stockpile stewardship and management operations are SM-29, SM-35, SM-39, SM-66, SM-102, and SM-141. Modifications are required for the following facilities:

- Renovations to Chemistry and Metallurgy Research building Wings 2, 4, and 9
- SM-102 change room and ventilation upgrades
- SM-66-D103 lithium forming, machining, and inspection
- SM-35 lithium purification, salvage, and storage

Table A.3.2.2–1 summarizes key facility data for the building and support structures to be utilized in secondary and case fabrication.

The Chemistry and Metallurgy Research building is a large reinforced concrete building with a basement, a first floor, and an attic floor. This building has been classified as a Performance Category PC-3 Nuclear Facility (per DOE-STD-3009-94). The administration wing and Wing 1 contain second-floor office areas. The plan of the building is centered on a spinal corridor oriented in a north-south direction with an administration wing and seven laboratory wings (Wings 1, 2, 3, 4, 5, 7, and 9) that extend from the corridor. Wings 2, 3, 4, 5, and 7 have equipment/change rooms located at the front of each wing and filter towers located at the end of the wings, which house the filter plenum and other large mechanical equipment for the exhaust ventilation system. The building also contains a waste assay facility located at the loading dock between Wings 1 and 4 and a Category I special nuclear material vault. The Chemistry and Metallurgy Research building replaced the World War II "D" building and was designed to house analytical chemistry facilities, plutonium metallurgy, uranium chemistry, engineering design and drafting, electronics, and other

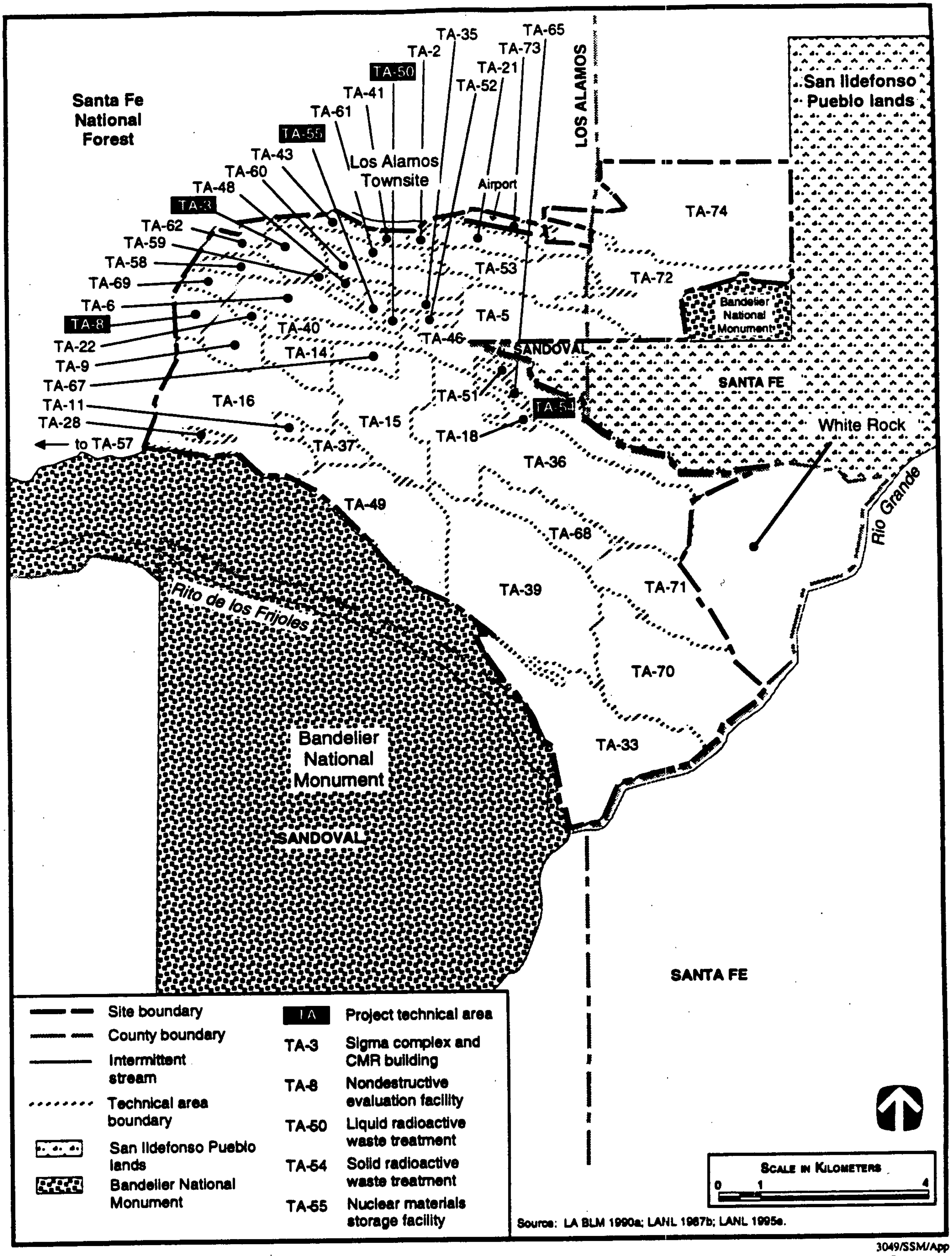

Figure A.3.2.2–1.—*Secondary and Case Fabrication Alternative Technical Areas at Los Alamos National Laboratory.*

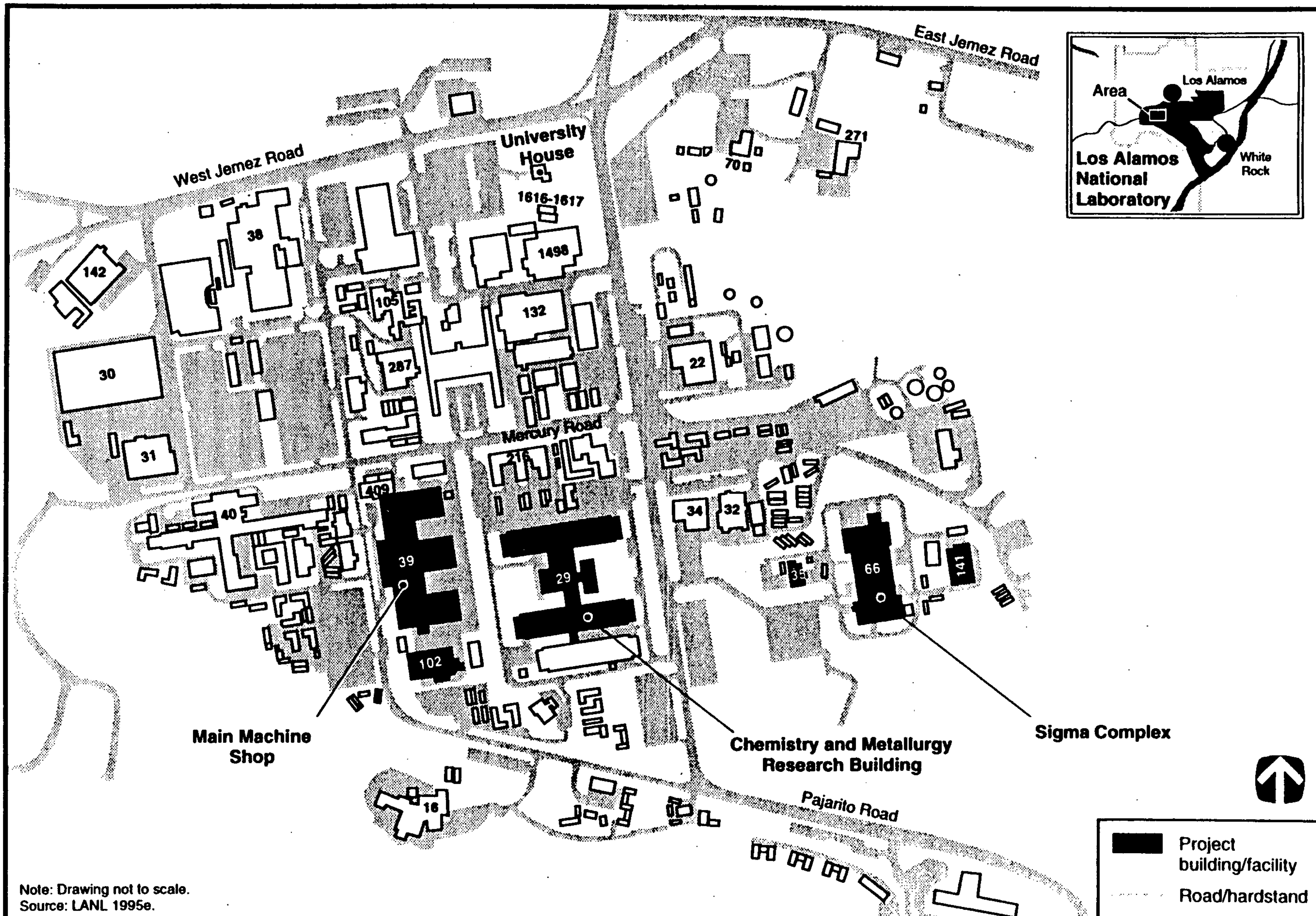

FIGURE A.3.2.2–2.—*Secondary and Case Fabrication Alternative Facilities at Los Alamos National Laboratory Technical Area 3.*

TABLE A.3.2.2–1.—*Los Alamos National Laboratory Secondary and Case Fabrication Facility Data*

Building	Footprint (m^2)	Number of Levels	Special Materials	Construction Type
SM-29 Chemistry and Metallurgy Research	51,097	3	Special nuclear materials	Concrete post and beam with concrete masonry unit in-fill walls
SM-66 Sigma	15,794	3	NA	Concrete post and beam with concrete masonry unit in-fill walls
SM-39 Nonnuclear Shops	14,202	3	NA	Concrete post and beam with concrete masonry unit in-fill walls
SM-102 Uranium Shops	2,090	3	NA	Concrete post and beam with concrete masonry unit in-fill walls
SM-141 Rolling Mill	1,858	2	NA	Concrete post and beam with concrete masonry unit in-fill walls
SM-35 Press	929	2	NA	Concrete foundation with steel pillars and sheet metal walls
SM-67 Guard Station Sigma	22.9			
SM-127 Cooling Tower	138			
SM-145 Switchgear Station	39			
SM-147 Air Plenum and Fan	15.2			
SM-154 Chemistry and Metallurgy Research Cooling Tower	37.2			
SM-159 Forming	14.9			
SM-161 Magazine	1.5			
SM-169 Warehouse	581			
SM-187 Cooling Tower	37.2			
SM-317 Graphite Flour Storage	140.5			
SM-451 Micro Machining	160			
TA-8-22 Nondestructive Evaluation Lab	843			
TA-8-23 Nondestructive Evaluation Support	316			

Note: NA - not applicable.
Source: LANL 1995e.

support functions. At the time it was built, the Chemistry and Metallurgy Research building represented the state-of-the-art instrumentation and safety controls for a modern chemistry laboratory.

The Sigma Complex comprises three main processing buildings located in TA-3 just east of the Chemistry and Metallurgy Research building. The fenced area encompassing the Sigma Facility contains a total of 16 buildings. The three buildings designated as SM-66, SM-141, and SM-35 contain the majority of laboratory space. Other structures house utilities, support functions, and storage areas. The Sigma Complex has been classified as a low-hazard chemical (PC-1), nonnuclear facility.

The Press building (SM-35) is the oldest building in this complex. Construction was completed in 1953. The building was originally designed to house the 4,536-t (5,000-ton) press for the Materials Technology Group. Building construction consists of a concrete foundation and supporting steel pillars with insulated double sheet metal walls outside. Inside walls (separating various work areas and offices) are similar or made of concrete block.

The Rolling Mill building (SM-141) has reinforced concrete foundations, floors, support columns, and beams with concrete block exterior walls. Interior walls separating various work areas and offices are made of concrete block and/or metal studs with gypsum board. The roof is built of tar and gravel over rigid insulation and is supported by steel joists. The building was designed to house areas for powder metallurgy and fabrication. Today the Rolling Mill building continues to house these activities in addition to work areas for ceramics research, beryllium technology, and development and rapid solidification research.

The Sigma building (SM-66) was constructed in 1959 and was originally designed to house activities in physical metallurgy, ceramics, powder metallurgy, plastics, a metal foundry, electrochemistry, fabrication, and other support functions. Today the Sigma building continues to house all these functions except plastics. The building is built on a reinforced concrete foundation using reinforced concrete post and beam construction techniques. The exterior walls are constructed of concrete block fill between the supporting posts and beams. The mezzanine spaces are constructed of supported metal decking. Interior walls separating various work areas and offices are also concrete block or metal studs and gypsum board. The roof is built of tar and gravel over rigid insulation and metal decking supported by steel joists. The building has a basement, a first floor, and a small second floor. The plan of the building is on a spinal corridor oriented in a north-south direction. SM-66 has 11 major work areas that extend from the corridor.

Building SM-102 is connected to the Main Shops building, SM-39, by a 38-m (125-ft) long corridor. Constructed in the late 1950s, it originally housed a foundry, a heat-treating operation, a graphite machining shop, and a radioactive materials machine shop. Since that time, the northeast corner of the building, which provided programmatic support to the Rover Project, has been decommissioned and now is dedicated to the support of Engineering, Sciences, and Applications division operations. Currently, the southern half of the building is occupied primarily by Shop 13, the uranium and lithium machine shops. The building is constructed of cinder block and has a concrete floor. Shop 13 contains machines that are used for machining operations on uranium. The majority of the building houses pyrophoric, toxic, and radioactive material machining and a dimensional inspection area. SM-102 has been classified as a low-hazard chemical (PC-1), nonnuclear facility.

Building SM-39 is of concrete and cinder block construction. The main bay is aligned from north to south and is 183 m (600 ft) in length by 37 m (120 ft) in width. Three wings extend eastward from the north and south ends of the bay, as well as the middle of the main bay. The south main (high) bay section, the middle wing, and the south wing contain metal and machining shops owned by the Mechanical Fabrication Group. SM-39 has been classified as a low-hazard chemical (PC-1), nonnuclear facility.

The north wing contains offices occupied by the Materials Technology Polymers & Coatings Group (MST-7) and the Standard and Calibration Group (ESH-9). It also contains Mechanical Fabrication Group beryllium machining and inspection, a glass shop operated by MST-7, and a Standards and Calibration Laboratory operated by ESH-9. Three transportable equipment storage trailers are located on the south side of the north wing.

Construction. Modification to the LANL facilities to perform the stockpile management secondary and case fabrication mission would require approximately 7 years for design, construction, mission transfer, and operational startup. With conceptual design beginning in 1997, operational startup could commence in 2004. The materials and resources consumed during modification activities are provided in table A.3.2.2–2.

Emissions generated during modification activities are provided in table A.3.2.2–3. The principal sources of airborne emissions during modification are fugitive dust, construction debris, and exhaust from construction equipment and vehicles.

TABLE A.3.2.2–2.—*Los Alamos National Laboratory Secondary and Case Fabrication Construction Materials/Resources Requirements*

Material/Resource	Total Consumption	Peak Demand[a]
Concrete (m^3)	245	
Electricity	4,130 MWh	0.75 MWe
Industrial gases[b] (m^3)	11,500	
Liquid fuel (L)	22,700	
Steel (t)	54	
Water (L)	4,160,000	

[a] Peak demand is the maximum rate expected.
[b] Cubic meters measured at standard temperature and pressure.
Source: LANL 1995b:4; LANL 1995e.

TABLE A.3.2.2–3.—*Los Alamos National Laboratory Secondary and Case Fabrication Construction Emissions*

Pollutant	Quantity (t)
Carbon monoxide	<1[a]
Lead	0
Nitrogen dioxide	<1[a]
Particulate matter	<1[a]
Sulfur dioxide	<1[a]
Volatile organic compounds	0

[a] The total of all criteria pollutants is estimated to be less than 1 metric ton.
Source: LANL 1995b:4; LANL 1995e.

Employment needs during the modification phase are presented in table A.3.2.2–4.

Operation. The secondary and case fabrication processes require the following utilities during operation: electricity, natural gas, diesel fuel, air, water, and steam. Table A.3.2.2–5 presents a listing of the utilities consumed during Secondary and Case Fabrication Facility surge operations. Chemicals consumed during operation are summarized in table A.3.2.2–6.

The annual emissions from surge operation required in the Secondary and Case Fabrication Facility are based on historical emissions and amounts of materials to be processed as shown in table A.3.2.2–7.

Employment. The employment needs in support of secondary and case fabrication surge operation activities at LANL are summarized in table A.3.2.2–8.

TABLE A.3.2.2–4.—*Los Alamos National Laboratory Secondary and Case Fabrication Construction Workers by Year*

Labor Category	Year 1	Year 2	Year 3	Year 4	Total
Total craftworkers	34	45	45	45	169
Construction management and support staff	6	10	10	10	36
Total Employment	40	55	55	55	205

Source: LANL 1995e.

TABLE A.3.2.2–5.—*Los Alamos National Laboratory Secondary and Case Fabrication Surge Operation Annual Utility Requirements*

Utility	Consumption	Peak Demand[a]
Diesel fuel (L)	100,000	
Electricity	36,000 MWh	5 MWe
Natural gas[b] (m^3)	0	
Water (L)	55,000,000	

[a] Peak demand is the maximum rate expected during any hour.
[b] Cubic meters measured at standard temperature and pressure.
Source: LANL 1995b:4; LANL 1995e.

TABLE A.3.2.2–6.—*Los Alamos National Laboratory Secondary and Case Fabrication Surge Operation Annual Chemical Requirements* [Page 1 of 2]

Chemical	Quantity (kg)
Solid Chemicals	
Aluminum nitrate	75
Aluminum trihydride	3,000
Barium nitrate	15
Borax	15
Calcium hydroxide	30,000
Calcium nitrate	150
Curing agent	4
Epoxy resin	10
Ferric sulfate	7,500
Graphite	2,000
Lithium chloride	6,000
Magnesium sulfate	100
Methylene diphenyl diisocyanate	100
Nickel compounds	75
Polycure	75
Potassium carbonate	3,000
PVC plastisol	1,500
Silicon carbide	40
Sodium bicarbonate	75
Sodium carbonate	450
Sodium molybdate dihydrate	5
Sodium nitrate	1,500
Trisodium phosphate	250
Tungsten carbide	1
Yttria	300

TABLE A.3.2.2–6.—*Los Alamos National Laboratory Secondary and Case Fabrication Surge Operation Annual Chemical Requirements* [Page 2 of 2]

Chemical	Quantity (kg)
Liquid Chemicals	
Acetic acid	15
Acetone	20
Acetonitrile	150
Anisol	200
Corrosion inhibitor	800
Diamond paste	1
Dibutyl carbitol	1,000
Ethanol	1,000
Gasoline and diesel	100,000
Hydraulic oil	3,000
Hydrogen peroxide	750
Kerosene, high grade	150
M-pyrol	50
Methanol	2,500
Micro/oakite detergent	12
Mineral oil	1,500
Mold release	7.5
Nitric acid	1,000
Nitrogen tetroxide	150
Oxalic acid	2
Petroleum oils (lubricants)	1,500
Potassium chloride	15
Propylene glycol	150
Pump oil	3
PVC primer	2
Solvent 140	750
Toluene 2,4 diisocyanate	100
Gaseous Chemicals	
Ammonia, anhydrous	7.5
Argon	1,000,000
Carbon dioxide	10,000
Chlorine	75
Freon or equal (cleaning)	750
Helium	6,000
Hydrogen	1,500
Nitrogen	500,000
Oxygen	50,000

Note: PVC- polyvinyl chloride.
Source: LANL 1995b:4; LANL 1996e:1.

TABLE A.3.2.2–7.—*Los Alamos National Laboratory Secondary and Case Fabrication Surge Operation Annual Emissions*

Pollutant	Quantity (t)
Carbon monoxide	4.5
Lead	0.1
Nitrogen dioxide	117
Particulate matter	0.3
Sulfur dioxide	48
Volatile organic compounds	0.6
Radiological Isotope	**Estimated Release**
Uranium 235 (microcuries)	486
Uranium 238 (microcuries)	1776

Source: LANL 1995b:4.

TABLE A.3.2.2–8.—*Los Alamos National Laboratory Secondary and Case Fabrication Surge Operation Workers*

Labor Category	Number of Employees	Employees at Risk of Radiological Exposure
Office and clerical	26	0
Officials and managers	34	4
Professionals	37	13
Service workers	244	61
Technicians	182	73
Total Employees	523[a]	151

[a] Total surge employment. Increment to current employment would be 321.
Source: LANL 1995b:4.

Nearly all of the personnel performing operations in the secondary fabrication facilities would be dosimeter-badged. As shown in table A.3.2.2–8, it is estimated that approximately 151 workers would be at risk of radiological exposure. In addition, a small fraction of badged visitors may nonroutinely enter radiological areas.

Waste Management. Wastes generated during secondary and case fabrication operations include radioactive, mixed, hazardous, and nonhazardous byproducts. Secondary and case fabrication operations would not generate any high-level or TRU wastes. Low-level radioactive waste would consist primarily of depleted uranium oxide chips, contaminated scrap metal, and filter media. Mixed and hazardous wastes would consist of ash, sludges, filters, rags, and wipes. Liquid radioactive and inorganic chemical wastes that meet the LANL waste acceptance criteria are sent either by truck or industrial drain to be processed at TA-50, Building 1. Mixed wastes are currently stored at TA-54; liquids in Area L and solids in Area G. Hazardous and organic chemical (RCRA) wastes are packaged and shipped to TA-54, Area G, for interim storage and subsequently shipped offsite. Nonhazardous solid waste is collected in dumpsters and taken to the landfill operated by Los Alamos County. Sanitary liquids are disposed of by either sanitary drain or permitted outfall. Sanitary process and support liquids are sent by drain to the sanitary wastewater treatment plant, TA-46, and treated similarly to municipal sewage. Table A.3.2.2–9 provides an estimate of the annual quantities of these waste categories for Secondary and Case Fabrication Facilit·· surge operation.

A.3.2.3 *Relocate to Lawrence Livermore National Laboratory*

The LLNL secondary and case fabrication facilities would be housed within existing buildings at the Livermore Site (figure A.3.2.3–1). All of the structures required to house the secondary and case fabrication functions are in place; finalizing the capability would require installing some new equipment, moving existing equipment to other locations, and modifying some facilities to meet production requirements. A new structure, a 167-m^2 (1800-ft^2) steel framed, Butler-type building would be required to provide covered space within the Superblock protected area in which to house the enriched uranium inventory. At the Livermore Site, the existing security system for the fenced Superblock could be used with minor modifications to include

TABLE A.3.2.2–9.—*Los Alamos National Laboratory Secondary and Case Fabrication Waste Volumes*

Category	Annual Average Volume Generated from Construction (m^3)	Annual Volume Generated from Surge Operations (m^3)	Annual Volume Effluent from Surge Operations (m^3)
Low-Level			
Liquid	None	192	None
Solid	134	690	349[a]
Mixed Low-Level			
Liquid	None	30	30
Solid	10	108	108
Hazardous			
Liquid	None	60	60
Solid	37	216	216
Nonhazardous (Sanitary)			
Liquid	890	20,240	20,370
Solid	120	1,160	639[b]
Nonhazardous (Other)			
Liquid	Included in sanitary	None	None
Solid	10[c]	3,000	3,000

[a] Assumes 2/3 of the solid LLW is compactible by a factor of 4:1. The wastewater to sludge ratio for liquid LLW treatment is 100:1, followed by 2:1 solidification ratio.

[b] Assumes 2/3 of the solid waste is compactible by a factor of 4:1. The wastewater to sludge ratio for liquid sanitary treatment is 350:1.

[c] Includes 300 t of recyclable steel and 18 t of recyclable copper.

Source: LANL 1995b:4; LANL 1995e.

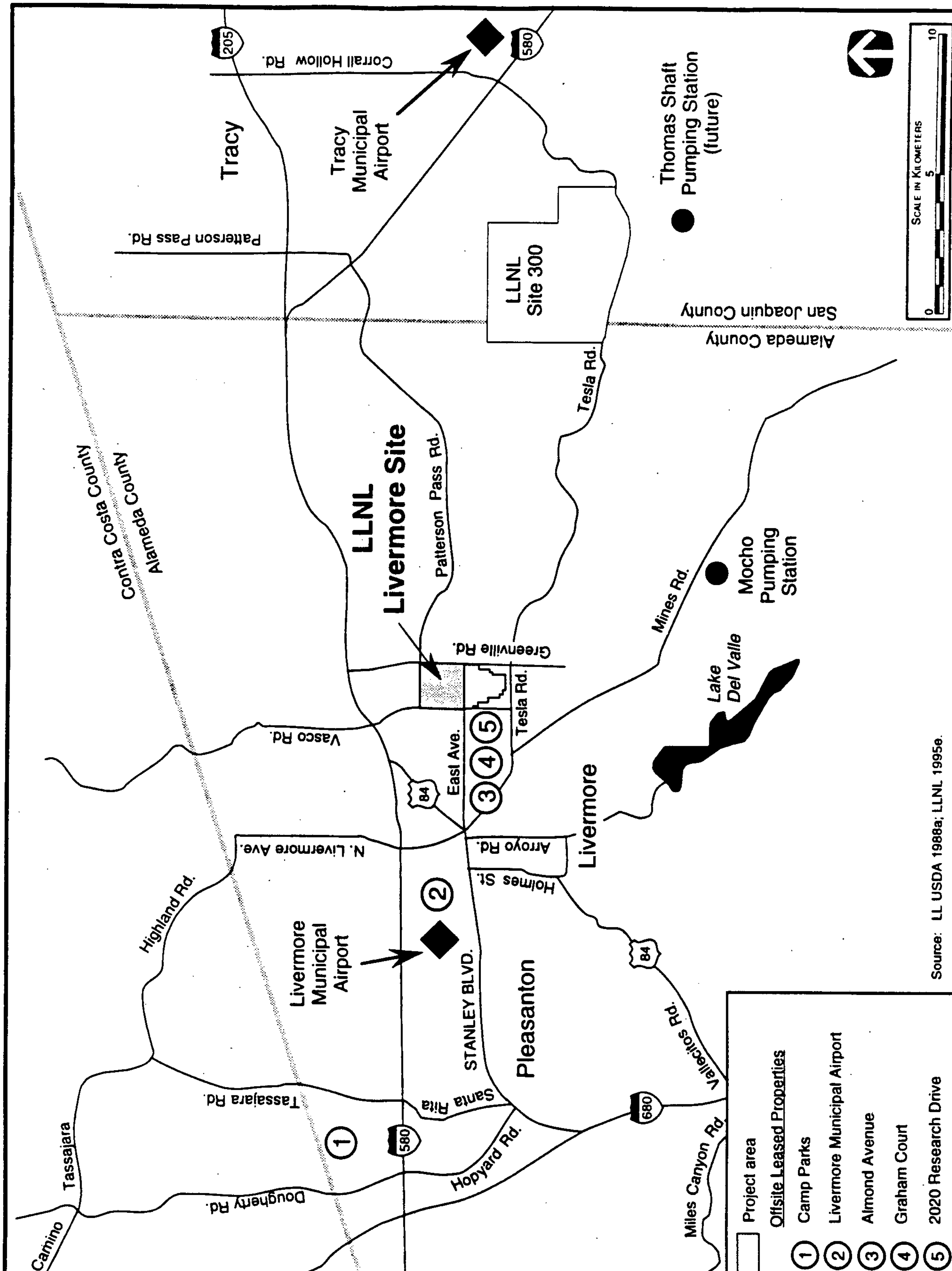

FIGURE A.3.2.3–1.—*Secondary and Case Fabrication Area at Lawrence Livermore National Laboratory.*

Building 239, the radiographic facility for enriched uranium fabrication, assembly, disassembly, storage, and surveillance operations.

Manufacturing and assembly of the canned secondary assemblies would take place in the buildings indicated on the Livermore Site plan, figure A.3.2.3–2. The overall site occupies approximately 332 ha (821 acres) and is surrounded by security fencing. The individual facilities to be used for secondary and case fabrication are within protected areas, limited areas, or exclusion areas as required for security and safeguards. Support facilities are located both inside and outside the security areas but inside the overall site perimeter fence, which is controlled at the entrances to the perimeter fenced area. The required facilities comprise approximately 19,500 m^2 (210,000 ft^2) and cover approximately 2 ha (5 acres). The Livermore Site has sufficient yard area and warehousing space to accommodate required laydown areas for receipt and staging of equipment and construction materials. In addition, parking for construction workers is available onsite.

Facility Description. Uranium parts are fabricated within a high-security, fenced area of the Livermore Site Superblock. Building 332 would house casting, machining, chemical recovery, destructive testing, nondestructive testing, dimensional inspection, storage, and A/D/surveillance operations. LLNL would use Building 334 as an additional site for A/D/surveillance operations and for metalworking of uranium parts.

The uranium processing facility is divided into three heating ventilation and air conditioning zones for radioactive contamination confinement. Zone 1 comprises areas where radioactive materials are handled and processed and includes enriched uranium receiving, processing, and storage areas. Zone 2 consists of areas where there is normally no radioactive contamination, but where there is the possibility of contamination. This zone includes the rooms containing glove boxes, process operating areas, and service corridors surrounding Zone 1 areas. Building 332 is a reinforced-concrete structure meeting the requirements of DOE 430.1, *Life-Cycle Asset Management*. The existing fire protection; radiation monitoring; heating, ventilation, and air conditioning; and emergency power facilities in Building 332 would be used. Building 239 would be used for radiography. Other buildings used in enriched uranium operations would include Building 177 for mass spectroscopy and Buildings 222, 235, and 251. These buildings are existing facilities that are adequate for this mission, and only minor modifications and upgrades would be needed.

As in the uranium parts manufacture, Building 239 is used for radiography, Building 177 for mass spectroscopy, and Buildings 222 and 251 for chemical laboratory analysis. The existing facilities in Building 235 are used for chemical laboratory analysis and nondestructive testing. Additional nondestructive testing functions take place in Building 327. Building 322 is used for some uranium part plating operations. The existing facilities in Buildings 322 and 327 are adequate for this mission. All of these facilities have been reviewed and approved for adequacy of building construction in accordance with applicable design codes and standards for the planned mission to be performed.

The special materials fabrication operations are performed in Buildings 231 and 241. Mass spectroscopy will be done in the existing facilities in Building 177, and chemical laboratory analysis in Buildings 222 and 235. Dimensional inspection is done in Building 321. Special materials would be fabricated in existing facilities in Building 231, with finishing operations to take place in Building 241. Again, all of these facilities have been reviewed and, with the exception of Building 241, approved for adequacy of building construction in accordance with applicable design codes and standards for the planned mission to be performed. Building 241 would require some minor, additional seismic retrofits before operations could commence.

The nonnuclear component fabrication capabilities would be housed in the extended Building 321 area complex at the Livermore Site. This includes the major Buildings 321 (with Wings A, B, C), 327, 329, and 322. Mechanical specimen testing would be performed in Building 231.

Table A.3.2.3–1 summarizes key facility data for the buildings and support structure to be utilized in secondary and case fabrication. While table A.3.2.3–1 summarizes all the facilities that are proposed for the canned secondary assemblies mission at LLNL, many of the facilities are used only for sample tests and are existing facilities that would

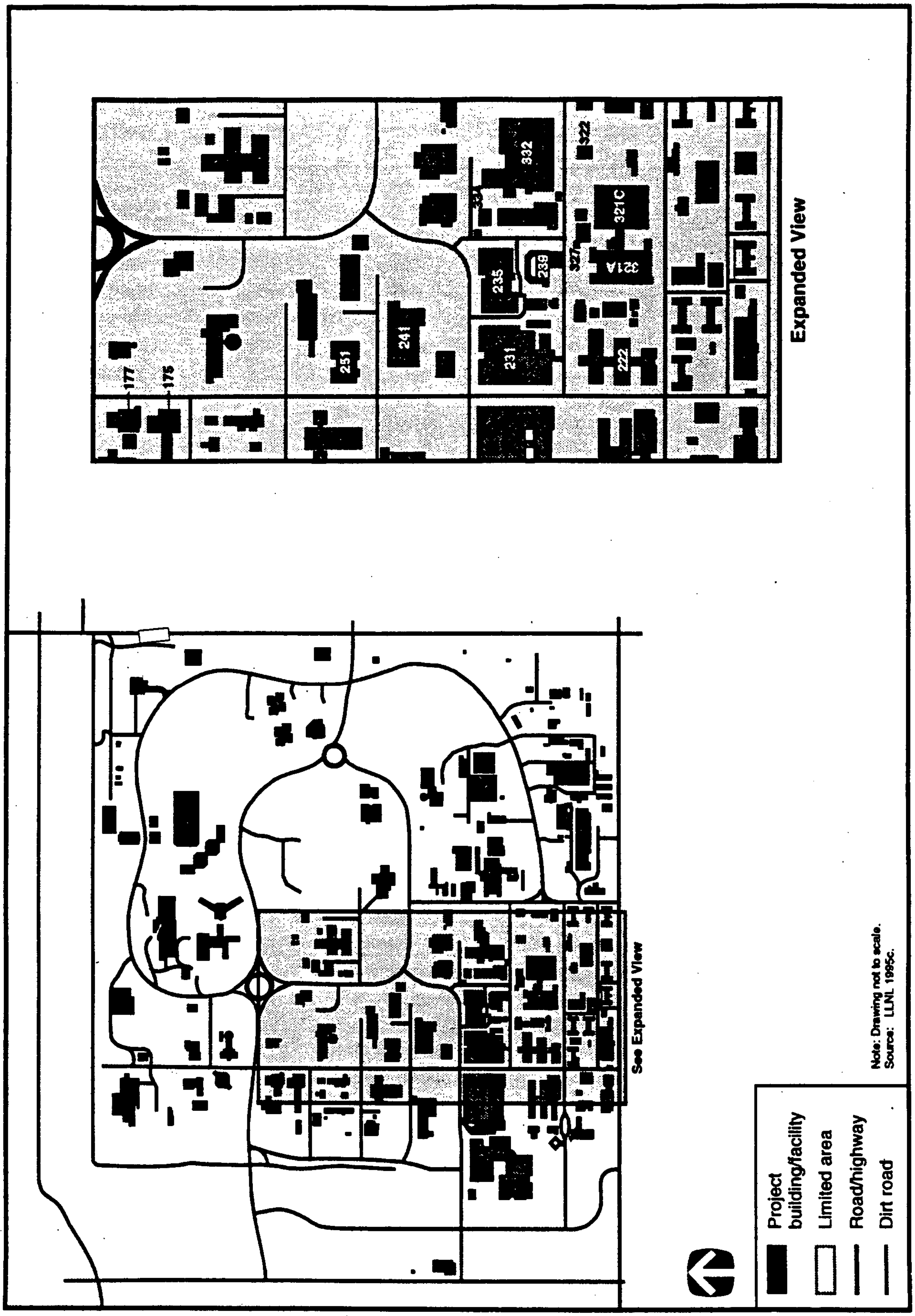

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FIGURE A.3.2.3–2.—*Secondary and Case Fabrication Site Plan at Lawrence Livermore National Laboratory.*

TABLE A.3.2.3–1.—*Lawrence Livermore National Laboratory Secondary and Case Fabrication Facility Data*

Building Name	Footprint (m^2)	Number of Levels	Special Materials	Construction Type
B-175	734	1	None	Reinforced concrete
B-177	28	1	SNM	Steel frame
B-222	113	1	SNM	Steel frame
B-231	1,661	1	None	Steel frame
B-235	140	2	SNM	Steel frame
B-239, Radiography	136	2 + basement	SNM	Reinforced concrete
B-241	620	1	None	Steel frame
B-251	19	1	SNM	Steel frame
B-321	13,945	2	None	Steel frame
B-322	149	1	None	Steel frame
B-327	143	1	None	Steel frame
B-329	484	1	None	Steel frame
B-332	738	2	SNM	Reinforced concrete
B-334	438	3	SNM	Reinforced concrete
New, Butler storage building	167	1	SNM	Steel frame

Note: SNM - special nuclear materials.
Source: LLNL 1995e.

be used as is and shared with other LLNL programs. Buildings 177, 222, 235, 251, 322, 327, and 329 fit into this category. The remaining facilities are discussed because they are the main processing facilities for the canned secondary assemblies mission.

Construction. Modification to the Livermore Site facilities, as discussed above, to perform the secondary and case fabrication mission would require approximately 3 years based on a fiscal year 1998 start date, with the first production unit scheduled for the beginning of 2004. To meet this milestone, facilities would have to be in place several years before that date to provide for certification of equipment and processes and for training and certification of personnel. It is anticipated that facilities would be required to be in place for this activity no later than 2001.

The materials and resources consumed during the modification phase are provided in table A.3.2.3–2. Information is based on a 3-year construction schedule.

TABLE A.3.2.3–2.—*Lawrence Livermore National Laboratory Secondary and Case Fabrication Construction Materials/Resources Requirements*

Material/ Resource	Total Consumption	Peak Demand
Concrete (m^3)	612	
Electricity	3,500 MWh	400 kW[a]
Gasoline, diesel fuel, and lube oil (L)	908,000	
Industrial gases[b] (m^3)	142	
Steel (t)	73	
Water (L)	8,710,000	

[a] Peak demand is the maximum rate expected.
[b] Cubic meters measured at standard temperature and pressure.
Source: LLNL 1995e.

Estimated emissions generated during modification activities for the secondary and case fabrication mission at LLNL are provided in table A.3.2.3–3. The

TABLE A.3.2.3–3.—*Lawrence Livermore National Laboratory Secondary and Case Fabrication Construction Emissions*

Pollutant	Quantity (t)
Carbon monoxide	635
Oxides of nitrogen	63.5
Particulate matter	544
Sulfur dioxide	5.44
Volatile organic compound	6.53

Source: LLNL 1995e.

principal sources of airborne emissions during facility modification would be fugitive dust, construction debris, and exhaust from construction equipment and vehicles. The peak year is defined as the year when modification activities would be the highest and equipment is anticipated to be arriving for installation.

Employment needs during the modification period are presented in table A.3.2.3–4. The modification activities would include some site work on the secondary fence enclosure of Building 239; seismic upgrades to Buildings 231 and 242; upgrades to building utilities such as electrical distribution systems, heating, ventilation and air conditioning, and security systems; and installation and checkout of equipment.

TABLE A.3.2.3–4.—*Lawrence Livermore National Laboratory Secondary and Case Fabrication Construction Workers*

Employees	Year 1	Year 2	Year 3	Total
Construction management and support staff	15	15	10	40
Craftworkers	115	115	60	290
Total Employment	130	130	70	330

Source: LLNL 1995e.

During modification activities, some support personnel and crafts would be at risk of radiological exposure. Approximately 20 personnel involved in decontamination of the 5 rooms in Building 332 would be at risk during the first year of construction. However, since the building is a certified plutonium handling facility, all construction personnel working in this building during the modification phase would be at some risk of radiological exposure.

Operations. The secondary and case fabrication processes would require consumable materials and resources to maintain facility operations. Annual utility consumption for surge operations secondary and case fabrication at the Livermore Site is presented in table A.3.2.3–5.

TABLE A.3.2.3–5.—*Lawrence Livermore National Laboratory Secondary and Case Fabrication Surge Operation Annual Utility Requirements*

Utility	Consumption	Peak Demand[a]
Electricity	15,000 MWh	2 MWe
Liquid fuel (L)	85,200	
Natural gas[b] (m^3)	566,000	
Raw water (L)	194,000,000	

[a] Peak demand is the maximum rate expected during any hour.
[b] Cubic meters measured at standard temperature and pressure.

Source: LLNL 1995e; LLNL 1995i:3; LLNL 1996i:2.

Table A.3.2.3–6 lists the estimated annual chemicals consumed during surge operation of the secondary and case fabrication mission at LLNL.

The estimated annual emissions from surge operation of the Secondary and Case Fabrication Facility are based on historical emissions and amounts of materials to be processed and are shown in table A.3.2.3–7.

Employment. The additional employment needs in support of secondary fabrication surge activities at LLNL are summarized in table A.3.2.3–8.

Approximately 250 (33 percent) badged employees would work inside radiological areas and are considered to be at risk for radiological exposure. In addition, a small fraction of badged visitors may non-routinely enter radiological areas. Table A.3.2.3–8 provides a breakdown of those employees who may be at risk of radiological exposure.

TABLE A.3.2.3–6.—*Lawrence Livermore National Laboratory Secondary and Case Fabrication Mission Surge Operation Annual Chemical Requirements*

Chemical	Quantity (kg)
Solid Chemicals	
Aluminum trihydride	875
Barium nitrate	4
Borax	4
Calcium hydroxide	8,730
Calcium nitrate	45
Calcium oxide	45
Curing agent	1
Diatomaceous earth	730
Epoxy resin	3
Erbium oxide	25
Ferric sulfate	2,200
Graphite	590
Lithium carbonate	350
Magnesium sulfate	30
Methylene diphenyl diisocyanate	30
Nickel compounds	25
Polycure	25
Potassium carbonate	875
PVC plastisol	450
Silicon carbide	15
Sodium bicarbonate	25
Sodium carbonate	135
Sodium molybdate dihydrate	1
Sodium nitrate	440
Sodium potassium	1
Trisodium phosphate	75
Tungsten carbide	0.3
Yttria	45
Zirconium oxide	55
Liquid Chemicals	
Acetic acid	4
Acetone	2
Acetonitrile	45
Anisol	60
Corrosion inhibitor	240
Diamond paste	0.3
Diesel fuel	21,850
Ethanol	300
Gasoline	32,000
Hydraulic oil	875
Hydrogen peroxide	220
M-pyrol	15
Methanol	730
Micro/oakite detergent	3
Mineral oil	440
Mold release	2
Nitric acid	300
Nitrogen tetroxide	45
Oxalic acid	0.1
Petroleum oils (lubricants)	440
Potassium chloride	4
Propylene glycol	45
Pump oil	1
PVC primer	1
Solvent 140	220
Toluene 2,4-diisocyanate	30
1,1,1-Trichloroethane	235
Gaseous Chemicals	
Ammonia, anhydrous	2
Argon	407,300
Carbon dioxide	8,750
Chlorine	25
Freon or equal (cleaning)	220
Helium	1,750
Hydrogen	440
Nitrogen	1,450,000
Oxygen	14,550

Note: PVC- polyvinyl chloride.
Source: LLNL 1995e; LLNL 1995i:3.

Waste Management. Radioactive wastes generated from construction activities would be from the five rooms in Building 332 which must be decontaminated before the installation of new equipment. Included in this waste is some ducting, flooring. equipment that would need to be disposed of, building partitioning materials. Hazardous waste

TABLE A.3.2.3–7.—*Lawrence Livermore National Laboratory Secondary and Case Fabrication Surge Operation Annual Emissions*

Pollutant	Quantity (t)
Carbon dioxide	3,100
Carbon monoxide	1.0
Chloride	1.6
Chlorine	0.05
Methyl alcohol	4.5
Nitric acid	2.3
Nitrogen dioxide	1.9
Ozone	0.03
Particulate matter	0.1
Pressing lubricant	0.1
Sulfur dioxide	0.02
Sulfuric acid	0.6
Total suspended particulates	3.2
Volatile organic compounds	0
Water vapor	1,040
Radiological Isotope	**Estimated Release**
Uranium-235 (microcuries)	135
Uranium-238 (microcuries)	480

Source: LLNL 1995e; LLNL 1995i:3.

TABLE A.3.2.3–8.—*Lawrence Livermore National Laboratory Secondary and Case Fabrication Surge Operation Workers*

Labor Category	Number of Employees	Employees at Risk of Radiological Exposure
Office and clerical	120	0
Officials and managers	45	10
Operatives	330	150
Professionals	120	50
Technicians	145	40
Total Employees	760[a]	250

[a] Total surge employment. Increase to current employment would be 290.

Source: LLNL 1995e.

would consist primarily of lubricants and coolants that would be recycled or disposed of in accordance with RCRA guidelines. Nonhazardous solids include construction debris, metal, containers, and packaging materials. Liquid nonhazardous wastes would be treated locally and discharged to the sanitary sewer or hauled to an offsite facility for treatment and disposal. Wastes generated during replacement secondary fabrication operations include radioactive, mixed, hazardous, and nonhazardous byproducts. Table A.3.2.3–9 provides an estimate of the quantities of these waste categories effluent volumes as a result of secondary fabrication construction and surge operations. Secondary and case fabrication operations would not generate any spent nuclear fuel, HLW, or TRU wastes.

LLW generated from fabrication activities includes protective clothing, abrasive materials, cutting tools, filters, small equipment, and mop water contaminated with uranium. This waste would be treated by sorting, separation, concentration, and size reduction processes. Processed LLW would be surveyed and shipped to an offsite facility for land disposal.

Mixed wastes would consist of analytical solutions, wipes and rags with acetronitrile and acetone, and organic wastes contaminated with uranium. These wastes would be packaged and shipped to a DOE waste management facility for temporary storage pending treatment and disposal.

Hazardous wastes would include analytical solutions, rags with acetonitrile and acetone, coolants, hydraulic fluid, curing agents, epoxy resins, and plastics. These wastes would be managed and shipped to a commercial waste facility for treatment and disposal.

Nonhazardous (sanitary) wastes would consist of such solid items as office waste, paper, spent tools, and scrap materials. These materials would be hauled to an offsite sanitary landfill for disposal. Sanitary liquids would include sewage waste, uncontaminated process fluids, and mop water. These wastes would be discharged to the local municipal sewage system.

Nonhazardous (other) wastes would be collected and examined before being reclaimed for other recycled use or release to the environment. Examples of this type of waste are paper, glass, and recyclable metals.

TABLE A.3.2.3–9.—*Lawrence Livermore National Laboratory Secondary and Case Fabrication Waste Volumes*

Category	Annual Average Volume Generated from Construction (m^3)	Annual Volume Generated from Surge Operations (m^3)	Annual Volume Effluent from Surge Operations (m^3)
Low-Level			
Liquid	None	105	None
Solid	5	370	304
Mixed Low-Level			
Liquid	None	550	550
Solid	None	12	12
Hazardous			
Liquid	11	540	540
Solid	41	18	18
Nonhazardous (Sanitary)			
Liquid	5,050	102,000	102,000
Solid	2,820	4,320	4,320
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	Included in sanitary
Solid	255	3,200[a]	None

[a] Recyclable wastes.
Source: LLNL 1995e; LLNL 1995i:3.

A.3.3 Pit Fabrication and Intrusive Modification Pit Reuse

A nuclear weapon has a primary assembly that contains a pit subassembly surrounded by HE. The nuclear material in a pit, typically plutonium, is encased in a shell of nonnuclear metal such as stainless steel. Fabricating and processing the plutonium, and assembling the pit components, is the task that LANL or SRS would perform under this option. For both pit fabrication and intrusive modification, plutonium would be supplied from existing pits that have been retrieved and disassembled.

In order to fabricate replacement pits, the plutonium from disassembled pits first would be processed (dissolution, purification, reduction to metal). Processing also provides means to convert manufacturing scrap and residue (oxides) to metal usable in fabrication operations. Plutonium fabrication involves foundry and mechanical operations, including casting, shaping, machining, bonding, assembly, inspection, and packaging. Intrusive modification would disassemble an existing pit, keeping the plutonium component intact. Modification would be made external to the plutonium and a new outer shell applied. These operations are similar to the assembly and inspection functions for replacement pit fabrication.

Waste management and analytical chemistry activities would also be required for all of the plutonium operations. The block flow diagram of pit fabrication is shown in figure A.3.3–1. In addition to the actual operational aspects of plutonium fabrication, several other important processing functions are required. For example, the plutonium metal is under strict accountability for security and safeguard reasons. These security and safeguard requirements influence some of the facility and personnel needs at LANL or SRS to accomplish this task. Also, the nuclear weapons design/production process includes pit certification and qualification, which influences the facility and personnel needs.

Process Descriptions

Pit Fabrication. Pit fabrication involves preparation of plutonium components (casting, machining, inspecting, and cleaning), assembly of the pits (assembling the plutonium and nonnuclear components then hermetically sealing the pit with a weld), and post-assembly processing of the pits to the stockpile configuration.

Plutonium Processing. Plutonium processing consists of disassembly and metal preparation (obtaining stockpile pits, extracting the plutonium, and purifying the plutonium metal to a reusable form) and chloride and nitrate processing (recovering plutonium from residues generated by the manufacturing processes by using either the chloride or nitrate plutonium recovery processes).

Waste Management. Waste management includes taking waste generated by the manufacturing processes and placing it in a form suitable for final disposal. Wastes to be managed would consist of liquid or solid, TRU or LLW, and may include hazardous or mixed waste.

Analytical Chemistry. Analytical chemistry consists of all analytical measurements required to support pit manufacturing. These chemical evaluations include metal samples from the metal preparation area, plutonium components, samples from the plutonium processing unit processes, all samples that support the disposition of waste, and samples required to maintain physical and administrative control of special nuclear material. Samples supporting waste disposition must meet standards set by the RCRA and EPA.

Storage. Storage would include interim storage of retired stockpile pits awaiting disassembly and new pits awaiting shipment to the nuclear weapons assembly facility, as well as long-term storage of plutonium and oxide.

A.3.3.1 *Reestablish at Los Alamos National Laboratory*

Currently, LANL processes plutonium for RD&T and stockpile support purposes on site. Reconfiguring and upgrading these existing plutonium laboratory facilities in TA-55 is the proposed approach to provide a Pit Fabrication and Intrusive Modification Pit Reuse Facility. Other nuclear facilities to be used for this effort are located in TAs -3, -8, -35, -50, and -54 (as shown in figure A.3.3.1–1). Within TA-55 is the Plutonium Facility (PF-4), which includes a Pit Fabrication Facility in the 300 Area and facilities for

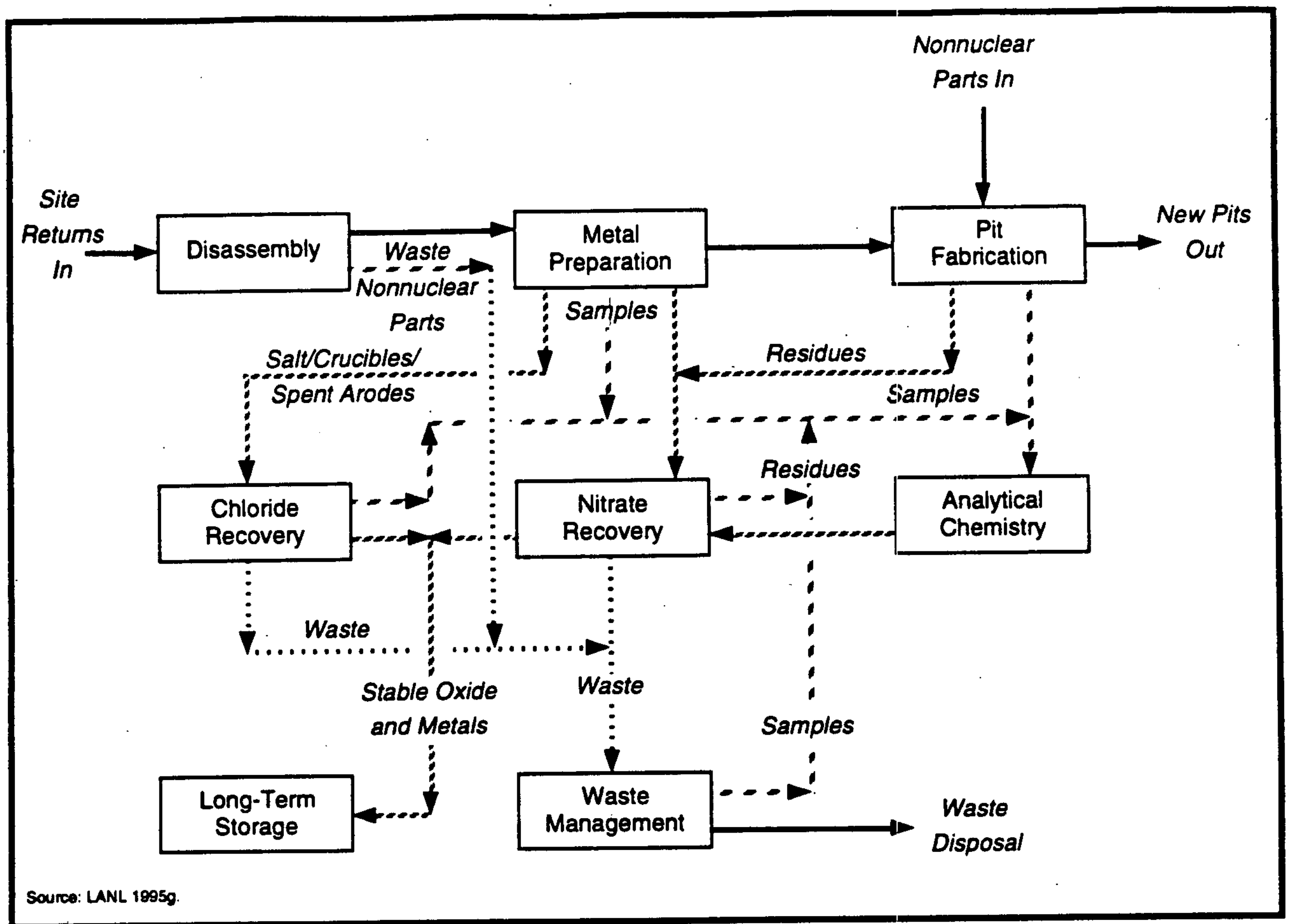

Figure A.3.3–1.—*Block Flow Diagram of Pit Fabrication.*

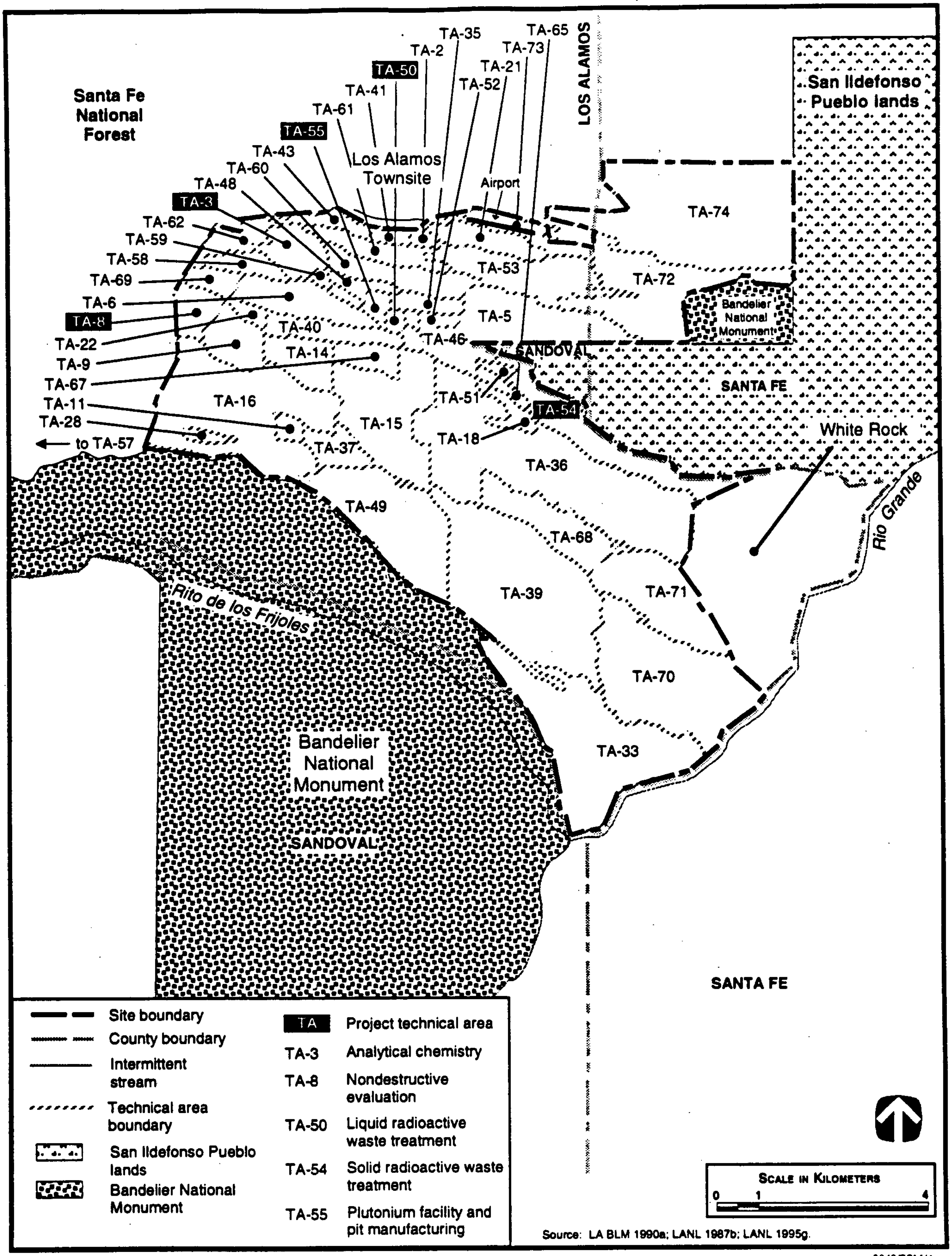

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Figure A.3.3.1–1.—*Pit Fabrication Alternative Technical Areas at Los Alamos National Laboratory.*

plutonium and waste processing in the 400 Area (as shown in figure A.3.3.1–2). TA-3 is a key area; it contains the Sigma Complex, Chemistry and Metallurgy Research building, and main machine shop. Another key area, TA-35, has the physical vapor deposition coating building. Nondestructive evaluation is carried out in a facility in TA-8. Radioactive waste is treated in TA-50 (liquid) and TA-54 (solid). The facilities that are currently used by stockpile surveillance activities would be shared with the pit fabrication group until dedicated facilities become available. The current stockpile Pit Rebuild Program at LANL would be absorbed within the pit fabrication effort as the activity is the same; only the number of pits produced would change. The number of pits fabricated annually is projected to be from 20 to 50 (depending on equipment availability), but could be about 80 if surge mode (multiple shifts, personnel overtime, and use of equipment to full capacity) were exercised. The key building descriptions for the Pit Fabrication and Intrusive Modification Pit Reuse Facility at LANL are shown in table A.3.3.1–1.

The pit fabrication process flow at LANL would begin with old pits from the weapons retirement process being routed to a disassembly area. The plutonium metal from disassembled pits would be purified before transfer to the fabrication area. Residues generated in the disassembly/metal purification areas are primarily chloride salts, crucibles, and chloride-contaminated scrap. The bulk of the residual plutonium would be purified and conver to plutonium metal in the chloride recovery ar Recovered plutonium metal would also be sent to the fabrication area. During fabrication, plutonium metal would be cast into the desired near-net-shape and machined to the final shape with desired tolerances. The finished components would then be assembled with other nonplutonium materials into the new weapon pit component.These new pits would then be sent to the weapon assembly facility. During the casting and machining operations, a number of residues would be generated that require processing and would subsequently undergo nitrate recovery operations. In nitrate recovery, the residues are purified and converted to oxide for return to the reduction operations. Solid and liquid wastes from processing areas would be routed to waste management facilities for processing into a disposable waste form. Analytical laboratories provide chemical analyses of plutonium metal, oxides, solutions, and wastes.

Tables A.3.3.1–2 and A.3.3.1–3 summarize resource requirements for facility modification and operati of the Pit Fabrication Facility. Table A.3.3.1–4 su marizes the bulk quantities of chemicals that would be used in the pit fabrication processes. These quantities assume the surge mode of 80 new pits per year.

TABLE A.3.3.1–1.—*Los Alamos National Laboratory Pit Fabrication Facility Data*

Building	Footprint (m^2)	Number of Levels	Special Nuclear Material Permitted	Construction
TA-55, PF-4 Plutonium Facility	14,000	2	Yes	Concrete post and beam with concrete masonry unit in-fill walls
TA-55, PF-4 Nuclear Material Storage Facility			Yes	Concrete post and beam with concrete masonry unit in-fill walls
TA-3, SM-29 Chemistry and Metallurgy Research Building	51,100	3	Yes	Concrete post and beam with concrete masonry unit in-fill walls
TA-3, SM-141 Nonnuclear Component Fabrication	1,860	1	No	Concrete post and beam with concrete masonry unit in-fill walls
TA-3, SM-66 Sigma Building	15,800	1	No	Concrete post and beam with concrete masonry unit in-fill walls
TA-3, SM-39 Nonnuclear Shops Building	7,660	1	No	Concrete post and beam with concre masonry unit in-fill walls

Source: LANL 1995g.

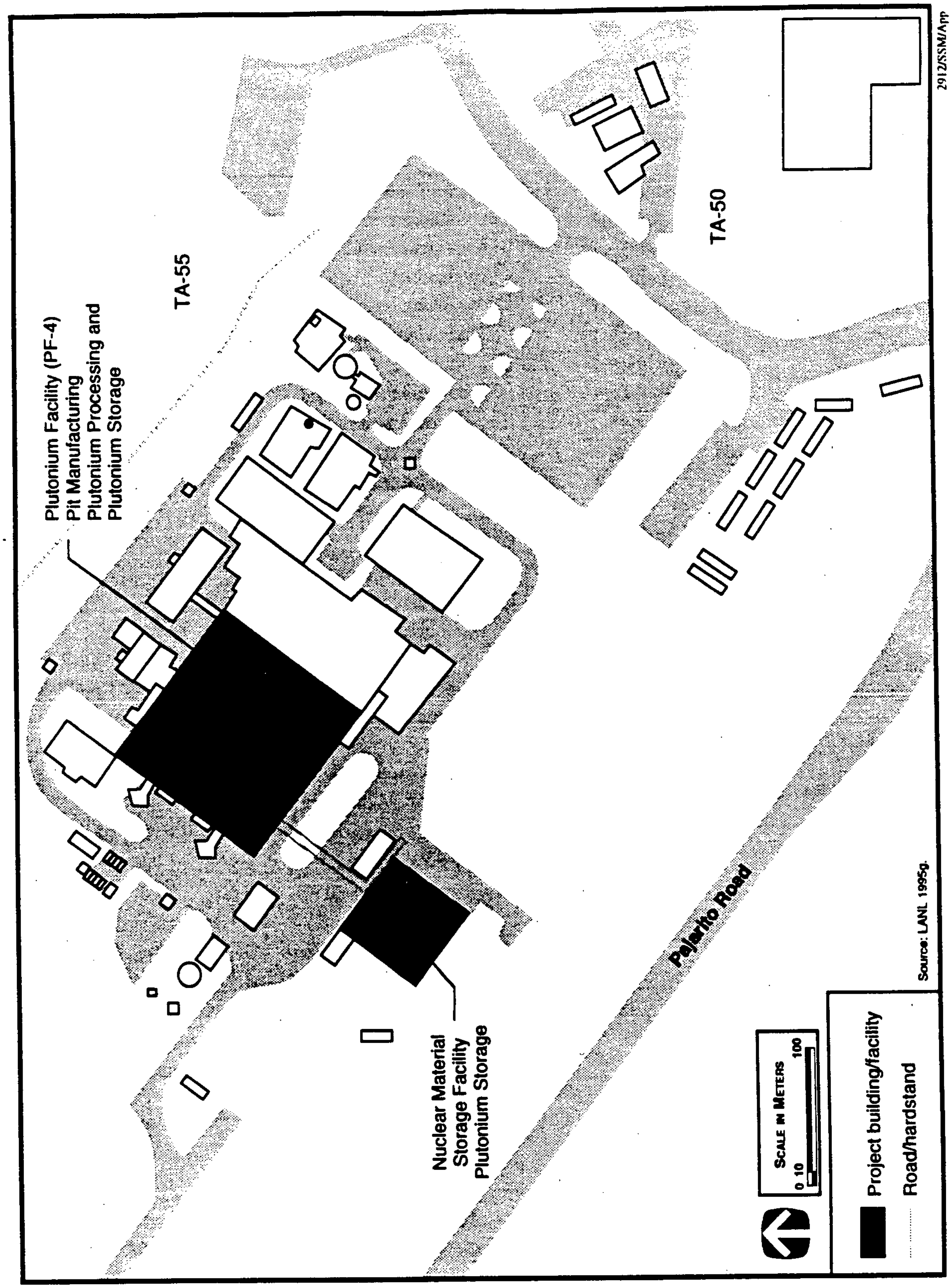


FIGURE A.3.3.1–2.—*Pit Fabrication Site Plan at Los Alamos National Laboratory, TA-55.*

TABLE A.3.3.1–2.—*Los Alamos National Laboratory Pit Fabrication Construction Requirements*

Requirement	Consumption
Material/Resource	
Electrical energy (MWh)	Minimal
Peak electrical demand (MWe)	Minimal
Concrete (m^3)	Minimal
Steel (t)	Minimal
Gasoline, diesel, and lube oil (L)	Minimal
Industrial gases[a] (m^3)	Minimal
Water (L)	Minimal
Land (ha)	None
Employment	
Total employment (worker years)	216
Peak employment (workers)	138
Construction period (years)	3

[a] Cubic meters at standard temperature and pressure.
Source: LANL 1995g.

TABLE A.3.3.1–3.—*Los Alamos National Laboratory Pit Fabrication Surge Operation Annual Requirements*

Requirement	Consumption
Resource	
Electrical energy (MWh)	5,480
Peak electrical demand (MWe)	0.7
Liquid fuel[a] (L)	None
Natural gas[b] (m^3)	30,900
Water (L)	30,200,000
Plant Footprint (ha)	NA[c]
Employment[d] (Workers)	628

[a] Used only for utility backup.
[b] Cubic meters at standard temperature and pressure.
[c] Within existing facilities.
[d] Total full time equivalent employment. Increment from current employment would be 260.
Note: NA - not applicable.
Source: LANL 1995b:4; LANL 1995g.

Waste Management. The liquid and solid hazardous and nonhazardous wastes generated during building modification would include concrete and steel construction waste materials. The steel waste would be recycled as scrap material before completing construction. The remaining nonhazardous wastes generated during construction would be

TABLE A.3.3.1–4.—*Los Alamos National Laboratory Pit Fabrication Surge Operation Annual Chemical Requirements*

Chemical	Quantity (kg)
Solid Chemicals	
Aluminum nitrate	2,041
Aluminum sulfate	2,041
Bentonite	1,021
Calcium fluoride	62
Calcium carbonate	1,021
Calcium chloride	227
Diatomaceous earth	45,360
Ferrous ammonium sulfate	5
Hydroxylamine hydrochloride	23
Iron, magnesium, calcium	11
Magnesium hydroxide	340
Oxalic acid	748
Portland cement	45,360
Resins	23
Sodium carbonate	57
Sodium hydroxide	28
Sodium nitrite	96
Sodium sulfite	794
Urea	20
Liquid Chemicals	
Carbon dioxide	17
Film developer, fixer, toner	1,043
Hydrochloric acid	1,497
Hydrofluoric acid	340
Hydroger peroxide	1,996
Hydroxylamine nitrate	658
Nitric acid[a]	3,420
Nitrogen	57
Potassium hydroxide	17,010
Sodium hydroxide	2,268
Gaseous Chemicals	
Argon	170,100
Chlorine	340
Helium	23
Hydrogen chloride	11
Nitrogen	1,360,800
Oxygen	1,814

[a] Annual makeup requirement with recycling. Total first year requirement is 32,886 kgs.
Source: LANL 1995b:4.

disposed of by the construction contractor. Wood, paper, and metal wastes would be shipped offsite to a commercial contractor for recycling. Hazardous wastes generated during construction would consist of such materials as waste adhesives, oils, cleaning fluids, solvents, and coatings. Hazardous waste would be packaged in DOT-approved containers and shipped offsite to commercial RCRA-permitted treatment, storage, and disposal facilities. Small amounts of radioactive waste would be generated during construction.

The project design considers and incorporates waste minimization and pollution prevention. Segregation of activities that generate radioactive and hazardous wastes would be employed, where possible, to avoid the generation of mixed wastes. Where applicable, treatment to separate radioactive and nonradioactive components would be performed to reduce the volume of mixed wastes and to provide for cost-effective disposal for recycling. To facilitate waste minimization, where possible, nonhazardous materials would be substituted for those materials which contribute to the generation of hazardous or mixed waste. Production processes would be configured with minimization of waste production given high priority. Material from the waste streams would be treated to facilitate disposal as nonhazardous wastes, where possible. Future D&D considerations have also been incorporated into the design.

Table A.3.3.1–5 presents the estimated annual waste volumes from the Pit Fabrication and Reuse Facility during modification activities and operation. Solid and liquid waste streams are routed to the waste management system. Figures A.3.3.1–3 through A.3.3.1–5 depict the waste management system. Solid wastes would be characterized and segregated into TRU, LLW, hazardous, and mixed wastes, then treated to a form suitable for disposal or storage within the facility. Liquid wastes would be treated onsite to reduce hazardous/toxic and radioactive elements before discharge or transport. All fire-sprinkler water discharged in process areas is contained and treated as process wastewater, when required.

Spent Nuclear Fuel. The Pit Fabrication and Reuse Facility would not generate any spent nuclear fuel.

Transuranic Waste. TRU waste would be generated from operation of the Pit Fabrication and Reuse Facility and would consist of glass, leaded gloves, plastics, equipment, metals, and heater elements. These wastes would be shipped to WIPP for disposal.

Low-Level Waste. LLW would be generated from operation of the Pit Fabrication and Reuse Facility and would consist primarily of plastics, metal, cement sludge, and vacuum filters. Liquid LLW would be sent either by truck or industrial drain to TA-50 for processing. The liquid LLW treatment facilities include a chemical treatment and ion-exchange plant at the radioactive liquid waste treatment facility and a chemical treatment plant. The waste would be processed, with radioactive constituents removed, in accordance with the NPDES permit. Low-level solids would be disposed of in 0.1-m^3 (2-ft^3) boxes at TA-54, Area G.

Mixed Low-Level Waste. No mixed LLW is expected to be generated. If any were to be generated, it would be managed in accordance with LANL Site Treatment Plan.

Hazardous Waste. Liquid hazardous wastes would be generated from solvents from cleaning operations and residue from painting and bonding operations. The cleaning solvents selected would be from a list of nonhalogenated solvents. Hazardous chemical wastes would be treated at commercial offsite RCRA-permitted facilities until completion of the Hazardous Waste Treatment Facility. The remaining liquid waste would be treated by gravity settling and discharged through an NPDES-permitted outfall. No solid hazardous wastes are expected to be generated.

Nonhazardous (Sanitary) Waste. Sewage wastewater and process wastewater would be sent by drain to the sanitary wastewater treatment plant (TA-46). Treated effluents would be disposed of by either sanitary drains or through permitted NPDES outfalls. Cooling tower blowdown and overflow would be discharged through outfalls permitted by the State of New Mexico. Sludge and other solid sanitary waste would be disposed onsite at the Sandia Canyon site (TA-61).

Nonhazardous (Other) Waste. Nonhazardous (other) wastes would be disposed of in a permitted landfill or discharged through permitted NPDES outfalls.

TABLE A.3.3.1–5.—*Los Alamos National Laboratory Pit Fabrication Waste Volumes (80 Pits Per Year)*

Waste Category	Annual Volume Generated from Construction (m^3)	Annual Volume Generated from Surge Operations (m^3)	Annual Volume Effluent from Surge Operations (m^3)
Transuranic			
Liquid	None	5	None
Solid	6[a]	43	60
Mixed Transuranic			
Liquid	None	None	None
Solid	None	2	2
Low-Level			
Liquid	None	15	None
Solid	12[b]	386	393
Mixed Low-Level			
Liquid	None	None	None
Solid	None	None	None
Hazardous			
Liquid	0.06	2	2
Solid	51	None	None
Nonhazardous (Sanitary)			
Liquid	None	12,300[c]	12,300
Solid	None	552[d]	552
Nonhazardous (Other)			
Liquid	None	Included in sanitary	Included in sanitary
Solid	26[e]	Included in sanitary	Included in sanitary

[a] Over a 3-year construction period a total of 27 t (30 tons) of associated piping and ventilation ductwork from glove boxes would be generated. For volume conversion, 1,500 kg/m^3 was assumed.

[b] Over a 3-year construction period a total of 41 t (45 tons) of glove boxes and 14 t (15 tons) of associated piping and ventilation ductwork would be generated. For volume conversion, 1,500 kg/m^3 was assumed.

[c] Assumes 50 gal/day/person/shift, with parameters of 250 days/yr, and 260 total additional employees for three shifts.

[d] Assumes 0.3 ft^3/day/person/shift, with parameters of 250 days/yr, 3 shifts/day, and 260 total additional employees for three shifts.

[e] Includes 0.15 t (0.175 tons) of steel assuming a density of 0.127 t/m^3.

Source: LANL 1995g; LANL 1996e:1.

A.3.3.2 *Reestablish at Savannah River Site*

The Pit Fabrication and Intrusive Modification Pit Reuse Facility at SRS would use existing hardened facilities but with all new equipment. The facilities available for this mission include the Separations Areas, F-Area, and H-Area (figure A.3.3.2–1). All aspects of pit component fabrication would be included: pit fabrication, plutonium processing, and waste management. Pit fabrication could be located in the 232-H Building or the F-Canyon. Plutonium processing would be in the F-Canyon facilities. The intrasite transfers of plutonium between areas would be in the form of metal ingots, buttons, and scrap as well as small quantities of oxide. Any liquid transfers would be performed through vessels and piping with secondary and tertiary containment systems. The nonnuclear portions of the pit component would be fabricated and manufactured elsewhere, then shipped to SRS as finished parts. Potentially tritium contaminated pits would not be handled at SRS; rather, they would be sent to LANL. The total number of pits fabricated annually is projected to be in the range of 20 (normal operations), 50 (design capacity, normal operations), or 120 in the surge mode (multiple shifts, personnel overtime, and use of equipment to full capacity).

Currently, Building 232-H is being used for tritium processing and handling operations. These missions are being moved to the Replacement Tritium Facility. The building would be refurbished, leaving adequate

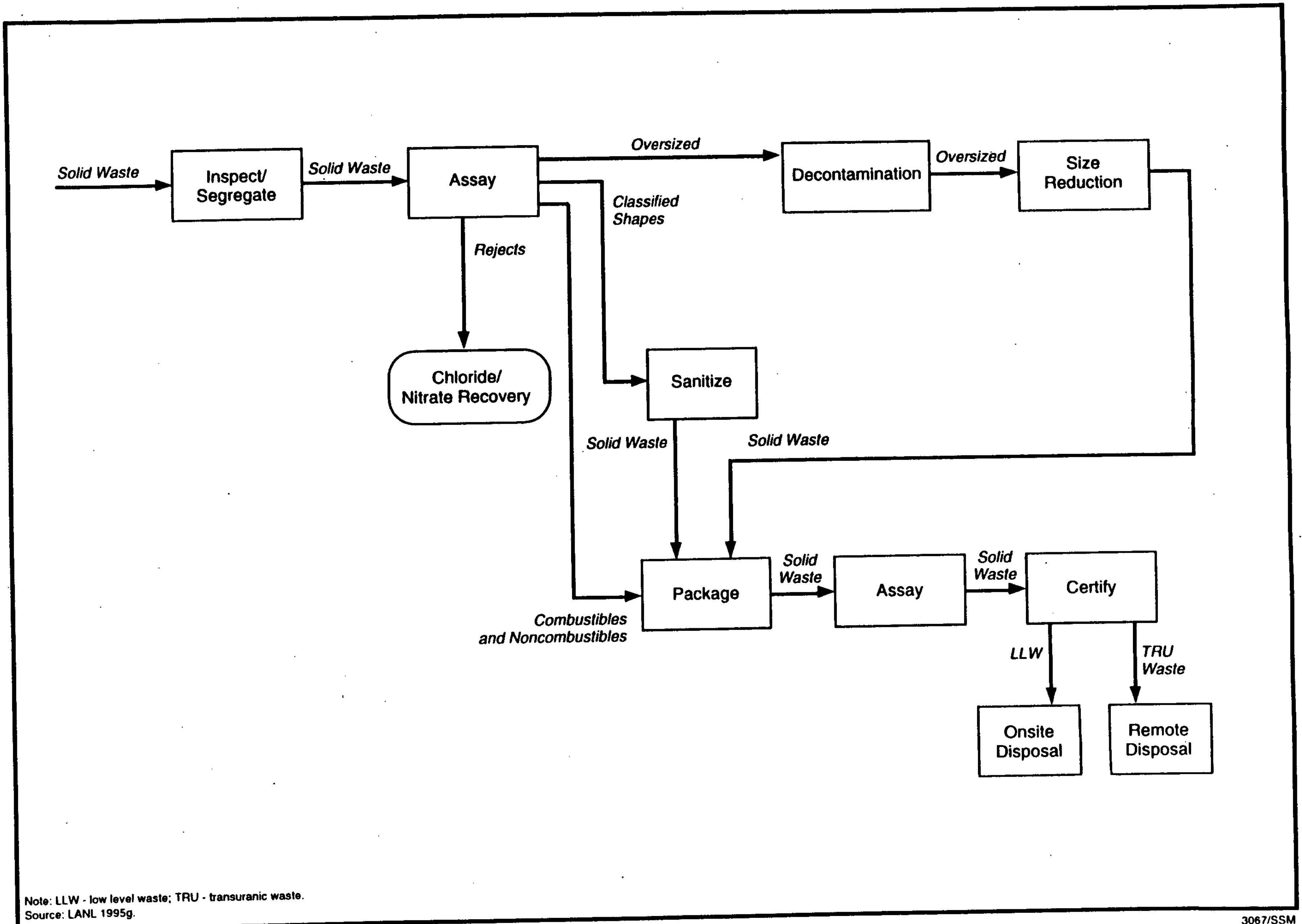


FIGURE A.3.3.1–3.—*Solid Waste Management at Los Alamos National Laboratory, TA-55.*

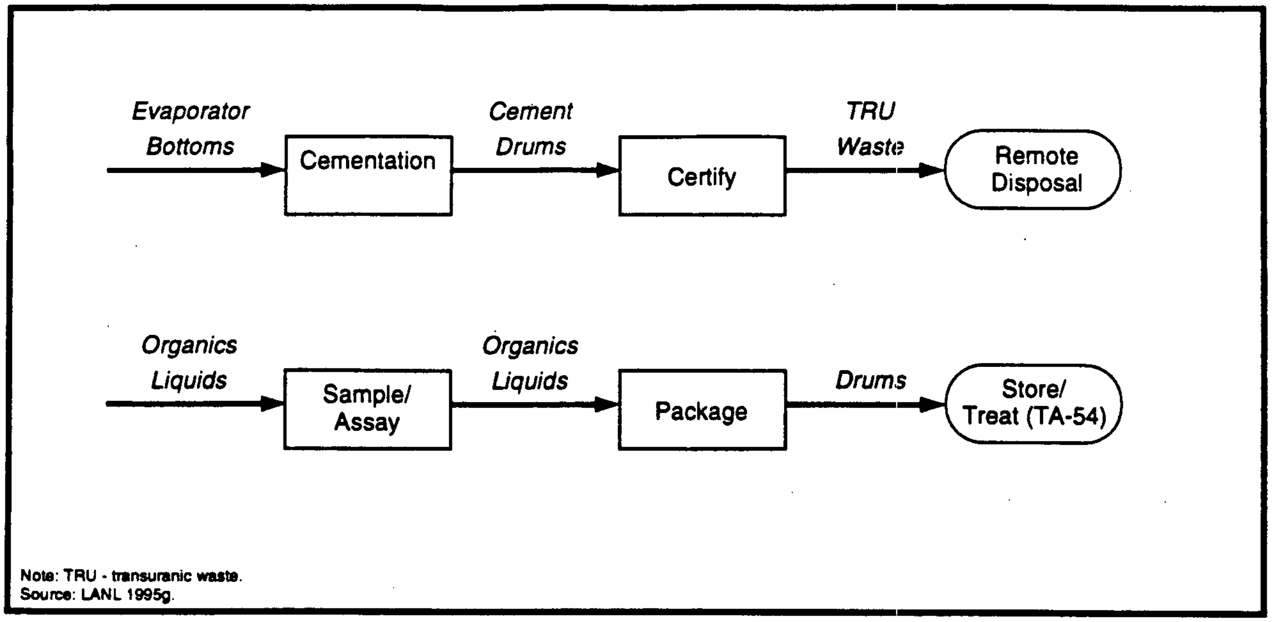
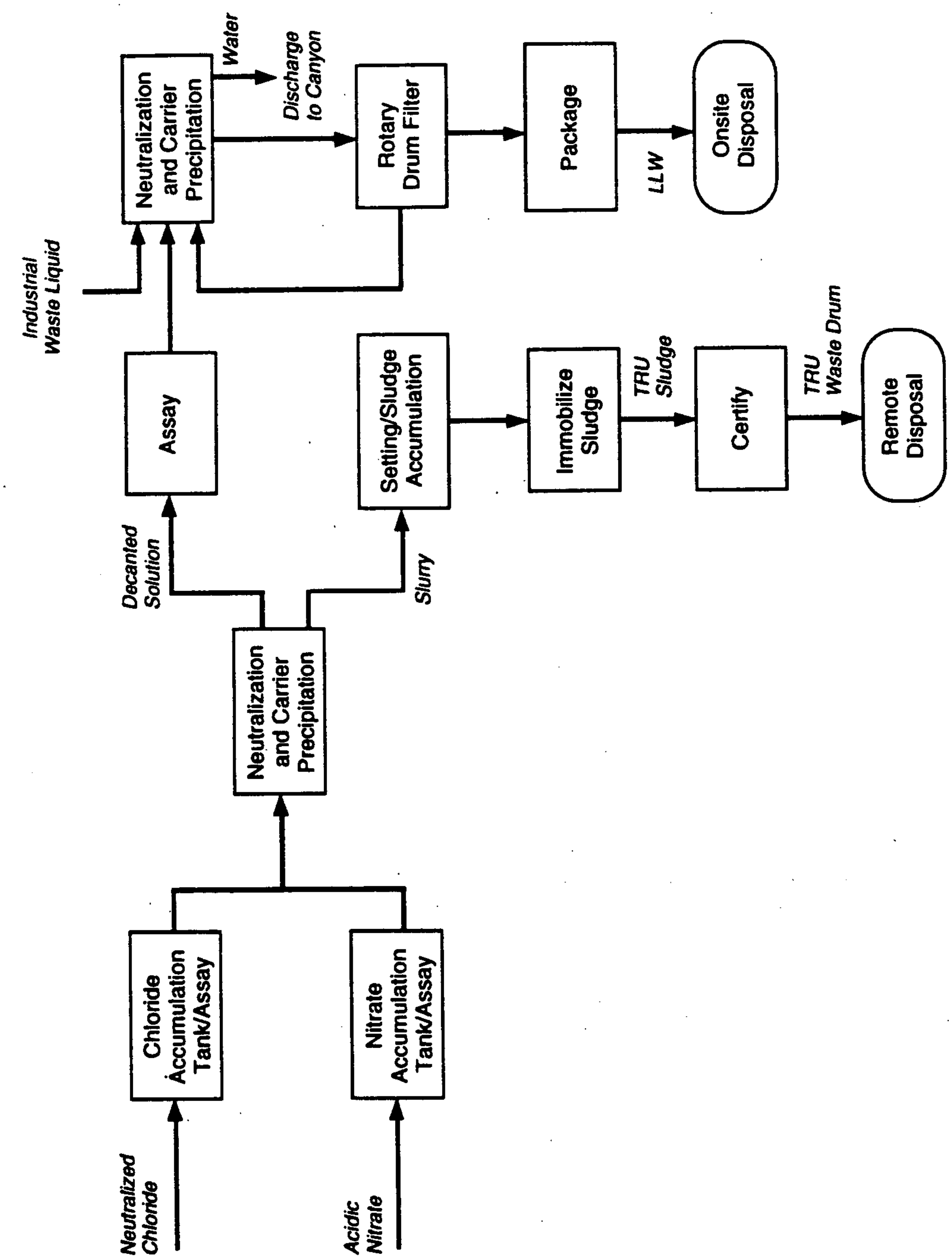


FIGURE A.3.3.1–4.—*Liquid Waste Management at Los Alamos National Laboratory, TA-55.*



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Note: LLW - low level waste; TRU - transuranic waste.
Source: LANL 1995g.

FIGURE A.3.3.1-5.—*Liquid Waste Management at Los Alamos National Laboratory, TA-50.*

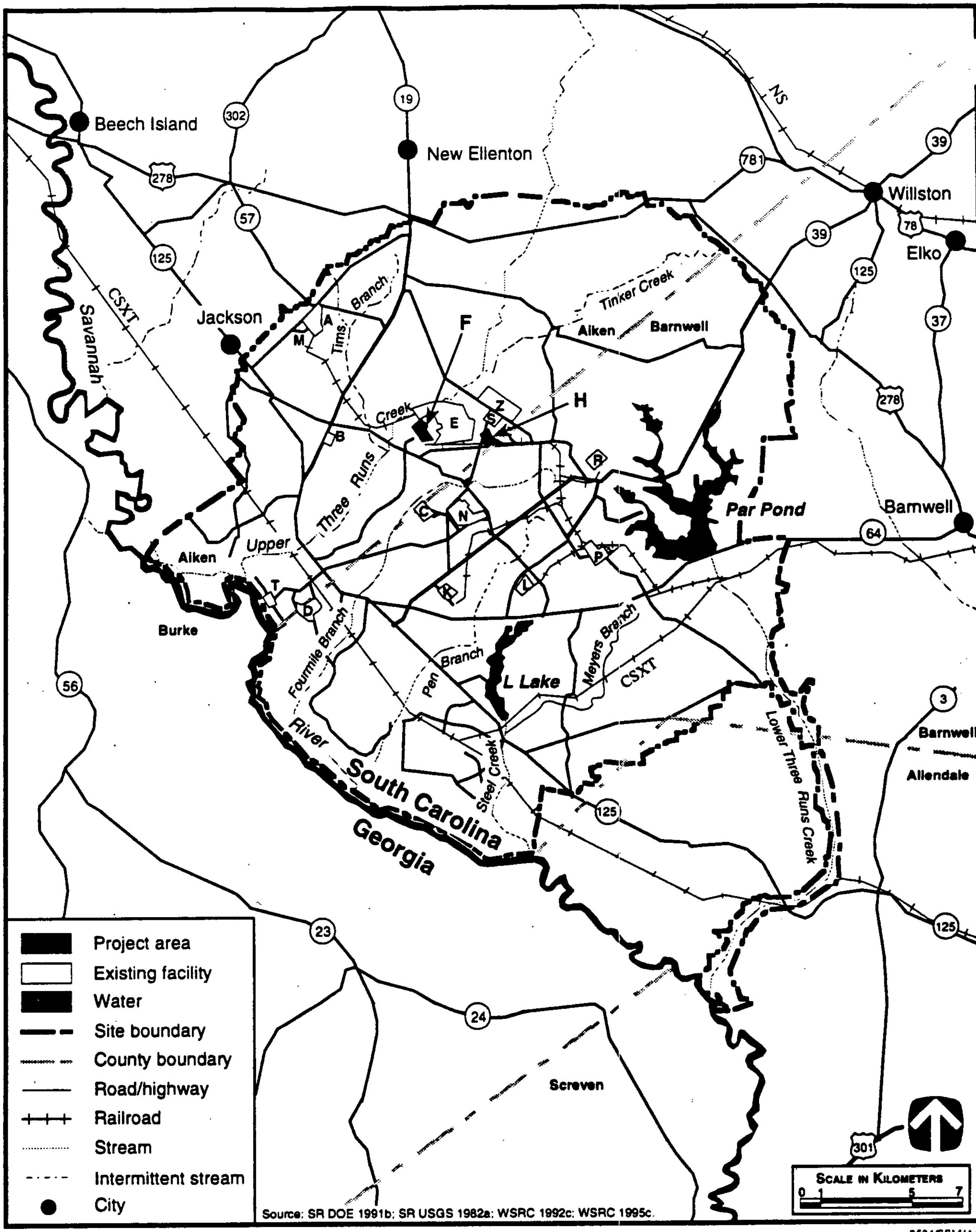


FIGURE A.3.3.2–1.—*Pit Fabrication Areas at Savannah River Site.*

space for pit fabrication. The space would be in a hardened facility and essentially free of tritium contamination. Those areas with high levels of tritium contamination would be isolated from the pit fabrication areas. Adjacent nonhardened areas would be used for receiving and handling nonnuclear components or direct service support to the pit fabrication process. Figure A.3.3.2–2 shows the H-Area proposed pit fabrication facilities.

The F-Canyon facilities have adequate noncontaminated hardened areas that can house the plutonium processing functions. The canyon includes the new, never operated, plutonium storage facility, the new special recovery facility, and a vacant production space that was previously decontaminated. Only minor modifications would be required to the glove boxes and equipment in the two new facilities. The plutonium processing operations would also handle the receiving, handling, and disposition of surplus plutonium. The existing waste management systems and laboratory facilities can be used to support the process.

The infrastructure at SRS includes liquid and solid waste management; analytical laboratories; security systems; ES&H systems; training facilities; and research, development, and demonstration facilities. The waste management operations are collocated with the plutonium processing facilities. This allows for the expedient transfer of byproducts from the plutonium purification process to the liquid waste stream, which is subsequently vitrified with high-level waste in the existing Defense Waste Processing Facility.

SRS has the existing support infrastructure to handle plutonium processing. Feedstock for the pit fabrication process would be plutonium metal. Plutonium would be received from offsite via safe secure trailer, unloaded into a staging area, then moved to the plutonium storage facility until needed. Once the retired pit is determined not to be contaminated, it would enter the disassembly process where the nonnuclear and other nuclear components would be removed from the plutonium. The plutonium would be collected and purified while the nonnuclear parts would be declassified and sent to solid waste treatment, and the other nuclear parts would be cleaned and sent to staging to await offsite transport. The purified plutonium would be converted back to metal and would enter the pit fabrication process. The listing of the major support facilities for the Pit Fabrication and Intrusive Modification Pit Reuse Facility is shown in table A.3.3.2–1.

The plutonium fabrication process is an abbreviated version used by the Rocky Flats Environmental Technology Site. Though there are several pit types, the process is basically the same. The process consists of casting parts to the near net-shape, machining the surfaces of the casting to achieve the final shape, and performing tests on the completed parts to assure suitability. After this inspection, the plutonium components are cleaned and assembled with the nonnuclear components to form a pit that is then welded together. Once the plutonium is encapsulated, it may then be safely removed from the glove box, certified, and stored or shipped offsite as needed.

Nonnuclear components used in the new pits would be received from offsite. After inspection these parts would be stored in Building 704-55H until needed for either newly fabricated or reused pits. Some nonnuclear parts require a vapor deposition coating of material be applied. Generally all of these coatings would be produced in a vacuum environment using either a thermal evaporation or plasma sputtering process. Tables A.3.3.2–2 and A.3.3.2–3 show resource requirements for facility modification and surge operation of the Pit Fabrication Facility. Table A.3.3.2–4 shows annual chemical usage for surge operation.

Waste Management. The solid and liquid nonhazardous wastes generated during modification activities would include concrete and steel construction waste materials and sanitary wastewater. The steel waste would be recycled as scrap material before completing construction. Liquid waste which is primarily sanitary water would be treated as sanitary plant waste. Solid nonhazardous waste would consist primarily of office trash and sludge from sanitary wastewater treatment. Nonrecyclable portions of this waste would be sent to a permitted landfill after volume reduction practices such as compacting and shredding had been performed. No liquid hazardous waste would be generated other than the lubrication oils and coolants needed to maintain the construction equipment. Solid hazardous waste would consist primarily of solvent

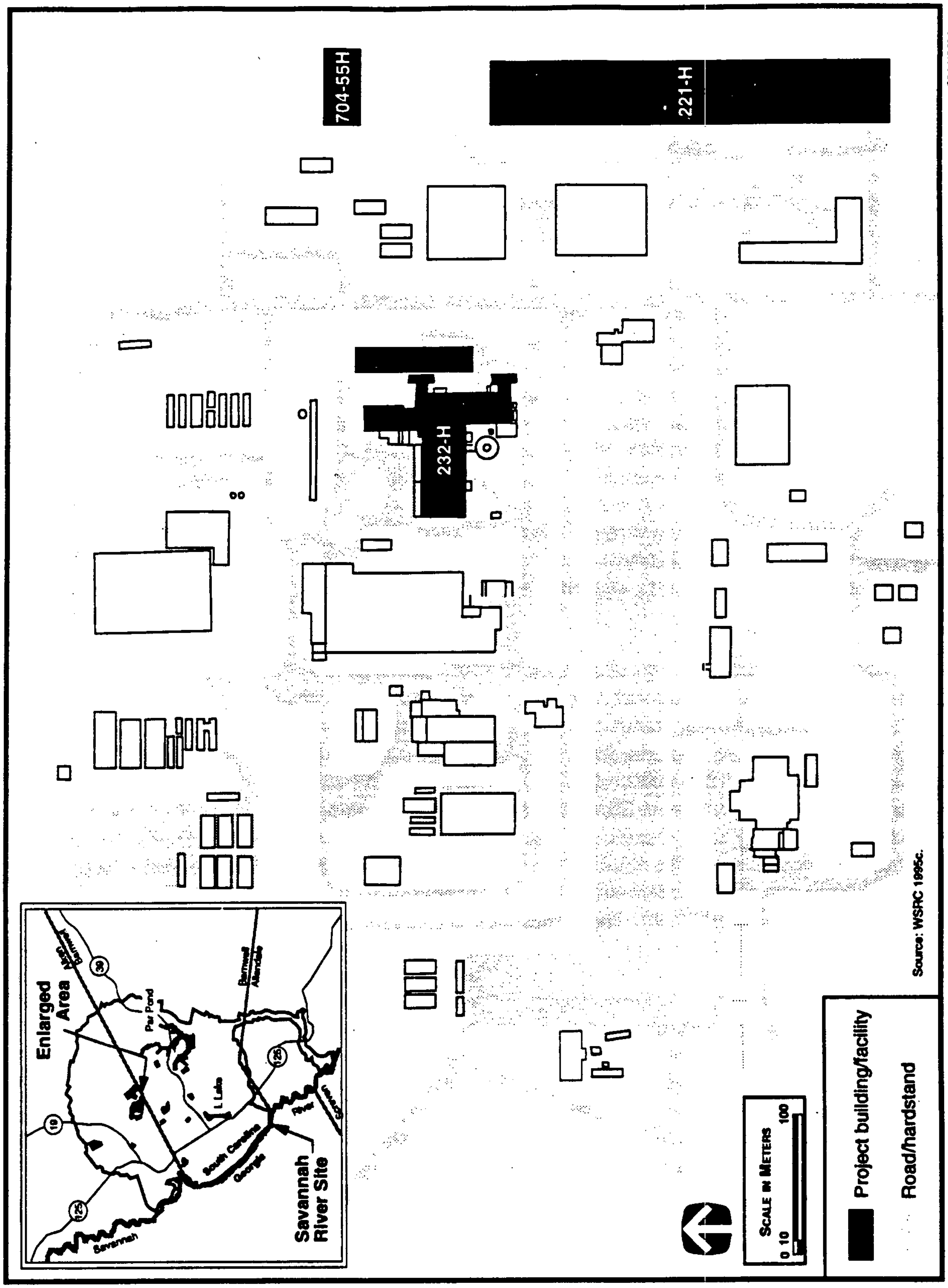


FIGURE A.3.3.2–2.—*Pit Fabrication Site Plan at Savannah River Site.*

TABLE A.3.3.2–1.—*Savannah River Site Pit Fabrication Facility Data*

Building	Facility Type	Footprint (m²)	Number of Levels	Construction
211-F	Supply tanks	NA	NA	Outside/metal frame
221-F	Feed preparation	4,060	6	Concrete/metal frame
292-F	Canyon exhaust fan house	1,160	1	Concrete
294-F	Sand filters	2,230	NA	Concrete
294-1F	Sand filters	3,340	NA	Concrete
703-F	Administration building	1,860	1	Metal frame
704-F	Administration building	1,130	1	Metal frame
707-F	Administration building	1,490	1	Metal frame
707-7F	Administration building	1,490	1	Metal frame
717-F	Mock-up/maintenance shops	1,170	2	Metal frame
723-F	Laundry	1,060	1	Metal frame
772-F	Laboratory	3,850	2	Concrete/metal frame
772-1F	Laboratory	280	1	Concrete/metal frame
232-H	Manufacturing	4,840	3	Concrete
232-1H	Shop and storage	1,210	1	Metal frame
235-H	Tritium facility office	780	1	Metal frame
703-H	Administration building	1,860	1	Metal frame
704-H	Administration building	1,390	1	Metal frame
704-2H	Administration building	4,670	1	Metal frame
704-55H	Administration building	1,230	1	Metal frame
707-H	Administration building	1,770	1	Metal frame
766-H	Training facility	7,620	2	Metal frame

Note: NA - not applicable.
Source: WSRC 1995c.

TABLE A.3.3.2–2.—*Savannah River Site Pit Fabrication Construction Requirements*

Requirement	Consumption
Material/Resource	
Electrical energy (MWh)	15
Peak electrical demand (MWe)	0.37
Concrete (m³)	1,600
Steel (t)	249
Gasoline, diesel, and lube oil (L)	175,000
Industrial gases (m³)[a]	3,780
Water (L)	30,000,000
Land (ha)	2
Employment	
Total employment (worker years)	801
Peak employment (workers)	288
Construction period (years)	5

[a] Cubic meters at standard temperature and pressure.
Source: WSRC 1995c.

TABLE A.3.3.2–3.—*Savannah River Site Pit Fabrication Surge Operation Annual Requirements*

Requirement	Consumption
Resource	
Electrical energy (MWh)	9,700
Peak electrical demand (MWe)	1.6
Liquid fuel (L)	28,400
Natural gas (m³)[a]	None
Water (L)	46,200,000
Coal (t)	1,090
Plant Footprint (ha)	NA[b]
Employment (Workers)	813

[a] Cubic meters at standard temperature and pressure.
[b] Contained within existing facilities.
Note: NA - not applicable.
Source: WSRC 1995c.

rags and empty containers of hazardous materials. Hazardous waste would be packaged in DOT approved containers and shipped offsite to commercial RCRA-permitted treatment,storage, and disposal facilities. No radioactive waste would be generated during construction.

TABLE A.3.3.2–4.—*Savannah River Site Pit Fabrication Surge Operation Annual Chemical Requirements*

Chemical	Quantity (kg)
Solid Chemicals	
Calcium carbonate	642
Calcium metal	227
Hydroxylamine nitrate	633
Magnesium oxide	383
Sodium hydroxide	4,983
Sodium nitrite	206
Water treatment chemicals	64
Liquid Chemicals	
Betz 25k series corrosion inhibitor	200
Betz Slimcide (CE-77 PE)	34
Cleaning/developing fluids	340
Hydrofluoric acid	10
Nitric acid[a]	3,420
Liquid nitrogen	4,000
Polyphosphate	191
Sodium hypochlorite	96
Gaseous Chemicals	
Argon	3,924
Carbon dioxide	45,360
Hydrogen	6
Hydrogen fluoride	442
Nitrogen	2,790

[a] Annual makeup requirement with recycling.
Source: WSRC 1995c.

The Pit Fabrication Facility considers and incorporates waste minimization and pollution prevention. Segregation of activities that generate radioactive and hazardous wastes would be employed, where possible, to avoid the generation of mixed wastes. Where applicable, treatment to separate radioactive and nonradioactive components would be performed to reduce the volume of mixed wastes and provide for cost-effective disposal or recycle. To facilitate waste minimization, where possible, nonhazardous materials would be substituted for those materials which contribute to the generation of hazardous or mixed waste. Production processes would be configured with minimization of waste production given high priority. Material from the waste streams would be treated to facilitate disposal as nonhazardous wastes, where possible. Future D&D considerations have also been incorporated into the design.

Table A.3.3.2–5 presents the estimated annual waste volumes from the Pit Fabrication Facility during modification activities and operation for the base case surge. Solid and liquid waste streams would be routed to the waste management system.

Figure A.3.3.2–3 depicts the overall waste management system at SRS. Additional figures by waste category are available in appendix section H.2.2. Solid wastes would be characterized and segregated into TRU, low-level, mixed, hazardous, and nonhazardous, then treated to a form suitable for disposal or storage. Liquid wastes would be treated onsite to reduce hazardous/toxic and radioactive elements before discharge or transport. All fire sprinkler water discharged in process areas would be contained and treated as process wastewater, when required.

Spent Nuclear Fuel. The Pit Fabrication Facility would not generate any spent nuclear fuel.

High-Level Waste. The Pit Fabrication Facility would not generate any operational HLW. However, as a result of the plutonium recovery and purification processes, plutonium processing would generate a liquid TRU waste that would be managed as a high specific activity waste at SRS. As shown in figure A.3.3.2–3, one of the final waste products from the treatment of this waste is a glass log composed of comingled TRU waste from pit fabrication and legacy HLW.

Transuranic Waste. As noted above, plutonium processing would generate a liquid TRU waste as a result of the plutonium recovery and purification processes. This waste would have a high specific activity and would be managed in accordance with the SRS High-Level Waste Management Plan as outlined in appendix H.2.2. Solutions from both processes would be transferred to F-Canyon, evaporated, and the resulting evaporator bottoms neutralized with sodium hydroxide and transferred to the F-Area Tank Farm. Excess oxalic acid in the precipitation filtrates would be destroyed during filtrate evaporation. The residual sludge consisting primarily of americium and plutonium would be fed to the Defense Waste Processing Facility for conversion to a HLW form using borosilicate glass. The waste would then be immobilized by melting and poured into stainless steel cylinders which would be stored until a repository is available.

TABLE A.3.3.2–5.—*Savannah River Site Pit Fabrication Waste Volumes (120 Pits Per Year)*

Category	Annual Average Volume Generated from Construction (m^3)	Annual Volume Generated from Surge Operations (m^3)	Annual Volume Effluent from Surge Operations (m^3)
Transuranic			
Liquid	None	28[a]	None
Solid	None	129[b]	129[b]
Mixed Transuranic			
Liquid	None	None	None
Solid	None	11	11
Low-Level			
Liquid	None	80[c]	None
Solid	None	88[d]	34
Mixed Low-Level			
Liquid	None	None	None
Solid	None	None	None
Hazardous			
Liquid	<0.01	<1	None
Solid	8[e]	None	<0.01[f]
Nonhazardous (Sanitary)			
Liquid	3,020	46,160	46,140[g]
Solid	23	1,450	1,580
Nonhazardous (Other)			
Liquid	None	None	None
Solid	500[h]	1,450[i]	None

[a] At SRS, this would be managed as high specific activity liquid waste which would be combined with HLW at the Tank Farm and then processed in accordance with the High-Level Waste Management Plan as depicted in appendix section H.2.2. The resultant waste forms include 0.61 glass logs composed of comingled TRU waste from pit fabrication and legacy HLW, and LLW saltstone. Based on aqueous alternative process for Complex 21; denitrated water=49.3 L/kg Pu metal processed and discarded filtrates=6.9 L/kg plutonium metal. Neutralized with 0.2 L of 50 percent caustic per kg of waste.

[b] One-half of this volume is considered intermediate-level waste at SRS and would be disposed of in the intermediate-level waste vaults in E-Area. It is managed as TRU waste because it contains beta or gamma emitters that produce a dose equal to or greater than 200 millirem/hr at 5 cm (2 in) from an unshielded container.

[c] Based on aqueous alternative process for Complex 21; 166 L of recycle water per kg of Pu metal processed. Assume "recycle" water sent to Effluent Treatment Facility; recovered acid is recycled.

[d] Incinerable=58 m^3, nonincinerable=30 m^3.

[e] Includes 7.6 m^3 (9.9 yd^3) of D&D wastes such as wall material contaminated with asbestos.

[f] Treatment of liquid hazardous wastes results in solid hazardous ash. Volume reduction is 200:1.

[g] Assumes 350:1 wastewater to sludge ratio for treatment of liquid sanitary waste.

[h] Includes 1.5 m^3 (2 yd^3) of concrete and 0.8 t (0.2 tons) of steel. Includes 498 m^3 (651 yd^3) of D&D wastes such as ductwork, concrete, electrical wiring, and equipment.

[i] Recyclable wastes.

Source: SRS 1996a:2; WSRC 1995c.

The solid TRU waste would consist primarily of graphite molds, crucibles, failed equipment, leaded gloves, filters, and combustible materials such as plastics and rags used during glove box operations. Approximately one-half of the volume of waste reported as TRU is considered as intermediate-level waste at SRS and would be disposed of in the intermediate-level waste vaults in E-Area. Intermediate-level waste is managed as TRU waste at SRS because it contains beta or gamma emitters that produce a dose equal to or greater than 200 mrem/hr at 5 centimeters (cm) (2 inches [in]) from an unshielded container. TRU waste destined for disposal in a Federal repository would be certified to meet the WIPP waste acceptance criteria and packaged in drums at the Pit Fabrication Facility then placed in interim storage. Disposal is planned for WIPP, once it has been determined to be a suitable repository for TRU wastes.

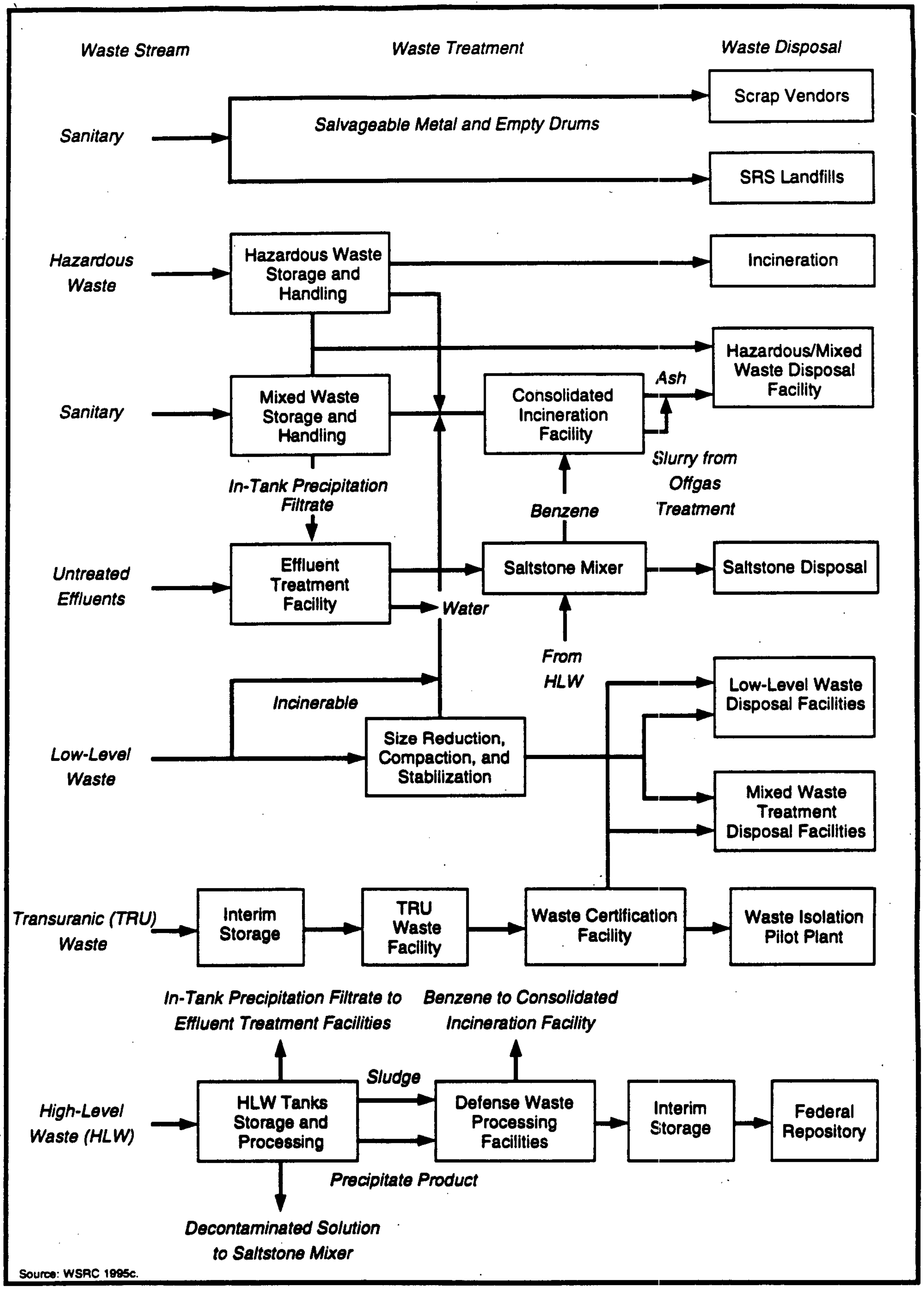


FIGURE A.3.3.2–3.—*Waste System at Savannah River Site.*

pursuant to the requirements of 40 CFR 191 and 40 CFR 268. Noncertifiable drums would be repackaged and certified for shipment to WIPP in the future TRU waste facility.

Mixed TRU waste consisting of leaded gloves and TRU waste contaminated with organics such as solvents would be managed in accordance with the SRS site treatment plan. Current plans call for disposal at WIPP.

Low-Level Waste. Solid LLW would consist primarily of failed equipment and combustible plastics and cellulose-based products used in maintaining and cleaning the facilities. Combustible LLW may be incinerated using the consolidated incineration facility. Solid LLW would be packaged in B-25 (90 ft^3) metal boxes and transported to the LLW disposal facility for disposal in concrete vaults. Evaporator overheads from the evaporation of the high-specific liquid waste described above and other liquid LLW would be sent to the F/H-Area Effluent Treatment Facility where radionuclide contaminants are removed using filtration, ion exchange, and reverse osmosis. The decontaminated effluent would be discharged through a permitted NPDES outfall. Concentrate from the F/H-Area Effluent Treatment Facility is transferred through the H-Area Tank Farm to Z-Area for solidification and final disposal in onsite vaults in Z-Area as a cement-based waste form called saltstone.

Mixed Low-Level Waste. The Pit Fabrication Facility is not expected to generate any mixed LLW. In the event any mixed LLW is generated, it would be managed in accordance with the SRS site treatment plan.

Hazardous Waste. Liquid hazardous wastes would be generated from solvents from cleaning operations and residue from painting and bonding operations. The cleaning solvents selected would be from a list of nonhalogenated solvents. Hazardous wastes would be collected in DOT-approved containers and sent to onsite hazardous waste accumulation areas (B-, M- and N-Areas). The hazardous waste accumulation area would provide a 90-day staging capacity. Incinerable waste would be shipped to an offsite vendor for treatment and disposal. Waste that cannot be incinerated would be placed in storage until the hazardous/mixed waste disposal facility and consolidated incineration facility are operational.

Nonhazardous (Sanitary) Waste. Sewage wastewater would be treated in the new central sanitary wastewater treatment facility prior to discharge through permitted NPDES outfalls. The sludge would be disposed of in a permitted landfill. Other nonrecyclable, nonhazardous, solid sanitary, and industrial wastes would be compacted and disposed of in a permitted landfill.

A.3.4 Nonintrusive Modification Pit Reuse

Unlike the pit fabrication and intrusive modification pit reuse function, the nonintrusive modification pit reuse function does not disassemble the pit. The entire pit is received through the weapons retirement/disassembly process. The pit is then cleaned and inspected, and, if necessary, the exterior of the pit is modified. No plutonium would be exposed in the nonintrusive modification pit reuse function. Since the intrusive modification pit reuse mission described in section A.3.3.1 for LANL and section A.3.3.2 for SRS inherently includes the nonintrusive modification pit reuse capability, a full discussion of the facilities and processes for conducting nonintrusive modification pit reuse activities at LANL and SRS is not included in this section. The nonintrusive modification pit reuse mission at Pantex and NTS are described in sections A.3.4.3 and A.3.4.4.

A.3.4.1 *Los Alamos National Laboratory*

The facilities necessary to accomplish these functions at LANL are a subset of those used in the intrusive modification pit reuse function and are discussed in section A.3.3.1.

A.3.4.2 *Savannah River Site*

The facilities necessary to accomplish these functions at SRS are a subset of those used in the intrusive modification pit reuse function and are discussed in section A.3.3.2.

A.3.4.3 *Pantex Plant*

Pits that are to be reused would be obtained from the weapons A/D Facility that is currently located at

Pantex. Pits would be transferred from one facility to another on the same site, and all infrastructure would be shared. Since the plutonium is encapsulated and any modification is made to the outside of the pit, the entire nonintrusive modification pit reuse process can be conducted in an area that will remain free of radioactive contamination. Three classes of nonintrusive modification pit reuse are proposed at Pantex: recertification (minimum requirement for those pits still within their original design life), requalification (more extensive requirement for those pits that have exceeded their original design life), and nonintrusive modification reuse (modifications imposed upon the pit due to design changes). Pantex would have the capability to recertify 120 pits per year with an annual surge, multi-shift capacity of 200 pits. The combined capability for requalified and modified reused pits would be 150 annually, with a surge annual capacity of 250 pits; of these numbers, approximately 20 pits would be modified. Normal operation is considered to be four 10-hour work days per week, 52 weeks per year.

The facilities that would be used to support the pit recertification, requalification, and nonintrusive modification reuse mission include the weapons assembly bays in Buildings 12-64, 12-84, 12-104, and 12-104A and the current support areas in Zone 12 North along with the special nuclear material facility, Building 12-116. Four existing A/D bays in Building 12-104 would be modified to meet the nonreactor nuclear facility requirements. These four bays, along with an area for control, decontamination, and access control portals, would become the Nonintrusive Modification Pit Reuse Facility. The Nonintrusive Modification Pit Reuse Facility and special nuclear materials facility would be used to consolidate the interim storage, staging, and operations that would be necessary to support recertification, requalification, and nonintrusive modification pit reuse activities.

The Nonintrusive Modification Pit Reuse Facility would make extensive use of robotics. The first area would be used for unpacking and receiving to prepare the pit for the reuse process. As the process starts, the pit would enter the qualification bay and an automated processing line. This line would clean, inspect, and verify tolerances and performance to the specified requirements. The pit would then enter the assembly and welding bay, which includes a glove box line for any needed pit modification. After inspection, the pit would go to the purge and backfill bay to be leak tested and cleaned.

The recertification, requalification, and nonintrusive modification reuse processes would generate LLW, hazardous, industrial, and potentially mixed wastes. The operating areas would have accumulation sites and would perform the onsite characterization. The Waste Operations Group would be responsible for establishing the waste streams, scheduling the waste movement from the accumulation sites to the waste packaging areas, and disposing of the wastes. These processes are not intended to generate radioactive contamination and would not generate TRU or mixed waste under normal operations.

A.3.4.4 *Nevada Test Site*

NTS is an alternative site for the proposed Nonintrusive Modification Pit Reuse Facility. This facility would require a new building, but it would be adjacent and connected to the Device Assembly Facility. It would be within the secure area of the Device Assembly Facility and would be considered a nonreactor nuclear facility handling special nuclear materials. Though new construction would be required, the existing NTS infrastructure would be sufficient to support the facility. The pits to be reused in this facility would come from the weapons A/D Facility. Locating the Nonintrusive Modification Pit Reuse Facility at NTS assumes that the new weapons A/D Facility would also be at NTS. The A/D Facility mission would be performed within the Device Assembly Facility (originally designed to support assembly of test devices) and the pits would be transferred through corridors between these facilities. Since the plutonium would be encapsulated and any modification would be made to the outside of the pit, the entire process can be conducted in an area which will remain free of radioactive contamination. Three classes of pit reuse are proposed at NTS: recertification (minimum requirement for those pits still within their original design life), requalification (more extensive requirement for those pits that have exceeded their original design life), and nonintrusive modification reuse (modifications imposed upon the pit due to design changes). The total nonintrusive modification pit reuse capability at NTS for these three classes is 50 pits per year, which is based upon one full shift per day (maintenance and training included in the same shift).

The new Nonintrusive Modification Pit Reuse Facility would use the same processes as proposed for use at Pantex. The basic services required would include radiography, interim storage, gas analysis, gas preparation, and security. Radiography would be accomplished by a linear accelerator that is a shared resource with the A/D Facility. An interim storage area for 50 pits would be planned for within the 2,230 m^2 (24,000 ft^2) new Nonintrusive Modification Pit Reuse Facility. Both the gas analysis and preparation services would be incorporated within the facility. Gas analyses would be used to evaluate samples from accelerated aging tests, material compatibility tests, development activities, material certification tests, and production operations. Security in and around the Device Assembly Facility is sufficient (though it would be expanded) for the new facility, and the shipping and receiving functions would be handled through the Device Assembly Facility. The waste streams and utility requirements would be considered a part of the A/D process and are included with that estimate (see section A.3.1.2). The processes would include a waste management facility, waste storage facility, mixed waste storage and LLW disposal facility, sanitary wastewater treatment unit, sanitary and industrial landfill, and stormwater ponds.

A.3.5 High Explosives Fabrication

The HE fabrication mission requires explosives synthesis, formulation, pressing, machining, testing, evaluation, and component manufacturing. In addition to these fundamental capabilities, a variety of support activities is required.

The explosives fabrication activity is important to the overall mission of the future DOE Complex. Over the past several years, economic trends have dictated a significant reduction in the domestic commercial support for this technology. In today's marketplace it is difficult to secure the small quantities of products necessary to sustain the reduced workload from commercial sources. The meticulous quality required of the explosives and components placed in nuclear weapons also disqualifies most commercial vendors.

Assumptions. In addition to the general assumptions used in preparing this PEIS, the following assumptions apply specifically to the HE fabrication mission:

- Baseline technologies will be used except where alternatives can be shown to meet requirements and be more cost effective.
- All production operations can be housed in existing facilities.
- Raw materials required to manufacture explosive charges are available either from within DOE or from commercial manufacturers.

General Functions and Layout. The general functions of HE fabrication are HE main charge manufacturing, small HE component manufacturing, HE formulation and synthesis, and HE testing and characterization. Production support functions include storage of raw materials and staging, packaging, and shipping of the intermediate and final product. These functions convert commercially available raw materials into HE and related components for weapons. These general functions also provide for testing and safe handling and storage of both raw materials and in-process and finished products.

The facilities required to perform HE fabrication functions can be arranged in a variety of layouts to accommodate existing structures. Structures containing explosives operations are generally constructed with steel-reinforced concrete and are designed to mitigate the effects of an accidental explosion. Although insensitive HE materials can generally be processed in conventional steel structures, concrete construction is typically used to maintain the flexibility to process conventional explosives. The resulting facility design typically consists of a number of separate operating bays that could vent to an unoccupied area should a detonation occur. Structures that do not require concrete construction due to a lack of HE presence are generally constructed of steel, although portions of these buildings may be concrete. Most facilities include support areas for offices, break rooms, rest rooms, electrical equipment, heating, ventilation, and air conditioning equipment, maintenance, and in-process staging of materials, components, tooling, and supplies. Many production and laboratory facilities also include vacuum systems. Utilities required include water, steam, compressed air, and electricity.

High Explosives Main Charge Manufacturing. This function manufactures main charge explosive subassemblies, main charge mock explosive assemblies, and explosive test specimens. An area must also be provided for conducting physical property testing on explosive components and materials. Each subfunction is described below.

High Explosives Pressings. Rough shapes for HE main charge subassemblies and material test billets are manufactured by pressing. These presses also produce rough shapes for mock components from nonexplosive materials. Sufficient area is needed to include presses, ovens, powder inspection tables, loading tables, and shadowgraph equipment.

Explosives Machining. The rough pressings are machined into hemispherical shapes or test elements using a combination of mills and lathes. HE machining is conducted wet, and a recirculating water treatment system is provided. Mock components may be machined in the same area or in the machine shop. Sufficient area is needed to include equipment for conducting density measurements, dye penetrant testing, and dimensional inspection.

Main Charge Subassembly. The explosive hemispheres are assembled with electrical parts and hardware to produce main charge subassemblies. This is a manual operation that generally involves potting and bonding.

Mechanical Properties Testing. The physical properties of explosive components and materials are tested to support War Reserve lot certification for materials and components and to support production development. The test configurations are assembled and tensile, torsion, and compression tests are conducted.

Small High Explosives Component Fabrication. This process fabricates small HE weapon components and test assemblies. Various small components are fabricated from HE powders and binders, metal or plastic components, electrical components, hardware, and assembly materials. The fabrication process requires equipment for explosive powder heating, pellet pressing, laser welding, ultrasonic cleaning, extrusion loading, density testing, and mechanical assembly. Functions are described below.

Pellet Pressing. Small pellets are pressed to density specifications from small energetic components assemblies.

Extrusion Loading. Extrudable (paste) explosive is loaded onto small fixtures for small component assemblies.

Small Component Assembly. Small HE pellets and/or fixtures containing extrudable paste explosives are assembled with inert parts to make small components.

High Explosives Formulation and Synthesis. This process produces a variety of explosive materials from chemical reactants and commercially produced explosives.

High Explosives Formulation. This function produces a variety of explosive materials from chemical reactants and commercially produced explosives. Material lots up to about 91 kg (200 lb) are produced through a series of batch operations. Some products are used to make small HE weapon components, while other products support the development of new explosives or explosives manufacturing processes.

High Explosives Synthesis. The synthesis process integrates a variety of vessels, filters, and transfer pumps which are used to synthesize, recrystallize, blend, and wash explosive powders. The facility includes bays for mixing/milling, particle-size reduction, drying/weighing/packaging, solvent storage, and refrigerated storage for explosives and chemicals.

High Explosives Testing and Characterization. Explosives test configurations are assembled and then detonated. The test data characterize the explosives performance and are required for the qualification of raw materials and production lots. Testing requires explosives containment chambers and an array of special instrumentation including streak cameras, rotating mirror framing cameras, an air image converter system, oscilloscopes and digitizers, flash x-ray systems, and velocity interferometers.

High Explosives Test Firing. Energetic materials components are test fired at a remote firing facility which includes an outdoor firing capability to conduct large-scale explosives tests that cannot be performed in a test chamber, such as main charges for explosives lot certification.

Nondestructive Evaluation. Explosive components are inspected using neutron radiography, x-ray, magnetic particle, and eddy current equipment to detect flaws, cracks, and voids in explosive and inert components.

Mechanical Properties Testing. The mechanical properties of explosive components and materials are tested to support lot certification for materials and components and to support fabrication development. The test configurations are assembled and tensile and comprehensive tests are conducted.

Analytical Laboratory. Chemical analyses are performed on explosive and nonexplosive materials to determine or verify their characteristics. The data obtained yield valuable information about the condition and composition of the material. This information is used to assure reliability of components and to statistically evaluate performance with material characteristics. The methods used include gas chromatography, liquid chromatography, size exclusion chromatography, infrared spectroscopy, thermal analysis, particle characterization, atomic spectroscopy, and emission spectroscopy. Surface chemistry, metallography, optical and scanning electron microscopy, and wet chemistry are also performed.

Material Compatibility Testing. Test coupons are assembled such that the subject materials are in direct contact with each other. These coupons are then placed in environmental ovens to accelerate the aging process. Gas samples are periodically taken from the coupon containers and analyzed by the gas laboratory. Compatibility testing is required to certify new materials for weapon use.

Production Support. The following functions and facilities are needed to support the HE fabrication missions.

Bulk Explosives Storage. This function requires facilities to store collectively 31,800 kg (70,000 lb) of conventional HE powders awaiting transfer to/from the HE staging facility and offsite explosives vendors. These materials are typically received in 4,500 to 9,000 kg (10,000 to 20,000 lb) lots. Storage facilities also are needed for storing 182,000 kg (400,000 lb) of insensitive HE that is awaiting transfer to and from the explosive staging facilities. The bulk explosives facilities would be designed to provide separation between incompatible explosives types and would be remotely located from the production operations.

Explosives Staging/Packaging/Shipping. This function would require staging a variety of explosive powders, components, and assemblies for supporting HE operations. These explosive materials include plastic bonded explosives for main charge manufacturing, completed main charges, small HE components, energetic feeds and products for HE formulation and synthesis, and explosive residues for disposal or recycling. The staging facilities would be designed to provide separation between incompatible explosives types.

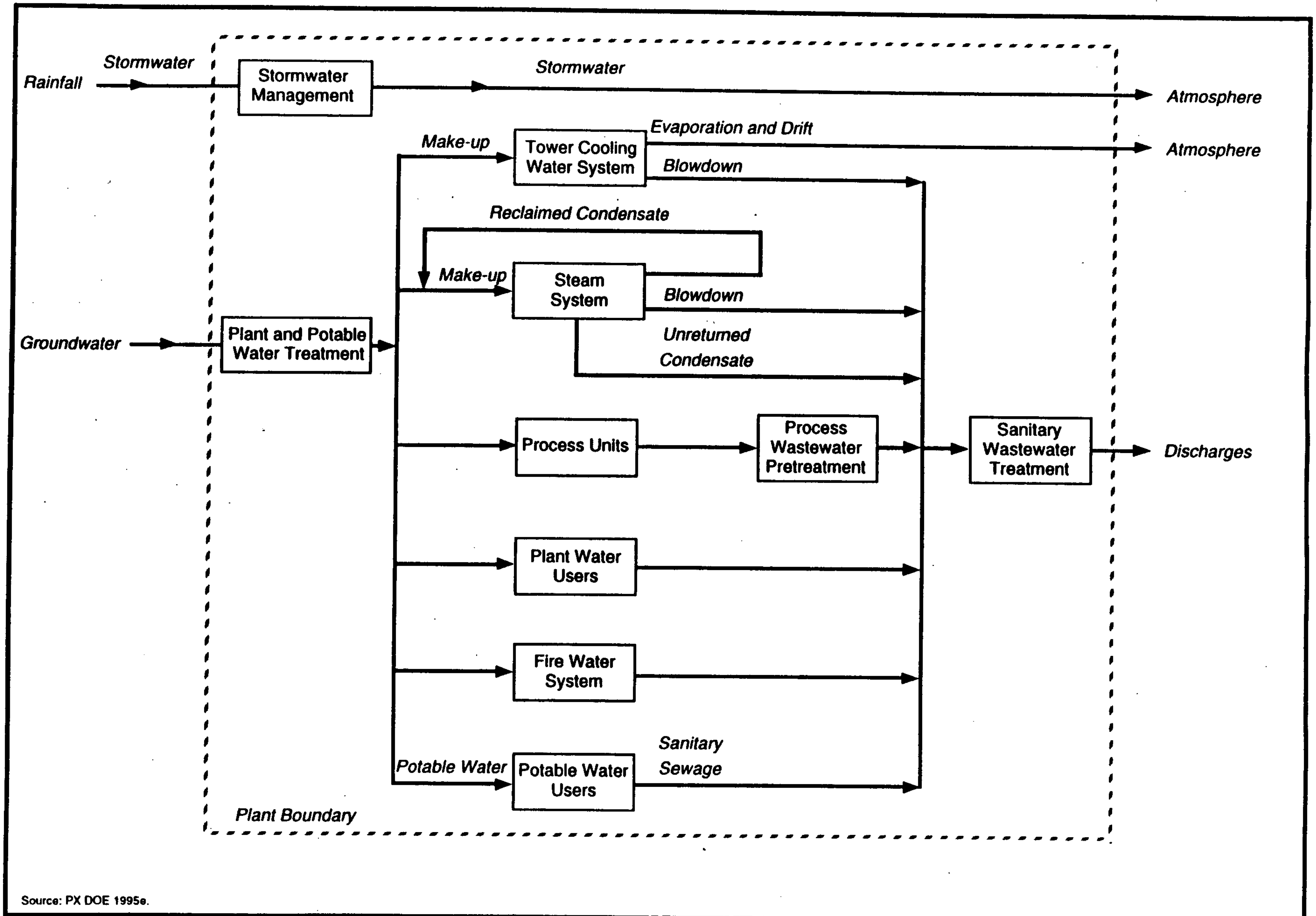
Process Support Systems. Process support for the HE manufacturing operation would include a machine shop and ES&H laboratory as well as other plant general services facilities. These facilities would directly support the HE fabrication mission as well as RD&T and other activities.

Facility Utilities. HE fabrication utility requirements are a function of the size, condition, ai location of the facilities as well as the production requirements. Therefore, the utility requirements vary at each of the three candidate sites. Utilities are described in subsequent sections for each candidate site. A typical water balance for HE fabrication is shown in figure A.3.5–1.

Chemicals Required. The chemicals and materials consumed during operation primarily include water treating chemicals, reactants and solvents for explosives formulation and synthesis, explosives powders, materials for facility equipment and vehicle maintenance, and bottled gases. Specific lists of chemicals used by each site are provided under the site alternative description.

The HE fabrication process also requires the following chemical support materials:

- Solvents and wipes for manual cleaning operations
- Adhesives and bonding agents for manual assembly operations
- Glycerin fluid for preparing the isostatic pressing fluid
- Release agents for coating the inside of mechanical die sets used in pressing operations
- Dye for the penetrant test
- Shipping and packaging materials
- X-ray film
- Bottled nitrogen for extrusion loading
- Bottled argon for laser welding
- Solvents and feedstocks for the synthesis of hexanitrostilbene and triaminotrinitrobenzene powders
- Other miscellaneous materials required for routine operations



2780/SSM

FIGURE A.3.5–1.—*High Explosives Fabrication Annual Water Balance.*

Transportation

Intersite Transportation. The HE shipping/receiving facility would be designed to ship and receive bulk HE materials to and from the HE plant. These materials typically would be received in 4,500 to 9,000 kg (10,000 to 20,000 lb) lots.

Shipping of completed charges would follow appropriate HE shipping regulations. All hazardous chemicals would be shipped using appropriate DOT requirements. The major type of hazardous material that would be transported to the plant would be HE materials. Bulk explosives powders would be delivered to the site by DOT-approved bulk commercial carriers. The powder would be unloaded at the bulk explosives storage facilities, which would isolate it from other facilities on the site.

Intrasite Transportation. All intrasite transportation required for manufacture would occur within existing site boundaries and would not require use of public roads. Appropriate HE shipping regulations as defined by DOE and DOT would be followed. Shipment of HE components for testing may require the use of public roads. After testing and manufacturing, subsequent movements of HE and explosive components would be performed by trucks and battery-powered vehicles specifically designed for this purpose. The quantity of HE (conventional and insensitive) transported onsite by these trucks would be strictly limited.

Explosives main charges and components would be transferred to staging areas while awaiting transfer to the A/D plant. In a similar manner, explosive components from the A/D plant would be transferred to the explosives production plant for demilitarization, sanitization, and disposition. Small quantities of hazardous wastes generated during operations would be collected, packaged, and transported by electric car to local accumulation sites and then by truck to a staging area. The waste would be transferred by truck for offsite disposal.

Waste Management. The HE fabrication process generates the following waste and residual materials:

- Bulk HE machining scrap
- Off-specification HE components
- HE-contaminated materials, such as gloves and wipes, from manual cleaning operations
- Glycerin pressing fluid
- Developing materials from x-ray and neutron radiography film processing
- Hazardous contaminated materials from chemical bonding operations, packaging/ repackaging, storage/staging, and shipment for ultimate disposal

The waste management process for HE fabrication at the alternative sites follows in sections A.3.5.1 through A.3.5.3.

A.3.5.1 *Downsize at Pantex Plant*

Pantex is the current DOE site for HE main charge manufacturing, small HE component manufacturing, HE formulation and synthesis, and HE testing and characterization. To efficiently meet the expected Complex workload, Pantex can downsize current HE fabrication operations. The following description assumes a downsized HE production mission at Pantex along with the A/D functions.

Significant downsizing actions at Pantex focus on functional consolidation. This can be achieved by reducing the number of facilities operating in the explosives area to 11 or 12 and decreasing the direct, direct support, and direct operations support personnel to about 50. There are no processes to be transferred from offsite. All facilities identified under this plan meet Federal regulations and DOE orders as they pertain to explosives manufacturing. Table A.3.5.1–1 indicates specific products and capabilities that comprise the HE fabrication mission at Pantex.

Assumptions. Requirements are based on an annual production rate of 150 replacements or retrofits. The 150 replacements or retrofits consist of 100 warheads and 50 bombs. The capability of providing explosives for two weapons systems in any given year is maintained. The Stockpile Evaluation Program consists of 120 disassemblies and inspections, 110 rebuilds, and additional joint test assemblies, joint test assembly post mortems, and test beds consistent

TABLE A.3.5.1–1.—*Pantex Plant High Explosives Fabrication Products and Capabilities*

Products	Capabilities
High Explosives	**Manufacturing Process Development**
	Stockpile stewardship support
	Formulation
	Synthesis
	Surveillance
Binders	**Main Charge Manufacturing**
	Pressing
	Machining
	Subassembly
	Receiving/storage
	QA-mechanical/chemical/test fire
	Disposition
Main Charge Formulations	**Energetic Component Manufacturing**
	Pressing
	Machining
	Subassembly
	Receiving/storage
	QA-mechanical/chemical/test fire
Initiation High Explosives	**Detonators**
Mock High Explosives Formulations	**Testing**

Note: QA - quality assurance.
Source: PX DOE 1995e.

with current guidance and stockpile levels. Some existing programs in the enduring stockpile use main charges made from conventional HE. Insensitive HE machining and storage continue to be explosive hazard Class IV operations. All hexanitrostilbene-based explosives and micronized-triaminotrinitrobenzene materials required would be produced at the HE production plant. Spare equipment and facilities are not included in the minimum facility requirements.

Facility and equipment maintenance would occur on he off-shift and the nonwork days when feasible. The Complex would be capable of producing materials and assembling replacement components and units for two weapon systems in any given year. This capability would be achieved by either simultaneous or sequential campaigns, as long as the sum of the product shipments for the year meets the annual production goals. The stockpile stewardship and management alternatives would not impact the ongoing plant missions, either during construction or during the life of the upgraded plant. Ongoing plant missions are defined as those functions performed today.

Strategic reserve requirements for explosives would be stored at the HE production site. The selected site for the HE production mission would be operational within 2 years after the ROD for this PEIS. The baseline technology for HE production comprises the present techniques utilized at Pantex. If transferred, prebuilds at the donor site would fill any production capability gap between the donor and receiver site for the HE operations. If HE production missions are transferred, a 5-year period is required to accomplish the D&D activities at Pantex.

Facility Description. As stated previously, there would be no product or process transfers; however, there would be substantial functional consolidation. For example, Pantex currently has seven functional test fire sites. All test activities identified as required to support the enduring stockpile can be consolidated into two sites: a fully contained indoor test chamber and an outdoor site to accommodate large charges. Explosives components fabrication would be reduced from four buildings to two. Chemical characterization, nondestructive evaluation, and mechanical testing would be consolidated from the current five facilities to two, as well. A comprehensive listing of the planned consolidations can be found in table A.3.5.1–2. Figures A.3.5.1–1, A.3.5.1–2, and A.3.5.1–3 show the locations of the zones and the facilities within these zones.

Pantex consists of 425 buildings containing approximately 232,300 m^2 (2.5 million ft^2) of floor space of which explosives operations occupy 37,200 m^2 (400,000 ft^2). Within 4,119 ha (10,177 acres), approximately 809 ha (2,000 acres) are dedicated to active facility operations. Approximately 3,270 ha (8,080 acres) are devoted to storage, disposal, and miscellaneous activities in support of plant operations.

TABLE A.3.5.1–2.—*Pantex Plant Functional Consolidation of Explosives Operations*

Capabilities	Current Facilities	Consolidated Facilities (Projected)
Synthesis	11-36	11-55
Formulation	12-19E, 12-62	11-50, 12-62
Isostatic pressing	12-63	12-63
Explosives machining	11-50, 12-121	12-121
Explosives subassembly	12-31	12-121
Explosives components	11-20, 12-17, 12-62, 12-63	12-62, 12-63
Evaluation/characterization	11-5, 11-17, 11-51, 12-21, 12-59	11-51, 12-104A
Test fire	11-18, 11-38, FS-10, FS-11, FS-21, FS-22, FS-24	FS-11, FS-22, FS-24
Explosives storage	11-42, 12-65, 12-83, Zone 4 (8 magazines)	12-65, Zone 4 (4 magazines)
Explosives disposal	Burning Ground	Burning Ground

Source: PX DOE 1995e.

Pantex structures containing explosives operations comply with the *DOE Explosives Safety Manual*, DOE/EV/06194 and are generally constructed with steel-reinforced concrete and designed to mitigate the effects of an accidental explosion. Although insensitive HE materials can generally be processed in conventional steel structures, concrete construction is typically used to maintain the flexibility to process conventional explosives. The resulting facility design typically consists of a number of separate operating bays with remote and/or contact operating capability that are fully contained or could vent to an unoccupied area should a detonation occur. Most facilities include support areas for offices, break rooms, rest rooms, electrical equipment, heating, ventilation, and air conditioning equipment, maintenance, and in-process staging of materials, components, tooling, and supplies. Many production and laboratory facilities also include vacuum systems. Utilities required include steam, compressed air, and electricity.

The HE facilities are primarily within the Applied Technology Division: These facilities would support main charge manufacturing, small component manufacturing, formulation and synthesis, and explosives testing and characterization, as well as HE storage and disposition.

Design Safety. The following sections identify important safety considerations incorporated in the design of explosives facilities. Performance goals commensurate with the associated hazard are selected for all structures, systems, and components. The term "hazard" is defined as a source of danger, whether external or internal. Natural phenomena such as earthquakes, extreme winds, tornadoes, and floods are external hazards to structures, systems, and components; whereas toxic, reactive, explosive, or radioactive materials contained within the facilities are internal hazards. Usage category is established by DOE management. Guidelines for usage category (performance category) and the corresponding performance goals are given in *Design and Evaluation Guidelines for DOE Facilities Subjected to Natural Phenomena Hazards* (UCRL-15910).

Earthquakes. All existing facilities meet the standards as cited below. Structures, systems, and components are designed for earthquake-generated ground accelerations in accordance with University of California Research Laboratory (UCRL)-15910. The applicable seismic hazard exceedance probability is $2x10^{-3}$ for general use (performance category 1), $1x10^{-3}$ for low and moderate hazard (performance categories 2 and 3), and $2x10^{-4}$ for high hazard (performance category 4) for structures, systems, and components.

Seismic design considerations for performance category 3 and 4 structures, systems, and components include provisions for such structures, systems, and components to function as hazardous materials confinement barriers and for adequate anchorage of building contents to prevent loss of critical function during an earthquake. In essence, design considerations are to avoid premature, unex-

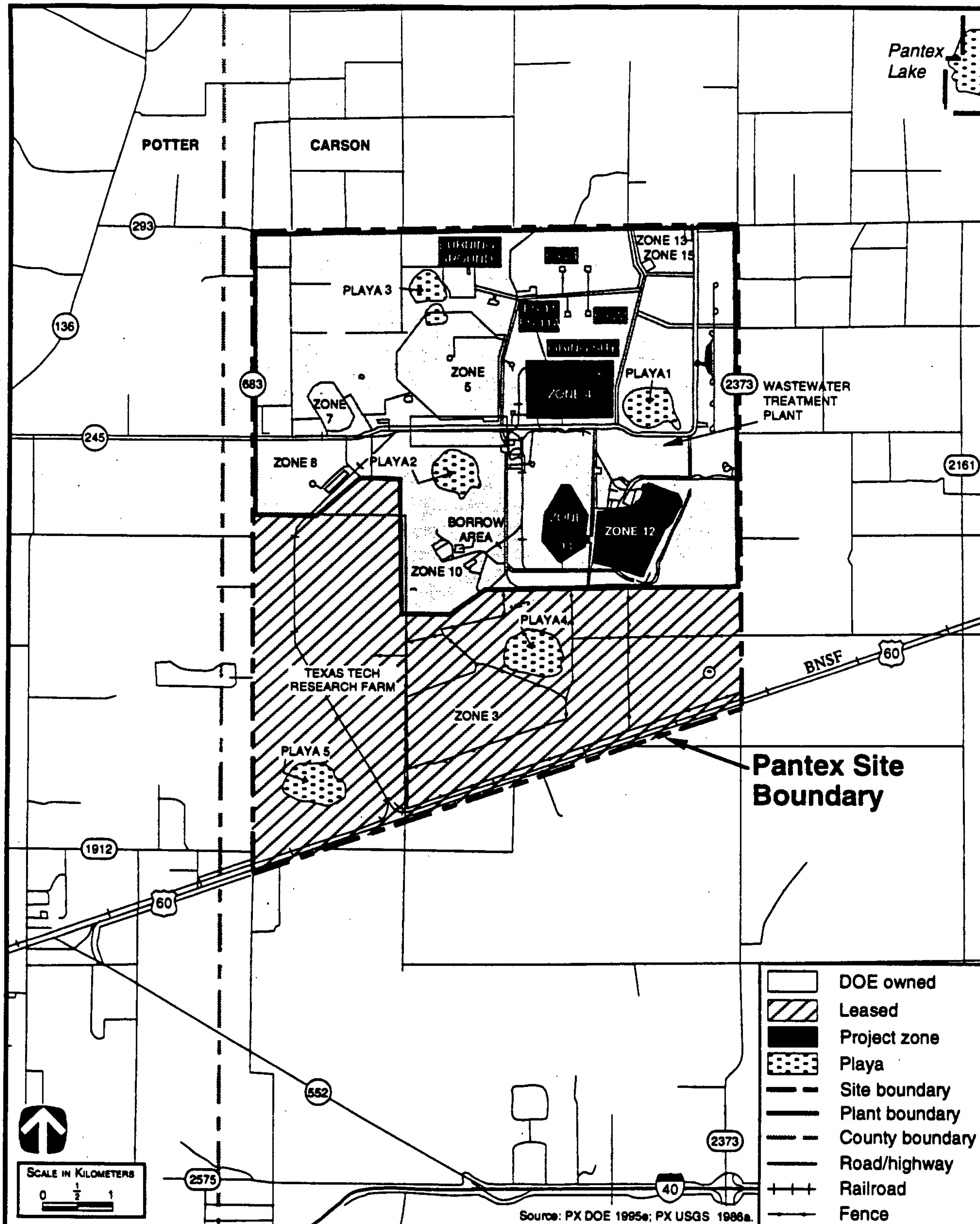


FIGURE A.3.5.1–1.—*High Explosives Fabrication Alternative Locations at Pantex Plant.*

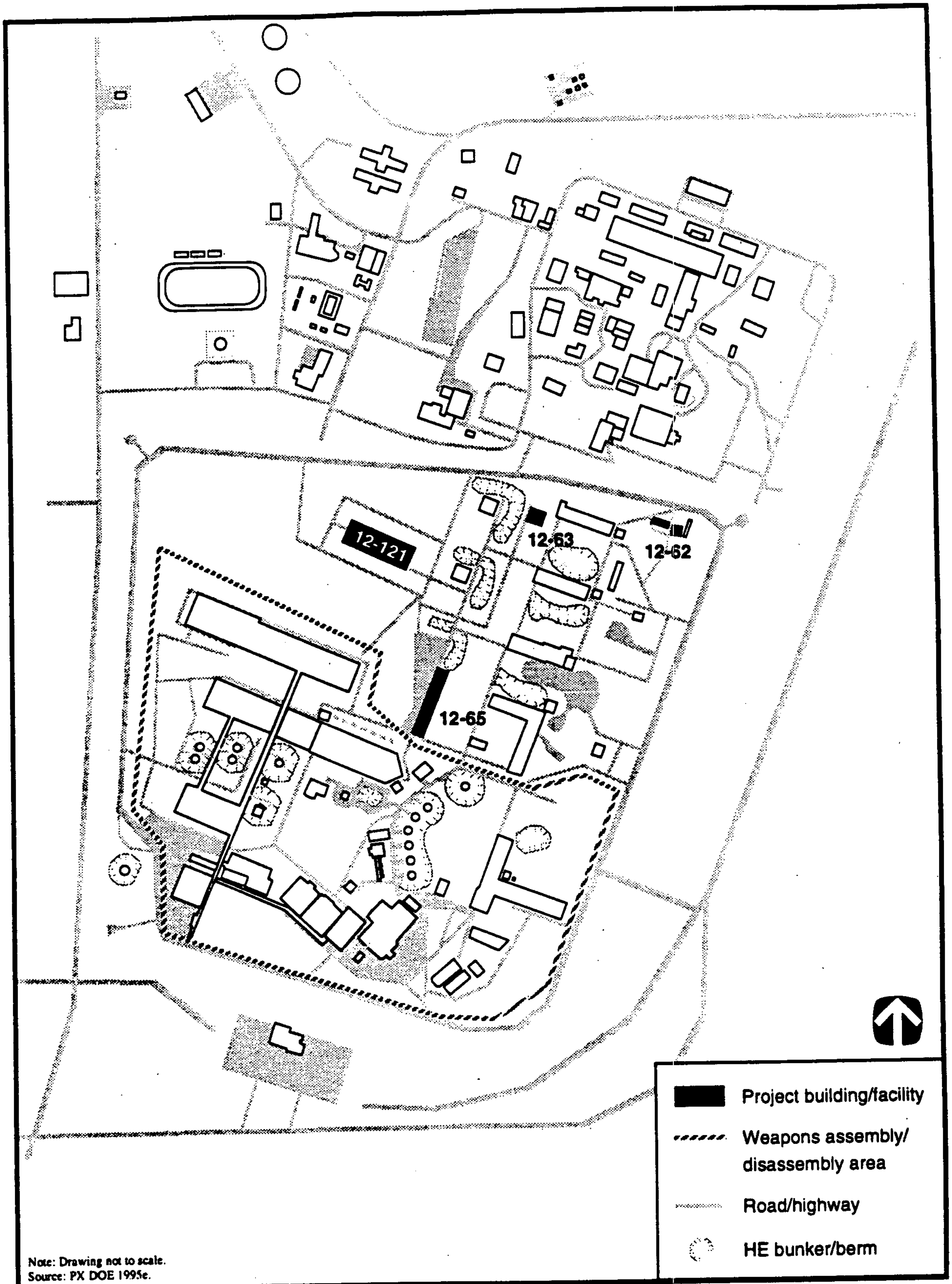


FIGURE A.3.5.1-2.—*High Explosives Fabrication Alternative Facilities Within Zone 12 at Pantex Plant.*

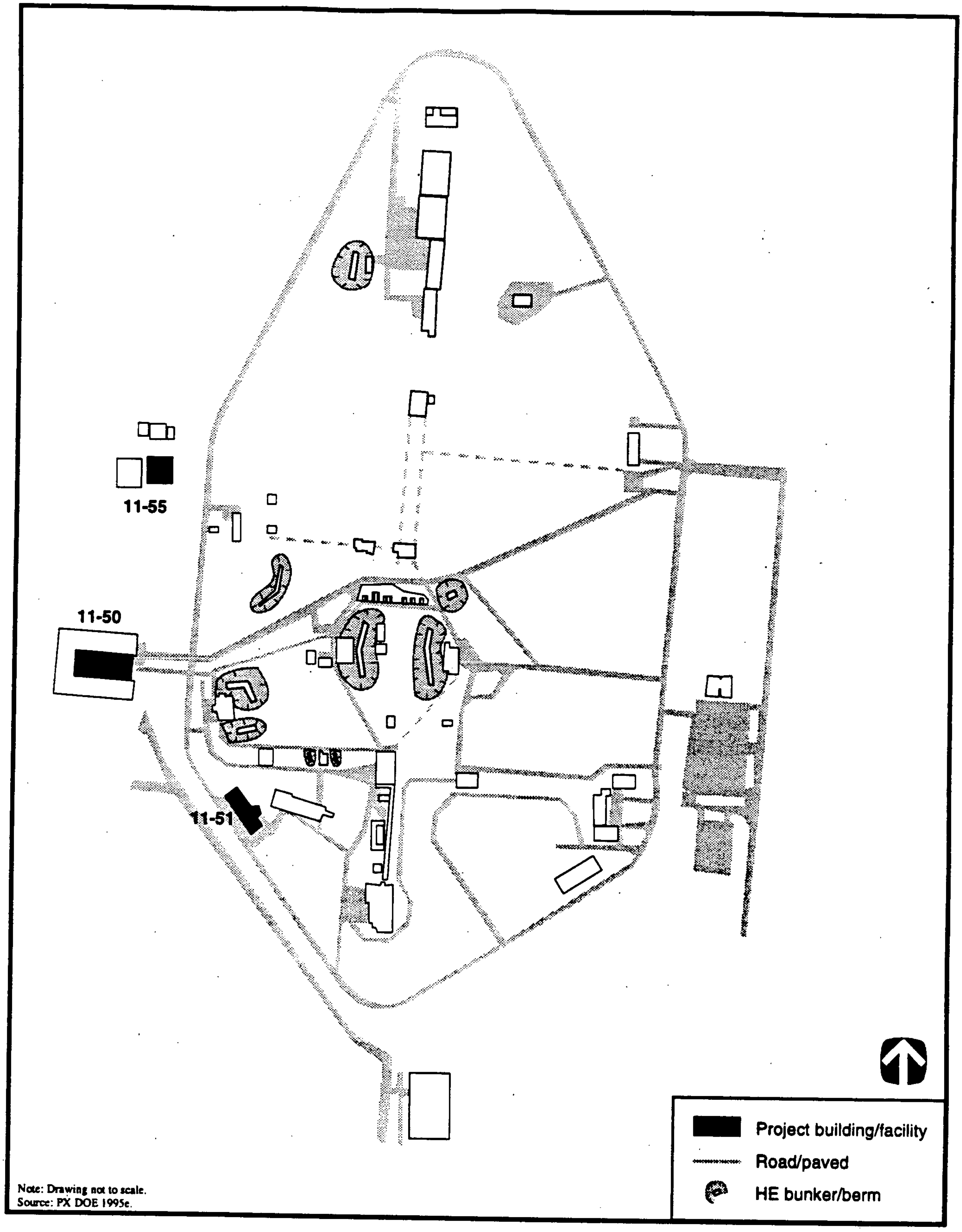


FIGURE A.3.5.1-3.—*High Explosives Fabrication Alternative Facilities Within Zone 11 at Pantex Plant.*

pected loss of function, and to maintain ductile behavior during earthquakes.

The fire protection system, emergency power, water supplies, and controls for the safety class equipment are some of the necessary emergency items that must be available following an earthquake. As stated in UCRL-15910, earthquake-resistant design considerations extend beyond the dynamic response of structures and equipment to include survival of systems that prevent facility damage or destruction due to fires or explosions.

Wind. All existing plant structures, systems, and components at Pantex meet the wind or tornado load criteria and the corresponding facility usage and performance goals. Wind design criteria are based on annual probability of exceedance, importance factor, missile criteria, and atmospheric pressure changes as applicable to each performance (usage) category as specified in UCRL-15910. Wind loads are based on the annual probability of exceedance of $2x10^{-2}$ for the general and low hazard (performance categories 1 and 2), $1x10^{-3}$ for the moderate hazard (performance category 3), and $1x10^{-4}$ for the high hazard (performance category 4) structures, systems, and components. Since tornadoes are the viable wind hazards, structures are designed for the annual probability of exceedance of $2x10^{-5}$ as defined in UCRL-15910.

Floods. All facilities required for the HE operations at Pantex are located above the critical flood evaluation. The extent of the flood hazard is determined using the appropriate usage (performance) category for determining the "Annual Hazard Probability of Exceedance": $2x10^{-3}$ for the general use (performance category 1), $5x10^{-4}$ for the important or low hazard (performance category 2), $1x10^{-4}$ for the moderate hazard (performance category 3), and $1x10^{-5}$ for the high hazard (performance category 4) facility as defined in UCRL-15910.

Whenever possible, all facilities in performance categories above the general use category (performance category 1) are constructed with the lowest floor of the structure, including subsurface floors, above the level of the 500-year flood. This requirement can be met by siting and/or flood protection. Whenever possible, all facilities, including their basements, in all performance categories are sited above the 100-year floodplain.

Fire Protection. The fire protection features for the plant and its associated support buildings are in accordance with DOE orders and the National Fire Prevention Association Fire Codes and Standards. Redundant firewater supplies and pumping capabilities are installed to supply the automatic and manual fire protection systems located throughout the site. Appropriate types of fire protection systems are installed to provide life safety, prevent large-loss fires, prevent production delay, ensure that fire does not cause an unacceptable onsite or offsite release of hazardous material that will threaten the public health and safety of the environment, and minimize the potential for the occurrence of a fire and related perils. Specific production areas and/or equipment are provided with the appropriate fire detection and suppression features, as required, with respect to the unique hazard characteristics of the product process.

Safety Class Instrumentation and Control. The safety classification of instrumentation and controls are derived from the safety functions which they perform. The safety classification is based on appropriate DOE orders. Existing facilities at Pantex meet all safety class requirements. Safety instrumentation is designed to monitor identified safety-related variables in safety class systems and equipment over expected ranges for normal operation, accident conditions, and safe shutdown. Safety class controls are provided when required to control these variables. Safety class instrumentation is designed to fail in a safe mode following a component or channel failure. Safety class Uninterruptable Power Supply power is provided when appropriate.

Ventilation. The heating, ventilation, and air conditioning system design of existing facilities meets all general design requirements in accordance with DOE orders, and American Society of Heating, Refrigerating, and Air Conditioning Engineers guides. The design includes engineered safety features to prevent or mitigate the potential consequences of postulated design basis accident events.

Internal Explosion. Buildings containing HE are designed to mitigate the effects of accidental explosion within a bay or cell. The design is in accordance with the *DOE Explosive Safety Manual*, DOE/EV/06194, including the quantity-distance and the level-of-protection criteria for each class of explosives activities.

Overall Facility Layouts and Design Description. Pantex facilities proposed for the HE fabrication mission are listed in table A.3.5.1–3 and described in this section. The table summarizes key facility data for existing buildings and support areas. Data for the facilities include building number, description, construction type (concrete or steel), gross square meters, number of levels in the structure, and explosives present.

Structures containing explosives operations are generally constructed with steel-reinforced concrete and are designed to mitigate the effects of an accidental explosion. Although insensitive HE materials can generally be processed in conventional steel structures, concrete construction is typically used to maintain the flexibility to process conventional explosives.

The resulting facility design typically consists of a number of separate operating bays that could vent to an unoccupied area should a detonation occur. Structures that do not require concrete construction due to the presence of HE are generally constructed of steel, although portions of these buildings may be concrete. Most facilities include support areas for offices, break rooms, rest rooms, electrical equipment, heating, ventilation, and air conditioning equipment, maintenance, and in-process staging of materials, components, tooling, and supplies. Many production and laboratory facilities also include vacuum systems. Utilities required include water, steam, compressed air, and electricity.

High Explosives Main-Charge Manufacturing. These facilities manufacture explosive subassemblies, main charge mock explosive hemispheres, and explosive test specimens. An area is also provided for conducting physical property testing on explosive components and materials. Each functional area is described below.

Isostatic Pressing (Building 12-63). Rough pressings for HE main charge subassemblies and material test billets are manufactured in Building 12-63.

TABLE A.3.5.1–3.—*Pantex Plant High Explosives Fabrication Facility Data*

Facility Function	Building Number	Construction Type	Gross Area (m^2)	Number of Levels	Special Materials
Bulk explosives storage	04-101 - 04-104	Concrete	441	1	HE
Synthesis	11-55	Concrete	279	1	HE
HE formulation	11-50	Concrete	2,062	2	HE
Chemical testing/evaluation	11-51	Concrete	1,078	1	None
HE main charge pressing	12-63	Concrete	223	1	HE
Explosives staging/packaging/shipping	12-65	Concrete	753	1	HE
Fabrication/assembly	12-62, 12-63	Concrete	548	1	HE
Explosives machining/gaging/subassembly/ safety testing/physical testing/ nondestructive evaluation	12-121	Concrete	4,562	1	HE
Test fire assembly	FS-11	Steel	190	1	HE
Outdoor firing site	FS-22	Concrete	167	1	HE
Contained firing site	FS-24	Concrete	701	1	HE
HE disposal	Burning Ground	Concrete	56	1	HE

Source: PX DOE 1995e.

Explosives Machining (Building 12-121). The rough pressings are machined in Building 12-121.

Main Charge Subassembly (Building 12-121). The explosives hemispheres are assembled in Building 12-121.

Mechanical Properties Testing (Building 12-121). The physical properties of explosive components and materials are tested in a portion of Building 12-121.

Small High Explosives Component Manufacturing (Buildings 12-63, 12-121). Various small components are manufactured from HE powders and binders, metal or plastic components, electrical components, hardware, and assembly materials. The manufacturing process requires equipment for explosive powder heating, pellet processing, laser welding, ultrasonic cleaning, extrusion loading, density testing, inspection, and mechanical and electrical assembly.

Test Firing (Buildings FS-11, FS-22, FS-24). Explosives test configurations are assembled and tested at Buildings FS-11, FS-22, and FS-24. The test data characterize the explosives performance and are required for the qualification of raw materials and production lots. Testing requires explosives containment chambers and an array of special instrumentation including streak cameras, rotating mirror framing cameras, digitizers, flash x-ray systems, and velocity interferometers. Outdoor firing sites are used to conduct explosives tests (e.g., skid and hydrodynamic tests greater than 1 kg [2.2 lb]) that cannot be performed in a test chamber. These facilities are remotely located from production operations.

Nondestructive Evaluation (Building 12-121). Explosive components are inspected using neutron radiography, x-ray, magnetic particle, and eddy current equipment to detect flaws, cracks, and voids in explosives and inert components. Nondestructive evaluation also supports the A/D mission.

High Explosives Formulation (Buildings 11-50 and 12-62) and Synthesis (Building 11-55). These facilities have the capability to produce a variety of explosives materials from chemical reactants and commercially produced explosives. Material lots up to about 91 kg (200 lbs) are produced through a series of batch operations. Some products are used to make small HE weapon components, while other products support the development of new explosives or explosives manufacturing processes.

The HE formulation and synthesis facilities include several flexible processing bays that contain a variety of vessels, filters, and transfer pumps used to synthesize, recrystallize, blend, and wash explosive powders. The facilities also include bays for mixing/milling, reducing particle size, drying/weighing/packaging, storing solvent, and refrigerated storing of explosives and chemicals. Building 11-55 replaces the existing synthesis facility (Building 11-36), which is in deteriorating condition. Building 11-50 replaces an existing formulation capability in Building 12-19E.

Production Support. The production support facilities house an analytical laboratory and material compatibility testing.

Analytical Laboratory (Building 11-51). Chemical analyses are performed on explosive and nonexplosive materials in Building 11-51 to determine or verify their characteristics. The data obtained yield valuable information about the condition and composition of the material. This information is used to ensure components' reliability and to statistically evaluate performance with material characteristics. The methods used include gas chromatography, liquid chromatography, size exclusion chromatography, infrared spectroscopy, thermal analysis, particle characterization, atomic spectroscopy, and emission spectroscopy. Surface chemistry, metallography, optical and scanning electron microscopy, and wet chemistry are also performed.

Material Compatibility Testing (Building 11-51). Test coupons are assembled such that the subject materials are in direct contact with each other. These coupons are then placed in environmental ovens to accelerate the aging process. Gas samples are periodically taken from the coupon containers and analyzed by the gas laboratory. Compatibility testing is accomplished in Building 11-51 and is required to certify new materials for weapon use.

Bulk Explosives Storage (Buildings 4-101 through 4-104). These facilities are designed to store collectively 31,800 kg (70,000 lb) of conventional HE powders while awaiting transfer to or from the HE staging facility and offsite explosives vendors. These materials are typically received in 4,500 to 9,000 kg (10,000 to 20,000 lb) lots. These facilities also are used for storing 182,000 kg (400,000 lb) of HE awaiting transfer to or from the explosives staging facilities. The bulk explosives facilities would be designed to provide separation between incompatible explosives types and would be located remotely from the production operations.

Explosive Staging/Packaging/Shipping (Building 12-65). These facilities are designed to stage a variety of explosives powders, components, and assemblies for supporting HE operations. These explosives materials include plastic bonded explosives for main charge manufacturing, completed main charges, small HE components, energetic feeds and products for HE formulation and synthesis, and explosives residues for disposal or recycling. These facilities are designed to provide separation between incompatible explosives types.

Resource Requirements During Construction/Modification. Requirements during construction and modification to implement the downsized configuration for HE fabrication at Pantex are described below.

Land Area Requirements During Modification. Downsizing in place of the explosives production operations at Pantex requires approximately 0.12 ha (0.3 acres) of land for construction laydown and warehousing and an additional 0.04 ha (0.1 acres) to accommodate construction parking. These activities would occur in previously developed land areas.

Materials and Resources Consumed During Modification. The materials and resources consumed during downsizing of the explosives production operation at Pantex are shown in table A.3.5.1–4. These resources include utilities, construction materials, liquid fuels, and industrial gases.

Emissions During Modification. Air pollutants are emitted during modification activities required for the downsizing of the explosives production operations. The principal sources of such emissions are fugitive dust from site preparation for material laydown areas, other construction activities, and exhaust from construction equipment and vehicles. The estimated annual emissions generated during a

TABLE A.3.5.1–4.—*Pantex Plant High Explosives Downsizing Materials/Resources Requirements*

Material/Resource	Total Consumption	Peak Demand[a]
Electricity	257 MWh	2 MWe
Water (L)	644,000	
Concrete (m^3)	356	
Steel (t)	6	
Liquid fuel (L)	12,200	
Industrial gases[b] (m^3)	258	

[a] Peak demand for electricity is the maximum rate. Peak demand for water is the average daily consumption during a 1-year period with peak construction activity.

[b] Cubic meters measured at standard temperature and pressure.

Source: PX 1995a:6; PX DOE 1995e.

1-year period with peak construction activity are shown in table A.3.5.1–5.

Employment During Modification. The number of workers required during each year of construction at Pantex for the HE downsizing alternative is presented in table A.3.5.1–6.

TABLE A.3.5.1–5.—*Pantex Plant High Explosives Downsizing Construction Emissions*

Pollutant	Quantity (t)
Carbon monoxide	0.54
Nitrogen oxides	0.19
Particulate matter	0.08
Sulfur dioxide	0.02
Total suspended particles	0.19
Volatile organic oxides	0.09

Source: PX DOE 1995e.

Resource Requirements During Operations—High Explosives Fabrication Mission. No additional land is required to operate the HE downsizing alternative at Pantex.

The utilities consumed during operation include electric power, liquid fuels, natural gas, and water. Annual utility consumption rates and peak electric power rates for surge operation are shown in table

TABLE A.3.5.1–6.—*Pantex Plant High Explosives Downsizing Construction Workers*

Employees	Year 1	Year 2	Year 3	Total
Craftworkers				
Carpenter	1	3	1	5
Construction management and support staff	0	3	1	4
Concrete mason	1	2	1	4
Electrician	0	3	2	5
Iron worker	1	3	1	5
Laborer	1	3	1	5
Millwright	0	1	1	2
Operator	0	1	0	1
Other craftworkers	0	2	1	3
Pipe fitter	0	2	1	3
Sheet metal worker	0	3	1	4
Sprinkler fitter	0	2	1	3
Teamsters	0	1	1	2
Total Employment	4	29	13	46

Source: PX DOE 1995e.

A.3.5.1–7 and are incremental to the A/D mission at Pantex.

All activities would be accomplished on a single, 40 hours-a-week shift. Any surge production would be achieved by increasing personnel and adding shifts (1-year lead time). The facilities would be operated under existing site labor agreements. Surge operation of the HE Fabrication Facility would require 37 direct workers (PX 1996e:1). Support workers for the A/D mission would provide sufficient support for the HE fabrication mission.

TABLE A.3.5.1–7.—*Pantex Plant High Explosives Downsizing Surge Operation Annual Utility Requirements*

Utility	Consumption	Peak Demand[a]
Electricity	3,250 MWh	1 MWe
Liquid fuel (L)	55,600	
Natural gas[b] (m^3)	500,000	
Water (L)	12,500,000	

[a] Peak demand is the maximum rate expected during any time.
[b] Cubic meters measured at standard temperature and pressure.
Source: PX 1995a:5; PX 1995a:6; PX DOE 1995e.

Chemicals Consumed During Operation. The chemicals and materials consumed during operations primarily include water treating chemicals, reactants and solvents for explosives formulation and synthesis, explosive powders, materials for facility equipment and vehicle maintenance, and bottled gases. No radioactive materials are required for explosives production. Materials with annual consumption in excess of 227 kg (500 lb) during surge operations are listed in table A.3.5.1–8.

TABLE A.3.5.1–8.—*Pantex Plant High Explosives Downsizing Surge Operation Annual Chemical Requirements*

Chemical	Quantity (kg)
Calcium chloride	4,080
Ethyl acetate	1,360
HE powders, insensitive	31,600
HE powders, conventional	15,800
Hydraulic/lubricating oil	4,310
Nitrogen	1,810
Paint	2,380

Source: PX 1995a:6; PX DOE 1995e.

Emissions During Operation. Gaseous environmental releases would result from operation of the thermal treatment units for bulk HE waste and nonradioactive HE-contaminated waste generated by Pantex for the explosives production operations. Emissions would also result from plant boiler operation, cleaning operations using solvents, and formulation and synthesis operations. The thermal treatment units would be designed and operated to attain and maintain temperatures which result in the destruction of hazardous constituents. Hazardous particulates would be trapped in filters. The releases would be limited to what is possible, using the best available control technology. The annual chemical emissions for the explosives production surge operations are shown in table A.3.5.1–9.

Waste Management

Wastes Generated During Construction. The liquid and solid wastes generated during construction would include concrete and steel waste construction materials, hazardous wastes, and sanitary wastewater. The steel construction waste material would be

TABLE A.3.5.1–9.—*Pantex Plant High Explosives Downsizing Surge Operation Annual Emissions*

Pollutant	Quantity (kg) Incremental with Assembly/ Disassembly
Criteria Pollutant	
Carbon monoxide	413
Nitrogen oxides	1,560
Particulate matter	68
Sulfur dioxide	0.01
Volatile organic compounds	122
Hazardous and Other Toxic Compounds	
Acetonitrile	0.45
Aldehydes	2.04
Ammonia	0.02
Benzene	3.00
Cresylic acid	0.0014
Cyclohexane	1.70
1,2-Dichloroethane	0.03
Dimethyl formamide	0.01
Dioxane	0.04
Hexane	0.09
Hydrogen chloride	3.20
Hydrogen fluoride	4.50
Mercury	$2x10^{-8}$
Methanol	2.7
Methyl ethyl ketone	349
Toluene	9.5
1,1,1-Trichloroethane	0.54
Trichloroethylene	0.45
Xylene	8

Source: PX DOE 1995e.

recycled as scrap metal. No radioactive or mixed wastes would be generated during construction.

The liquid and solid wastes generated during HE downsized fabrication functions are discussed in the subsections below. The annual quantity of solid and liquid waste generated by the explosives production operations at Pantex during surge operation is shown in table A.3.5.1–10.

Hazardous toxic wastes would consist of solid residue (ash) from thermal treatment units, solvents from operations, wash water and residual reactants from explosives formulation and synthesis, and residue from painting and bonding operations. This waste would be stabilized and sent to an approved permitted RCRA disposal site.

Solid nonhazardous, nonradioactive wastes generated by the explosives production operations would consist primarily of solid sanitary waste, residue from facility and vehicle maintenance, spent desiccants, and sanitized and demilitarized paper and parts. Nonrecyclable portions of this waste would be sent to an offsite landfill. Liquid sanitary wastewater and process wastewater would be treated and discharged to a permitted drainage channel.

Transportation. The major type of hazardous material that would be transported to Pantex would be HE materials. Bulk explosives powders would be delivered to the site by DOT-approved bulk commercial carriers. The powder would be unloaded at the bulk explosives storage facilities, isolated from other facilities on the site. Subsequent movements of HE and explosives components would be performed by trucks and battery powered vehicles specifically designed for this purpose. The quantity of HE (conventional and insensitive) transported onsite by these trucks would be strictly limited.

Explosives main charges and components would be transferred to staging areas for transfer to the A/D plant. In a similar manner, explosives components from the A/D plant would be transferred to the explosives production plant for demilitarization, sanitization, and disposition. Small quantities of hazardous waste generated during operations would be collected, packaged, and transported by electric car to local accumulation sites and then by truck to a staging area. The waste would be transferred by truck for offsite disposal.

A.3.5.2 *Relocate to Los Alamos National Laboratory*

The HE processing facilities at LANL (figures A.3.5.2–1 and A.3.5.2–2) were designed and built for production scale operations and were operated as production facilities supplying nuclear weapons HE components for many years. LANL has continued to upgrade and modernize processing equipment in these existing facilities to provide prototype HE components to meet hydrodynamic and NTS program

TABLE A.3.5.1–10.—*Pantex Plant High Explosives Fabrication Facility Waste Volumes*

Category	Annual Average Volume Generated from Construction (m^3)	Annual Volume Generated from Surge Operations (m^3)	Annual Volume Effluent from Surge Operations (m^3)
Low-Level			
Liquid	None	None	None
Solid	None	Minimal	Minimal
Mixed Low-Level			
Liquid	None	None	None
Solid	None	None	None
Hazardous			
Liquid	None	0.23	0.23
Solid	0.06	30	30
Nonhazardous (Sanitary)			
Liquid	146	7,120	7,120
Solid	None	17	8[a]
Nonhazardous (Other)			
Liquid	Included in sanitary	None	None
Solid	2[b]	Included in sanitary	Included in sanitary

[a] Assumes 2/3 of solid sanitary waste is compactible by a factor of 4:1.
[b] Includes 2 m^3 of concrete and 0.25 t (0.28 tons) of recycled steel. Density of steel was assumed to be 0.127 m^3/t for volume conversion.
Source: PX 1995a:5; PX 1995a:6; PX DOE 1995e.

requirements. Using the existing HE manufacturing infrastructure along with state-of-the-art processing equipment, LANL produces high-quality complex HE components to meet one-of-a-kind prototype requirements or limited production runs of HE components used in test programs. Typically, LANL fabricates an average of 1,200 to 1,500 HE parts per year. Surveillance (returned stockpile) HE components are also processed for weapon aging studies.

LANL's full range of HE-processing capabilities includes HE storage magazines, HE synthesis, HE formulation, pressing, machining, assembly, and subassembly of HE devices, proven quality assurance processes, and stringent disposal requirements. In addition, LANL has facilities for environmental, safety, and performance testing of HE and HE assemblies. In all, the inherent capacity of the LANL HE plant exceeds weapons R&D testing program requirements. Furthermore, expanding workloads at LANL to support the projected production would not tax or require full capacity of LANL's existing infrastructure.

LANL would assume the responsibility for providing all HE feedstock, main charge, and component procurement, and fabrication as required by the HE fabrication mission. The products and capabilities for which LANL would be responsible are shown in table A.3.5.2–1.

Assumptions. The general and facility assumptions on which the data in this section are based follow.

General Assumptions

- LANL currently has adequate infrastructure in place to meet all ES&H safeguards and security and waste management requirements for the HE fabrication mission.
- Additional staff would be required to support new HE production.
- Transition from Pantex and qualification and process prove-in will take approxi-

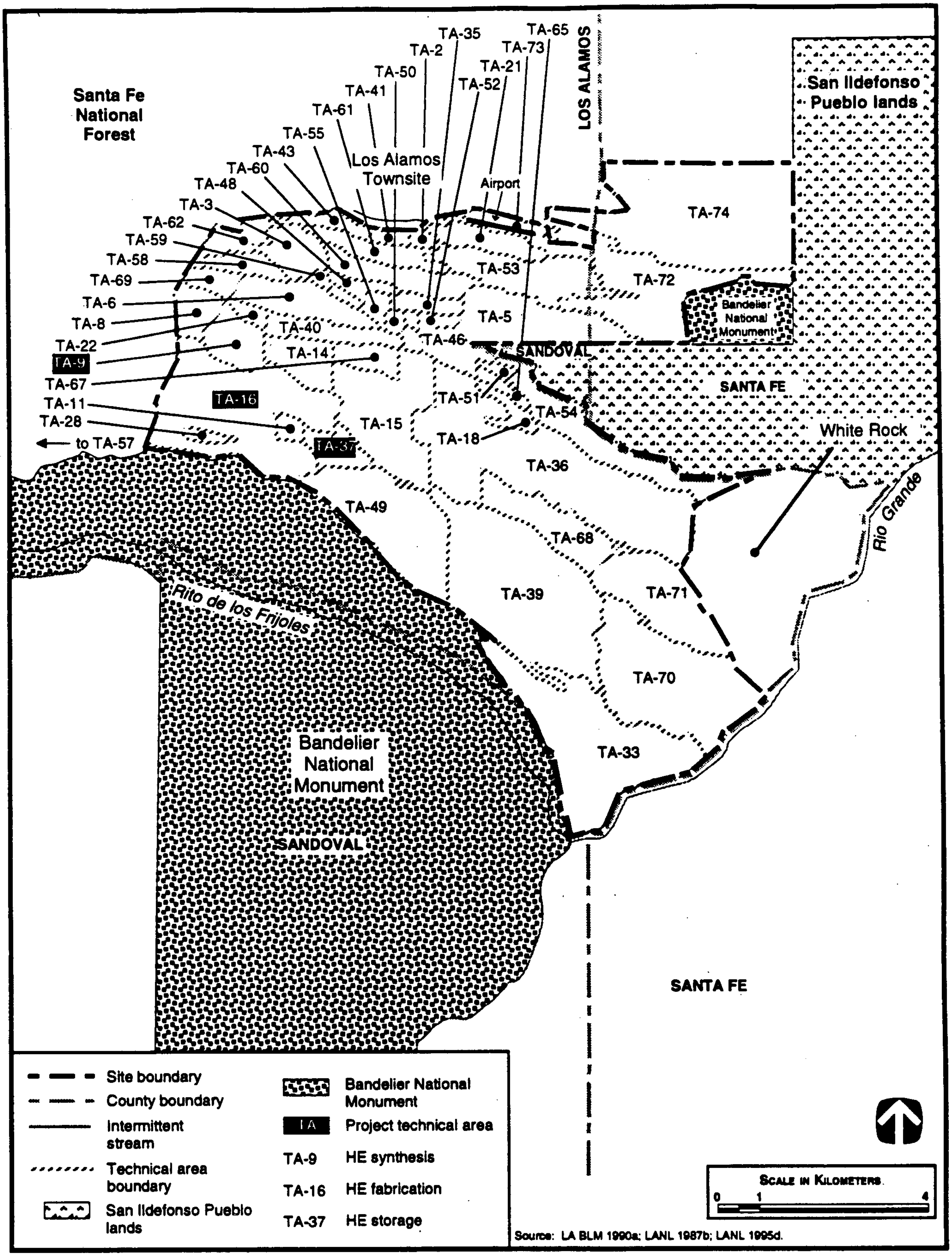


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FIGURE A.3.5.2–1.—*High Explosives Fabrication Alternative Technical Areas at Los Alamos National Laboratory.*

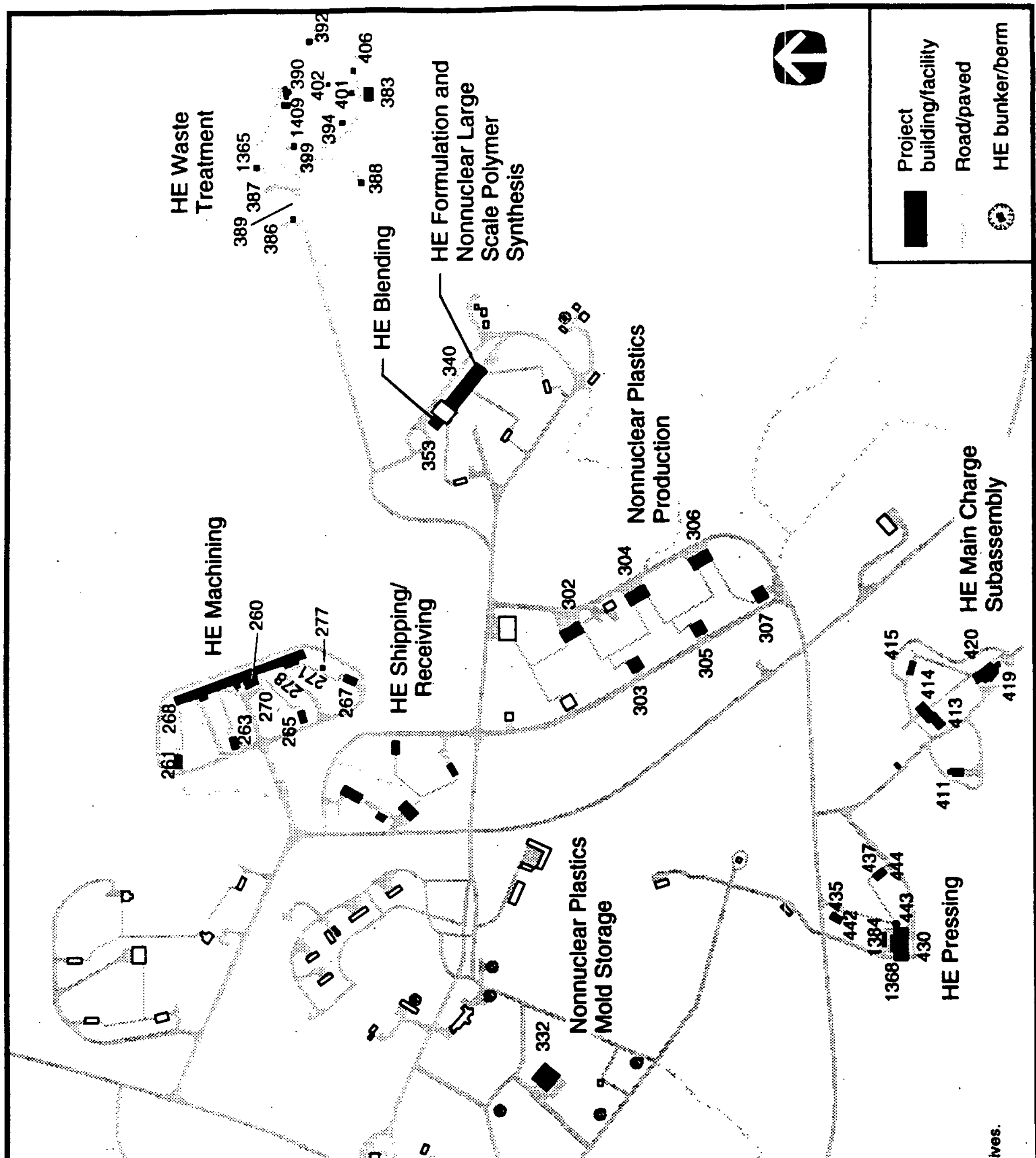


FIGURE A.3.5.2–2.—*Technical Area 16 Site Plan at Los Alamos National Laboratory.*

mately 2 years, beginning in fiscal year 1997 after the ROD.

- Steady state operations begin at LANL in fiscal year 1999.

- Steady state operations include manufacturing, testing, and quality assurance evaluation of parts and returned stockpile surveillance components (approximately 10 percent of the production rate).

Facility Capacity/Capabilities Assumptions

- The capacity is defined as 150 sets of explosives components for new builds and 110 sets of explosives components for rebuilds.

- All products and capabilities defined by the HE manufacturing block flow diagrams will be supported.

- Some existing programs in the enduring stockpile use main charges made from conventional HE. All new weapon programs will use main charges made from insensitive HE. Insensitive HE machining and storage continue to be explosive hazard Class IV operations.

- Appropriate portions of the existing storage facilities will be upgraded and reserved to provide adequate storage for the HE fabrication mission, estimated as 182,000 kg (400,000 lb) of insensitive HE and 31,750 kg (70,000 lb) of conventional HE.

- Existing S-Site facilities will be operated according to the current shift system (four 10-hour days per week) to meet normal production requirements. The facilities will be operated under existing labor agreements.

TABLE A.3.5.2–1.—*Los Alamos National Laboratory High Explosives Fabrication Products and Capabilities*

Products	Capabilities
High Explosives	**Manufacturing Process Development**
	Stockpile stewardship support
	Formulation
	Surveillance
	Synthesis
Binders	**Main Charge Manufacturing**
	Pressing
	Machining
	Subassembly
	Receiving/storage
	Quality assurance-mechanical/chemical/test fire
	Disposition
Main Charge Formulations	**Energetic Component Manufacturing**
	Pressing
	Machining
	Subassembly
	Receiving/storage
	Quality assurance-mechanical/chemical/test fire
	Disposition
Initiation High Explosives	**Detonators**
Mock High Explosives Formulations	**Testing**

Source: LANL 1995d.

- No new facility construction will be needed.

Facility Description. LANL has all the facilities and equipment needed to carry out the HE fabrication mission. These HE processing facilities are located primarily in TAs -9 and -16. The synthesis, analytical laboratory, and pilot scale formulation activities are located at TA-9. These facilities, including administrative support and HE storage, comprise 39 buildings with over 3,700 m^2 (40,000 ft^2) of floor space. Formulation, pressing, machining, receiving, storage, subassembly, radiography, and disposal processes are carried out at TA-16, which houses 65 buildings covering over 8,900 m^2 (96,000 ft^2). Testing and nondestructive evaluation would be carried out in a variety of other TAs. TA-37 would provide storage of HE parts and components. All LANL facilities are designed to meet the requirements of the *DOD Ammunition and Explosive Safety Standards* (DOD 6055.9) and the *DOE Explosives Safety Manual* (DOE/EV/06194) for quantity-distance and operational criteria. The HE safety requirements applicable to operations involving the development, testing, handling, and processing of explosives or assemblies containing explosives are identified in DOE/EV/06194. This manual reflects the state of the art in HE safety. Again, no new construction or major equipment transfers from Pantex are required to support the HE fabrication mission at LANL.

State- and Federal-permitted waste disposal facilities are located at TA-54 for hazardous materials (non-HE contaminated) and at TA-16 for HE and HE-contaminated waste. LANL operates in compliance with all state and Federal requirements and regulations, applying a process of continuous process improvements to drive an effective "best practices" program in waste minimization.

Currently, processing routing flow sheets accompany HE components as they are moved through each processing step. Operators sign off as each process is completed. When the processing is completed, the flow sheets are sent to production control where the processing and inspection data are entered into databases and then filed in production control files. Database inventories and task order files are kept on all components, assemblies, and raw materials used in the HE Fabrication Facility.

Although the facilities are in remote locations, they are well integrated into the infrastructure of LANL. They all have intrasite transportation connections so that transportation of explosives and components on public roads is not of concern for operations. Because of their location, HE facilities are well buffered and are not subject to population pressures.

The HE facilities are primarily centralized in the Dynamic Experimentation and Engineering Sciences and Application Divisions and are used in support of DOE and DOD programs. These facilities will be used for the HE fabrication processes including synthesis and formulation, main-charge manufacturing, testing and characterization, small component manufacturing, HE storage, and disposition. The TAs used to support the production include TAs -8, -9, -11, -14, -15, -16, -21, -22, -28, -36, -37, -39, and -40. The majority of the HE processing operations are located at TAs -9, -16, -28, and -37.

HE performance testing and characterization can be conducted at any of several firing sites operated by DX Division. TAs include TAs -14, -15, -16, -21, -22, -36, -39, and -40. Hazardous waste treatment and disposal facilities are located at TA-54, while HE disposal facilities are located at TA-16.

Design Safety. Important safety considerations are incorporated into the design of DOE facilities. Performance goals commensurate with the associated hazard are selected for all structures, systems, and components. The term "hazard" is defined as a source of danger, whether external or internal. Natural phenomena such as earthquakes, extreme winds, tornadoes, and floods are external hazards to structures, systems, and components; whereas, toxic, reactive, explosive, or radioactive materials contained within the facilities are internal hazards. Usage category is as established by DOE management. Guidelines for usage category (performance category) and the corresponding performance goals are given in UCRL-15910.

Earthquake. All existing HE fabrication structures located in Dynamic Experimentation and Engineering Sciences and Application Divisions meet all current applicable standards. An engineering study showed that the reinforced concrete structures used for HE processing buildings used for blast loading requirements exceed the seismic loading for structural capacity. New structures, systems, and components, when required, shall be designed for earthquake-generated ground accelerations in accordance with UCRL-15910, with applicable seismic hazard exceedance probability of $2x10^{-3}$ for general use (performance category 1), $1x10^{-3}$ for low and moderate hazard (performance category 2 and 3), and $2x10^{-4}$ for high hazard (performance category 4) structures, systems, and components.

Wind. All existing HE fabrication structures at TA-9 and TA-16 meet the wind criteria as discussed below. All new structures, systems, and components would be designed for wind or tornado load criteria when required in accordance with UCRL-15910 and the corresponding facility usage and performance goals. Wind loads shall be based on the annual probability of exceedance of $2x10^{-2}$ for the general and low hazard (performance categories 1 and 2), $1x10^{-3}$ for the moderate hazard (performance category 3), and $1x10^{-4}$ for the high hazard (performance category 4) structures, systems, and components. Wind design criteria is based on annual probability of exceedance, importance factor, missile criteria, and atmospheric pressure change, as applicable, to each performance (usage) category as specified in UCRL-15910.

Floods. All HE facilities and buildings at the LANL HE Fabrication Facility are located above the critical flood elevation from the potential flood source (river, dam, levee, precipitation, etc.). The extent of the flood hazard is determined using the appropriate usage (performance) category for determining the annual hazard probability of exceedance: $2x10^{-3}$ for general use (performance category 1), $5x10^{-4}$ for important or low hazard (performance category 2), $1x10^{-4}$ for moderate hazard (performance category 3), and $1x10^{-5}$ for high hazard (performance category 4) facilities as defined in UCRL-15910.

The critical flood elevation is determined by obtaining the design basis flood level. The design basis flood level is the peak hazard level (flow rate, depth of water, etc.) corresponding to the mean annual hazard probability of exceedance or combinations of flood hazards (river flooding, wind-wave action, etc.) and corresponding loads associated with the peak hazard level and applicable load combination (hydrostatic and/or hydrodynamic forces, debris loads, etc.). LANL run-off site drainage conforms to the State of New Mexico and NPDES requirements. The minimum design level for the stormwater management system is the 25-year, 6-hour storm, but potential effects of larger storms up to the 100-year 6 hour storm are also considered.

Fire Protection. The fire protection features for the existing HE Fabrication Facility and its associated support buildings are in accordance with DOE orders and the National Fire Prevention Association Fire Codes and Standards.

Redundant firewater supplies and pumping capabilities (electric motor drivers with diesel generator backup) would be installed to supply the automatic and manual fire protections systems located throughout the site. One tank and one set of pumps would be designed to meet design basis event requirements. Appropriate types of fire protections systems would be installed to provide life safety, to prevent large-loss fires, to prevent production delay, to ensure that fire does not cause an unacceptable onsite or offsite release of hazardous material that would threaten the public health and safety or the environment, and minimize the potential for the occurrence of a fire and related perils. Specific production areas and/or equipment would be provided with the appropriate fire detection and suppression features, as required, with respect to the unique hazard characteristics of the product or process.

A fire hazards analysis would be performed to assess the risk from fire within the individual fire areas of the facility. All fire sprinkler water that has been discharged during and after a fire would be collected in building sump systems, monitored, sampled, and, if required, retained until it could be disposed of.

Safeguards and Security Systems Description. The HE fabrication facilities located at TA-9 and TA-16 are located within a security parameter with multiple fences surrounding the areas. The main large scale HE processing buildings, assembly area, and magazine storage areas at TA-16 and TA-37 are located within a separate fenced HE exclusion area.

Safety Class Instrumentation and Control. The safety classification of instrumentation and controls is derived from the safety function each performs. This safety classification is based on appropriate DOE orders. HE facilities at LANL that utilize instrumentation for explosives operations currently meet all the safety class requirements.

Ventilation. The heating, ventilation, and air conditioning system provides environmental conditions for the health and comfort of personnel and for equipment protection.

Internal Explosion. New and existing buildings are designed for the effects of accidental explosion within a bay or cell. The design is in accordance with the *DOE Explosives Safety Manual* (DOE/EV/06194), including the quantity-distance and the level of protection criteria for each class of explosives activities.

Overall Facility Layouts and Design Descriptions. The existing HE fabrication facilities at LANL would be used to support the production mission for HE fabrication. These facilities were designed to meet the *DOD Ammunition and Explosives Safety Standards* (DOD 6055.9) and DOE/EV/06194. Operations are segregated by hazard class: Class I processes, the most hazardous processes, were designed for remote operations with an accidental detonation venting the process bay via a frangible (blow-out) wall away from inhabited areas. Fragment distances and blast overpressure (interline distance) set the criteria for locating operating buildings.

All LANL HE processing facilities are designed for Class I (remote) and Class II (operated attended) operations as defined by DOD 6055.9. While some processing operations require some minimal changes for processing conventional HE, there are no major differences in equipment or facilities. The just-in-time flexible manufacturing approach allows the facilities to alternately process both insensitive HE and conventional HE in the same equipment and facilities. This operational philosophy allows optimized fabrication of all HE and gives the flexibility to make production lots of materials, as required (i.e., plane wave lenses), as well as to manufacture a single quantity of weapon HE components for local hydrodynamic tests and custom HE part requirements.

Structures containing HE and those in which HE operations are conducted are constructed with thick (0.6-m [2-ft]) thick, steel-reinforced, concrete walls designed to mitigate the effects of an accidental explosion. These facilities contain protective berms and are located to meet quantity-distance criteria. Most facilities include support areas for offices; break rooms; restrooms; electrical equipment; heating, ventilation, and air conditioning equipment; maintenance; and in-process staging of materials, components, tooling, and supplies. Table A.3.5.2–2 lists functional HE processing technology, building numbers, and working floor space. No new facilities or structures are required to support the HE manufacturing production mission.

High Explosive Main-Charge Manufacturing. The HE processing facility is used to manufacture main charge subassemblies, mock main charge hemispheres, and explosive test specimens. An area is also provided for conducting physical property testing on explosives components and materials. Each functional area is described below:

Isostatic Pressing. Rough pressings for HE main charge subassemblies, material test billets, and pellets for small components and boosters are fabricated in TA-16-430.

Explosives Machining. Rough pressings are radiographed, inspected, and machined into hemispherical shapes or test charges in TA-16-260.

Inspection. HE components are inspected in TA-16-260.

Main Charge Subassembly. The explosives hemispheres are assembled in TA-16-410.

Small High Explosives Component Manufacturing. This facility manufactures small HE weapon components and test assemblies and conducts qualification and development testing for explosives components and materials. Various small components are manufactured in TAs-16-340, -430, -260, and -410 from HE powders and binders, metal or plastic components, electrical components, hardware, and assembly materials. The manufacturing process requires equipment for explosives powder heating, pellet pressing, laser welding, ultrasonic cleaning, extrusion loading, density testing, and mechanical assembly.

Inert Machining. Small components are manufactured in TA-16-370 and TA-3-39. Additional facili-

TABLE A.3.5.2–2.—*Los Alamos National Laboratory High Explosives Fabrication Facility Data*

Functional Area	Existing Facilities	
High Explosives Technology	**Gross Area (m²)**	**Building Number**
Main Charge Fabrication		
HE pressing	740	TA-16-430
HE machining, inspection	930	TA-16-260
HE subassembly	370	TA-16-410
Physical property testing	185	TA-11, All
High Explosives Staging, Insensitive High Explosives, and Conventional High Explosives	280	TA-16-261 TYPICAL
Main Charge Test Fire	93	TA-15, TA-40
Energetic Components		
Small component fabrication	700	TA-16-340
Test fire	93	TA-15, TA-40
Component nondestructive evaluation	560	TA-8-22, -23
Formulation and Synthesis		
HE synthesis	460	TA-9-45, -46
HE formulation	700	TA-16-340
Chemical storage	47	TA-16-344
HE staging	47	TA-16-341, -343, -345
Production Support		
Analytic/environmental lab	460	TA-9-21 and -32
Metrology	185	TA-16-260, -410
Materials compatibility testing	280	TA-9-21, -40, -42
Machine shop	185	TA-16-370
High Explosives Shipping/Receiving	230	TA-16-280
Outdoor Test Fire	93	TA-15, TA-11
High Speed Test Machining	18	TA-16-340, -476
High Explosives Storage, Insensitive High Explosives, and Conventional High Explosives	930	TA-37-1 through -37
High Explosives Tech Ramps	2,790	TA-16-413, -332
Component Warehouse	280	
Total	10,655	

Source: LANL 1995d.

ties at the central shop (TA-13-39) include full service, high precision metal manufacturing capability.

Synthesis (Technical Areas 9-45, -46) and Formulation (Technical Area 16-340). These facilities have the capability to produce a variety of explosives materials from chemical reactants or to formulate HE composites from commercially produced explosives. Material lots up to about 91 kg (200 lb) are produced through a series of batch operations. Some products are used to make small HE weapons components, while other products support the development of new explosives or explosives manufacturing processes. Blending capabilities for producing uniform blends up to 454 kg (1,000 lb) to minimize batch-to-batch variations are available at the TA-16-340 complex. The HE formulation and synthesis facility includes several flexible processing bays that contain a variety of vessels, filters, and transfer pumps which are used to synthesize, recrystallize, blend, and wash explosive powders. The facility also includes six bays for mixing/milling, particle size reduction (micronization), drying/weighing/packaging, solvent storage, and refrigerated storage for explosives and chemicals.

High Explosives Shipping and Storage. The HE shipping/receiving facility in TA-16-280 and TA-37-1 through TA-37-26 is designed to ship and receive bulk HE materials to and from the HE Fabrication Facility. These materials are typically received in 4,500 to 9,000 kg (10,000 to 20,000 lb) lots. Parts would be shipped out as needed in small lots to the A/D Facility.

High Explosives Disposal (Technical Area 16-389). LANL disposal facilities is in place and permitted by the State of New Mexico for disposal of HE waste and HE-contaminated materials. There is a large flash pad that thermally decontaminates items subject to trace HE contamination prior to burial. Two aboveground burning trays are used to destroy HE scrap and residue, and two sand filters are used to remove HE-contaminated water from sump sludge for drying and burning. One aboveground tray burns contaminated oil. An incinerator burns room trash from the HE area (potential contamination due to association only). All water is filtered to remove HE; treated with activated carbon for solvent removal; and measured for chemical oxygen demand, suspended solids, and acidity prior to release to the environment.

Explosives Testing and Characterization. HE testing and characterization cover a wide range of activities and processes and provide quality assurance data that can be used to certify a HE lot for production use or to provide test firing information to qualify small HE component lots for use in production assemblies. LANL has facilities, instrumentation, and test equipment to support the certification of HEs and HE components that would be used for production. These facilities can be used for analytical chemistry evaluation, physical testing, nondestructive evaluation, materials compatibility testing, and firing sites for performance and safety evaluations of HEs and HE assemblies. The full complement of testing and characterization activities is used for surveillance evaluation of returned stockpile HEs.

Analytical Laboratory. Chemical analyses are performed in TA-9-21 on explosives and on explosives materials to determine or verify their characteristics. Analysis methods include gas chromatography, liquid chromatography, ion chromatography, size exclusion chromatography, infrared spectroscopy, thermal analysis, particle characterization, mass spectroscopy, atomic spectroscopy, and emission spectroscopy. Small-scale safety tes[ts] required for evaluation of HEs are conducted in this facility. Tests include drop weight impact, friction, electrostatic discharge, and thermal tests.

Material Compatibility Testing. Test coupons are assembled in TA-9-40, TA-9-21, and TA-9-42 so that the subject materials are in direct contact with each other. These coupons are then placed in environmental chambers to accelerate the aging process. Temperatures can be cycled between -55 °C (-67 °F) and +75 °C (+167 °F) in the chambers. Gas samples are periodically taken from the coupon containers and analyzed. Compatibility testing is required to certify new materials for weapon use and HE compatibility. Two large environmental chambers that can be used for cycling full scale weapons systems are located in TA-9-42.

Physical Properties Testing. The physical properties of explosives components and materials are tested in TA-16-340 and TA-9-37 to support lot certification for materials and components and to support production development. The test configurations are assembled, and tensile, torsion, and compression tests a[re] conducted.

Nondestructive Evaluation. Explosives and nonexplosives components are inspected in TAs-8-22, -23, -70 and TA-16-260 with neutron, x-ray, magnetic particle, and eddy current equipment to detect flaws, cracks, voids, and foreign materials.

Test Firing. LANL assembles and detonates explosive test configurations in TA-15, TA-40, and TA-11-25. Tests require explosive containment chambers and an array of special instrumentation including streak cameras, rotating mirror framing cameras, an air image converter system, digital oscilloscopes, flash x-ray systems, and velocity interferometers. LANL conducts large-scale safety tests such as skid tests and spigots at the TA-11 drop tower facility. Vibration test capabilities are also located in this area and can be used for full scale weapons tests as well as components tests.

High Explosives Staging Areas and Corridors. In-process storage in TA-16 is required for a variety o[f] HE powders, components, and assemblies for supporting the HE fabrication operations. These explosives materials include PBXs for main charge manufacturing, completed main charges, small HE components, energetic feed materials and products for HE formulation and synthesis, and explosives residues for disposal or recycle. Staging magazines exist in conjunction with each operational building. The staging magazines are connected with the operational buildings with enclosed corridors. These corridors are used for equipment and material transfers only. Major process buildings are not interconnected.

Resource Requirements During Construction/Modification/Transition. Since only minimal new equipment is needed at LANL, there are no facility construction or modification requirements to conduct the HE fabrication mission at LANL. LANL already has all the technologies needed to provide HE materials, component fabrication, characterization, surveillance, and quality assurance for the future nuclear weapons requirement. The capacity of LANL HE fabrication facilities exceeds R&D mission requirements and can easily accommodate the required production load.

LANL has a full spectrum of HE research, development, fabrication, and test capabilities managed by the Dynamic Experimentation and Engineering Sciences and Applications Divisions. The existing facilities, equipment, and infrastructure would be used to satisfy future production requirements for the HE fabrication mission. The existing capabilities are used to manufacture prototype weapon components for full scale testing that provide the basis for production specifications. Additionally, LANL has demonstrated the capability to manufacture limited production quantities of HE components. Typically, LANL produces 1,200 to 1,500 HE parts per year for use in the weapons research development and testing programs, which include requirements for small production lots (~500) of HE components. These components are manufactured to strict quality assurance requirements and are used in complex hydrodynamic and NTS program requirements.

The equipment and processes used in the HE fabrication processes are very similar and in some cases identical to those used at Pantex for production. By using the same equipment and processing technologies, both LANL and Pantex manufacture parts by the same methods. The processes used by Pantex for HE component production would be used by LANL, except in rare cases where process and/or product improvements can be demonstrated to be cost effective and still meet production requirements. Transition of the HE fabrication processes from Pantex to LANL would require very little press development since equipment and processes are almost identical.

The transition period for transferring the HE fabrication mission to LANL is estimated to take 2 years after the ROD of this PEIS. HE main-charge components may exhibit dimensional instabilities (material creep) when stored for periods of time in excess of 6 to 8 months. Production scheduling plans for "just-in-time" manufacturing of HE components to be used in weapon assemblies. Additionally, extrudable HE used in weapons application, must be stored at -30 °C (-22 °F), and have a 24-hour room temperature working life before the materials cure and setup. The shelf life of the extrudables, when stored at -30 °C (-22 °F), is typically on the order of 6 to 8 months. Because of these concerns, it is not feasible to prebuild HE components during the transition period. It will be necessary for Pantex to remain operational for producing HE components until the receiver site becomes operational. For LANL, this transition period would require 2 years, with steady state operations beginning in fiscal year 1999.

Resource Requirements During Operations–High Explosives Fabrication Mission. HE operations are conducted within the existing LANL boundaries and occupy approximately 5,180 ha (12,800 acres). Table A.3.5.2–2 lists all the required facilities for HE fabrication operations at LANL and the footprint or area on the ground required for each facility.

General utilities and resource requirements including electric power, steam, natural gas, liquid fuels, and water would be supplied by existing LANL infrastructure. Capacity of the general utilities support is sufficient to meet the current requirements of the HE Fabrication Facility for R&D operations and an increase in capacity to meet production requirements is not needed. The utilities and resources consumed during operations include electric power, liquid fuels, natural gas, and water. Annual utility resource consumption rates and peak electric power rates for surge operation are estimated in table A.3.5.2–3.

TABLE A.3.5.2–3.—*Los Alamos National Laboratory High Explosives Fabrication Surge Operation Annual Utility Requirements*

Utility	Consumption	Peak Demand[a]
Electricity	5,600 MWh	1.0 MWe
Liquid fuel (L)	94,600	
Natural gas[b] (m^3)	3,650,000	
Coal (t)	0	
Water (L)	13,000,000	

[a] Peak demand is the maximum rate expected during any time.
[b] Standard cubic meters standard temperature and pressure.
Source: LANL 1995b:4; LANL 1995d.

LANL's HE fabrication processing facilities currently operate on a 4-day week, 10 hours per day, for 50 weeks per year. Maintenance personnel that support the HE processing equipment work a 5-day week, 8 hours per day. Routine and preventive maintenance is conducted on Fridays, as scheduling permits. Actual operational schedules will be dependent on workload and scheduling requirements.

Table A.3.5.2–4 provides the estimated number of additional direct operating and direct support personnel required at LANL to meet the HE fabrication requirements under base case surge (three shifts per day) operation. The DOE production control documents for the enduring stockpile systems would be used for planning and scheduling of the HE components needed to meet the production requirements. In addition, manpower estimates for manufacturing quality assurance parts and preparing surveillance samples for testing and evaluation have been included.

TABLE A.3.5.2–4.—*Los Alamos National Laboratory High Explosives Fabrication Surge Operation Workers*

Labor Category	Number of Workers
Direct workers	35
Direct support workers	30
Operations support workers	40
Indirect support workers	95
Total	200[a]

[a] Total surge employment. Increase to current employment would be 67.
Source: LANL 1995b:4; LANL 1995d.

Chemicals Consumed During Operation. The chemicals consumed during all HE fabrication operations are shown in table A.3.5.2–5.

Emissions During Operations. The HE fabrication operations at LANL do not require radiological materials. Under normal operations, no workers could be exposed to radiation. Emissions during operation are listed in table A.3.5.2–6. Gaseous environmental releases would result from operation of the thermal treatment units (incinerator baseline) for bulk HE waste and nonradioactive HE-contaminated waste. Emissions would also result from plant boiler operation, cleaning operations using solvents, and small scale synthesis operations, although the incremental amount of emissions over current operations would be very small. The thermal treatment units would be designed and operated to attain and maintain temperatures which would result in the destruction of hazardous constituents. Hazardous particulates would be trapped in filters. The releases would be limited to as low as achievable using the best available control technology.

Waste Management. Liquid and solid waste streams generated by the HE fabrication operations are processed to meet state, Federal, and DOE requirements for the various types of nonhazardous, hazardous, radioactive, and mixed wastes. LANL waste management facilities would be used to receive, track, characterize, treat, package, store, and ship wastes generated by HE plant operations. These facilities include a waste management operation, waste storage facility, sanitary wastewater treatment unit, and a sanitary and industrial landfill.

Nonhazardous wastes generated at the HE Fabrication Facility would primarily consist of solid sanitary waste, sludge from sanitary wastewater treatment, maintenance residues, and scrap parts. Materials unsuitable for recycle would be appropriately disposed of in an approved landfill. Liquid sanitary wastewater will be discharged to the environment after treatment, subject to the NPDES requirements.

Hazardous wastes generated by the HE Fabrication Facility would consist of solid residue from thermal treatment of scrap explosives and explosive-contaminated combustible materials, spent carbon from HE- and solvent-contaminated water treatment, and waste oils and paint residues from routine maintenance

TABLE A.3.5.2–5.—*Los Alamos National Laboratory High Explosives Fabrication Surge Operation Annual Chemical Requirements*

Chemical	Quantity (kg)	Chemical	Quantity (kg)
Acetone	2,722	Ethylene glycol	227
Acetonitrile	1,814	X-Ray film developer, fixer, and toners	227
Acid neutralizers/spill kits	272	HE powders	45,360
Adiprene polyurethane composition	45	Hydrochloric acid	45
Activated carbon	454	Hydraulic lube oils	2,268
Aluminum metal	454	Mild steel	454
Argon	907	Nitrogen	227
Carbon dioxide	227	Silicone elastomer	91
Cyanuric acid	454	Sodium hydroxide	227
Degreaser	45	Stainless steel	454
Desiccants/molecular sieves	136	Talc	454
Elastomer binders	227	Tetrahydrofuran	113
Ethanol	272	Toluene	680
Ethyl acetate	454	Water chemicals	91

Source: LANL 1995b:4; LANL 1995d.

TABLE A.3.5.2–6.—*Los Alamos National Laboratory High Explosives Fabrication Surge Operation Annual Emissions*

Pollutant	Quantity (kg)
Criteria Pollutants	
Carbon monoxide	4,540
Nitrogen oxides	22,700
Particulate matter	227
Volatile organics	4,540
Hazardous and Other Toxic Compounds	
Ammonia	454
Acetonitrile	4.5
Cyclohexane	2.3
Dioxane	2.3
Hydrogen chloride	113
Hydrogen fluoride	45.4
Methyl ethyl ketone	22.7
Toluene	22.7

Source: LANL 1995d.

operations. LANL would stabilize all hazardous materials for disposal/treatment at an approved RCRA disposal site.

Low-level radioactive waste would only be generated from A/D operations involving depleted uranium parts, or from processing of surveillance materials or other HE charges returned from stockpile with slight contamination. There would be no radioactive wastes associated with HE fabrication. In all cases, compliance with all appropriate regulations and standards concerning all wastes, including mixed waste, would be met.

HE residual materials, such as bulk HE machining scrap, off-specification HE components, HE-contaminated materials (including gloves, wipes, and rags) and process water generated during HE fabrication operations are the source of most of the waste material that must be processed. LANL uses waste minimization and recycle processes to reduce the amounts of material that ultimately must be subjected to waste treatment processes. Recycled scrap HE and HE-contaminated process water are not considered waste and are handled as in-plant operations.

Currently, thermal treatment of HE and HE-contaminated materials (open air burning and incinerators) are the preferred permitted techniques used to dispose of and decontaminate solid materials. LANL is looking at several alternative processes in the event state and Federal agencies do not approve permit applications. Some of these processes include base-hydrolysis decomposition of HE, followed by supercritical water oxidation, molten salt destruction, and bioremediation techniques. The open burning and incineration techniques at LANL are subject to environmental monitoring, and emissions must meet permit requirements.

HE-contaminated process water generated by synthesis and formulation processes, vacuum pump seal water, and HE machining processes, would be collected in tanks and then treated with activated carbon filters to remove residual HEs and solvents. The water would then be recycled or discharged to the environment subject to NPDES permit requirements. LANL collects sanitary wastewater in a separate system and routes it to septic tanks or sanitary waste water treatment facilities. Stormwater is collected separately, and a stormwater pollution prevention plan is in place.

The thermal treatment of HE scrap and HE-contaminated materials would result in emission of decomposition gases. Typical decomposition gases include carbon monoxide, oxide of nitrogen, volatile organics, hydrogen chloride, hydrogen fluoride, and ammonia. Small amounts of organic solvent vapors from materials such as toluene, acetone, methyl ethyl ketone, and ethyl acetate can also be generated during treatment processes as well as normal plant operations.

All LANL operations involving HE, including waste disposal, must comply with DOE/EV/106194 and meet explosives safety requirements. Buildings meet blast-resistant building construction standards and quantity distance criteria. Remote operations capabilities exist for disposal processes.

The HE fabrication process would generate the following waste and residual materials:

- Bulk HE machining scrap
- Off-specification HE components
- HE-contaminated materials, such as gloves and wipes, from manual cleaning operations
- Glycerin pressing fluid
- Developing materials from x-ray and n-ray film processing
- Hazardous contaminated materials from chemical bonding operations, packaging/repackaging, storing/staging, and shipping for ultimate disposal.

Several facilities exist within LANL's waste management infrastructure that process the plant non-HE wastes. These facilities are used to receive, track, characterize, treat, package, store, and ship wastes generated by HE fabrication operations. Included are a waste storage facility, a sanitary wastewater treatment unit, a sanitary and industrial landfill, and stormwater ponds. Hazardous waste that has been HE decontaminated would be handled through the LANL waste management operations at TA-54. The increased loading on the LANL infrastructure which handles these types of wastes would be minimal, requiring no additional capacity or facilities. The radioactive wastes, mixed wastes, hazardous wastes, and nonhazardous wastes generated during the surge operations are quantified in table A.3.5.2–7.

Transportation. All intrasite transportation required for manufacturing is done within existing site boundaries and does not require use of public roads. Appropriate HE shipping regulations as defined by DOE and DOT are followed.

The HE shipping and receiving facility is designed to ship and receive bulk HE materials to and from the HE Fabrication Facility. These materials are typically received in 4,500 to 9,000 kg (10,000 to 20,000 lb) lots. All completed charges are shipped following appropriate HE shipping regulations. All hazardous chemicals are shipped using appropriate DOT requirements.

A.3.5.3 *Relocate to Lawrence Livermore National Laboratory*

LLNL maintains self-contained HE RD&T, and fabrication capabilities at the remote explosives testing

TABLE A.3.5.2–7.—*Los Alamos National Laboratory High Explosives Fabrication Waste Volumes*

Category	Annual Average Volume Generated from Construction (m^3)	Annual Volume Generated from Surge Operations (m^3)	Annual Volume Effluent from Surge Operations (m^3)
Low-Level			
Liquid	None	None	None
Solid	None	Minimal	Minimal
Mixed Low-Level			
Liquid	None	None	None
Solid	None	None	None
Hazardous			
Liquid	None	4[a]	4
Solid	None	13	13
Nonhazardous (Sanitary)			
Liquid	None	5,900	5,880[b]
Solid	None	Included in liquid	17
Nonhazardous (Other)			
Liquid	None	6,930[c]	6,930
Solid	None	28	28

[a] Includes HE process solvents and contaminated oils.
[b] Assumes 350:1 wastewater to sludge ratio in treatment of liquid sanitary waste.
[c] Treated process water to NPDES permitted outfalls.
Source: LANL 1995b:3; LANL 1995b:4; LANL 1995d.

area, Site 300, and at the HE Applications Facility at the Livermore Site. LLNL has the facilities, equipment, and infrastructure to satisfy the current production requirements for the HE fabrication mission for all weapon systems in the enduring stockpile. The health and safety, materials management, and materials characterization (nondestructive examination, test fire, and chemical analysis) infrastructures are already in place and available to support the production function as well as the R&D function. No significant HE Applications Facility or Site 300 upgrades are anticipated to receive the mission for HE fabrication in the Complex. No deviations from the current baseline technologies at Pantex are anticipated.

Site 300 is dedicated to all aspects of HE RD&T and is remotely situated on 2,800 ha (7,000 acres) in California's Central Valley, 24 km (15 mi) east of the Livermore Site (figure A.3.5.3–1). Large-scale synthesis, formulation, and test firing is done at Site 300. The HE Applications Facility staff administers the technical work from the Livermore Site. Small-scale process development/prove-in would be done in the HE Applications Facility. The HE Applications Facility meets or exceeds all the applicable ES&H requirements for explosives R&D and production support. Synthesis and formulation would be performed in this building and would be locally supported by the theory and modeling efforts in the HE Applications Facility. A full spectrum of other HE activities take place at this facility, ranging from detonator development to experiments involving 10-kg (22-lb) detonations.

No significant upgrades to the HE Applications Facility would be required. Larger-scale work at Site 300 is done in parallel with the HE Applications Facility's small-scale process development. Both sites are fully self-contained installations. Site 300's synthesis and formulation complex provides the capability to conduct both remote and contact HE operations in facilities that meet current DOE design levels of environment, safety, and health protection criteria, as well as the current regulatory requirements of applicable Government agencies. LLNL would assume responsibility for providing all HE feedstock,

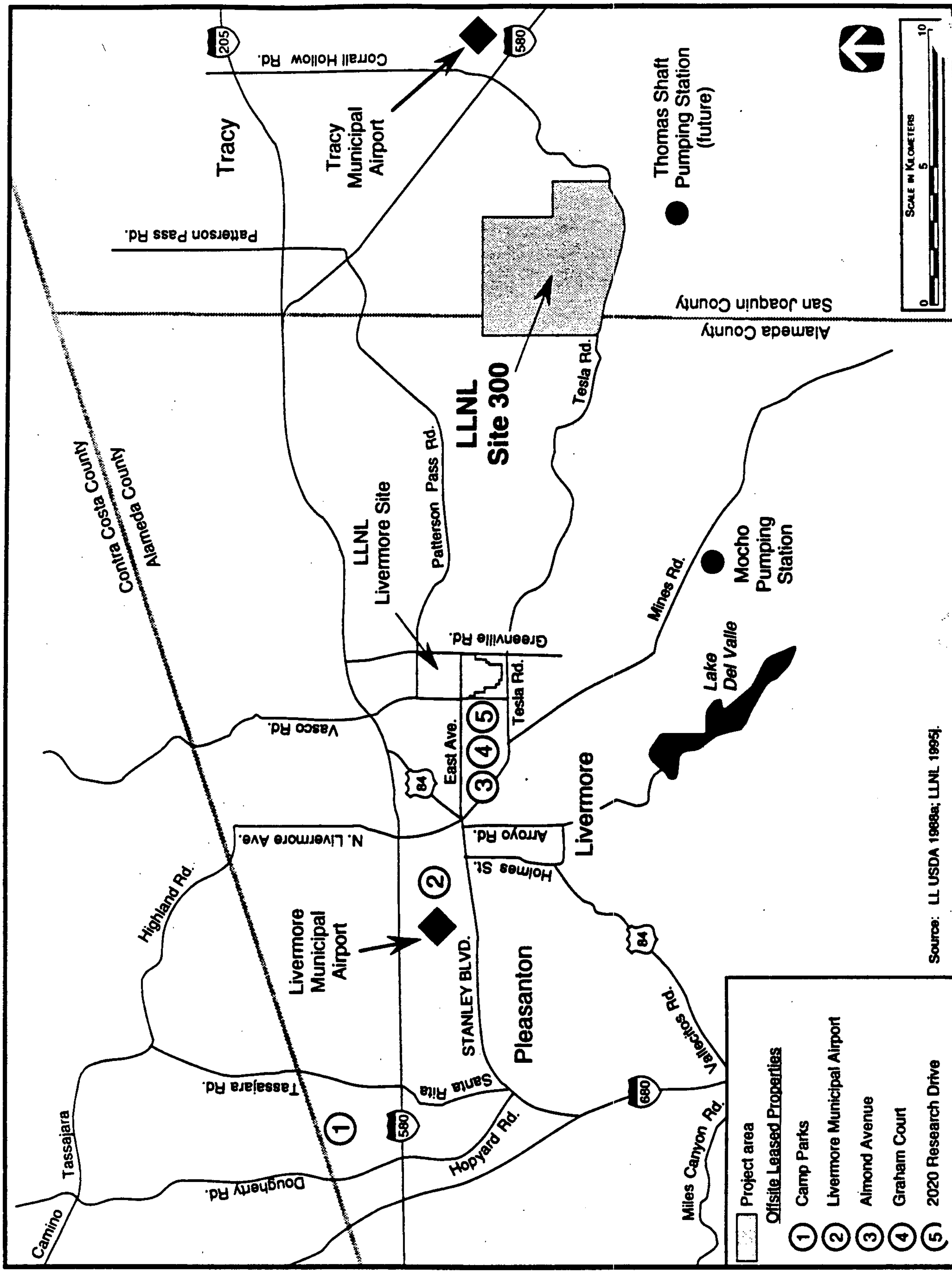

Tracy
Tracy Municipal Airport
Corral Hollow Rd.
205
580
Patterson Pass Rd.
Thomas Shaft Pumping Station (future)
San Joaquin County
Alameda County
LLNL Site 300
Tesla Rd.
Contra Costa County
Alameda County
LLNL Livermore Site
Patterson Pass Rd.
Mocho Pumping Station
Mines Rd.
Greenville Rd.
Lake Del Valle
Vasco Rd.
East Ave.
Tesla Rd.
84
Livermore
N. Livermore Ave.
Arroyo Rd.
Holmes St.
Highland Rd.
Livermore Municipal Airport
STANLEY BLVD.
Pleasanton
Vallecitos Rd.
Tassajara Rd.
Santa Rita
680
Tassajara
Hopyard Rd.
Doughery Rd.
Camino
Miles Canyon Rd.
Project area
Offsite Leased Properties
1 Camp Parks
2 Livermore Municipal Airport
3 Almond Avenue
4 Graham Court
5 2020 Research Drive
Source: LL USDA 1988a; LLNL 1995j.
Scale in Kilometers
0 5 10

TABLE A.3.5.3–1.—*Lawrence Livermore National Laboratory High Explosives Fabrication Products and Capabilities*

Products	Capabilities
High Explosives	**Manufacturing Process Development**
	Support stockpile stewardship
	Formulation
	Synthesis
	Surveillance
	Main charge manufacturing
Binders	Pressing
	Machining
	Subassembly
	Receiving/storage
	Quality assurance-mechanical/chemical/test fire
	Disposition
Main Charge Formulations	**Energetic Component Manufacturing**
	Pressing
	Machining
	Subassembly
	Quality assurance-mechanical/chemical/test fire
Initiation High Explosives	**Detonators**
Mock High Explosives Formulations	**Testing**

Source: LLNL 1995j.

main charge and component procurement, and fabrication as required by the production mission. The products and capabilities for which LLNL would be responsible are shown in table A.3.5.3–1.

Assumptions. The specific assumptions for the HE fabrication mission at LLNL are as follows:

- All production operations can be housed within existing buildings with one exception: modifications would be undertaken only when necessary or where it could be shown to be cost-effective. Modifications include moving, adding or subtracting walls, relocating existing equipment, purchasing new equipment and all associated costs.
- DOE R&D funding for present HE activities would continue at the current level in fiscal year 1995 dollars, adjusted for inflation. This includes mutually dependent R&D missions and interfacing activities. The Work for Others category of activities in energetic materials would remain at least at constant fiscal year 1995 levels and would likely increase.
- Baseline technologies would be employed except where alternatives could be shown to meet requirements and be more cost effective (i.e., faster, better, and/or cheaper). Technical shortfalls identified in the current baseline technology would be addressed with alternative technology.
- The LLNL health and safety structure is adequate to support production needs. Additional staff would be added, if required.

- The LLNL materials management infrastructure could fulfill all material, control, and accountability plus shipping and receiving requirements for the production operation. Additional staff would be added, if required.

- The LLNL waste management infrastructure is adequate to deal with any new or additional waste streams. Additional staff would be added, if required.

- LLNL has adequate safeguards and security infrastructure to deal with the production mission. Additional staff would be added, if required.

- LLNL would not store excessive quantities of conventional HE or insensitive HE. In certain cases, there would be room to expand existing storage capacities by moderate amounts, as necessary, to accommodate production throughput requirements.

- A separate management structure, capable of implementing the production operation and fulfilling all quality assurance and certification requirements, would be put in place if LLNL is selected for the HE production mission.

- A site-specific EIS would most likely not be needed to fulfill NEPA requirements for the overall production mission. The need for further NEPA documents would be assessed, as appropriate.

- The first production unit for new HE production would be October 1, 1998.

- A 27-month period, commencing July 1, 1996, would be an adequate transition time with the only exception being Pantex D&D overhead costs and safe shutdown costs.

- Dismantlement schedules would not affect first production unit for HE production.

Transition of High Explosives Fabrication Mission to Lawrence Livermore National Laboratory. LLNL maintains a full-spectrum HE RD&T and fabrication capability. The energetic materials program is conducted at Site 300 and in the HE Applications Facility at the Livermore Site. LLNL has maintained the ability to fabricate sizable numbers of HE components on an annual as-needed basis in support of the nuclear test schedule and in support of DOD projects and missions. Assumption of the production and fabrication of HE components and materials mission would be a readily accommodated incremental increase to the workload currently supported by the HE technology at LLNL.

Small-scale process development/prove-in would be done at the HE Applications Facility, which meets or exceeds all applicable ES&H requirements for explosives R&D and production support. Synthesis and formulation would be performed in this building. The full spectrum of other HE-required activities takes place here, ranging from detonator development to experiments involving 10-kg (22-lb) detonations. No significant upgrades to the HE Applications Facility would be required.

Large-scale synthesis and formulation is currently done at Site 300. The HE Applications Facility staff administers the technical work performed at Site 300 to ensure full program synergy. Thus the larger scale work at Site 300 is done in parallel with the HE Applications Facility's small-scale process development. It is not necessary to ship significant quantities of HE (>10 g) between the locations: Site 300, like the HE Applications Facility, is a fully self-contained installation. There are no public roads at the site, and population encroachment is not an issue. LLNL would be able to perform synthesis and formulation manufacturing of required energetic materials and main charge fabrication at Site 300 for the foreseeable future. Site 300 facilities contain the necessary equipment for fabrication work. Specialized equipment needed for R&D of new processes and of the next generation of explosives, which may be required by the enduring stockpile, are currently available at Site 300. For example, three deaerator loaders for injection loading of explosives that range in capacity from 50 g to 23 kg (1 ounce to 50 lb) are fully operational.

Both the HE Applications Facility and the synthesis, formulation, and production area at Site 300 have local analytical capability. To enhance capabilities in a cost-effective fashion, the HE program also extensively utilizes LLNL's main analytical laboratories. The Site 300 synthesis and formulation complex is located near the associated HE activities (e.g., the processing area, the engineering area, the radiography laboratory, the environmental test facilities, and the hydrodynamic test bunkers). LLNL analytical capabilities are such that no problems are anticipated in developing the appropriate characterization infrastructure to support the new mission. Test fire capabilities at many levels of charge size exist at Site 300 and in the HE Applications Facility.

LLNL synthesis and formulation staff with present facilities can produce plastic bonded explosives fabrication levels of 450 kg/week (1,000 lb/week) which would be sufficient to meet anticipated production requirements. There would be no facility capacity restrictions for the envisioned material quantities.

The LLNL waste minimization program has reduced the waste associated with HE manufacturing. The HE fabrication mission quantities would involve levels of HE waste generation that are well within disposal capability limits and NEPA/CEQ requirements.

Facility Description. The facility at LLNL would consist of a fabrication facility consisting of one main functional area; HE technology with four main functions: HE main-charge fabrication, small HE formulation and synthesis; and HE testing and characterization. LLNL has the facility infrastructure shown in table A.3.5.3–2 available to support the HE fabrication mission.

In addition to the facilities listed in table A.3.5.3–3 that are to be used directly in support of HE fabrication, 11,000 m^2 (119,000 ft^2) of other support facilities at Site 300 and at the Livermore Site would be available for support of HE fabrication efforts. There are also 8,600 m^2 (92,935 ft^2) of support facilities at Site 300 and at the Livermore Site. The nondestructive evaluation, chemical analysis, or characterization areas that directly support the HE effort are critically important support facilities for other LLNL missions and would remain whether or not HE fabrication is carried out as a LLNL mission.

TABLE A.3.5.3–2.—*Lawrence Livermore National Laboratory High Explosives Fabrication Facility Infrastructure*

23 buildings (Site 300 and Livermore Site)
66 magazines (200,000 lb limit)
Working space (68,000 ft^2)
Waste tanks for all buildings
Backup power for all buildings and equipment
Independent boilers for all buildings
Independent compressors for all buildings
Air exchange cycle rate of 4 per hour per laboratory
Facilities meet all DOE explosives safety requirements
Operations are fully permitted
Open burning for disposal of minimized HE waste permitted

Source: LLNL 1995j.

Design Safety. The following sections identify important safety considerations incorporated in the design of DOE facilities. Performance goals commensurate with the associated hazard are selected for all structures, systems, and components. The term "hazard" is defined as a source of danger, whether external or internal. Natural phenomena such as earthquakes, extreme winds, tornadoes, and floods are external hazards to structures, systems, and components; whereas, toxic, reactive, explosive, or radioactive materials contained within the facilities are internal hazards. The usage category is established by DOE management.

Earthquake. All existing HE plant structures at Site 300 meet all current applicable standards. New plant structures, systems, and components, when required, shall be designed for earthquake-generated ground accelerations in accordance with *Design and Evaluation Guidelines for DOE Facilities Subjected to Natural Phenomena Hazards* (UCRL-15910), with applicable seismic hazard exceedance probabilities of $2x10^{-3}$ for general use (performance category 1), $1x10^{-3}$ for low and moderate hazard (performance categories 2 and 3), and $2x10^{-4}$ for high hazard (performance category 4) structures, systems, and components.

Wind. All existing HE plant structures at Site 300 meet the wind criteria as discussed below. All new plant structures, systems, and components would be designed for wind or tornado load criteria when required in accordance with UCRL-15910 and the corresponding facility usage and performance goals. Wind loads shall be based on the annual probabilities of exceedance of $2x10^{-2}$ for the general and low hazard (performance category 1 and 2), $1x10^{-3}$ for the moderate hazard (performance category 3), and $1x10^{-4}$ for the high hazard (performance category 4) structures, systems, and components. Wind design criteria is based on annual probability of exceedance, importance factor, missile criteria, and atmospheric pressure change as applicable to each performance (usage) category as specified in UCRL-15910.

Floods. All HE facilities and buildings at Site 300 are located above the critical flood elevation from the potential flood source (river, dam, levee, and precipitation). The extent of the flood hazard is determined, using the appropriate usage (performance) category for determining the Annual Hazard Probability of Exceedance: $2x10^{-3}$ for general use (performance category 1), $5x10^{-4}$ for important or low hazard (performance category 2), $1x10^{-4}$ for moderate hazard (performance category 3), and $1x10^{-5}$ for high hazard (performance category 4) facilities as defined in UCRL-15910.

The critical flood elevation is determined by obtaining the appropriate design basics flood level. The design basics flood level is the peak hazard level (flow rate and depth of water) corresponding to the mean Annual Hazard Probability of Exceedance or combinations of flood hazards (river flooding and wind-wave action), and corresponding loads associated with peak hazard level and applicable load combinations (hydrostatic and/or hydrodynamic forces and debris loads). LLNL site drainage conforms to the governing local agency regulations. The minimum design level for the stormwater management system is the 25-year 6-hour storm, but potential effects of larger storms up to the 100-year 6-hour storm are also considered.

Fire Protection. The fire protection features for the existing plant and its associated support buildings are in accordance with DOE orders and the National Fire Protection Association Fire Codes and Standards. A fire hazards analysis would be performed to assess the risk from fire to the HE Fabrication Facility within the individual fire areas of the facility. All fire sprinkler water that has been discharged during and after a fire would be contained, monitored, sampled and, if required, retained until it could be disposed.

Safety Class Instrumentation and Control. The safety classification of instrumentation and controls is derived from the safety functions each performs. This safety classification is based on appropriate DOE orders. HE facilities at Site 300 that utilize instrumentation for explosives operations currently meet safety class requirements.

Ventilation. The heating ventilation and air conditioning system provides environmental conditions for the health and comfort of personnel and for equipment protection.

Internal Explosion. New and existing buildings are designed for the effects of accidental explosions within a bay or cell. The design is in accordance with DOE/EV/06194, including the quantity-distance and the level-of-protection criteria for each class of explosives activities. Additional resource documents for the siting and design of explosives facilities listed in the above-referenced manual are utilized to provide a safe design where applicable.

Safeguards and Security System Description. Site 300 is surrounded by multiple fences for security. Although not indicated on the plot plan, there are two security access areas within which various components of the HE Fabrication Facility are located: the limited area and the property protection area. The property protection area surrounds the limited area. Main-charge pressing, machining, and inspection; HE and conventional explosives shipping and receiving; and explosives storage would be performed within a limited area. Synthesis and formulation and test firing would also be performed within a limited area. Most other support facilities would be in a property protection area. All security access areas meet DOE safeguards and securities standards for the proscribed activities associated with HE main-charge fabrication and associated activities for nuclear weapons applications.

Overall Facility Layouts and Design Descriptions. The HE fabrication facilities are described in tables A.3.5.3–3, A.3.5.3–4, and A.3.5.3–5, which summarize facility data for buildings and support areas including the structure footprint area, construction material, and the security area. Structures con-

TABLE A.3.5.3–3.—*Lawrence Livermore National Laboratory High Explosives Fabrication Facility Data*

Facility Function	Building[a]	Construction Type	Footprint (m^2)	Number of Levels	Special Materials	Access Area
Main Charge Fabrication						LA
Pressing		Concrete		1	HE	
Machining	817		300			
	806		600			
	809		150			
Subassembly						
Physical prop	810		500			
	HEAF		66			
Small High Explosives Components	HEAF	Concrete	30	1	HE	LA
	826		160			
Main Charge Test Fire	851	Concrete	1,000	1	HE	LA
High Explosives Formulation and Synthesis	826		160			LA
	827A		155			
	827C		168			
	827D		168			
	827E		168			
Conventional High Explosives Storage	New	Concrete	116	1	HE	LA
Explosives Storage	854J	Concrete	500	1	HE	LA
Explosives Shipping, Receiving, and Inspection	805	Concrete	636	1	HE	LA
High Explosives Test Firing and Characterization	HEAF	Concrete	28	2	HE	LA
	222		28	1	non-HE	LA
	235		28	2	non-HE	LA
	241		9	2	non-HE	PPA
Nondestructive Evaluation	823	Steel	255	1	HE	LA
Metrology	806 (room 105)	Concrete	90	1	HE	LA

[a] High Explosives Applications Facility (HEAF) is Building 191 on the Livermore Site; all other buildings are at Site 300.
Note: LA - limited area; PPA - property protection area.
Source: LLNL 1995j.

TABLE A.3.5.3–4.—***Lawrence Livermore National Laboratory Support Facilities Description***

Facility Name	Building	Construction Type	Footprint (m^2)	Number of Levels	Special Materials	Access Area
Central shipping and receiving warehouse	875	Steel	1,380	2	None	PPA
Effluent monitoring/ meteorological tower						PPA
Facility maintenance shops	873	Steel	1,400	2	None	PPA
Vehicle maintenance facility	879	Steel	255	1	None	PPA
Fire station and security	870 and 882	Steel	557	1	None	PPA/LA
Medical center	877	Steel	310	1	None	PPA
Administration	871	Steel	930	1	None	PPA
Change house/laundry	813	Steel	262	1	None	PPA
Cafeteria	880	Steel	218	1	None	PPA
ES&H lab	222					LA
Helicopter pad						PPA
Storage yard			1,860			PPA
Parking						PPA

Note: LA - limited area; PPA - property protection area.
Source: LLNL 1995j.

TABLE A.3.5.3–5.—***Lawrence Livermore National Laboratory Support Function Facilities Description***

Facility Name	Building	Construction Type	Footprint (m^2)	Special Materials	Access Area
Plant Utilities					
Utility building		Steel	670	None	PPA
Water storage tanks			76		PPA
Raw water supply			186		PPA
Plant water treatment	All located in General Services Area		427		PPA
Tower cooling water facility			560		PPA
Firewater storage tank and pumphouse			370		PPA
Switchyard			186		PPA
Emergency generator		Steel	130	None	PPA
Diesel fuel storage			93		PPA
Nitrogen tanks			200		PPA
Waste Management		Concrete		HE	
Explosives waste management, handling, storage, and treatment	816, M1 through M5		96 129 827		PPA
Sanitary wastewater treatment	845		4,645	non-HE	PPA

Note: PPA - property protection area.
Source: LLNL 1995j.

taining explosives are generally constructed from steel-reinforced concrete and are designed to mitigate the efforts of a potential accidental explosion. Although insensitive HE materials can generally be processed in conventional steel structures, concrete construction is typically used in current facilities to maintain the flexibility to process conventional explosives. The resulting facility design typically consists of a number of separate operating bays that could vent to an unoccupied area should a detonation occur. This is true for existing buildings which meet current and anticipated explosives safety requirements. Structures that do not require concrete construction due to the presence of HE are generally constructed of steel, although portions of these buildings may be concrete. One-half of Building 875 would be used for inert storage for this mission.

High Explosives Main-Charge Manufacturing. These buildings compose the facility that fabricates main-charge hemispheres, mock main-charge hemispheres, and explosive test specimens. The various functional areas are described below:

<u>Isostatic Pressing.</u> Rough pressings for HE main-charge hemispheres and material test billets would be fabricated in Buildings 817A, B, C, D, E, and F, which are moderate hazard (performance category 2) facilities.

<u>Explosives Machining.</u> The rough pressings are machined into hemispherical shapes or test elements in Buildings 806 and 809.

<u>High Explosives Main-Charge Subassembly.</u> The explosive hemisphere assembly would be done in Buildings 810A and 810B.

<u>High Explosives Shipping and Receiving.</u> Building 805 is designed to ship, receive, and inspect HE bulk and parts (both conventional and insensitive HE).

<u>High Explosives Storage.</u> Building 854J comprises 378 m^2 (4,068 ft^2) and has more than adequate space available for bulk and parts storage and staging.

<u>Conventional High Explosives Storage.</u> A facility would be constructed at the HE storage area near M30 and M34. This 116-m^2 (1,250-ft^2) facility would have a 11,350-kg (25,000-lb) conventional HE bulk and parts storage and staging capacity.

Small High Explosives Component Fabrication. This activity fabricates small HE weapon components and test assemblies. Various small components are fabricated from HE powders and binders, metal or plastic components, electrical components, hardware, and assembly materials. The fabrication process requires equipment for explosive powder heating, pellet pressing, laser welding, ultrasonic cleaning, extrusion loading, density testing, and mechanical assembly. Functions are described below.

<u>Pellet Pressing.</u> Small pellets are pressed to density specifications for small energetic component assemblies in Building 191 (HE Applications Facility).

<u>Extrusion Loading.</u> Extrudable (paste) explosive is loaded onto small fixtures for small component assemblies in Building 826.

<u>Small Component Assembly.</u> Small HE pellets and/or fixtures containing extrudable paste explosive are assembled with inert parts to make small components in Building 810A.

High Explosives Formulation and Synthesis. This activity has the capability to produce a variety of explosive materials from chemical reactants and commercially produced explosives.

<u>High Explosives Formulation.</u> For purposes of this analysis, material lots up to about 90 kg (200 lb) are assumed to be produced through a series of batch operations in Buildings 826 and 827C, D, and E. Some products are used to make small HE weapon components while other products support the development of new explosives or explosives fabrication processes.

<u>High Explosives Synthesis.</u> Buildings 827C, D, and E contain a variety of vessels, filters, and transfer pumps which are used to synthesize, recrystallize, blend, and wash explosive powders. The facility also includes bays for mixing/milling, particle-size reduction, drying/weighing/packaging, solvent storage, and refrigerated storage for explosives and chemicals.

High Explosives Testing and Characterization. Explosives test configurations are assembled and detonated. The test data characterizes the explosives performance and are required for the qualification of raw materials and production lots. Testing requires explosives containment chambers and an array of special instrumentation, including streak cameras, rotating mirror framing cameras, an air image converter system, oscilloscopes and digitizers, flash x-ray systems, and velocity interferometers.

High Explosives Test Firing. Energetic materials components are test fired at the HE Applications Facility, Building 191, at the Livermore Site. This facility has a considerable gas gun capability with 10-kg (22-lb) (trinitrotoluene [TNT]-equivalent) rated contained-firing tank. This facility has a total of six contained firing chambers which range in HE capacity from a few grams to 10 kg (22 lb) (TNT-equivalent).

The remote firing facility, Building 851 at Site 300, is remotely located from HE fabrication operations and includes an outdoor firing capability to conduct large-scale explosives tests that cannot be performed in a test chamber, such as main charges for explosives lot certification.

Nondestructive Evaluation. Building 823 is an area where explosive and inert components are inspected with radiography equipment to detect flaws, cracks, and voids.

Mechanical Properties Testing. The mechanical properties of explosive components and materials are tested in Building 191 (Livermore Site) to support lot certification for materials and components and to support fabrication development. The test configurations are assembled, and tensile and compressive tests are conducted.

Analytical and Materials Characterization Laboratories. Chemical analyses are performed on explosive and nonexplosive materials in Buildings 191, 222, 235, and 241 (Livermore Site) to determine or verify their characteristics. The data obtained yield valuable information about the condition and composition of the material. The methods used include gas chromatography, liquid chromatography, size exclusion chromatography, infrared spectroscopy (Building 222), particle characterization (Building 241), atomic spectroscopy, emission spectroscopy (Building 235), and thermal analysis (Building 191).

Material Compatibility Testing. Test coupons are assembled such that the subject materials are in direct contact with each other in Building 810A. These coupons are then placed in environmental ovens to accelerate the aging process. Gas samples are peri[illegible]ically taken from the coupon containers a[illegible] analyzed. Compatibility testing is required to certify new materials for weapon use.

Process Support Systems. Process support for the HE fabrication operation includes a machine shop and ES&H laboratory, as well as other plant general services facilities. These facilities directly support the HE fabrication mission, as well as existing, ongoing missions such as RD&T and other activities at LLNL.

Resource Requirements During Construction. All HE fabrication operations can be housed within existing buildings except for the conventional HE storage building. This building would have 11,350 kg (25,000 lb) conventional HE bulk and parts storage capacity and a 116 m^2 (1,250 ft^2) staging capacity. The total construction requirements for materials and utilities are shown in table A.3.5.3–6. Peak construction year emissions and construction worker requirements are shown in tables A.3.5.3–7 and A.3.5.3–8, respectively.

TABLE A.3.5.3–6.—*Lawrence Livermore National Laboratory High Explosives Fabrication Construction Materials/Resources Requirements*

Material/Resource	Total Consumption[a]	Peak Demand
Electricity (MWe)	15MWh	0.2 MWe
Water (L)	1,230,000	
Concrete (m^3)	190	
Steel (t)	15	
Liquid fuel, and lube oil (L)	9,500	
Industrial gases[b] (m^3)	3	

[a] Total construction period is 1 year.
[b] Cubic meters at standard temperature and pressure.
Source: LLNL 1995i:3; LLNL 1995j.

Resource Requirements During Operations–High Explosive Fabrication Mission. Table A.3.5.3–3 lists all the required facilities for HE fabrication operations at LLNL and the footprint or area on the ground required for each facility. Requirement[illegible] operate the LLNL HE fabrication facilities are show[illegible] in tables A.3.5.3–9, A.3.5.3–10, and A.3.5.3–11. The HE Fabrication Facility is located on approximately

TABLE A.3.5.3–7.—*Lawrence Livermore National Laboratory High Explosives Fabrication Construction Emissions*

Pollutant	Quantity (kg)
Carbon monoxide	7.3
Oxides of nitrogen	2.7
Particulate matter	0.9
Sulfur dioxide	0.23
Volatile organic compounds	1.4

Source: LLNL 1995i:3; LLNL 1995j.

TABLE A.3.5.3–8.—*Lawrence Livermore National Laboratory High Explosives Fabrication Construction Workers*

Employees	Year 1
Craftworkers	
Carpenter	3
Concrete mason	1
Electrician	1
Iron worker	1
Laborer	1
Millwright	1
Operator	1
Other craftworkers	1
Pipe fitter	1
Sheet metal worker	1
Sprinkler fitter	1
Teamster	1
Construction management and support staff	5
Total Employment	19

Source: LLNL 1995i:3; LLNL 1995j.

TABLE A.3.5.3–9.—*Lawrence Livermore National Laboratory High Explosives Fabrication Surge Operation Annual Utility Requirements*

Utility	Consumption	Peak Demand[a]
Electricity	4,300 MWh	1 MWe
Liquid fuel (L)	53,100	
Natural gas[b] (m^3)	None	
Water (L)	58,200,000	

[a] Peak demand is the maximum rate expected during any time.
[b] Cubic meters measured at standard temperature and pressure.
Source: LLNL 1995i:3; LLNL 1995j.

TABLE A.3.5.3–10.—*Lawrence Livermore National Laboratory High Explosives Fabrication Surge Operation Workers*

Labor Category	Number of Employees
Direct workers	52.5
Direct support workers	42
Operations support workers	17
Facilities support workers	8.9
Indirect support workers	112
Total	232[a]

[a] Total surge employment. Increase to current employment would be 100.
Source: LLNL 1995i:2; LLNL 1995i:3; LLNL 1995j.

2,800 ha (7,000 acres) of land at Site 300. The additional utilities and fuel required for conducting the HE fabrication mission at LLNL are shown in table A.3.5.3–9.

The facility operations required to meet the HE fabrication mission at LLNL are based on a single shift per day, 50 weeks per year, 40 hours per week, for 250 days of operational time annually. Maintenance time and scheduling for manufacturing operations would be based on equipment and facility-specific requirements and, as such, routine maintenance would be performed as needed and scheduled such that there is minimal impact to operation schedules by correlating equipment maintenance with maintenance schedules for plant activities.

The number of workers required at LLNL to accomplish the HE fabrication mission at LLNL are shown in table A.3.5.3–10.

Chemicals Consumed During Operations. The chemicals consumed during all HE fabrication operations at LLNL are shown in table A.3.5.3–11. The HE fabrication operations do not require radiological materials and no workers would be exposed to radiation under normal operations.

Emissions During Operations. The additional emissions that would result from accomplishing the HE fabrication mission are shown in table A.3.5.3–12.

Waste Management. The liquid and solid waste streams generated by the HE fabrication mission

TABLE A.3.5.3–11.—*Lawrence Livermore National Laboratory High Explosives Fabrication Surge Operation Annual Chemical Requirements*

Chemical	Quantity (kg)	Chemical	Quantity (kg)
Acetone	227	Helium	45
Acetonitrile	91	Heptane	45
Activated charcoal	45	Hydraulic/lubricating oil	908
Adiprene polyurethane composition	45	Hydrochloric acid	68
Aluminum metal	454	Joint compound	45
Ammonia	454	Kimwipes	908
Aqueous film forming foam	91	Micro liquid lab cleaner	5
Circlene Fg 20	91	Mild steel metal	454
CLEPOX 143	91	Molecular sieve	45
Copper/CuO wire	9	Neutrasorb acid neutralizer	45
Copper metal	23	Nitrogen	227
Cyanuric acid	45	Paint	454
Degreaser	5	PLANISOL-M concentrate	23
Desiccants	91	Polyalkylene and ethylene glycol	14
Dispersant	23	Potassium hydroxide	45
Dry air	136	Silicone elastomer	91
DUST-OFF	23	Siliconized ammonium phosphate base	5
ECO-STAR	23	Sodium hydroxide	45
Electrode/probe solutions	23	Solksorb solvent absorbent	227
Ethyl alcohol	91	Sulfuric acid	23
Ethyl acetate	136	TALC	5
Fixer and replenisher	91	Tetrahydrofuran	227
Glass cleaner	45	TISAB with CDTA	14
Glass beads	145	Toluene	227
Glycerine	68	Toner	23
HE powders, insensitive	54,432	Trichlorotrinitobenzene	23
HE powders, conventional	18,144	Water treating chemicals	91

Source: LLNL 1995i:3; LLNL 1995j.

would be processed to meet Federal, state, and DOE requirements for the various types of nonhazardous, hazardous, and radioactive wastes. Waste management facilities and assets would be used to receive, track, characterize, treat, package, store, and ship wastes generated by HE fabrication. Facilities would include a waste management operation, waste storage facility, sanitary wastewater treatment unit, and a sanitary and industrial landfill.

Nonhazardous waste generated at the HE Fabrication Facility would consist primarily of solid sanitary waste, sludge from sanitary wastewater treatment, maintenance residues, and scrap parts. Materials unsuitable for recycling would be disposed of appropriately. Liquid sanitary wastes would be collected by independent underground septic tanks at HE fabrication buildings and by sewer pipe systems from most of the support buildings in the General Services Administration area and routed to the domestic sewage lagoon for evaporation and percolation. Excess water would be discharged to a natural drainage channel. Sewage sludge would be disposed of in offsite sanitary and industrial landfills. Process wastewater would be sent to holding tanks for treatment and recycling, where appropriate. Stormwater from all areas of Site 300 would go into natural drainage channels. Nonhazardous rinsewater from

TABLE A.3.5.3–12.—*Lawrence Livermore National Laboratory Incremental Annual Emissions During Operations*

Pollutant	Quantity (kg)
Criteria Pollutant	
Carbon monoxide	1,315
Nitrogen oxides	349
Ozone (as VOC)	45
Particulate matter	27
Sulfur dioxide	24
Hazardous and Other Toxic Compounds	
Ammonia	4.5
Acetonitrile	14
Bisphenol alpha epichlorohydrin	0.5
Benzene	0.2
Chloroform	0.5
Cresylic acid	0
Cyclohexane	0.5
Dibutyl phthalate	0.05
1,2-Dichloroethane	0.9
Dimethyl formamide	0.5
Dioxane	0.5
Ferric ferrocyanide	0
Hexane	0.5
Hydrogen chloride	11.3
Hydrogen fluoride	22.7
Hydrogen sulfide	0.2
Mercury	0
Methanol	4.5
Methyl ethyl ketone	22.7
n-Butyl glycidyl ether	0.2
Propylglycol methyl ether	0.5
Toluene	2.3
Trichloroethylene	0.2
Triethylamine	0.2
2,2,4-Trimethyl-1, 3-pentane-diol isobutyrate	0.5
Xylene	2.3

Source: LLNL 1995i:3; LLNL 1995j.

HE formulation and machining operations is discharged to a surface impoundment for evaporation.

Hazardous wastes generated by the HE fabrication mission would consist of solid residue from thermal treatment (open burning) of scrap explosives and explosives-contaminated combustible materials. This residue and other hazardous wastes, such as waste oils and paint residues, would be properly packaged and managed for offsite treatment and disposal at RCRA-permitted facilities.

HE residual materials such as bulk HE machining scrap and off-specification HE components and HE-contaminated materials, including gloves, wipes, rags, and process water generated during HE fabrication operations, would be the source of most of the waste material that would be processed. Waste minimization and recycle processes would be used to reduce the amounts of material that ultimately must be subjected to waste treatment processes. Scrap HE and HE-contaminated process water that are recycled are not considered waste and would be handled as in plant operations.

Currently, thermal treatment of HE and HE-contaminated materials (open air burning) is the preferred permitted technique used to dispose of and decontaminate solid materials. Next generation, more environmentally benign destruction technologies are being developed and would be incorporated when available and appropriate.

HE-contaminated process water generated by synthesis and formulation processes, and vacuum pump seal water would be collected in tanks and analyzed for appropriate waste classification and then disposed of as appropriate. Water from HE machine processes would be filtered through a weir and clarifier system and then discharged to holding ponds. Sanitary wastewater would be collected in a separate system and routed to septic tanks or sanitary wastewater treatment facilities. Stormwater would go into natural drainage channels at Site 300.

The utilities required for operation of waste treatment functions associated with the HE fabrication processes would include water, electric power, liquid fuels, steam, compressed air, and propane gas. These utilities are also used in normal HE plant operations and would not pose any significant increase in consumption nor any unique requirements.

The wastes and emissions generated during HE fabrication waste treatment operations would include gaseous decomposition products of combustible materials, hazardous solid waste, and nonhazardous solid and liquid wastes. Hazardous wastes consisting of solid residue (ash) from the thermal treatment process would be characterized, packaged, and sent to an approved RCRA-permitted disposal site. Non-hazardous wastes generated by HE fabrication would consist of solid sanitary waste, sludge from sanitary wastewater treatment, and other noncombustible parts. Materials that cannot be recycled would be sent to an approved landfill.

All operations involving HE must comply with DOE/EV.106194 and meet explosives safety requirements. Buildings must meet blast-resistant building construction standards and quantity-distance criteria. A capability for remote operations would also be necessary for disposal processes. The design would incorporate spill-prevention control and countermeasure elements.

The Livermore Site and Site 300 waste management facilities to support the HE fabrication mission include:

- The waste management facility, which provides space and equipment for receiving, tracking, packaging/repackaging, and shipping of solid and liquid wastes. Areas are segregated by waste type. Operating areas are provided for waste staging and container storage.

- The waste storage facility, which stores hazardous waste for up to 1 year of operation prior to offsite treatment/disposal. An explosive waste storage facility is currently being constructed and permitted to manage explosive wastes. Storage and staging areas are segregated by waste type. Equipment and design features are provided for handling drums, controlling spills, and monitoring.

- The open burn facility, which treats scrap explosives and explosive-contaminated combustible material. Plans and permits are being pursued for a new open burn and open detonation facility to treat high explosives.

- The Livermore Site, which has the ability to handle and store mixed and LLW wastes, and the HE Fabrication Facility would have the ability to handle these types of wastes if required.

- The HE fabrication facilities, all of which have a septic tank system. Industrial wastewater would be placed in holding tanks for chemical analysis to determine proper disposal method. Nonhazardous HE rinsewater is disposed of onsite in a permitted surface impoundment. Other liquid industrial wastes are shipped offsite for disposal.

Table A.3.5.3–13 lists the incremental quantities of the types of wastes that would be generated at LLNL to accomplish the HE fabrication mission.

Transportation. Transportation requirements exist at both the Livermore Site and Site 300 (intrasite) and between the HE Fabrication Facility and the A/D site (intersite).

Intrasite Transportation. Transportation of products within the HE Fabrication Facility would be performed by LLNL transportation, meeting all applicable DOT and DOE criteria for transportation of the energetic materials. Transportation of classified products within the HE Fabrication Facility would be performed by LLNL transportation which meets DOE safeguards and security criteria for transporting classified products. Subsequent movements of HE and explosive products would be performed by vehicles specifically designed for this purpose. The quantity of HE (conventional and insensitive) transported onsite by these trucks would be strictly limited. HE products would be transported by appropriate vehicle to an HE staging area for eventual recycle or disposal onsite. HE waste would be collected, transported, and disposed of, as appropriate, for explosives materials.

Intersite Transportation. Transportation of the products from the HE Fabrication Facility would be performed by commercial vendors that meet all applicable DOT and DOE criteria for transportation of the specified materials. Transportation of classified products from the HE Fabrication Facility to the A/D plant would be performed by commercial vendors that meet DOE safeguards and security criteria for transporting these classified products, as well as DOT

TABLE A.3.5.3–13.—*Lawrence Livermore National Laboratory High Explosives Fabrication Waste Volumes*

Category	Annual Average Volume Generated from Construction (m^3)	Annual Volume Generated from Surge Operations (m^3)	Annual Volume Effluent from Surge Operations (m^3)
Low-Level			
Liquid	None	None	None
Solid	None	Minimal	Minimal
Mixed Low-Level			
Liquid	None	None	None
Solid	None	None	None
Hazardous			
Liquid	1	3	3
Solid	2	54	54
Nonhazardous (Sanitary)			
Liquid	454	7,270	7,250[a]
Solid	11	69	55[b]
Nonhazardous (Other)			
Liquid	946	568	566
Solid	8[c]	36	20

[a] Assumes 350:1 wastewater to sludge ratio for treatment of liquid sanitary waste.

[b] Assume 2/3 of solid is compactible by a factor of 4:1.

[c] Includes 7.6 m^3 (9.9 yd^3) of concrete and 3 t (3.3 tons) of steel which is recycled.

Source: LLNL 1995i:3; LLNL 1995j.

requirements for safe packaging and shipping of HE products. Other inert or ancillary materials that would require transportation would also be transported by qualified commercial vendors.

A.3.6 Nonnuclear Fabrication

The nonnuclear fabrication function provides the capability to fabricate nonnuclear components and perform nonnuclear component surveillance. Nonnuclear component products and/or processes fall within the groupings of those manufactured onsite and those procured. Several common subgroups have been identified:

- System Level: e.g., firesets and radars
- Electrical Components: e.g., integrated circuits and semiconductors, interconnect cables, and passive components
- Mechanical Components: e.g., radio frequency and multipin connectors, Rolamites, actuator assemblies, and reservoirs and valves
- Materials and Explosives: e.g., nuclear grade steel and molded plastic parts

The following discussion briefly describes the site alternatives for the nonnuclear fabrication mission:

Kansas City Plant. This alternative consists of three major factories involved in electronics and mechanical and engineered materials product lines, as well as outsourcing some components. KCP would downsize but maintain all of its current missions, reducing the KCP footprint to 167,000 m^2 (1.8 million ft^2) for DP activities from the current 297,000 m^2 (3.2 million ft^2). Estimated start would be in April 1998 with steady-state operation proposed in October 2003.

Los Alamos National Laboratory. This alternative is based on the use of existing facilities which are organized into a plastics facility, a pilot plant, a detonator facility, and a reservoir/valve/steel facility. The mission would be to provide high energy detonator inert components and fabrication of reservoirs, valves, and nuclear grade steel. Construction could begin in fiscal year 2000 with steady-state operation starting in fiscal year 2003.

Lawrence Livermore National Laboratory. This alternative has LLNL fabricating nuclear system plastic components, instead of LANL. The LLNL nonnuclear manufacturing facility would provide the plastic components and polymers currently produced at KCP, including filled and unfilled molded parts; syntactic, rigid, and flexible foam parts; composite structures; and specialty polymers currently produced at the KCP pilot plant. The 7,200-m^2 (77,840-ft^2) facility would be housed in five existing buildings in a limited access area at LLNL. Construction would begin in fiscal year 1998 with steady-state operation starting in fiscal year 2003.

Sandia National Laboratories. This alternative would transfer the majority of current KCP missions to SNL, except for nuclear system plastic components and high energy detonator inert components. SNL could also fabricate reservoirs, valves, and nuclear grade steel instead of LANL. This alternative requires both modification of existing facilities and construction of new facilities. Depending on the specific approach, total area affected would range from 56,100 to 63,200 m^2 (605,000 to 680,000 ft^2), new construction would range from 33,900 to 58,100 m^2 (365,000 to 625,000 ft^2), and modifications would range from 5,000 to 22,000 m^2 (55,000 to 240,000 ft^2). Construction would begin in the first quarter of fiscal year 1998 with steady-state operation starting in the first quarter of fiscal year 2004.

A generic set of products and services required to produce a typical bomb or re-entry warhead was defined to provide a common basis for estimating. Current program look-alikes were established to determine the standard hour content of manufactured product, productive material costs, and the cost of procured components and services. Minimum quantities per year were developed to maintain a production capability for "in-house" manufactured product.

A make-buy determination was made for each product or service (see table A.3.6–1). KCP, SNL, LANL, and LLNL used the make-buy analysis to define the manufacturing area requirements, the direct and indirect support staff, the infrastructure support staff, and productive material cost required to support anticipated production requirements. The capacity of this basic capability supports all current schedules and anticipated retrofit needs.

TABLE A.3.6-1.—*Nonnuclear Fabrication Production Products Make/Buy Matrix* [Page 1 of 4]

Product	KCP Fabricate	KCP Procure	SNL Fabricate	SNL Procure	LANL Fabricate	LANL Procure
WES/AF&F	X		X			
Firesets	X		X			
Printed wiring boards		X		X		
Printed wiring assemblies	X		X			
Multichip modules	X			X		
Hybrid microcircuits	X		X			
Housings (buy casting, forging, or bulk)	X	X	X	X		
Electronic components		X		X		
Radars (like firesets)	X		X			
Antennas		X		X		
Nose assemblies	X		X			
Electrical component assemblies	X		X			
Lasers and electro optics		X		X		
Programmers	X		X	X		
Filter packs		X		X		
Voltage regulators		X		X		
Accelerometers/ Environmental Sensing Devices	X		X			
Interconnect/junction boxes		X		X		
Preflight controllers	X		X			
Ready-safe switches		X		X		
Option select switches		X		X		
Coded switches	X		X			
Trajectory Sensing Signal Generators	X		X			
Piezoelectric motors		X		X		
Relays		X		X		

TABLE A.3.6–1.—*Nonnuclear Fabrication Production Products Make/Buy Matrix* [Page 2 of 4]

Product	KCP Fabricate	KCP Procure	SNL Fabricate	SNL Procure	LANL Fabricate	LANL Procure
Output switches	X		X			
Category F - cases and electronics assemblies	X		X			
Timers	X	X	X	X		
Connectors		X				
Lightning arrester connectors	X		X	X		
Strong links	X	X	X	X		
Actuator assemblies		X		X		
Detonator cables	X				X	X
Interconnect cables		X		X		
Flat flex		X		X		
Fiber optic		X		X		
RF and coaxial		X		X		
High voltage		X		X		
CF round wire		X		X		
Valves	X		X		X	
Reservoirs	X		X		X	
Major mechanical parts	X	X	X	X		
Molded plastic parts		X		X		
Transfer molded		X		X	X[a]	X[a]
Compression molded		X		X	X[a]	X[a]
Injection molded		X		X	X[a]	X[a]
Machined		X		X	X[a]	X[a]
Cushions					X[a]	
RTV	X				X[a]	
Cellular silicone	X				X[a]	
Foam supports	X		X		X[a]	
Syntactic supports	X		X		X[a]	
Filled polymers	X				X[a]	
Desiccants	X		X			
Getters	X		X			

TABLE A.3.6–1.—*Nonnuclear Fabrication Production Products Make/Buy Matrix* [Page 3 of 4]

Product	KCP Fabricate	KCP Procure	SNL Fabricate	SNL Procure	LANL Fabricate	LANL Procure
Parachute assemblies		X		X		
Hand T gear		X		X		
Trainer hardware and kits		X		X		
Retrofit kits		X		X		
D/855	X		X			
Joint test assemblies	X	X	X	X		
Transducers/detectors	X	X	X	X		
Data and flight recorders	X	X	X	X		
Special design hardware	X	X	X	X		
Commercial hardware		X		X		
Transportation Safeguards Division-Safe Secure Trailers	X	X	X	X		
Trailers	X	X	X	X		
Escort vehicles	X	X	X	X		
TC firing systems		X		X		
D/50 reprocessing	X		X			
Services-DOE and/or product required						
Test equipment field support	X		X			
Storage	X		X			
Testers	X		X			
Tools	X		X			
Gauges	X		X			
Data/records	X		X			
Material	X		X			
Boron reclamation/certification/storage	X				X	
Polymer pilot facility	X				X[a]	

TABLE A.3.6–1.—*Nonnuclear Fabrication Production Products Make/Buy Matrix* [Page 4 of 4]

Product	KCP Fabricate	KCP Procure	SNL Fabricate	SNL Procure	LANL Fabricate	LANL Procure
Cellular silicone compounding	X				X[a]	
Classified automated data processing	X		X			
Logistics and manufacturing center	X		X			
Test equipment maintenance	X		X	X		
Transportation containers	X	X	X	X		
Tool and gauge fabrication	X	X	X	X		
Tool and gauge design	X	X	X	X		
Test equipment design and fabrication	X	X	X	X		
SECOM	X		X			
Nuclear grade steel acceptance/storage	X		X		X	
Kirtland operations	X		X			

[a] LLNL is an alternative site for production of nonnuclear plastic components.
Source: KC ASI 1995a; LANL 1995c; LLNL 1995f; SNL 1995e.

A.3.6.1 *Downsize at Kansas City Plant*

KCP provides most of the nonnuclear components for the current nuclear weapons stockpile. KCP can effectively support the future stockpile management missions of the nuclear weapons program through a major downsizing of the physical plant and the functions required to support the production mission. The plant was designed, sized, and organized around the mission and workload of the Cold War era, and thus is not appropriately structured to efficiently accomplish the reduced workload of the future. The consolidation of the physical plant would allow a much more efficient organizational approach to be implemented to provide required direct and indirect support functions. The downsized plant would be referred to as KCP II.

The proposed KCP II consists of changing the existing plant and operational approach in four major aspects: (1) physically reducing the size of the facility, (2) changing the approach to manufacturing from product-based to process-based, (3) reducing the support infrastructure appropriate for the right-sized operation, and (4) changing the basic organizational structure to focus directly on the core manufacturing mission.

The proposed KCP II concept was developed to accommodate current and future active stockpile needs. The KCP II facility is to provide, with a 3-year notice, any conceivable combination of components for 150 factory retrofits as well as 150 field retrofits per year on a single-shift basis. These requirements are in addition to limited-life component exchanges, the stockpile evaluation program, and the stockpile surveillance program (joint test assemblies and warhead rebuild) currently scheduled.

Currently KCP consists of approximately 297,000 m^2 (3.2 million ft^2) of space contained in three connected buildings: the Main Building, the Manufacturing Support Building, and the Technology Transfer Center (figure A.3.6.1–1). Much of this floor space is underutilized and very costly to maintain. Many of the production departments are staffed with only a few people because of the low workload in some production technologies. The KCP II proposal and earlier independent space consolidation initiatives would reduce the size of the plant to approximately 167,000 m^2 (1.8 million ft^2) for DP activities. The Technology Transfer Center and Manufacturing Support Building facilities would be vacated of DP activities. All operations and support functions required for stockpile management would be accomplished within reduced floor space of the main buildings.

The KCP II proposal is based on the consolidation of similar processes in three separate production areas (the electronic, mechanical, and engineered materials factories) and several product-based departments.

Electronics Factory. The products described in this section consist of electronic systems and electrical subsystems that function within weapon systems. There are three process modules: microelectronics, interconnects, and final assembly. Table A.3.6.1–1 shows the major processes within each of the electronics modules and the product types produced by these procedures. Total production floor space requirement would be approximately 12,454 m^2 (134,000 ft^2).

Microelectronics. A significant portion of the microelectronics fabrication would be performed in an existing hybrid microcircuit production facility. This 2,970-m^2 (32,000-ft^2) facility is divided into a number of sub-areas. Some of these areas have unique cleanliness capabilities from Class 100 to Class 10,000. The facility is also designed to provide differing temperature and humidity controls, as required, for the various areas. The balance of the microelectronics fabrication would be performed 1,282 m^2 (13,800 ft^2) of the Electronics Factory Mezzanine.

Interconnects. The area for this work would occupy 2,304 m^2 (24,800 ft^2) of the Electronics Factory Mezzanine. It would include an environmentally controlled photo-imaging area and an etching area to support flat flex cables for detonator assemblies. The remaining areas would be temperature and humidity-controlled, consistent with traditional electronics manufacturing requirements.

Final Assembly. The area for this work would occupy 3,019 m^2 (32,500 ft^2) and, with one exception, would also reside on the Electronics Factory Mezzanine. The one exception would be for nose assemblies, which would be built on the factory floor near the

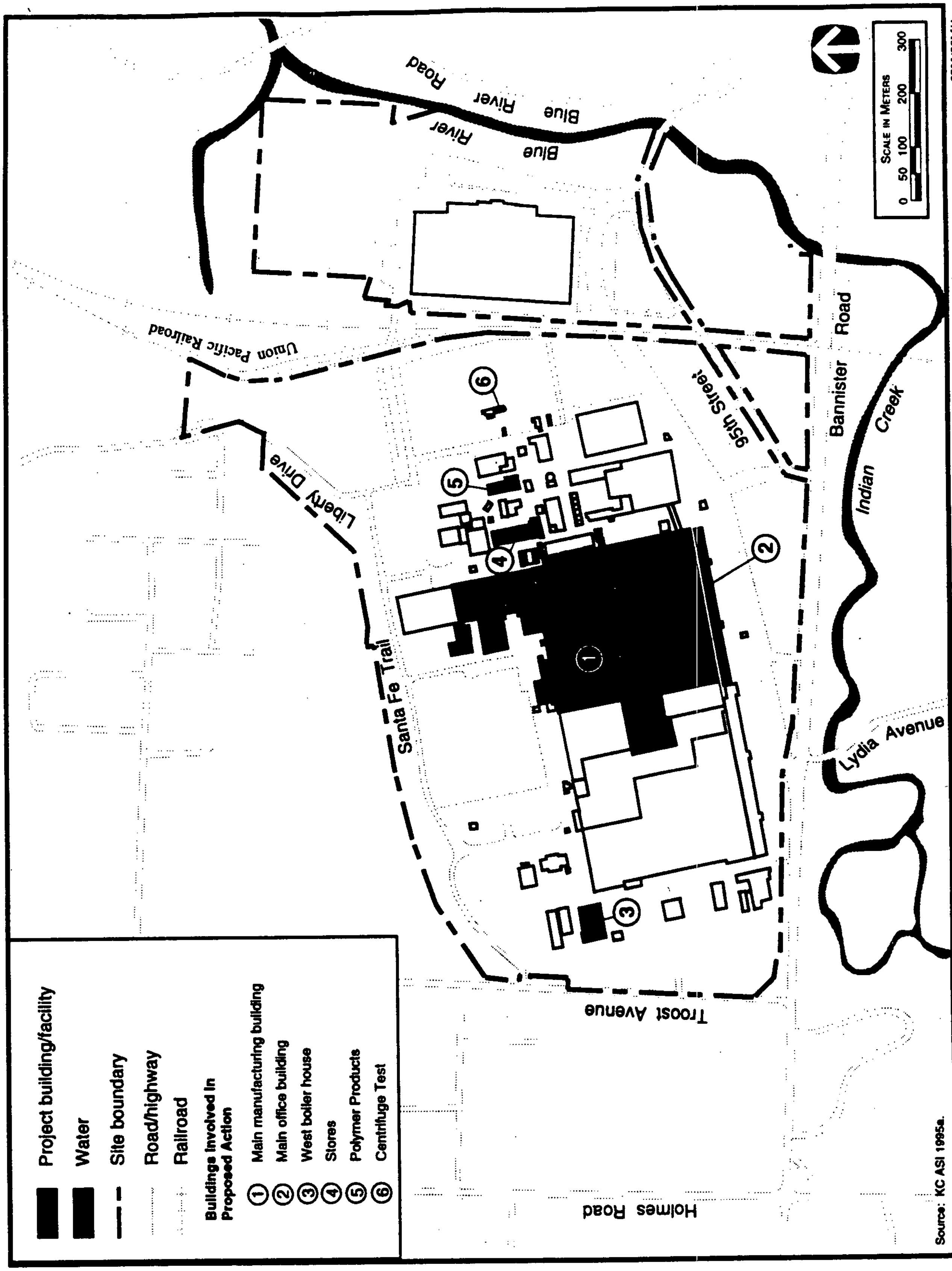


Figure A.3.6.1–1.—*Location of Downsized Nonnuclear Fabrication Facilities at the Bannister Federal Complex/Kansas City Plant.*

TABLE A.3.6.1–1.—*Kansas City Plant II Electronics Factory Processes and Products*

Process Module	Major Processes	Product Types
Microelectronics	Vacuum deposition	Leadless chip carriers
	Plating	Thick film networks
	Screen printing	Thin film networks
	Photo lithography	Multichip modules
	Beam lead bonding	Hybrid microcircuits
	Fine wire bonding	
	Soldering	
	Component placement	
	Hermetic sealing	
	Cleaning	
Interconnects	Manual soldering	Printed wiring assemblies
	Wave and drag soldering	
	Auto component placement	
	Component insertion	
	Robotic tinning and preforming	
	Cleaning	
	Electrical testing	
	Photo imaging	Flat flex cables
	Etching	Detonator cables and assemblies
	Laminating	
	Lead titanate processing	Lightning arrestor connectors
	Manual assembly	
Final assembly	Manual assembly	Nose assemblies
	Hand soldering	Radars
	Welding	Firesets
	Encapsulation	Arming, fusing, and firing assemblies
	Bonding	ECA's
	Cleaning	Programmers
	Electrical testing	Timers
		Controllers
		Trajectory sensing signal generators
		Code activated processes

Source: KC ASI 1995a.

new microelectronics facility. The welding and encapsulation area would support all of the weapon electronics products, as well as some joint test assemblies, special electronic assemblies, and mechanical product requirements. Temperature and humidity controls for traditional electronics manufacturing would also be provided. Products currently fabricated in-house, but to be purchased as a result of KCP II consolidation are printed wiring boards, junction boxes, antennas, voltage regulators, interconnect cables (round coaxial wire, high voltage), ready-safe switches, filter packs, and option select switches.

Joint Test Assembly/Special Electronic Assembly Factory. Security, production, and quality requirements of the joint test assembly and special electronic assembly product lines are not conducive to integration with other factory areas. Products built within the joint test assembly and special electronic assembly are primarily electronics operations and use similar or identical processes. These are bonding, cleaning, coating, encapsulation, mechanical assembly, soldering, swaging, and electrical verification.

Since the joint test assembly mission supports weapons throughout their life in the stockpile, the product lines within the joint test assembly area are somewhat insensitive to changes in weapon production requirements. As a result, reductions in the joint test assembly area would not be as dramatic as in other factory estimates. For future capacity requirements, the joint test assembly operation would be sized to produce assemblies at a rate that would support stockpile evaluation schedules currently in planning for the enduring stockpile.

The current joint test assembly production area would shrink by 33 percent to 1,644 m^2 (17,699 ft^2) (excluding stores and storage). The special electronics assembly manufacturing area would be reduced by 55 percent to 1,352 m^2 (14,550 ft^2). The joint test assembly area would be relocated to the Electronics Factory Mezzanine, while the special electronics assembly operation would be downsized in place. The estimated reduction in floorspace would primarily result from the elimination of capital equipment, testers, and tooling that are unnecessary to support the baseline workload. No special environments or highly hazardous operations would be required as a part of the production processes.

The joint test assembly operation is a job shop environment which makes use of a very limited amount of highly automated assembly, cleaning, and soldering processes. Prior to the relocation of the area, the newer products requiring automated processes would be built. At the end of that period, related test equipment and capital equipment would be moved and requalified over an 8-month period. In the interim, the labor force would be directed to build those assemblies requiring only manual soldering and cleaning techniques. Phasing production by program and process would result in a negligible increase in cost. Based on past precedent, a requalification of each product would be unnecessary since most production processes are manual and the quality of joint test assembly products is controlled primarily by the operator.

The planned special electronic assembly operation rearrangement would keep critical manufacturing equipment in place. Process requalifications would be unnecessary.

Mechanical Factory. The proposed Mechanical Factory would maintain most of the capabilities presently available with significantly reduced capacity. The factory is based on projected production rates for reservoirs, transportation safeguards division products, and a small quantity of other unscheduled production requirements. This workload exercises key factory capabilities and maintains the ability to support currently unscheduled stockpile replacement product. Total productive floor space requirement would be 20,900 m^2 (225,000 ft^2).

The workload mandates the consolidation of several previously separate manufacturing departments. The rearrangement consolidates all general machining processes in a common area. These consolidations allow for enhanced utilization of floor space, equipment, and personnel. Table A.3.6.1–2 lists mechanical factory products.

Engineered Materials Factory. The Engineered Materials Factory is designed to accommodate the minimum manufacturing capabilities required to support current and anticipated weapon program needs for all nonmetallic products. Basic processing capabilities have been retained to produce the following product families: polyurethane foam supports, syntactic foams, cushions, filled polymers, secure container assemblies, desiccants and getters, nonmetallic machining, and the polymer pilot plant. The minimum complement of manufacturing equipment to produce these products was determined and each production area sized appropriately.

Current manufacturing floor space of 11,241 m^2 (121,000 ft^2) within the main building would be reduced by more than 34 percent to 7,350 m^2 (79,150 ft^2). The polymer plant, a stand-alone facility used to produce unique materials not available from commercial suppliers, would not be reduced. Individual modules are described below:

- Compounding--164 m^2 (1,767 ft^2): This area supports the compounding of polymeric materials for urea-filled cellular silicone cushion material and metal-filled polymers for fabrication.

- Foam molding–492 m^2 (5,300 ft^2): Specially formulated polyurethane

TABLE A.3.6.1-2.—*Kansas City Plant II Alternative Mechanical Factory Products*

Area	Products
Transportation safeguards products	Safe secure trailer/safeguards transport roadworthy refurbishment
	Safe secure trailer/safeguards transport retrofit/upgrades
	Safe secure trailer decommissioning
	Escort vehicle production
	Miscellaneous trailer production/repair
Metal machining	**Metal parts to support:**
	Mechanical assembly
	Electrical assembly
	Joint test assembly
	Cases and structural parts (limited)
Sheet metal and support processes	**Sheet metal parts to support:**
	Mechanical assembly
	Electrical assembly
	Liners and housings
	Support processes:
	Plating
	Painting
	Heat treatment
Mechanical welding	Support of mechanical assembly and sheet metal
Model shop/tool support	Tool repair and emergency fabrication
	Capability for prototype and evaluation hardware

Source: KC ASI 1995a.

materials are mixed, poured, and cured to form structural parts for component packaging.

- Pressing—2,075 m^2 (22,335 ft^2): This facility molds-to-size all cushion and filled polymer products. Press capacity ranges from 9 to 1,814 t (10 to 2,000 tons).

- Machining—823 m^2 (8,864 ft^2): This environmentally controlled temperature and humidity area provides the capability to machine all nonmetallic products to their final configuration. Fabrication of syntactic foam products is also accomplished in this area.

- Assembly—2,404 m^2 (25,881 ft^2): This area supports lay-up, wrapping, and impregnating capabilities to manufacture secure container assemblies. Desiccant and hydrogen getter materials are blended, formed, and assembled in this facility.

- Polymer production—1,394 m^2 (15,000 ft^2): This external facility provides the polymer reactor capability to blend polyurethane materials that are unavailable from commercial suppliers. This facility has the capability to repackage bulk material into smaller unit quantities for production use.

Special environmental requirements were defined for machining, foam molding, and secure container assemblies, and appropriate areas were sized within the capability footprint of each module. Special security classification needs of secure container assemblies, cushion, and filled polymers have been considered and sufficient isolation provisions have been incorporated into the new factory concept.

Outsourcing Kansas City Plant-Made Products. A key tactic of the KCP II alternative is to aggressively pursue the outsourcing of products currently manufactured within KCP. KCP currently maintains most of the manufacturing technologies required to support weapons production. Anticipated reductions in production schedules and funding will no longer support maintaining all of these technologies in-house. Outsourcing is the preferred alternative as product designs become more compatible with commercial industry capabilities. Products to be outsourced are antennas, interconnect cables, retrofit kits, filter packs, molded plastic parts, trainer hardware, voltage regulators, parachute assemblies, piezoelectric motors, junction boxes, handling equipment, TC firing sets, ready-safe switches, test gear, printed wiring boards, option select switches, trainer kits, lasers/electro-optics, and actuator assemblies.

Facilities modification to establish the KCP II configuration would take approximately 4 years. The following list describes the facility modification required to accomplish the proposed plant consolidation:

- Design and construction of standard manufacturing facilities
- Installation of modular clean rooms
- Design and construction of a fire-rated wall separating DOE from other site occupants
- Installation of heating, ventilation, and air conditioning systems and controls
- Extension of existing utility systems for chilled water, steam, sanitary, and industrial drains, and other mechanical and electrical services
- Site preparation, modification, and installation of walls and partitions, floor and ceiling finishes, security and fire protection features, and material handling equipment
- Rearrangement of existing operations and relocation of production equipment

Materials/resources consumed during KCP II construction are listed in table A.3.6.1–3. Emissions during construction/plant reduction would be negligible. The numbers of KCP II alternative construction workers required for construction/plant reduction can be found in table A.3.6.1–4.

TABLE A.3.6.1–3.—*Kansas City Plant II Construction/Plant Reduction Materials/Resources Requirements*

Material/Resource	Total Consumption	Peak Demand
Electricity	Negligible	Negligible
Concrete (m^3)	286	
Structural steel (t)	220	
Water	Negligible	

Source: KC ASI 1995a; KCP 1995a:2.

TABLE A.3.6.1–4.—*Kansas City Plant II Construction/Plant Reduction Construction Workers*

Employees	1998 Year 1	1999 Year 2	2000 Year 3	2001 Year 4	Total
Total craftworkers	87	162	104	40	393
Construction management and support staff	15	25	18	8	46
Total Employment	102	187	122	48	459

Source: KC ASI 1995a.

KCP is completing an extensive renovation and upgrade of the plants major utility systems through the facilities capabilities assurance program. KCP has upgraded the high voltage electrical distribution systems including the replacement of approximately 50 substations and switchgear and 13,800 volt cables. In addition, the majority of the roof mounted air-handling units, dehumidification units, controls and duct work, chillers and cooling towers at the west boilerhouse have been replaced. Sprinklers and fire main systems have also been upgraded to provide continued reliable fire protection for KCP. KCP manages two boiler and chiller sites on a 7-day-per-week, 24-hour-per-day basis. These locations provide chilled water, steam, and compressed air for KCP and the other Federal agencies occupying the site.

Taking the renovation and upgrade activities into account, downsizing and reconfiguring the plant for KCP II would have no impact on the utility system capacities. KCP II alternative surge operation utility requirements are shown in table A.3.6.1–5.

TABLE A.3.6.1–5.—*Kansas City Plant II Nonnuclear Fabrication Surge Operation Annual Utility Requirements*

Utility	Consumption	Peak Demand[a]
Electricity	225,000 MWh	30 MWe
Liquid fuel (L)	0	
Natural gas[b] (m^3)	18,900,000	
Raw water (dry site) (L)	1,340,000,000	

[a] Peak demand is the maximum rate expected during any hour.
[b] Cubic meters measured at standard temperature and pressure.
Source: KC ASI 1995a; KCP 1995a:2; KCP 1995a:3.

KCP II alternative operation annual chemical requirements are listed in table A.3.6.1–6, and KCP II alternative surge operation emissions are listed in table A.3.6.1–7.

TABLE A.3.6.1–6.—*Kansas City Plant II Nonnuclear Fabrication Surge Operation Annual Chemical Requirements*

Chemical	Quantity
Nitrogen	
Gas (m^3)	3,270
Liquid (L)	14,900,000
Argon	
Gas (m^3)	4,830
Liquid (L)	236,000
Carbon Dioxide	
Gas (m^3)	322
Liquid (L)	122,000
Hydrogen	
Gas (m^3)	0.1
Helium	
Gas (m^3)	883
Liquid (L)	1,650

Source: KC ASI 1995a.

Waste Management. The solid and liquid nonhazardous wastes generated during modification activities would include concrete and steel construction waste materials and sanitary wastewater. The steel waste would be recycled as scrap material before completing construction. The remaining nonhazardous wastes generated during construction would be disposed of by the construction contractor. Sanitary

TABLE A.3.6.1–7.—*Kansas City Plant II Nonnuclear Fabrication Surge Operation Annual Emissions*

Pollutant	Quantity (t)
Acetone	0.32
Carbon monoxide	13.17
Chromium	<0.01
Cyanide	<0.01
Ethyl benzene	0.054
Formaldehyde	<0.01
Hydrochloric acid	0.018
Isopropyl alcohol	4.44
Methanol	0.009
Methyl ethyl ketone	0.14
Methyl isobutyl ketone	0.027
Particulate matter	1.03
Perc	0.29
Sulfur dioxide	0.35
Toluene	0.59
Toluene diisocyanate	<0.01
1,1,1-Trichloroethane	0.036
Trichloroethylene	3.82
Volatile organic compounds	13.05
Xylene	0.25

Source: KC ASI 1995a; KCP 1995a:3.

wastewater would be processed in the sanitary wastewater system. Wood, paper, and metal wastes would be shipped offsite to a commercial contractor for recycling. Hazardous wastes generated during construction would consist of such materials as waste adhesives, oils, cleaning fluids, solvents, and coatings. Hazardous waste would be packaged in DOT-approved containers and shipped offsite to commercial RCRA-permitted treatment, storage, and disposal facilities. No radioactive waste would be generated during construction.

The project design considers and incorporates waste minimization and pollution prevention. To facilitate waste minimization, where possible, nonhazardous materials would be substituted for those materials that contribute to the generation of hazardous waste. Production processes would be configured with minimization of waste production given high priority. Material from the waste streams would be treated to facilitate disposal as nonhazardous wastes, where

TABLE A.3.6.1–8.—*Kansas City Plant II Nonnuclear Fabrication Facility Waste Volumes*

Category	Annual Average Volume Generated from Construction (m^3)	Annual Volume Generated from Surge Operations (m^3)	Annual Volume Effluent from Surge Operations (m^3)
Low-Level[a]			
Liquid	None	None	None
Solid	None	None	None
Mixed Low-Level[a]			
Liquid	None	None	None
Solid	None	None	None
Hazardous			
Liquid	None	60	60
Solid	786	61	61
Nonhazardous (Sanitary)			
Liquid	None	570,000	570,000
Solid	745	310	310
Nonhazardous (Other)			
Liquid	None	223,900	223,900
Solid	None	11,500	11,500

[a] LLW or mixed LLW would not be routinely generated during normal operations. However, upset conditions may result in the generation of minimal quantities of LLW or mixed LLW.

Source: KC ASI 1995a; KCP 1995a:2; KCP 1995a:3.

possible. Future D&D considerations have also been incorporated into the design.

Table A.3.6.1–8 presents the estimated annual waste volumes from the nonnuclear fabrication plant at Kansas City during construction and surge operations. Solid and liquid wastestreams are routed to the waste management system. Solid wastes would be characterized and segregated into hazardous or nonhazardous wastes, then treated to a form suitable for offsite disposal. Liquid wastes would be treated onsite to reduce hazardous/toxic elements before discharge or transport. All fire sprinkler water discharged in process areas is contained and treated as process wastewater, when required.

Transuranic Waste. The Nonnuclear Fabrication Facility at KCP would not generate any TRU waste.

Low-Level Waste. The Nonnuclear Fabrication Facility at KCP would not routinely generate any LLW.

Mixed Low-Level Waste. The Nonnuclear Fabrication Facility at KCP would not routinely generate any mixed LLW.

Hazardous Waste. Hazardous wastes generated by the Nonnuclear Fabrication Facility at KCP would consist of acidic and alkaline liquids, solvents, and oils and coolants. Processes such as plating, etching, electronic assembly, metals and plastics machining and forming, and wastewater treatment are the principal generators. Liquid hazardous wastes would be collected in DOT-approved containers and sent to an onsite hazardous waste accumulation area. The hazardous waste accumulation area would provide a 90-day staging capacity prior to shipment to an offsite commercial RCRA-permitted treatment, storage, and disposal facility, using DOT-certified transporters. After compaction, if appropriate, the solid hazardous wastes would be packaged in DOT-approved containers and sent to a hazardous waste accumulation area for staging, characterization, and packaging prior to shipment to an offsite commercial RCRA-permitted treatment, storage, and disposal facility using DOT-certified transporters.

Nonhazardous (Sanitary) Waste. Nonhazardous waste generated at the Nonnuclear Fabrication Facility at KCP primarily consists of liquid sanitary, nonrecyclable, nonhazardous solid sanitary, and industrial wastes. Liquid sanitary wastes would be collected by sewer pipe systems from most of the support buildings and discharged directly to the Kansas City municipal sanitary sewer system. Process wastewater is sent to holding tanks for treatment and recycled, where appropriate. Process rinsewater waste streams are routed to the industrial wastewater pretreatment facility for treatment and then discharged to the Kansas City municipal sanitary sewer system.

Nonhazardous (Other) Waste. One-pass cooling water, fire sprinkler water, water from air dryers and vacuum pumps, as well as stormwater from areas of KCP would be discharged through the Blue River and Indian Creek NPDES outfalls.

A.3.6.2 *Relocate to Los Alamos National Laboratory*

Historically, LANL has designed nuclear weapons and has fabricated the development hardware to support the nuclear weapon design process. LANL has made a clear distinction between fabrication for production and fabrication for design agency requirements. At LANL production agency responsibilities would be separately managed. The LANL alternative would rely primarily on in-house production of nonnuclear components and services. Table A.3.6–1 shows the list of nonnuclear products and make-buy decisions. The following sections describe the nonnuclear fabrication products and processes that would be carried out at LANL.

Plastics, Detonators, and Pilot Plant Operations. Technologies currently in place at LANL, with the exception of parylene coating, large scale polymer pilot operations, cellular silicone compounding, and certain filled polymer molding, can support production of all components under consideration.

Generic descriptions of the products or processes to be transferred include inert components for high energy main charge detonators, inert components for high energy neutron generator detonators, blown and cellular silicone foams, polyurethane foams, silicone elastomer molding, composite molding, commodity material molding, filled silicone molding, and pilot scale synthesis of polymeric materials.

Due to the small scale and specialty nature of weapons components, most would be made internally. Materials that would most likely be procured include commodity molded materials. Polyurethane resin currently fabricated at the polymer pilot plant is made in relatively large lots, and, as such, may be procurable from outside vendors. In all cases, internal capability would be maintained to fabricate all materials and components. If internal capability to fabricate specialty items were lost, the technical risk of meeting scheduled or unscheduled production deadlines would be significantly increased. Additional processing capability would be required in the areas of polyurethane foam dispensing, intensive mixing, extruding and leaching of cellular silicone, flame spraying, and parylene coating. For pilot plant operations, additional processing capability would be required for large scale processing of up to 380 L (100 gal). All detonator flat cable processing capability is currently available; however, upgraded equipment would be required to better meet production requirements. High energy detonator fabrication capabilities would need to be installed.

Reservoirs and Valves. LANL has the capability for small scale fabrication for valves and reservoirs in support of R&D of new boost systems, NTS operations, and local hydrodynamic or other experimental testing. Generic descriptions of the products or processes to be transferred include the procurement, certification, and storage of all nuclear-grade materials needed by production. These materials include different alloys of stainless steel, beryllium, copper, aluminum, weld filler materials, and other specialty materials unique to boost system applications. These materials may take the form of raw billets, forging, partially machined parts, finished machine parts, subassemblies, and finished assemblies. Also included in this parts list are vendor purchased parts such as elastomer seals, metal seals, screws, and filters. Fabrication of boost systems includes the procurement of material stock, machining operations, mechanical and radiographic inspection, cleaning, welding, assembly, proof pressure testing, leak testing, volume measurement, packaging, storage, and shipment. As part of the product certification, shelf life storage units would be manufactured to represent the product and monitored throughout the stockpile life.

Facility Description. LANL occupies an area of 111,000 ha (274,000 acres) with 30 active TAs (figure A.3.6.2–1). Figures A.3.6.2–2 through A.3.6.2–5 show the detailed facility layout for project TAs.

The following facilities, with the specified installations/upgrades, would be used for nonnuclear production activities at LANL:

- *Plastics production.* TAs-16-302, -303, -304, -305, -306, and -307: New or transferred equipment would be installed in these facilities. Electrical system upgrades would be required in some of these facilities.

- *Reservoir and valve production.* TA-3-SM-39: Removal of existing machine tools and replacement with new or transferred machine tools would be required. No other upgrades would be necessary.

- *Detonator component manufacture.* TA-22-91: New or transferred equipment would be installed at this facility. Electrical systems upgrades would be required.

- *Large scale pilot plant polymer synthesis.* TA-16-340: New or transferred equipment would be installed at this facility. Electrical systems upgrades would be required.

- *Small scale pilot plant polymer synthesis operations.* TA-35-213; no additional installations or upgrades required.

- *Mold storage.* TA-16-332: no installations or upgrades required.

Table A.3.6.2–1 presents facility data for the nonnuclear fabrication missions at LANL.

Technical Areas-16-302, -303, -304, -305, -306, and -307. These buildings would contain the plastics production activities associated with the proposed production activities. Buildings 302, 304, and 306 are single story with equipment room basements. Buildings 303, 305, and 307 are single story. The buildings are each concrete-walled, roofed structures that currently house plastics-related production, fabrication, and storage functions. Each of the buildings is served by 480-volt power and each has existing process steam, vacuum, air, and ventilation systems required for plastics fabrication and manufacture. The proposed production activities would require that several types of new or transferred equipment (mixers, extruders, roll mills, presses, coaters, screeners, testing equipment, and quality assurance equipment) be installed in Buildings 303 through 307. Building 302 would be used for raw material storage and bonded material/product storage. Although the existing electrical power would accommodate the added equipment, power distribution panels and associated wiring would have to be upgraded in some facilities. The steam, ventilation, air, and vacuum systems would not require upgrades.

Technical Area-3-SM-39. This facility would contain the metal machining, inspection, packaging, and storage functions required for reservoir and valve production. The facility is a two-story (second floor is mezzanine), concrete-walled, roofed structure with steel beam construction. The facility was originally designed as and is currently used as a machine shop, with air ventilation systems required for metal machining. The proposed production activities would require that several types of new or transferred machine tools (lathes, mills, drills, grinders, welders, inspection/testing equipment) be installed. Although the existing electrical power would accommodate the added equipment, power distribution panels and associated wiring would have to be installed for the specific machines. Besides rearranging equipment and storage locations, no other upgrades would be required.

Technical Area-22-91. This facility would contain the inert detonator manufacture and assembly operations. The facility is a single-story, block and concrete structure with joist/concrete roof that was originally designed for detonator fabrication and assembly. The proposed production activities would require that several types of new or transferred equipment be installed. Although the existing electrical power would accommodate the added equipment, power distribution panels and associated wiring would have to be installed for the specific equipment. No other upgrades would be required.

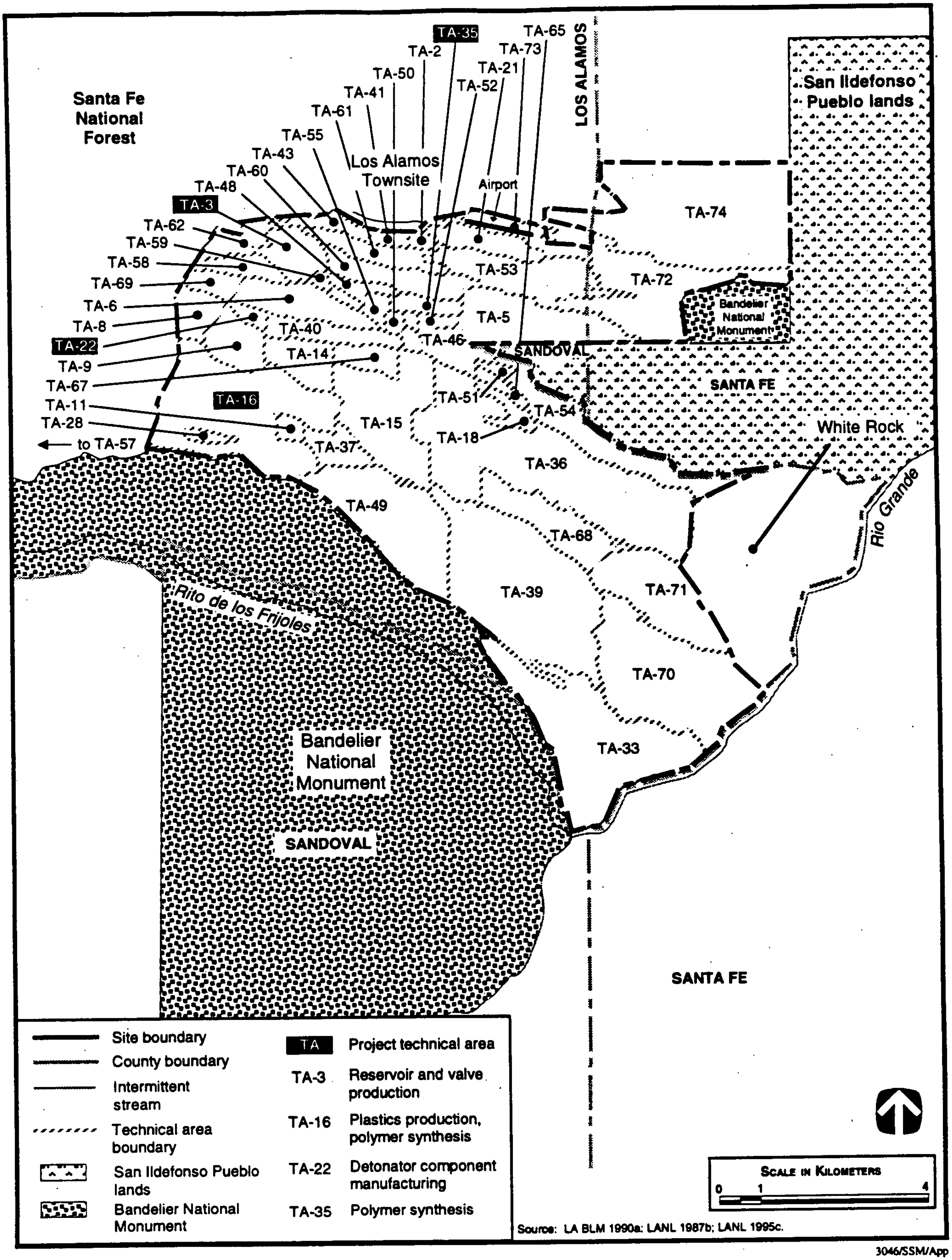


FIGURE A.3.6.2–1.—*Nonnuclear Fabrication Alternative Technical Areas at Los Alamos National Laboratory.*

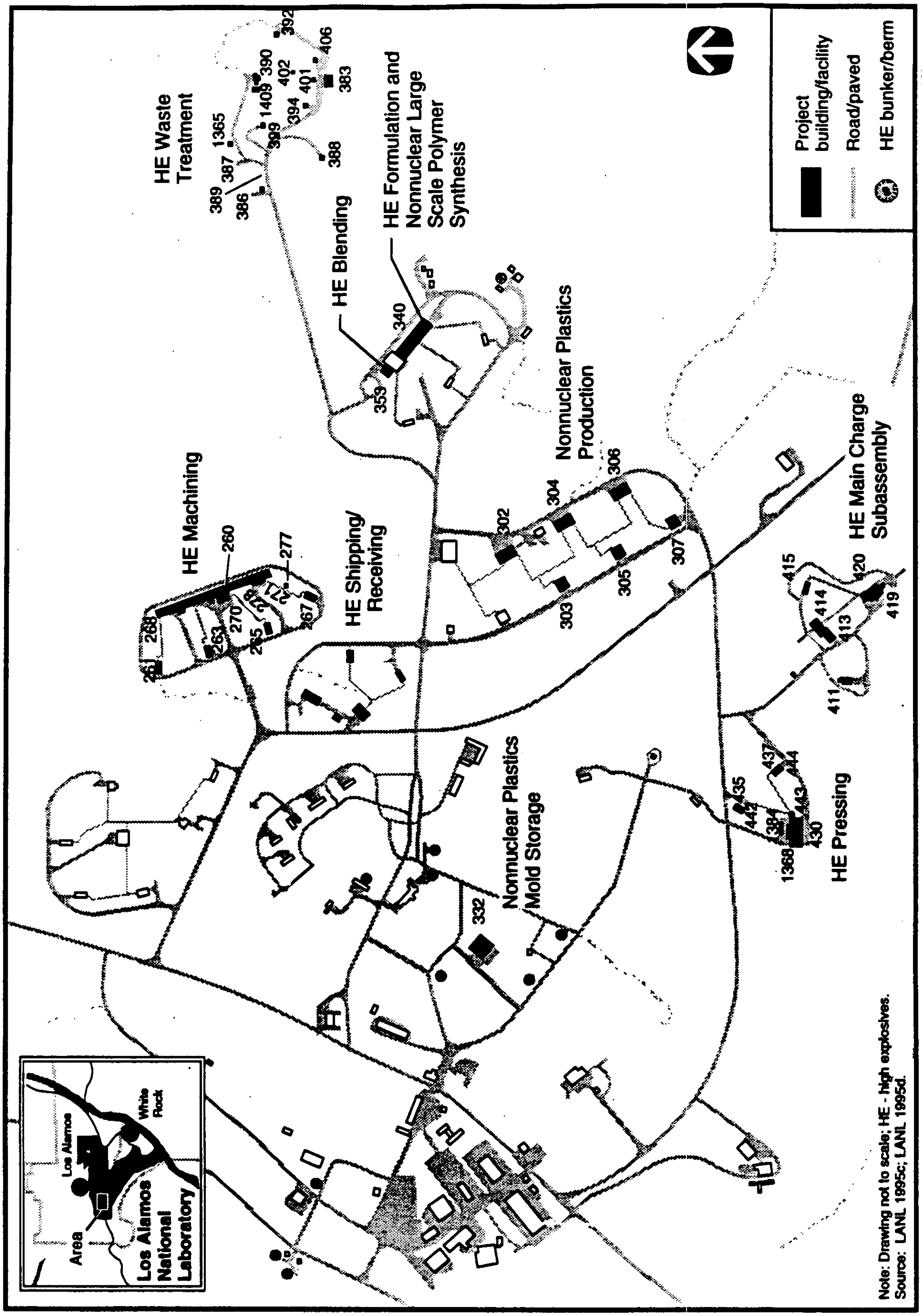


FIGURE A.3.6.2–2.—*Nonnuclear Fabrication Technical Area 16 Site Plan at Los Alamos National Laboratory.*

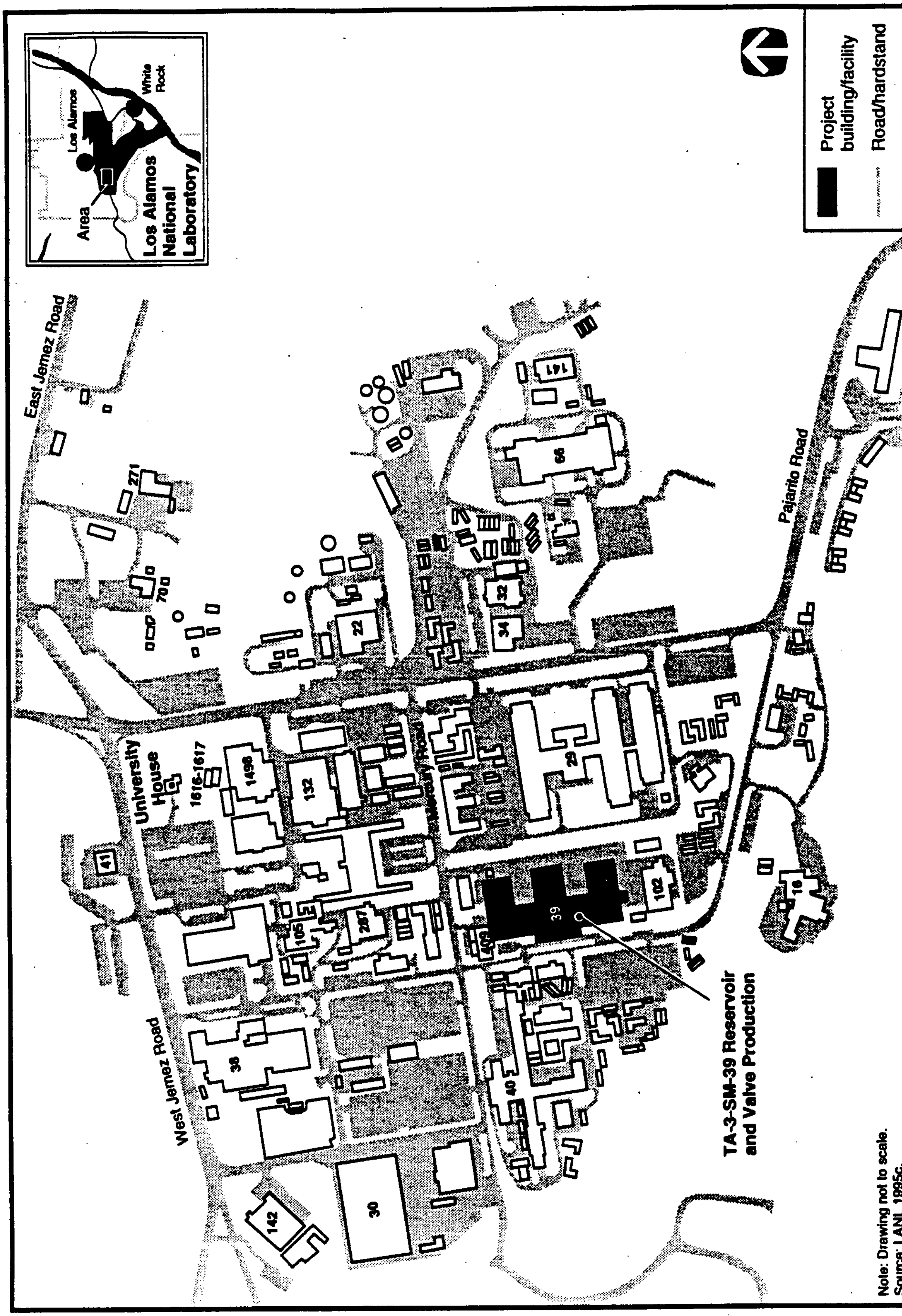


FIGURE A.3.6.2–3.—*Nonnuclear Fabrication Technical Area 3-SM-39 Site Plan at Los Alamos National Laboratory.*

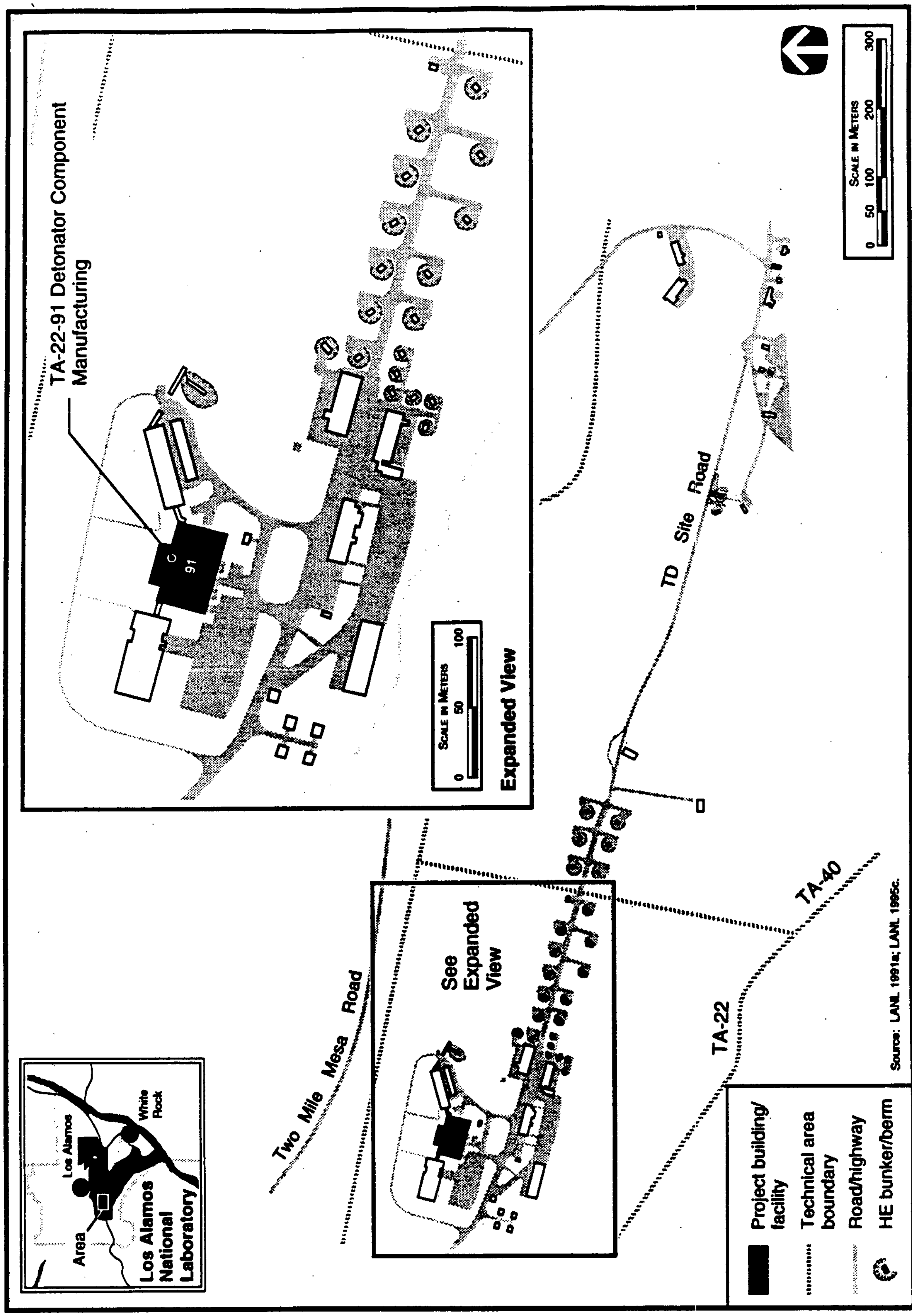


FIGURE A.3.6.2–4.—*Nonnuclear Fabrication Technical Area 22 Site Plan at Los Alamos National Laboratory.*

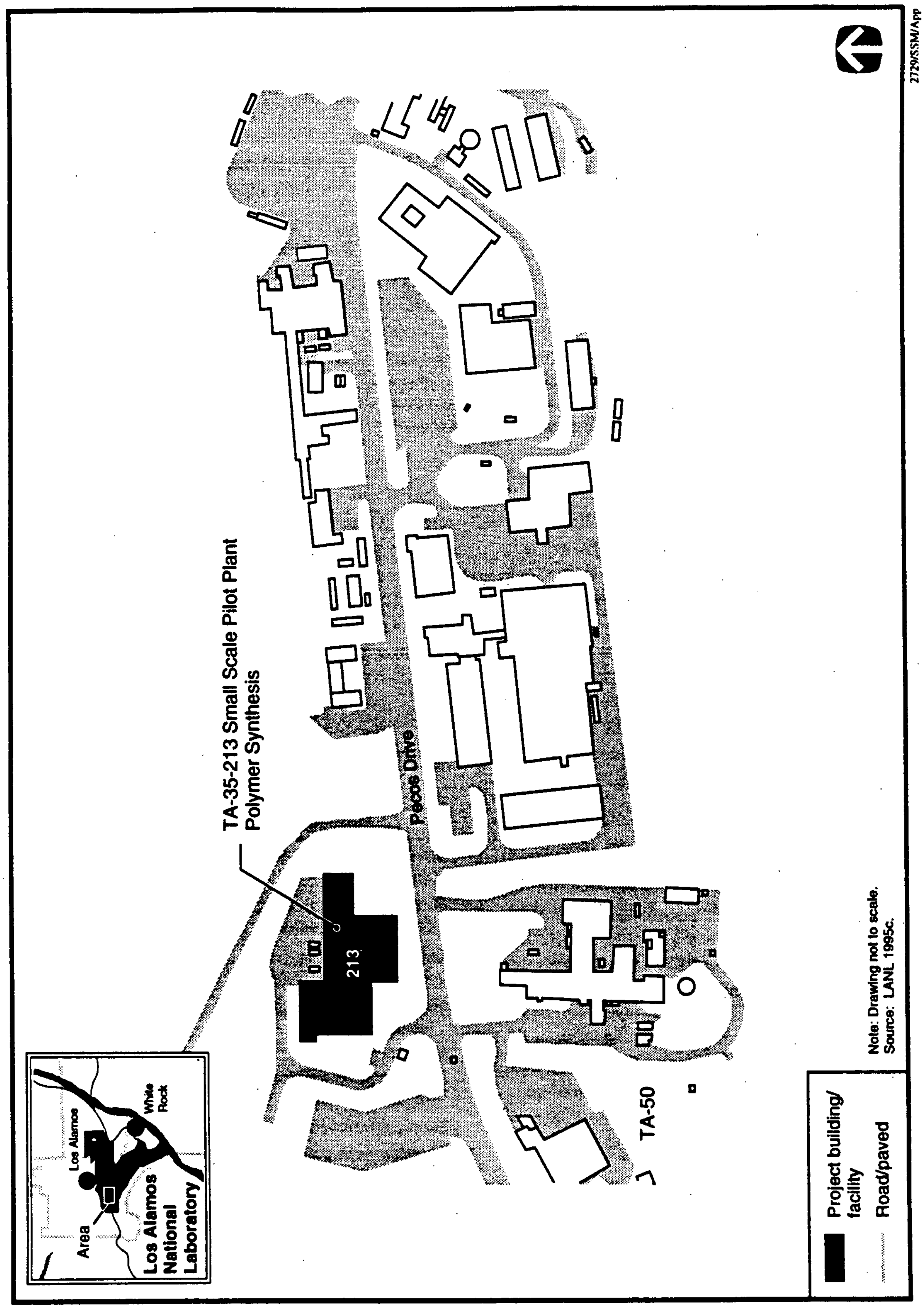


FIGURE A.3.6.2–5.—*Nonnuclear Fabrication Technical Area 35 Site Plan at Los Alamos National Laboratory.*

TABLE A.3.6.2–1.—*Los Alamos National Laboratory Nonnuclear Facilities*

Facility	Number of Stories	Total Space (m^2)	Utilized Space[a] (m^2)	Construction Type
TA-3-SM-39	2	10,405[b]	2,323	Concrete with steel beam
TA-16-302	1	566	566	Concrete walls/roof
TA-16-304	1	566	566	Concrete walls/roof
TA-16-306	1	566	566	Concrete walls/roof
TA-16-303	1	273	273	Concrete walls/roof
TA-16-305	1	273	273	Concrete walls/roof
TA-16-307	1	273	273	Concrete walls/roof
TA-16-332	1	929	929	Steel joist/metal sheet
TA-16-340	2	2,111[b]	149	Concrete walls/roof
TA-22-91	1	2,002	2,002	Concrete walls/roof
TA-35-213	3	7,880	1,125	Concrete walls/roof

[a] Space in existing facility that will be used for the proposed production activity.
[b] Includes mezzanines.
Source: LANL 1995c.

Technical Area-16-340. Bays 109 and 110 of this facility would contain the large scale pilot plant polymer synthesis. The building is a two-story (second floor is equipment room) concrete-walled, roofed structure with blowout walls originally designed for explosive synthesis operations. The proposed production activities would require that a reactor vessel, mixer heater, pulverizer, solvent recovery equipment, and storage area be located in the bays. New electrical service to the equipment would have to be installed. No other upgrades would be required.

Technical Area-35-213. This facility would contain the small scale plant polymer synthesis. The building is a three-story formed concrete structure with a joist/concrete roof. The proposed production activities would not require any modification or installations as all of the required equipment currently exists.

Technical Area-16-332. This facility would be used as a storage area for raw materials and/or components associated with the proposed production activities. The building is a single-story, steel-framed metal building. No upgrades or installations would be required.

Table A.3.6.2–2 presents a schedule for implementation of nonnuclear fabrication activities at LANL. Construction would consist of new or transferred equipment in existing facilities and upgrades to electrical systems within the proposed facilities. The proposed installations and modifications would occur over a 2-year period. The resources and raw materials would consist of only what would be required to install 50 pieces of equipment and to upgrade electrical systems. Materials/resources consumed during the entire construction phase are presented in table A.3.6.2–3.

TABLE A.3.6.2–2.—*Los Alamos National Laboratory Schedule of Activities for Nonnuclear Fabrication*

Activity	Start	End
Research and development duration	1/96	1/97
Hazard/risk assessment, NEPA determination	1/96	1/98
Engineering design (conceptual, final)	1/97	1/00
Modifications/equipment installations	1/00	1/01
Mission transfer/qualification/ proof of operation	1/99	12/02
Steady-state operations	12/02	
Decontamination/decommissioning or conversion	1/30	

Source: LANL 1995c.

Because the construction activities associated with the proposed activities would consist only of installa-

TABLE A.3.6.2–3.—*Los Alamos National Laboratory Nonnuclear Fabrication Construction/Upgrade Materials/Resources Requirements*

Material/Resource	Total Consumption	Peak Demand
Electricity	105 kWh	3.8kWe
Electrical wiring (m)	762	
Conduit (m)	3,050	
Water (L)	9,500	

Source: LANL 1995c.

tion of equipment and upgrade of electrical systems, there would be no aerial emissions of criteria or other pollutants.

Only small quantities of nonhazardous solid and liquid wastes would be generated as a result of the equipment installation and electrical upgrade work required for the proposed activities. Table A.3.6.2–4 lists the total number of personnel that would be required to perform the installation/modification work. This includes only those actually involved with the work and does not include process development or design work. The number of employees listed are spread out over a 1-year period, and more than the listed quantity could be present at any time during the year (1.5 workers per year may consist of 3 workers for a 6-month period).

TABLE A.3.6.2–4.—*Los Alamos National Laboratory Nonnuclear Fabrication Construction Workers*

Employees	2000	2001	Total
Total craftworkers	3.0	3.0	6
Construction (installation) management/support staff	0.25	0.25	0.5
Technical support personnel	2.0	2.0	4
Project support personnel	1.0	1.0	2
Total Employment	6.25	6.25	12.5

Source: LANL 1995c.

Table A.3.6.2–5 provides estimates of the electrical, steam, and water usage that would be added to facility surge operations due to the proposed action. Because all of the activities would occur in existing buildings, space heating loads and electrical loads from normal occupancy (lighting and ventilation) are not included. Raw water consumption includes added sanitary usage from increased personnel that would occupy the facilities due to the proposed activities.

It is noted that all of the facilities associated with the proposed activities are heated either by steam or by central gas heating systems. At the TA-16 facilities, steam is also used as a process heating method and for process washdown/cleaning activities.

TABLE A.3.6.2–5.—*Los Alamos National Laboratory Nonnuclear Fabrication Surge Operation Annual Utility Requirements*

Utility	Consumption	Peak Demand[a]
Electricity	525 MWh	0.23 MWe
Liquid fuel	None	
Natural gas	340	
Steam (m^3)	95	
Raw water (L)	48,300,000	

[a] Peak demand is the maximum rate expected at any hour.
Source: LANL 1995b:3; LANL 1995c.

Table A.3.6.2–6 lists the annual chemicals consumed during surge operation.

TABLE A.3.6.2–6.—*Los Alamos National Laboratory Nonnuclear Fabrication Surge Operation Annual Chemical Requirements*

Chemical	Quantity
Raw materials/chemicals used for plastics formulation	38,600
Metals for valve/reservoir/detonator production (kg)	3,020
Machine tool cutting fluids/lube oils (kg)	511
Cleaning/developing fluids for detonator assembly (kg)	2,270

Source: LANL 1995c.

Emissions. None of the proposed activities would require discharge to existing NPDES-permitted outfalls. Although there would be a slight increase in once-through cooling water discharged from the steam plant to an NPDES outfall resulting from the slight increase in process steam usage, this is not considered to be a pollutant. Aerial emissions of combustion by-products from the slight increase in process steam usage are listed as annual surge operation emissions in table A.3.6.2–7.

TABLE A.3.6.2–7.—*Los Alamos National Laboratory Nonnuclear Fabrication Surge Operation Annual Emissions*

Pollutant	Quantity (t)
Carbon monoxide	0.0002
Nitrogen oxides	0.0002
Particulate matter	0.00007
Sulfur oxides	0.000003
Volatile organic compounds	0.282

Source: LANL 1995c.

Waste Management. Small amounts of nonhazardous liquid and solid wastes would be generated as a result of the installation of equipment and upgrade of the electrical systems. No radioactive waste or hazardous waste would be generated during construction.

The project design considers and incorporates waste minimization and pollution prevention. Production processes would be configured with minimization of waste production given high priority. Material from the waste streams would be treated to facilitate disposal as nonhazardous wastes, where possible. Future D&D considerations have also been incorporated into the design.

Table A.3.6.2–8 presents the estimated annual waste volumes from the Nonnuclear Fabrication Facility at LANL during modification activities and surge operations. Solid and liquid waste streams are routed to the waste management system. Solid wastes would be characterized and segregated into hazardous and nonhazardous wastes, then treated to a form suitable for offsite disposal or storage within the facility. Liquid wastes would be treated onsite to reduce hazardous/toxic characteristics before discharge or transport.

Transuranic Waste. The Nonnuclear Fabrication Facility at LANL would not generate any TRU waste.

Low-Level Waste. The Nonnuclear Fabrication Facility at LANL would not generate any LLW.

Mixed Low-Level Waste. The Nonnuclear Fabrication Facility at LANL would not generate any mixed LLW.

TABLE A.3.6.2–8.—*Los Alamos National Laboratory Nonnuclear Fabrication Waste Volumes*

Category	Annual Average Volume Generated from Construction (m^3)	Annual Volume Generated from Surge Operations[a] (m^3)	Annual Volume Effluent from Surge Operations (m^3)
Hazardous			
Liquid	None	11	11
Solid	None	0.11	0.11
Nonhazardous (Sanitary)			
Liquid	None	568	566[b]
Solid	None	10	6[c]
Nonhazardous (Other)			
Liquid	5[d]	25[e]	None
Solid	0.04	3[f]	None

[a] Data for multiple shift were not provided. Single-shift values were multiplied by 3.
[b] Assumes a 350:1 wastewater to sludge ratio in the treatment of liquid sanitary wastes.
[c] Assumes that 2/3 of the solid waste is compactible by a factor of 4:1.
[d] 2,500 gal of cleanup/washdown water, converted to cubic meters and divided by 2 for the 2-year construction period.
[e] Industrial liquid wastes which include cleaners, cutting liquids, lube oils, and developers are recycled.
[f] Metal machining wastes, wire, scrap, and molds are recycled.
Source: LANL 1995c.

Hazardous Waste. Some hazardous wastes would be generated as a result of the Nonnuclear Fabrication Facility at LANL; however, no new hazardous waste streams would be generated. These wastes consist of liquid solvent wastes and solid beryllium wastes from machining operations. Liquid hazardous wastes would be collected in DOT-approved containers and sent to an onsite hazardous waste accumulation area. The hazardous waste accumulation area would provide a 90-day staging capacity prior to shipment to an offsite commercial RCRA-permitted treatment, storage, and disposal facility, using DOT-certified transporters. The solid hazardous wastes would be packaged in DOT-approved containers and sent to a hazardous waste accumulation area for staging, characterization, and packaging prior to shipment to an offsite commercial RCRA-permitted treatment, storage, and disposal facility using DOT-certified transporters.

Nonhazardous (Sanitary) Waste. Nonhazardous process wastes generated at the Nonnuclear Fabrication Facility at LANL consist of washdown and cleaning water containing soaps and other cleaning agents. These wastes would be discharged to the sanitary waste systems. Solid nonhazardous plastics waste and wastewater sewage sludge is disposed of in offsite industrial and sanitary landfills.

Nonhazardous (Other) Waste. Liquid nonhazardous wastes such as spent machine tool cutting fluids and spent lubricating oils will either be recycled or disposed of onsite or offsite by the LANL Waste Management Group. Solid nonhazardous wastes such as excess electrical wire, resins, and molds would also be generated. This waste would be salvaged, recycled, or disposed of offsite.

A.3.6.3 *Relocate to Lawrence Livermore National Laboratory*

Nonnuclear fabrication at LLNL would include production or procurement of all plastic components, polymers, and composite parts. Nearly all processes are currently, or have been, in operation at LLNL on the same scale as needed for the nonnuclear fabrication mission. The nonnuclear fabrication mission would be accomplished within 15 departments listed in table A.3.6.3–1.

TABLE A.3.6.3–1.—*Lawrence Livermore National Laboratory Existing Nonnuclear Fabrication Departments*

Department Number	Function
1	Compression molding
2	Transfer molding
3A	Cellular silicone foam
3B	Brown silicone foam
4	Injection molding
5	Polyurethane foam molding
6	Casting and encapsulation
7	Machining
8	Composite fabrication
9	Repackaging
10	Polymer synthesis
11	Receiving
12	Packaging/shipping
13	Document control
14	Quality control
15	In-process material handling

Source: LLNL 1995f.

Nonnuclear fabrication would take place at the Livermore Site as shown in figure A.3.6.3–1. The fabrication, including polymer synthesis, would be confined to a consolidated area consisting of five adjacent buildings as shown in figure A.3.6.3–2.

Departments 1, 2, 3B, 4, 6, 7, 8, and 9 currently exist in dedicated facilities within the B231 complex at LLNL. Equipment for Department 5 is available but would be relocated to B131 in an existing low-relative-humidity operations area. Relative-humidity-sensitive and precision machining operations would also be located in this area. Department 3A would most likely be a scaled down version of the existing process and would be located in area B231. Department 10 would be an entirely new process which would be located in B232. Large scale storage of incoming and finished product would be accomplished in B131 adjacent to the Department 5 facility. Receiving inspections would be accomplished in B223. Finished product packaging and short-term storage would be in B227. In-process storage would be in the high bay area on B231. Support offices and in-process quality control would also be located in B231.

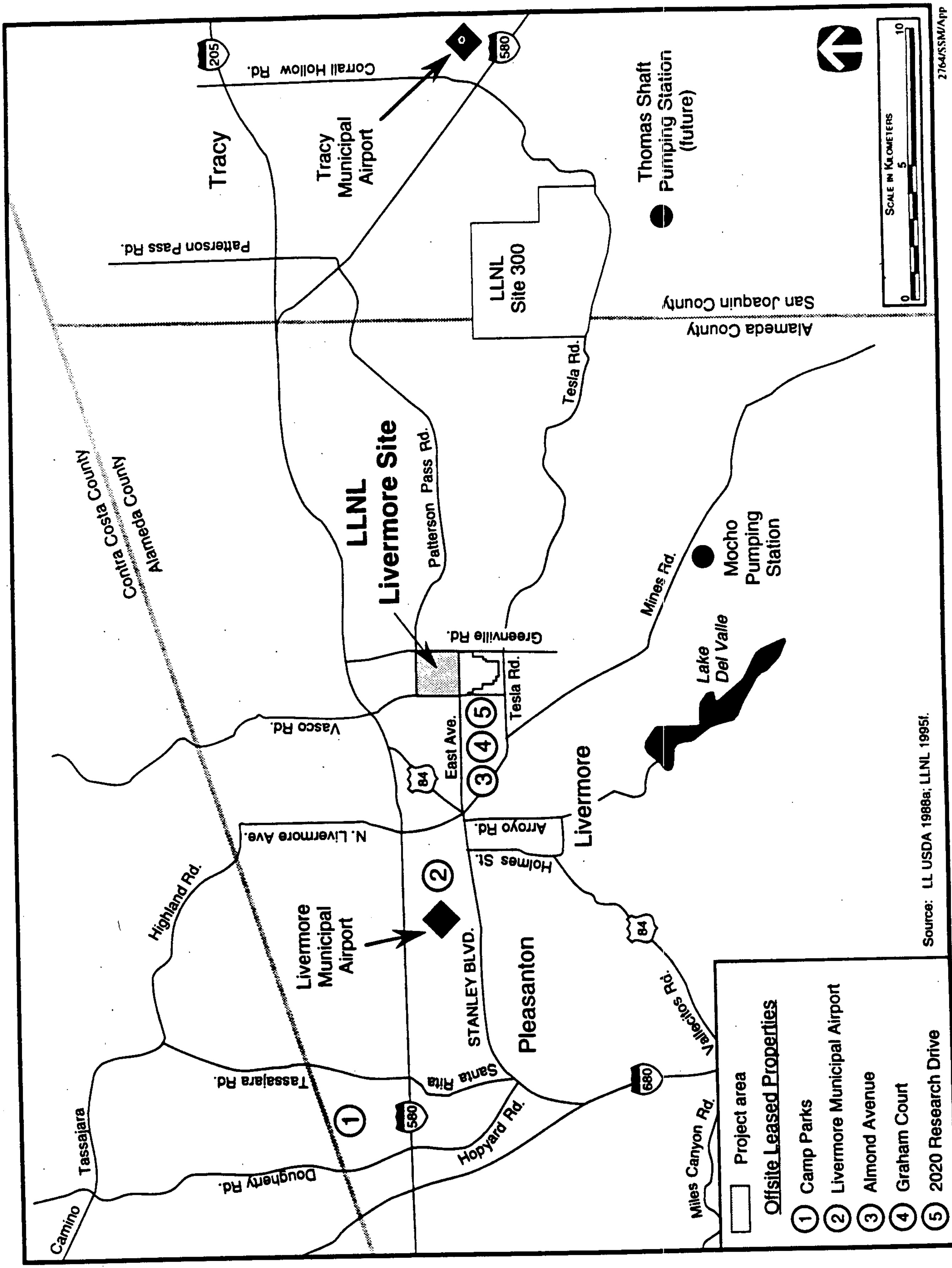
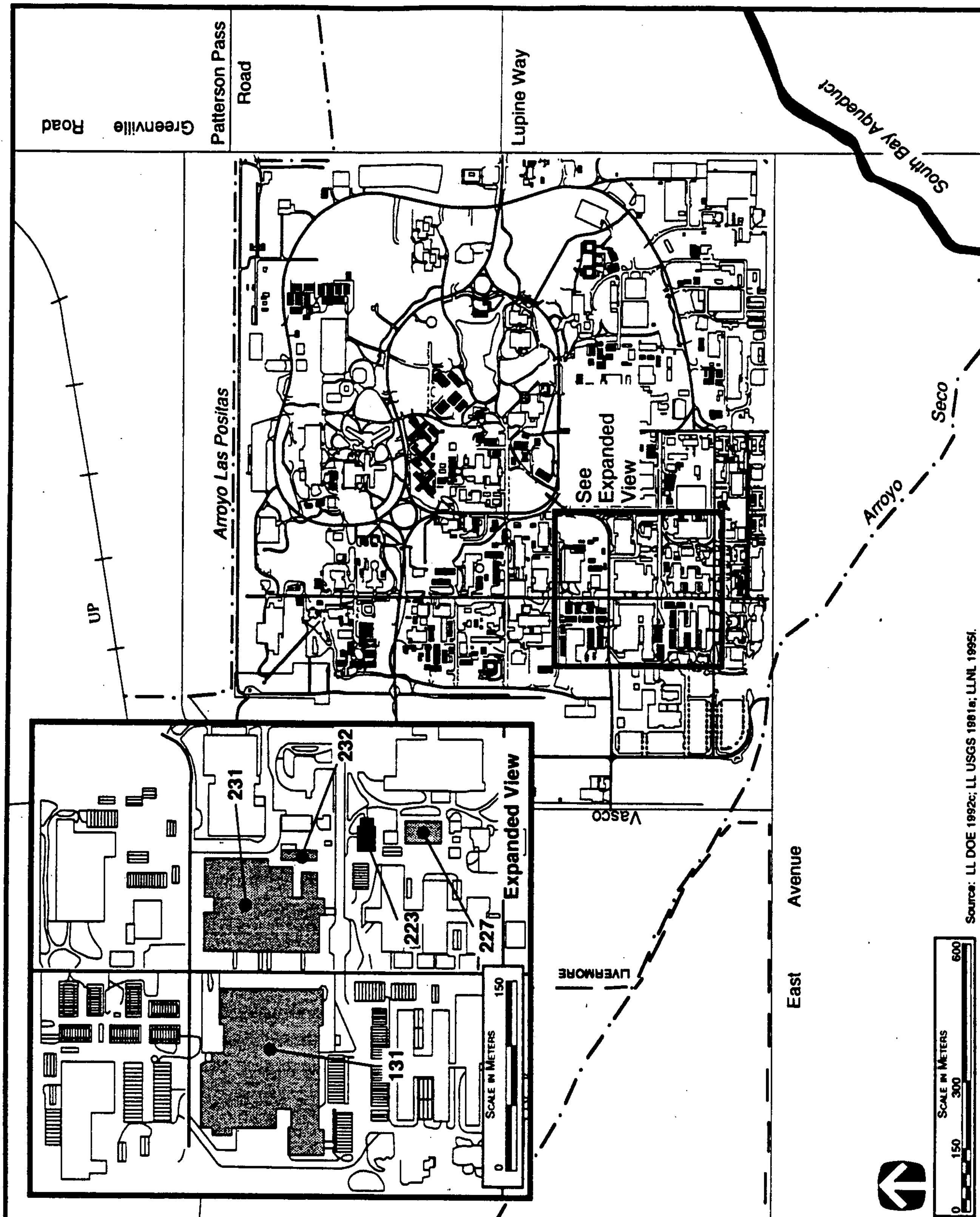


FIGURE A.3.6.3–1.—*Nonnuclear Fabrication Area at Lawrence Livermore National Laboratory.*



Source: LL DOE 1992c; LL USGS 1981a; LLNL 1995l.

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FIGURE A.3.6.3–2.—*Nonnuclear Production Facility Plot Plan at the Livermore Site.*

The process/products included in the LLNL nonnuclear fabrication alternative are transfer molded parts, compression molded parts, injection molded parts, machined plastic parts, silicone cushion (all types), syntactic components, filled polymers, and polymer synthesis.

This alternative covers processes for fabrication of nearly all plastic nonnuclear components needed to meet nonnuclear fabrication requirements. There are a few components that can be obtained more cost effectively through procurement. Some very specialized plastic film and tubing parts for certain assemblies may more effectively be produced or procured by the agency producing the assembly. Synthesis of basic polymers is included to provide raw materials that are not commercially available.

Compression Molding. The compression molding process would be used to produce filled and unfilled, elastomeric or rigid, thermosetting components.

Existing roll mill capacity would be sufficient for all products except cellular silicone. Currently ceramic rolls are used for high purity instead of beryllium oxide rolls utilized at KCP. The beryllium oxide rolls would have to be transferred or a modification made to the process specifications to allow for other materials. An intermediate size roll mill and Banbury mixer for use with cellular silicone are included in capital equipment. Scales, preform cutting, and in-process storage are available.

The facility is capable of utilizing integrally heated or platen heated tools. Thus, existing tooling should be sufficient in all cases. Tooling would be stored in the B231 complex in the 1300 Wing.

There is very little transfer molding involved in this alternative. Diallyl phthalate electronic components would be procured by the agency needing the components. However, the capability would exist within the production facility.

Preforming would be done on existing compression or transfer presses located in Department 2. The dielectric heater would be transferred from the production agency or purchased new. Post cure can be accomplished in the current oven capacity at the facility. In-process trim and inspection would be accomplished in the same area used for compression molded parts. Overflow inspection capability would exist in room 1240.

Cellular Silicone Compounding. The current production process for cellular silicone compounding could either be scaled down to a more appropriate size or the equipment could be transferred from the current production agency. The most economical approach would be to scale this process down to a much smaller batch size. Similar parts were made 10 years ago in the existing equipment at LLNL. This equipment includes the Banbury mixer, compounding roll mills, and sheeting roll mills. Production levels dictate an equipment size in-between those at LLNL and KCP. The current proposal allows for scaling down the process; however, there is an area set aside in the B231 high bay for installation of KCP equipment. Another option would be to transfer the production agency equipment to LLNL. In that case, the compounding operations would be installed in the high bay of B231 in place of existing temporary structures.

The urea screening operation either would be transferred from the production agency or a new system of smaller capacity would be installed at LLNL. This equipment would be scheduled for B231, in a dedicated area in either case. Washing and drying operations would be located in B231 in a newly enclosed area in Wing 1200. Two washers would be transferred from KCP. A reverse osmosis water system would be installed in B232 and piped to the 1200 Wing of B231. A new drying oven would be purchased. Molding operations would be conducted in the compression molding department.

Blown Silicone Foam Molding. The current operation for blown silicone foam molding in department 3B utilizes equipment in the compression molding department. There is some ancillary equipment in place that is functionally identical to that used at KCP.

Injection Molding. The installed injection molding (Department 4) capacity at LLNL includes machines of up to 260-g (9-ounce) and 100-t (110-ton) capacity. The capability at KCP includes machines of this size and also 400, 740, 790, and 2,270 g (14, 26, 28, and 80 ounces). The need for this larger equipment would be evaluated as the requirement warranted. The machines at LLNL are in excellent condition. The

100-t (110-ton) machine at LLNL utilizes dedicated computer control. This feature is very useful in a production environment when a variety of products are involved because of the rapid, error free setting of machine variables from stored programs. Large polymethylpentene blanks are currently made at KCP using the 2,270-g (80-ounce) injection molding machine in a specialized process that is somewhat similar to compression injection but on a very large scale. This process could be sent to an outside vendor if a change in grade of material could be approved. This would be the option of choice. However, there are two other options: install the 2,270-g (80-ounce) machine in the B231 high bay adjacent to existing injection molding facilities or qualify the process currently in use at LLNL for the production of large polymethylpentene castings.

Polyurethane Foam Molding. LLNL currently operates three machines in Department 5 that can be utilized for the polyurethane foam molding process. One is a resin transfer molding unit that can be modified for foam. This machine is extremely versatile and would be the machine of choice for most production.

This process would be located in Wings 1300 and 1400 of B131, less than 100 m (328 ft) from the Central Process Area in B231. This is the location of preference since 10 percent relative humidity control is installed and operational. Foam and other relative humidity sensitive and precision machining operations would be collocated in the same wing. Much of that machining capacity is already installed. Existing tooling could be used in all cases. Tooling storage would be in an adjacent storage area.

Casting and encapsulation. Casting and encapsulation is a routine operation in the current Department 6 facility, and no significant changes are anticipated. Vacuum/pressure encapsulators are available. Existing tooling should be adequate in all cases. Tooling storage would be similar to that for compression molding.

Machining. Machining operations would be conducted in Department 7 in the B231 Machine Facility in Wing 1500. Composite machining would occur in Room 1019, B231. This room is currently dedicated to this type of machining and has the proper tooling, including diamond tools, and the proper high speed machining heads. HEPA filtration and high velocity dust extraction is built into this facility.

Low relative humidity and precision machining would occur in B131. The current facility can be humidity controlled to less than 10 percent relative humidity and has substantial matching and inspection capability in place. Certain specific machines may have to be relocated from other onsite locations or, if necessary, from KCP.

Composite Fabrication. There is only a small amount of composite fabrication needed for this alternative. These few parts can readily be fabricated in the current facilities, located in Department 8. The most sophisticated component is a carbon/phenolic part. The existing 318-t (350-ton) press has highly flexible bump cycle programming which can be utilized for fabricating this part.

Repackaging. Repackaging is a routine operation within the existing Department 9 facility. No additional changes would be required for this alternative.

Polymer synthesis. Polymer synthesis would be a new Department 10 operation at LLNL. Reactors of 190- and 380-L (50- and 100-gal) capacity and associated support equipment would be located in B232. Reactors, complete with a dedicated hot oil heating system, are included in capital equipment. The units would be installed in the south portion of B232. This is an abandoned high pressure facility and is ideal for this operation. Items such as product dryers and precipitators would be transferred from KCP.

A list of materials and resources consumed during modification activities can be found in table A.3.6.3–2. A list of emissions produced during modification activities can be found in table A.3.6.3–3. A list of construction workers needed during the modification phase can be found in table A.3.6.3–4. A list of utilities consumed during surge operation can be found in table A.3.6.3–5. A list of the annual chemicals consumed during surge operation can be found in table A.3.6.3–6. A list of emissions produced during surge operations can be found in table A.3.6.3–7.

Waste Management. The solid and liquid nonhazardous wastes generated during modification activities would include concrete and steel construction

TABLE A.3.6.3–2.—*Lawrence Livermore National Laboratory Nonnuclear Fabrication Construction/Modification Materials/Resources Requirements*

Material/Resource	Total Consumption	Peak Demand[a]
Electricity	21 MWh	50 kWe
Fuel (L)	19,900	
Water (L)	79,500	
Concrete (m^3)	7.6	
Steel (t)	7.3	
Industrial gases (m^3)	7.5	

[a] Peak demand is the maximum expected during any hour.
Source: LLNL 1995f.

TABLE A.3.6.3–3.—*Lawrence Livermore National Laboratory Nonnuclear Fabrication Construction/Modification Emissions*

Pollutant	Quantity (t/yr)
Carbon monoxide	3.08
Nitrogen oxides	1.09
Particulate matter	0.36
Sulfur dioxide	0.09
Volatile organic compounds	0.54

Source: LLNL 1995f.

TABLE A.3.6.3–4.—*Lawrence Livermore National Laboratory Nonnuclear Fabrication Construction/Modification Construction Workers*

Employees	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Architectural design	0.14	0.35	0.43	0.35	0.14	1.4
Plant design	0.09	0.22	0.26	0.22	0.09	0.9
Project manager	0.09	0.22	0.26	0.22	0.09	0.9
Construction manager	0.13	0.31	0.38	0.31	0.13	1.3
Inspectors	0.13	0.31	0.38	0.31	0.13	1.3
Document clerk	0.01	0.03	0.04	0.03	0.01	0.1
Craftworkers	1.27	3.20	3.80	3.20	1.27	12.7
Total Employment	1.9	4.6	5.5	4.6	1.9	18.6

Source: LLNL 1995f; LLNL 1995i:2.

TABLE A.3.6.3–5.—*Lawrence Livermore National Laboratory Nonnuclear Fabrication Surge Operation Annual Utility Requirements*

Utility	Consumption	Peak Demand[a]
Electricity	108 MWh	0.095 MWe
Natural gases (m^3)	28,900	
Liquid fuel (L)	0	
Water (L)	3,790,000	

[a] Peak demand is the maximum rates expected at any hour.
Source: LLNL 1995f; LLNL 1995i:2

TABLE A.3.6.3–6.—*Lawrence Livermore National Laboratory Nonnuclear Fabrication Surge Operation Annual Chemical Requirements*

Chemical	Quantity
Nitrogen	
Gas (m^3)	37.8
Liquid (L)	278,000
Argon	
Gas (m^3)	39.2
Liquid (L)	3,420
Carbon dioxide	
Gas (m^3)	2.35
Liquid (L)	1,760
Hydrogen	
Gas (m^3)	0.04
Liquid (L)	0
Helium	
Gas (m^3)	71.64
Liquid (L)	22.7

Source: LLNL 1995f; LLNL 1995i:2.

TABLE A.3.6.3–7.—*Lawrence Livermore National Laboratory Nonnuclear Fabrication Surge Operation Annual Emissions*

Chemical	Quantity (t)
Acetone	0.066
Isopropanol	0.13
Methyl ethyl ketone	0.006
Toluene	0.006

Source: LLNL 1995f.

waste materials and sanitary wastewater. The steel waste would be recycled as scrap material before completing construction. The remaining nonhazardous wastes generated during construction would be disposed of by the construction contractor. Uncontaminated wastewater would be used for soil compaction and dust control, and excavated soil would be used for grading and site preparation. Wood, paper, and metal wastes would be shipped offsite to a commercial contractor for recycling.

Hazardous wastes generated during construction would consist of such materials as waste adhesives, oils, cleaning fluids, solvents, and coatings. Hazardous waste would be packaged in DOT-approved containers and shipped off site to commercial RCRA-permitted treatment, storage, and disposal facilities. No radioactive waste would be generated during construction.

The project design considers and incorporates waste minimization and pollution prevention. Segregation of activities that generate radioactive and hazardous wastes would be employed, where possible, to avoid the generation of mixed wastes. Where applicable, treatment to separate radioactive and nonradioactive components would be performed to reduce the volume of mixed wastes and provide for cost-effective disposal or recycle. To facilitate waste minimization, where possible, nonhazardous materials would be substituted for those materials which contribute to the generation of hazardous or mixed waste. Production processes would be configured with minimization of waste production given high priority. Material from the waste streams would be treated to facilitate disposal as nonhazardous wastes, where possible. Future D&D considerations have also been incorporated into the design.

Table A.3.6.3–8 presents the estimated annual waste volumes from the Nonnuclear Fabrication Facility at LLNL during modification activities and surge operations. Solid and liquid waste streams are routed to the waste management system. Solid wastes would be characterized and segregated into nonhazardous or hazardous wastes, then treated to a form suitable for disposal or storage within the facility. Liquid wastes would be treated onsite to reduce hazardous/toxic elements before discharge or transport. All fire sprinkler water discharged in process areas is contained and treated as process wastewater, when required.

Transuranic Waste. The Nonnuclear Fabrication Facility at LLNL would not generate any TRU waste.

Low-Level Waste. The Nonnuclear Fabrication Facility at LLNL would not generate any LLW.

Mixed Low-Level Waste. The Nonnuclear Fabrication Facility at LLNL would not generate any mixed LLW.

Hazardous Waste. Hazardous wastes generated by the Nonnuclear Fabrication Facility at LLNL would consist of acetone, toluene/methanol mixture, toluene, and dimethyl formamide in aqueous solution. The toluene/methanol waste stream has been evaluated as a strong candidate for recycling by distillation to recover the high value solvent components. The distillation of this waste stream would result in the generation of distillation bottoms, which would be removed periodically and managed as a solid hazardous waste. Liquid hazardous wastes would be collected in DOT-approved containers and sent to an onsite hazardous waste accumulation area. The hazardous waste accumulation area would provide a 90-day staging capacity prior to shipment to an offsite commercial RCRA-permitted treatment, storage, and disposal facility, using DOT-certified transporters. After compaction, if appropriate, the solid hazardous wastes would be packaged in DOT-approved containers and sent to a hazardous waste accumulation area for staging, characterization, and packaging prior to shipment to an offsite commercial RCRA-permitted treatment, storage, and disposal facility using DOT-certified transporters.

Nonhazardous (Sanitary) Waste. Nonhazardous waste generated by the Nonnuclear Fabrication Facility at LLNL primarily consists of process water and incidental water usage, and nonrecyclable, nonhazardous solid sanitary and industrial wastes. Liquid sanitary wastes would be collected by sewer pipe systems from most of the support buildings and discharged directly to the city of Livermore municipal sanitary sewer system. One of the projected waste streams, an aqueous solution of urea, will be sampled to establish a baseline of waste stream constituents, and directed to the sanitary sewer system. Process wastewater is sent to holding tanks for treatment and recycled where appropriate. Process rinsewater waste streams are pretreated and then discharged to the sanitary sewer system

TABLE A.3.6.3–8.—*Lawrence Livermore National Laboratory Nonnuclear Fabrication Waste Volumes*

Category	Annual Average Volume Generated from Construction (m^3)	Annual Volume Generated from Surge Operations[a] (m^3)	Annual Volume Effluent from Surge Operations (m^3)
Hazardous			
Liquid	0.08	7[b]	3[c]
Solid	0.15	None	0.2
Nonhazardous (Sanitary)			
Liquid	36	5,770[d]	5,770[e]
Solid	0.9	127[f]	64[g]
Nonhazardous (Other)			
Liquid	76	Included in sanitary	Included in sanitary
Solid	10	Included in sanitary	Included in sanitary

[a] With the exception of sanitary wastes, the data for a multiple shift were determined by multiplying the single-shift values by 2.5.

[b] Data were provided as 2,500 lb of acetone, 3,500 lb of toluene/methanol, 250 lb of toluene, and 270 lb of dimethyl formamide. Assuming a density of 1,000 kg/cubic meter, these were converted to cubic meters.

[c] Assumes toluene/methanol wastestream would be recycled by a distillation process. Five percent of the toluene/methanol volume is assumed for the distillation bottoms which appear as a solid waste effluent.

[d] No data provided for liquid sanitary wastes such as sewage. Assumed 50 gal per day per person, 250 days per year operation. Number of employees used is 47.5. The urea waste stream was multiplied by 2.5. The rest of the sanitary waste was multiplied by 2.4 for three shifts.

[e] LLNL does not treat sanitary wastewater as it goes to the municipal sanitary sewer system; thus the effluent is the same as generated.

[f] No data provided for solid sanitary wastes such as housekeeping trash. Assumed 0.3 ft^3 per day per person, 250 days per year operation. Number of employees used is 47.5, which was multiplied by 2.4 to get three shifts.

[g] Assumes that 2/3 of the solid waste is compactible by a factor of 4:1.

Source: LLNL 1995f; LLNL 1995i:2.

according to permit requirements and the city of Livermore Public Services Ordinance.

Nonhazardous (Other) Waste. The bulk of waste would be thermoplastic and cured thermoset materials and various fillers or reinforcements. LLNL is conditionally permitted in California to treat any unused thermosetting waste in order to make the waste nonhazardous. Stormwater from areas of LLNL is allowed to go in natural drainage channels.

A.3.6.4 *Relocate to Sandia National Laboratories*

Most products and services currently obtained from KCP would be obtained by SNL, which is located in New Mexico, through procurement from the commercial sector or through capabilities that would be developed internal to SNL. Procurement of products and services from the private sector would be the preferred alternative. Key nonnuclear product and process descriptions for items to be purchased are described in the following section.

System Level Products (Made up of more than one component to form a kit or system.)

Retrofit Kits. Retrofit kits would be assembled, stored, packaged, and shipped to various locations for repairing problems in weapons or upgrading weapon capabilities. Retrofit kits would be maintained in a bonded storage area, and when complete would be specially packaged and shipped to where they are needed. Sometimes specialty packaging would be done at the fabrication point within the plant.

Trainer Kits. Trainer kits are a package that may contain a variety of weapon components that may be hazardous or operationally irreversible in their realistic form but are functional in helping to teach the customer how to test, operate, or install a real component prior to actually doing so. Alternately, the kit may be used to teach the customer how to perform a weapon retrofit. The trainer kit may also contain tools, test devices, bolt packs, or similar hardware packs to perform tests or component replacement training. Trainer kits would be made in-house for components that are made in-house.

SECOM Relay Station. DOE currently maintains five high frequency relay station facilities around the country in support of its redundant secure communications network. KCP has maintained the high frequency relay station physically located south of KCP for nearly 20 years. Current responsibilities include upkeep of the grounds including security fencing, mowing, building repair, generator repair, and maintenance of the computers, transmitters, receivers, and antenna field.

Electrical Components

Hybrid Microcircuit Substrates. Ceramic substrates with conductor patterns are needed to support assembly of circuits for radar units. These substrates would be purchased to meet the circuit layout specifications.

High Energy Density Capacitors and Passives: Ceramic Capacitors, Resistors, and Filters. This group of components includes high energy density capacitors and all passive electrical components such as capacitors, resistors, and filters.

Integrated Circuits and Semiconductor Components. These components include the full range of all the semiconductor products including diodes, transistors, and large-scale integrated circuits used in war reserve assemblies.

Joint Test Assembly Components. These are telemetry components used on joint test assemblies that are all procured from outside suppliers. They include pulse code modulators, voltage controlled oscillators, a mixer amplifier, a crystal oscillator, transmitters, and transponders.

Printed Wiring Products. This group of products consists of a wide variety of items processed in the printed wiring facility at KCP. These products range from rigid multilayer boards, multilayer flex, and special material boards to polyimide quartz boards, detonator cables, and chem-milled products used to fabricate rolamites.

Interconnects Cable Fabrication. Cable fabrication includes round wire, flat flex, and radio frequency types of cables.

Junction Boxes. Junction boxes are used to electrically connect internal weapons components to each other and the weapon control panel. The junction box has many lines and some components internally wired to several connectors at the junction box surface. The various weapon components are then attached with cables to the junction box connectors as the weapon is being assembled.

Mechanical Components

Transducers. Transducer components consist of pressure transducers, accelerometers, rate gyro assemblies, and temperature piezoelectric transduces.

Radio Frequency and Multicontact Connectors. The radio frequency multicontact connector product category includes all electrical connectors used on all weapons programs. The primary next-assemblies for the radio frequency and coaxial connectors are radars, antenna systems, and system-level coaxial cable assemblies. The multipin connectors are used throughout systems on firesets, radars, and programmers, in addition to being used for system-connect cables.

Handling Gear. Weapon systems require specially designed equipment for handling, lifting, and transportation called handling gear. There are two distinct types of handling gear: team gear and ultimate user package gear. Team gear is designed by SNL and is purchased by DOD. Ultimate user package gear is typically designed by SNL for DOE; thus, DOE owns and maintains it. Ultimate user package gear normally consists of shipping and storage containers and bomb hand trucks.

Piezoelectric Motors. Miniature piezoelectric motors are currently being developed to replace solenoids in some applications.

Molded Plastic Parts. There are 550 to 650 molded plastic parts in weapon systems. Approximately 60 percent of the parts contain inserts that are molded in place. Most of the parts are transfer-molded, with some compression-molded and some injection-molded.

Major Mechanical Parts. Major mechanical parts are nonfunctional structural components. Most of these parts will be machined metal components, but they could also be components fabricated from plastics, ceramics, or sheet metal.

O-rings, Cushion, and Gaskets. O-rings are used extensively in maintaining environmental and functional seals in most nuclear weapons systems. There are many types of materials available to compensate for the effects of temperature changes and materials compatibility within the weapon system.

Honeycomb Parts. Honeycomb components are used for structural purposes and shock mitigation in some nuclear weapons systems.

Parachute Assemblies. Parachute assemblies consist of four major components: the parachute tube and end, the parachute, the reefing line cutter, and the explosive deployment component. The parachute tube is a machined component. In some systems, a pilot parachute and ejection plate are used in place of a tube.

Commercial Hardware. Commercial hardware encompasses all the small hardware items used to support weapon builds, limited-life component exchanges, and stockpile maintenance. This includes screws, bolts, nuts, and other fasteners, as well as other commercially available parts.

Precision Machining. Precision machining is a service required for numerous products currently manufactured at KCP. Various machining processes are already available at SNL that could be utilized in support of war reserve production activities. The local and national vendor base with precision machining capability has been well categorized in the past, and good relations with sufficient case histories are present to aid the transition from make in-house to buy outside.

Gas Transfer Systems-Buy Items. Because SNL plans to do only final assembly, testing, and acceptance of reservoirs, there would be significant procurement of piece parts and subassemblies. All electro-explosive valves and interconnect tubing and fittings would be procured from commercial suppliers. Similarly, all machined reservoir components from hemispheres, caps, stems, sleeves, and forgings would be machined by private industry. Currently, buy items such as nuts, bolts, washers, protective caps, and raw material for forgings will continue to be procured commercially.

Materials/Explosives/Other

Detonator Cables. Detonator cables (nonprimary) consist of a header that contains the electrical wire leads and the bridge wire. Header material may vary from plastic to a metal/ceramic combination. The electric connection may be hookup wire leads, coaxial, or multipin assembly.

Military Base Spare. Military base spares are kits that DOE is required to provide to the military to maintain nuclear weapons. Currently, about 140 different kits are supplied with approximately 50 percent of the items consisting of off-the-shelf hardware and 50 percent being limited-shelf-life chemicals.

Nuclear-Grade Materials. Nuclear-grade materials comprise special controlled chemistry wrought product (bar and plate stock) used for critical and noncritical applications. This encompasses special specification materials for gas transfer systems as well as commercial grade materials for structural and nonstructural applications.

The only products to be assembled or manufactured at SNL would be those that have exceptional security requirements or that employ technologies unavailable in the commercial sector. The principal activity at SNL would be the assembly of piece parts and subassemblies procured from the commercial sector, and manufacture and assembly of those components with special security requirements. Key nonnuclear product and program descriptions for items to be manufactured in-house are described in the following sections.

System Level

Arming, Fuzing, and Firing Assembly. This process is the final assembly of the arming, fuzing, and firing subsystems. This major hardware assembly is composed of printed wiring boards, battery pack, various electronic components, connectors, wiring harness, other materials, and outer containers. All are assembled in a precise step-by-step process to meet rigid final assembly requirements. The arming, fuzing, and firing assembly is a complex process involving many different activities, supporting equipment, and personnel skill sets to achieve product realization. It is not expected that the SNL assembly process would be markedly different from that employed at KCP.

Nose Assemblies. Nose assembly includes both new-build and refurbishment assemblies. The nose assembly process is straightforward and involves several different activities, supporting equipment, and personnel skill sets.

Joint Test Assemblies. Joint test assemblies consist mainly of internal power supplies, signal conditioning, circuitry, neutron and/or x-ray detectors, and analog and digital circuitry to process data during DOE test flights. This data is transmitted to ground stations or stored in an internal data recorder for recovery after the flight.

Safeguards Transporter. The safeguards transporter new-build activity integrates both new and proven security and safety technologies into a modern transport design that will ultimately replace the safe secure trailer. The safeguards transporter project includes developing a manufacturing capability and producing safeguards transporters. Approximately 20 percent of the production work would be done at SNL and 80 percent would be procured commercially.

Electrical Components

Lightning Arrester Connectors. Lightning arrester connectors are multicontact circular hermetic connectors that must reliably function as a connector in normal environments and must divert current from a direct lightning strike, or any other high voltage source, from the connector contacts to the connector shell. A lightning arrester connector is made from commercially manufactured connector shell and piece parts, combined with specially formulated granules. The special granules give the lightning arrester connector its lightning protection capability.

Firesets Capacitor Discharge Unit Firing Systems. The primary purpose of a capacitor discharge unit firing system is to provide the timing and initiation power for the weapon electrical system. The firing systems also provide the packaging for other weapon components depending on the specific requirements. Hence, firing systems use low and high voltage circuits, power and voltage switches, stronglinks, regulators, and related circuitry. The processes currently in use at KCP would continue much the same at SNL except that more parts would be commercially procured.

Radars. The following list briefly outlines the required processes:

- Radio frequency and printed wiring assembly: kitting of parts, circuit board population, belt/hand soldering, cleaning, laser marking, final visual/electrical inspection

- Channel assembly: install logic/converter and radio frequency assemblies, attach flex, cables, clean, first visual/electrical inspection, temperature cycle, encapsulate, final visual/electrical inspection

- Radar assembly: select two channels, first electrical, install desiccant and compression pad, laser weld channels, first leak test, purge and backfill, weld evacuated tubes, final leak test, laser mark, final visual/electrical inspection

- E-test/D-test: short/medium term vibration, shock, temperature cycling, electrical test, dissection

Antennas. The process of antenna manufacturing consists of machining, welding, and plating a housing. Feed network component parts are assembled into the housing and welded together. A dielectric is sealed into the housing, and the assembly is leak tested. The completed assembly then undergoes an environmental preconditioning (temperature cycling). The antenna is then radio frequency tested on a ground plane in an anechoic chamber. Samples are pulled periodically and undergo test environments to ensure product and process reliability.

Use Control Hardware. All use control hardware would be manufactured in-house. In some cases, commercial parts would be used. All repair of use control hardware would also be performed in-house.

Mechanical Components

Gas Transfer Systems. Gas transfer systems include high pressure reservoirs for containing either boost or inert working gases, explosive valves to open the reservoirs, and tubulations and connectors to transfer the contained gases to required locations within the weapon. Electro-explosive valves are used to accomplish several functions including opening and closing gas flow paths and/or diverting gas flow. SNL currently possesses reservoir production capability but without sufficient capacity. The fabrication process begins with commercial vendor-supplied metal forgings made from certified controlled chemistry bar stock material procured by SNL. Piece parts and subassemblies would be qualified and certified at the vendor by SNL personnel. Final reservoir assembly, primarily welding, would be conducted at SNL along with final inspection and testing. The only machining done at SNL would be post-welding dressing to achieve final contours in the welded areas. Final certification, including volume measurement and proof testing, packaging, and shipping, would be an SNL responsibility.

Desiccants and Getters. Desiccants are made of molded materials that combine epoxies, curatives, and zeolite desiccant material. Getters are organic compounds that are mixed with a catalyst and binder. Getters and desiccants are used to control environments in weapon systems. SNL would use the current KCP processes.

Process Support Systems. Process support systems include capabilities and facilities that are used to support production activities across a wide variety of product lines. These range from general, commonly used services such as materials characterization, and analysis, and environmental and nondestructive testing, to more specialized support such as failure analysis and reliability physics for semiconductor devices, and metrology. While the general activity transfer philosophy is to purchase goods and services from commercial sources wherever possible, the approach with the services and support systems described here is to meet requirements by building upon SNL's existing capabilities. In almost all cases, these capabilities must be maintained in order to meet SNL traditional missions. In addition, particularly for analytical and testing services, the wide spectrum of required tests coupled with the large capital expenditure for testing instrumentation makes commercial availability of these services uncommon.

The alternative for siting nonnuclear production facilities in New Mexico at SNL calls for providing a new stand-alone production site. New production facilities would be provided near an existing Technical Area. Figure A.3.6.4–1 indicates location of technical areas at SNL. The new site (figure A.3.6.4–2) would be independent of the existing technical areas, but would be connected to the area's utility network. The new construction would total approximately 58,060 m^2 (625,000 ft^2) which would be located on 9 ha (22 acres) of available land. In addition to major renovation projects, some existing buildings would undergo minor modifications to accept the new workload. These minor modifications would yield an additional 5,110 m^2 (55,000 ft^2) of work space. Table A.3.6.4–1 lists key facilities. A description of the key nonnuclear fabrication facilities is discussed in the following section.

Office and Distribution Center. Standard open-bay office setup with modular furniture, break areas, files and reproduction areas, conference rooms, secure storage, and executive offices. This space would also include a visitor entry way, an equipment room, and a communications room.

Distribution Center Facility. This would be a standard environmentally controlled warehouse with an administrative office section. Space would include an equipment and communications room.

Electronic Assembly Facility. This facility would include electronic assembly, clean room, and heavy lab capability. Its modules would contain clean rooms, screen room, conductive flooring, special temperature and humidity areas, and assembly areas. The space would include a chemical and materials handling and distribution area, an equipment room, and communications room.

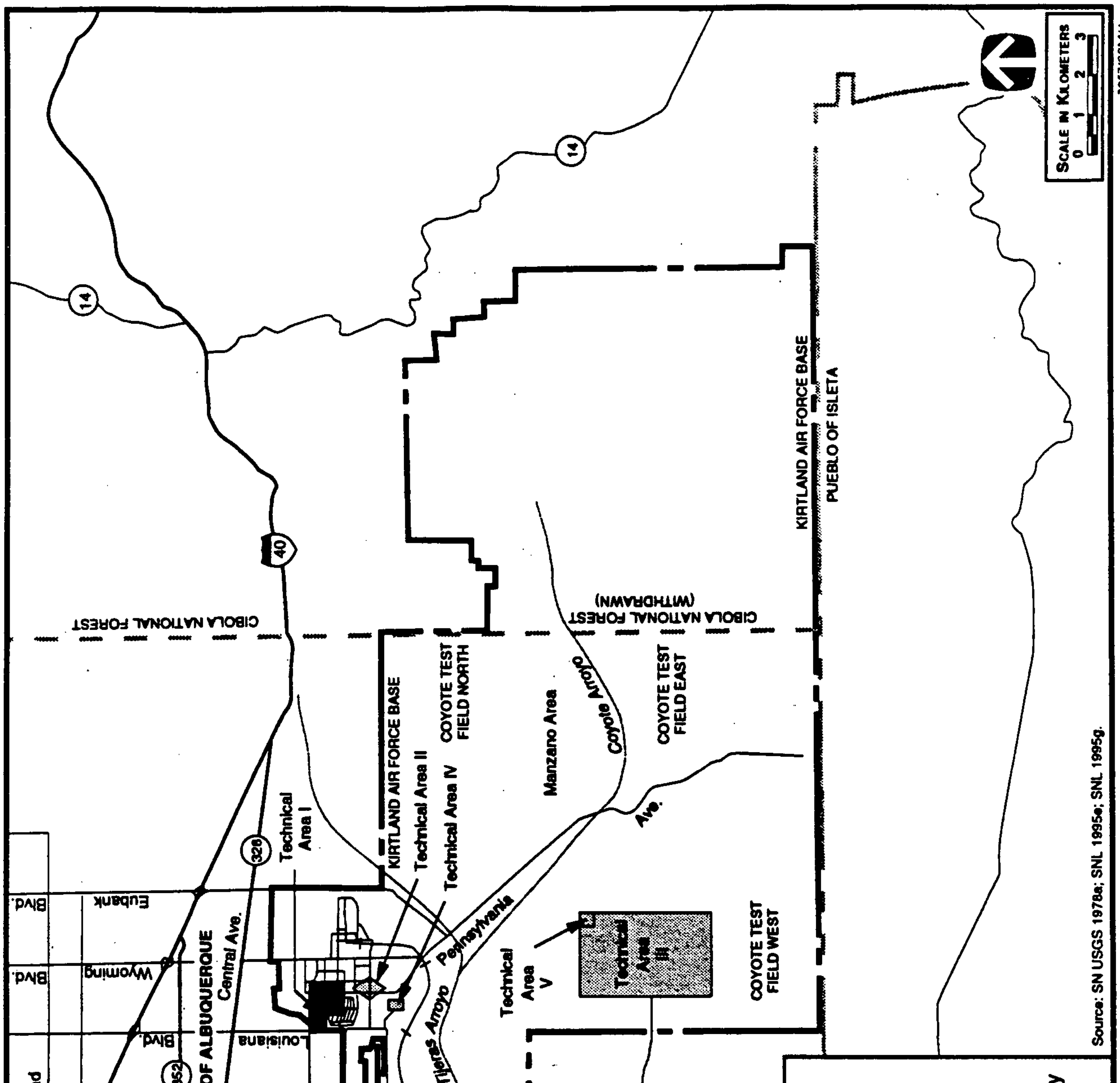
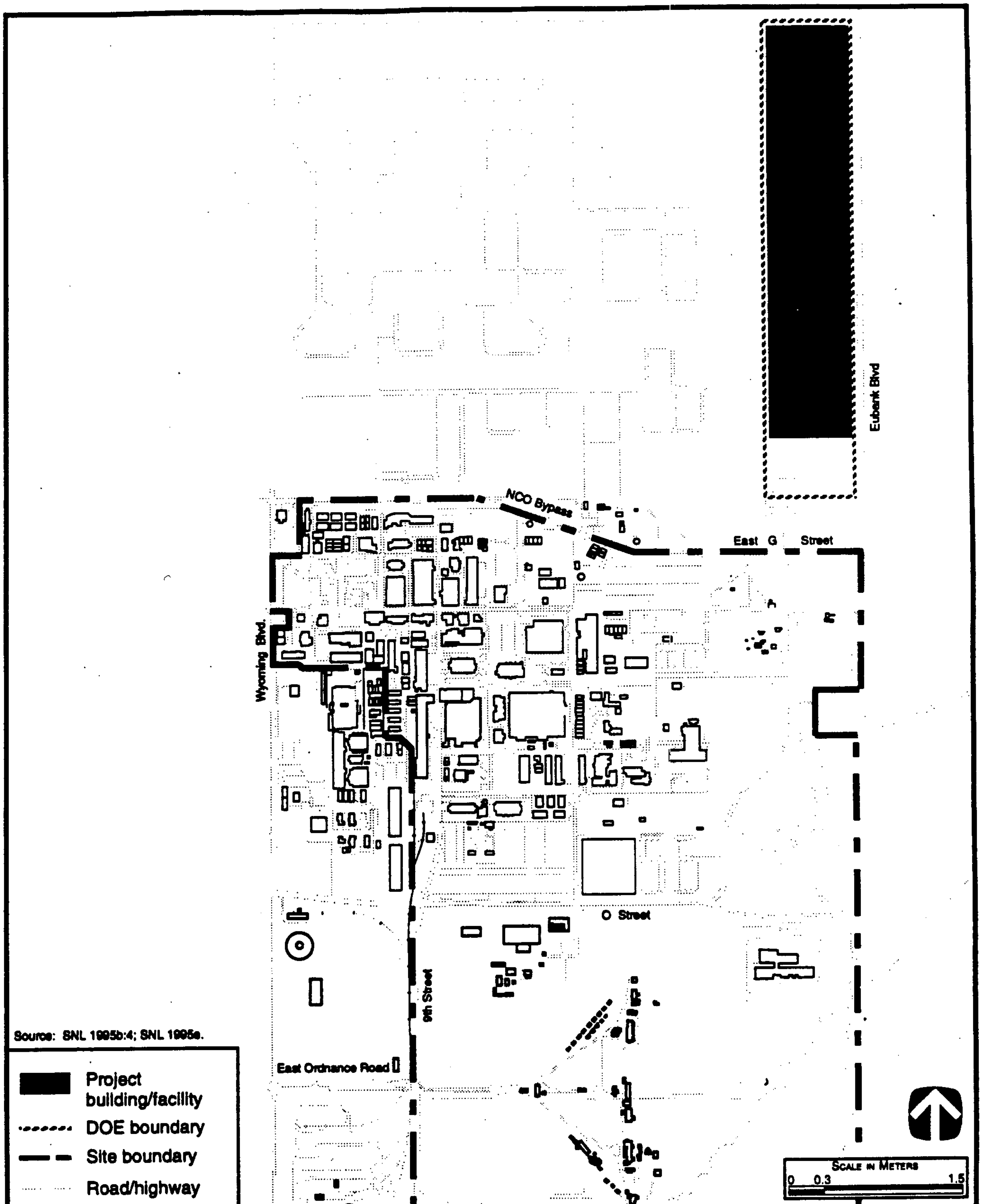


FIGURE A.3.6.4–1.—*Nonnuclear Fabrication Areas at Sandia National Laboratories, New Mexico.*



3047/SSM/App

FIGURE A.3.6.4–2.—*Nonnuclear Fabrication Facility Plot Plan at Sandia National Laboratories.*

Mechanical Assembly Facility. This facility would include a high bay, heavy lab, mechanical assembly, clean room, and some offices. It would also contain a precision machine shop with forges, presses, ovens, and other metal-forming and metal-treating equipment, mechanical assembly areas, and clean room areas. Space would include an equipment room and a communications room.

TABLE A.3.6.4–1.—*Sandia National Laboratories Nonnuclear Fabrication Facility Data*

Facility	Floor Space (m^2)
Office facility	10,219
Distribution center facility	12,277
Electronics assembly facility	16,537
Mechanical assembly facility	6,225
Special production facility	5,574
Central utility building	929
Existing building modifications	5,110
Additional contingency space	4,645
Total	61,316

Source: SNL 1995e.

Special Products Facility. The space would include a high bay, heavy lab, electrical assembly, mechanical assembly, clean room, equipment and communications room. This facility would also have a vault-type security system for controlled areas.

Central Utility Building. In addition to the central chiller and other utilities, this facility would serve as the maintenance headquarters for the site. It would contain offices, records storage, and an emergency management center.

Construction activities would consume electrical power, potable and construction water, and fuel for heavy construction equipment. Emissions generated during construction would include vehicle exhausts and fugitive dust from land clearing and other construction operations. Wastes generated during construction would consist of wash water, construction debris, scrap materials, and hazardous materials such as lead paint and asbestos collected during renovation of older buildings. A list of materials and resources consumed during construction can be found in table A.3.6.4–2.

The number of construction personnel can be found in table A.3.6.4–3.

TABLE A.3.6.4–2.—*Sandia National Laboratories Nonnuclear Fabrication Construction Materials/Resources Requirements*

Material/Resource	Total Consumption	Peak Demand
Electricity	46.8 MWh	2.5 MWe
Fuel (L)	2,600,000	
Water (L)	2,200,000	
Concrete (m^3)	12,800	
Steel (t)	5,440	
Industrial Gases	NA	

Note: NA - not applicable.
Source: SNL 1995b:5; SNL 1995e.

TABLE A.3.6.4–3.—*Sandia National Laboratories Nonnuclear Fabrication Construction Workers*

Employees	Personnel Required			
	Year 1	Year 2	Year 3	Total
All crafts and laborers	120	320	200	640
Supervisors and foremen	10	23	16	49
Office and support	20	26	20	66
Inspectors	8	10	8	26
Total Employment	158	379	244	781

Source: SNL 1995e.

Utilities consumed during operation would include electric power; natural gas-fired and/or central-plant steam heat, potable, fire protection, irrigation, and process hot/chilled water; clean dry air; and sanitary sewer. The central steam plant is fired by commercially purchased natural gas. Electric power is purchased from the local utility, who generates it from coal-fired plants augmented by a natural-gas fired peak-power plant. Water is pumped electrically from wells. The other utilities are produced through the use of electrical power. The actual consumables used by SNL directly, therefore, are electricity, natural gas, and water. The surge operation utilities usages are listed in table A.3.6.4–4. A list of annual chemical use during operation can be found in table A.3.6.4–5.

Emissions from the complex during operations would include exhaust from vehicles and small quantities of aromatic hydrocarbon solvents, alcohols, and related chemistry. Usage quantities of these chemicals preclude any possibility of emissions greater than the 9.1 t (10 tons) per year threshold for *Clean Air Act* 1990 amendments. A list of these emissions can be found in table A.3.6.4–6.

TABLE A.3.6.4–4.—*Sandia National Laboratories Nonnuclear Fabrication Surge Operation Annual Utility Requirements*

Utility	Consumption	Peak Demand[a]
Electricity	39,700 MWh	6.2 MWe
Liquid fuel	0	
Natural gas[b] (m^3)	3,270,000	
Raw water (L)	893,000,000	

[a] Peak demand is the maximum rate expected during any hour.
[b] Cubic meters measured at standard temperature and pressure.
Source: SNL 1995b:4; SNL 1995b:5; SNL 1995e.

TABLE A.3.6.4–5.—*Sandia National Laboratories Nonnuclear Fabrication Surge Operation Annual Chemical Requirements*

Chemical	Quantity
Nitrogen	
Gas (m^3)	3,270
Liquid (L)	14,900,000
Argon	
Gas (m^3)	4,830
Liquid (L)	236,000
Carbon dioxide	
Gas (m^3)	322
Liquid (L)	121,000
Hydrogen	
Gas (m^3)	0.1
Helium	
Gas (m^3)	883
Liquid (L)	1,650

Source: SNL 1995b:4.

TABLE A.3.6.4–6.—*Sandia National Laboratories Nonnuclear Fabrication Surge Operation Annual Emissions*

Pollutant	Quantity (t)
Acetone	0.44
Carbon monoxide	13.17
Chromium	<0.01
Cyanide	0.01
Ethyl benzene	0.05
Formaldehyde	<0.01
Hydrochloric acid	0.03
Isopropyl alcohol	1.62
Methanol	0.01
Methyl ethyl ketone	0.16
Methyl isobutyl ketone	0.03
Particulate matter	1.03
Perc	0.29
Sulfur dioxide	0.35
Toluene	0.50
Toluene diisocyanate	<0.01
1,1,1-Trichloroethane	0.04
Trichloroethylene	2.60
Volatile organic compound	1.9
Xylene	0.26

Source: SNL 1995b:4.

Waste Management. The solid and liquid nonhazardous wastes generated during construction would consist of the collection and ponding of wash water, landfilling of construction debris and scrap materials (especially from the renovation of existing buildings), and collection and disposal of hazardous materials (primarily asbestos and lead paint) during renovation of older buildings. The nonhazardous wastes generated during construction would be disposed of as part of the construction project by the contractor. Uncontaminated wastewater would be used for soil compaction and dust control, and excavated soil would be used for grading and site preparation. Wood, paper, and metal wastes would be shipped offsite to a commercial contractor for recycling. Hazardous wastes generated during construction would consist of such materials as waste adhesives, oils, cleaning fluids, solvents, and coatings. Hazardous waste would be packaged in DOT-approved containers and shipped offsite to commercial RCRA-permitted treatment, storage, and disposal facilities. No radioactive waste would be generated during construction.

The project design considers and incorporates waste minimization and pollution prevention. To facilitate waste minimization, where possible, nonhazardous materials would be substituted for those materials which contribute to the generation of hazardous waste. Production processes would be configured with minimization of waste production given high priority. Material from the waste streams would be treated to facilitate disposal as nonhazardous wastes, where possible. Future D&D considerations have also been incorporated into the design.

Table A.3.6.4–7 presents the estimated annual waste volumes from the Nonnuclear Fabrication Facility at SNL during construction and surge operations. Solid and liquid wastestreams are routed to the waste management system. Solid wastes would be characterized and segregated into hazardous or nonhazardous wastes, then treated to a form suitable for disposal or storage within the facility. Liquid wastes would be treated onsite to reduce hazardous/toxic elements before discharge or transport. All fire sprinkler water discharged in process areas is contained and treated as process wastewater, when required.

No new wastestreams would be generated. Wastes from the complex would include metal and dielectric material machining chips and turnings, solder scrap, acids and other eychants, curing compounds for various electrical encapsulants, test and analytical reagents, hydraulic fluid and other machine servicing compounds, reverse-osmosis backflush water, silicon slurries and other wastes generated as part of integrated circuit manufacture, sanitary sewer flows, and related materials.

Transuranic Waste. The Nonnuclear Fabrication Facility at SNL would not generate any TRU waste.

Low-Level Waste. The Nonnuclear Fabrication Facility at SNL would not generate any LLW.

Mixed Low-Level Waste. The Nonnuclear Fabrication Facility at SNL would not routinely generate any mixed LLW.

Hazardous Waste. Hazardous wastes generated by the Nonnuclear Fabrication Facility at SNL would consist of acids and other etchants, curing compounds, solvents, test and analytical reagents, and other wastes generated as part of integrated circuit manufacture. Liquid hazardous wastes would be collected in DOT-approved containers and sent to an onsite hazardous waste accumulation area. The hazardous waste accumulation area would provide a 90-day staging capacity prior to shipment to an offsite commercial RCRA-permitted treatment, storage, and disposal facility, using DOT-certified transporters. After compaction, if appropriate, the solid hazardous wastes would be packaged in DOT-approved containers and sent to a hazardous waste accumulation area for staging, characterization, and packaging prior to shipment to an offsite commercial RCRA-permitted treatment, storage, and disposal facility using DOT-certified transporters.

Nonhazardous (Sanitary) Waste. Nonhazardous liquid waste generated at the Nonnuclear Fabrication Facility primarily consists of reverse-osmosis backflush water, and sanitary sewer flows. Nonrecyclable, nonhazardous solid sanitary and industrial wastes would be compacted and disposed of in local commercial facilities. Liquid sanitary wastes would be collected by independent underground septic tanks at nonnuclear fabrication buildings and by sewer pipe systems from most of the support buildings and routed to municipal treatment facilities. Excess water is discharged to a natural drainage channel. Process wastewater is sent to holding tanks for pretreatment and screening prior to discharge to the publicly owned treatment works. The sewage wastewater would be routinely monitored for radioactive contaminants.

Nonhazardous (Other) Waste. Stormwater from areas of SNL is allowed to go in natural drainage channels.

TABLE A.3.6.4–7.—*Sandia National Laboratories Nonnuclear Fabrication Waste Volumes*

Category	Annual Average Volume Generated from Construction (m^3)	Annual Volume Generated from Surge Operations[a] (m^3)	Annual Volume Effluent from Surge Operations (m^3)
Low-Level[b]			
Liquid	None	None	None
Solid	None	None	None
Mixed Low-Level[b]			
Liquid	None	None	None
Solid	None	None	None
Hazardous			
Liquid	0.11	15	15
Solid	23	17	17
Nonhazardous (Sanitary)			
Liquid	6,160[c]	291,470	291,470[d]
Solid	236	7,880	3,940[e]
Nonhazardous (Other)			
Liquid	383[f]	Included in sanitary	Included in sanitary
Solid	5	Included in sanitary	Included in sanitary

[a] The data for a multiple shift were determined by multiplying single-shift data by 2.

[b] LLW or mixed LLW would not be generated during normal operations. However, upset conditions may result in the generation of minimal quantities of LLW or mixed LLW.

[c] No data provided. Assumes 25 gallons per day per construction worker for 250 days per year and 260 construction workers. Construction toilets are trucked off site for servicing.

[d] SNL sanitary wastewater goes to the city of Albuquerque sanitary sewer system; thus the effluent is the same as generated.

[e] Assumes that 2/3 of the solid waste is compactible by a factor of 4:1.

[f] Includes washing from flushing mechanical systems, dust control water, and blockwork, cementitious coatings.

Source: SNL 1995b:5; SNL 1995e.

APPENDIX B

Appendix B

APPENDIX B: AIR QUALITY

B.1 INTRODUCTION

This appendix provides detailed data that support impact assessments for air quality addressed in sections 4.X.2.3, Affected Environment—Air Quality and 4.X.3.3, Environmental Impacts—Air Quality. The data presented include emission inventories from site-related activities and facility emissions for various alternatives. Section B.2 presents the methodology and models used in the air quality assessment. Section B.3 presents supporting data applicable to each site. The tables included in sections B.3.2 through B.3.9 contain site-specific information applicable to the air quality assessments at each site including figures containing wind rose data specific to each site.

B.2 METHODOLOGY AND MODELS

The assessment of potential impacts to air quality is based upon comparisons of proposed project effects with applicable standards and guidelines. The Industrial Source Complex Short-Term model, version 2, is used to estimate concentrations of pollutants from emission sources at each site.

The air quality modeling analysis performed for the alternative sites is considered a "screening level" analysis incorporating conservative assumptions applied to each of the sites such that the impacts associated with the respective alternatives could be compared among the sites. The assumptions are as follows: major source criteria pollutant emissions were modeled using actual source locations and stack parameters to determine No Action criteria pollutant concentrations; toxic/hazardous pollutant emissions were modeled from a single source centrally located within the complex of facilities on each site assuming a 10-meter (m) (32.8-foot [ft]) stack height, a stack diameter of 0.3 m (1 ft), stack exit temperature equal to ambient temperature, and a stack exit velocity equal to 0.03 m/second (s) (0.1 ft/s), unless otherwise specified.

These assumptions will tend to overestimate pollutant concentrations since no credit is given to spacial and temporal variations of emission sources. Emission sources for the facilities for each alternative were located at the same location as the existing toxic/hazardous pollutant emission sources and assumed the modeling parameters used for these emissions.

B.3 SUPPORTING DATA

B.3.1 Overview

This section presents supporting information for each of the eight existing Department of Energy (DOE) sites considered under various alternatives. Table B.3.1–1 presents the air quality standards applicable to each site. Subsequent sections present supporting information used in the air quality analysis at Oak Ridge Reservation (ORR), Savannah River Site (SRS), Kansas City Plant (KCP), Pantex Plant (Pantex), Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL) (which includes the Livermore Site and Site 300), Sandia National Laboratories (SNL), and Nevada Test Site (NTS).

B.3.2 Oak Ridge Reservation

This section provides information on meteorology and climatology, emission rates, modeling assumptions, atmospheric dispersion characteristics, and annual mean wind speed and direction frequencies (figure B.3.2–1) at ORR. Table B.3.2–1 presents emission source inventories for criteria and toxic/hazardous pollutants at ORR. This information supports data presented in the environmental impacts section for air quality.

Climatology and Meteorology. The wind direction above the ridge tops and within the valley at ORR tends to follow the orientation of the valley. On an annual basis, the prevailing winds at the National Weather Service station in the city of Oak Ridge are either up-valley, from west to southwest, or down valley, from east to northeast. Figure B.3.2–1 shows mean wind speeds and direction frequencies for 1990 measured at the 30-m (100-ft) level of the ORR meteorology tower. The prevailing wind directions are from the southwest and northeast quadrants. Annual mean wind speeds measured in the region are relatively low averaging 2 m/s (4.5 miles per hour

TABLE B.3.1–1.—*Ambient Air Quality Standards Applicable to the Candidate Sites* [Page 1 of 2]

Pollutant	Averaging Time	Primary NAAQS[a] (μg/m³)	Secondary NAAQS (μg/m³)	California (Livermore Site and Site 300) (μg/m³)	Nevada (NTS) (μg/m³)	Kansas (KCP) (μg/m³)	Texas (Pantex) (μg/m³)	Tennessee (ORR) (μg/m³)	Georgia and South Carolina (SRS) (μg/m³)	New Mexico (LANL/SNL) (μg/m³)
Criteria Pollutant										
Carbon monoxide	Annual	b	b	b	b	b	b	b	b	b/4,600
	8-hour	10,000	b	10,000	10,000	10,000	10,000	10,000	10,000	7,689/10,000
	1-hour	40,000	b	23,000	40,000	40,000	40,000	40,000	40,000	11,578/15,000
Lead	Calendar quarter	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5/1.5
	30-day	b	b	1.5	b	b	b	b	b	b/3
Nitrogen dioxide	Annual	100	100	100	100	100	100	100	100	73/94
	24-hour	b	b	b	b	b	b	b	b	145/117
	1-hour	b	b	470	b	b	b	b	b	b/b
Ozone	1-hour	235	235	180	235	235	235	235	235	235/235
Particulate matter	Annual	50	50	30	50	50	50	50	50	50/50
	24-hour	150	150	50	150	150	150	150	150	150/150
Sulfur dioxide	Annual	80	b	80	80	80	80	80	80	40/11
	24-hour	365	b	105	365	365	365	365	365	202/92
	3-hour	b	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300/1,300
	1-hour	b	b	655	b	b	b	b	b	b/b
	30-minute	b	b	b	b	b	1,045	b	b	b/b
State and County Mandated Pollutants										
Arsenic, Copper & Zinc	30-day	b	b	b	b	b	b	b	b	b/10
Beryllium	30-day	b	b	0.01	b	b	b	b	b	b/0.01
	24-hour	b	b	b	b	b	0.01	b	b	b/b
Hydrocarbons (non-methane)	3-hour	b	b	b	b	b	b	b	b	b/100
Hydrogen fluoride	30-day	b	b	b	b	b	0.8	1.2	0.8	b/b
	7-day	b	b	b	b	b	1.6	1.6	1.6	b/b
	24-hour	b	b	b	b	b	2.9	2.9	2.9	b/b
	12-hour	b	b	b	b	b	3.7	3.7	3.7	b/b

TABLE B.3.1-1.—*Ambient Air Quality Standards Applicable to the Candidate Sites* [Page 2 of 2]

Pollutant	Averaging Time	Primary NAAQS[a] (μg/m³)	Secondary NAAQS (μg/m³)	California (Livermore Site and Site 300) (μg/m³)	Nevada (NTS) (μg/m³)	Kansas (KCP) (μg/m³)	Texas (Pantex) (μg/m³)	Tennessee (ORR) (μg/m³)	Georgia and South Carolina (SRS) (μg/m³)	New Mexico (LANL/SNL) (μg/m³)
State and County Mandated Pollutants (Continued)										
Hydrogen sulfide	1-hour	b	b	42	112	b	b	b	b	11/4
	30-minute	b	b	b	b	42	b	b	b	b/b
Photochemical oxidants	1-hour	b	b	b	b	b	b	b	b	b/20
Sulfate	24-hour	b	b	25	b	b	b	b	b	b/b
Sulfuric acid	24-hour	b	b	b	b	10	b	b	b	b/b
	1-hour	b	b	b	b	30	b	b	b	b/b
Total reduced sulfur	1-hour	b	b	b	b	b	b	b	b	3/4
Total suspended particulates	Annual	b	b	b	b	b	b	b	75	60/60
	30-day	b	b	b	b	b	b	b	b	90/90
	7-day	b	b	b	b	b	b	b	b	110/110
	24-hour	b	b	b	b	b	b	150	b	150/150
Vinyl chloride	24-hour	b	b	26	b	b	b	b	b	b/b

[a] The NAAQS (40 CFR 50), other than those for ozone, particulate matter, lead, and those based on average annuals, are not to be exceeded more than once per year. The ozone standard is attained when the expected number of days per year with maximum hourly average concentrations above the standard is less than or equal to one. The 24-hour particulate matter standard is attained when the expected number of days with a 24-hour average concentration above the standard is less than or equal to one. The annual arithmetic mean particulate matter standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard. The calendar quarter lead standard is not to be exceeded.

[b] There is no standard.

Note: NAAQS - National Ambient Air Quality Standard.

Source: 40 CFR 50; CA EPA 1993a; MO DNR 1994a; NM EIB 1996a; NV DCNR 1995a; SC DHEC 1992b; TN DEC 1994a; TX ACB 1987a; TX ACB 1993a; TX NRCC 1992a.

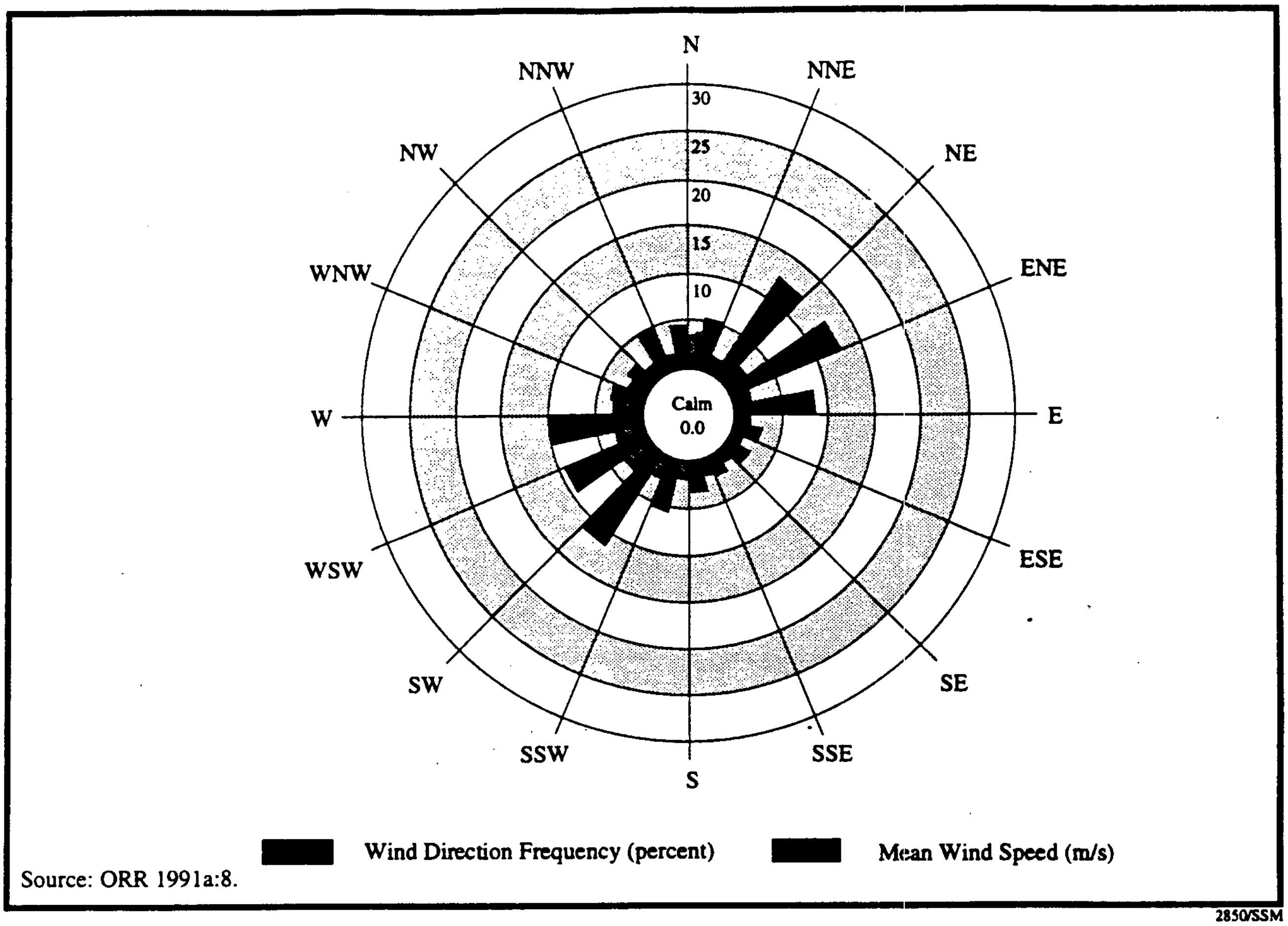


FIGURE B.3.2–1.—*Wind Distribution at Oak Ridge Reservation, 1990.*

at the Oak Ridge National Weather Service station at the 14-m (46-ft) level and 2.1 m/s (4.7 mph) at the ORR Bethel Valley monitoring station at the 10-m (32.8-ft) level. The average annual temperature at ORR is 13.7 Celsius degrees (°C) (56.6 degrees Fahrenheit [°F]); temperatures vary from an average daily minimum of -3.8 °C (25.1 °F) in January to an average daily maximum of 30.4 °C (86.7 °F) in July. Relative humidity readings taken 4 times per day range from 51 percent in April to 92 percent in August and September (NOAA 1994c:3).

The average annual precipitation measured at ORR in Bethel Valley is 131 centimeters (cm) (56.1 inches [in]), while the average annual precipitation for the Oak Ridge National Weather Service station is 136.4 cm (53.77 in). The maximum monthly precipitation recorded at the Oak Ridge National Weather Service station was 48.9 cm (19.27 in) in July 1967, while the maximum rainfall in a 24-hour period observed was recorded in August 1960 at 19 cm (7.48 in). The average annual snowfall as measured at the Oak Ridge National Weather Service station is 24.9 cm (9.8 in) (NOAA 1994c:3).

Damaging winds are uncommon in the region. Peak gusts recorded in the area range from 26.8 to 30.8 m/s (60 to 69 mph) for the months of January through July; from 21.9 to 26.8 m/s (49 to 60 mph) for August, September, and December; and 16.1 to 20.1 m/s (36 to 45 mph) in October and November (ORNL 1982a:2-72). The fastest mile wind speed (the 1 mile [mi] [1.6 kilometer {km}]) passage of wind with the highest speed for the day) recorded at the Oak Ridge National Weather Service station for the period of record 1958 through 1979 was 26.4 m/s (59.1 mph) in January 1959 (NOAA 1994c:3).

The extreme mile wind speed at a height of 9.1 m (30 ft) that is predicted to occur near ORR once in 100 years is approximately 39.8 m/s (89 mph). The approximate values for occurrence intervals of 10, 25, and 50 years are 28.6, 32.6, and 34.0 m/s (64, 73, and 76 mph), respectively (ORNL 1981a:3.3-7).

Between 1916 and 1972, there were 25 tornadoes reported in the counties of Tennessee having borders within about 64.4 km (40 mi) of ORR. The probability of a tornado striking a particular point in the vicinity of ORR is estimated to be $3.6x10^{-4}$ per year (ORNL 1982a:2-125).

On February 21, 1993, a tornado passed through the northeastern edge of ORR and caused considerable damage to a number of structures in the nearby Union Valley Industrial Park. Damage from this tornado to ORR was relatively light. The wind speeds associated with this tornado ranged from 17.9 m/s (40.0 mph) to those approaching 58.1 m/s (130 mph) (OR DOE 1993c:iii).

Emission Rates. ORR exceeds the applicable 250-ton-per-year emissions criterion for nitrogen dioxide and sulfur dioxide and is therefore classified as an existing major source for these pollutants. The classification of ORR as a major source may require further prevention of significant deterioration review than sites not classified as a major source. Table B.3.2–1 presents the emission rates for criteria and toxic/hazardous pollutants at ORR. These emission rates were used as input into the Industrial Source Complex Short-Term model, version 2, to estimate pollutant concentrations.

Modeling Assumptions. Additional model input used to estimate maximum pollutant concentrations at or beyond the ORR site boundary include the following: criteria pollutant emissions were modeled from actual stack locations using actual stack heights, stack diameter, exit velocity, and exit temperature, taken from operating permits; toxic/hazardous pollutant emissions were modeled from a centrally located stack in the Y-12 Plant (Y-12) complex at a height of 10 m (32.8 ft), stack diameter of 0.3 m (1.0 ft), exit velocity of 0.03 m/s (0.1 ft/s), and exit temperature equal to ambient temperature.

TABLE B.3.2–1.—*Emission Rates for Proposed Management Alternatives at Oak Ridge Reservation*

Pollutant	2005 No Action (kg/yr)	Downsize Secondary and Case Fabrication (kg/yr)[a]	Phaseout of Secondary and Case Fabrication (kg/yr)
Criteria Pollutant			
Carbon monoxide	95,000	89,500	(12,900)
Nitrogen dioxide	870,000	708,000	(357,000)
Particulate matter	8,300	7,930	(870)
Sulfur dioxide	972,000	904,000	(148,000)
Total suspended particulates	1,125,000	1,025,000	(110,000)
Hazardous and Other Toxic Compounds			
Acetic acid	1	1	(1)
Chlorine	1,750	1,740	(160)
Hydrogen chloride	6,420	5,480	(5,740)
Hydrogen fluoride	70	70	(70)
Hydrogen sulfide	b	b	b
Methyl alcohol	26,400	16,600	(23,800)
Nitric acid	9,500	8,100	(8,500)
Sulfuric acid	2,500	2,120	(2,180)
1, 1, 1-Trichloroethane	220	220	(200)

[a] Based upon reduction of No Action emissions.

[b] No sources indicated.

Note: Parentheses indicate a net reduction in emissions.

Source: OR DOE 1993a; OR DOE 1995g.

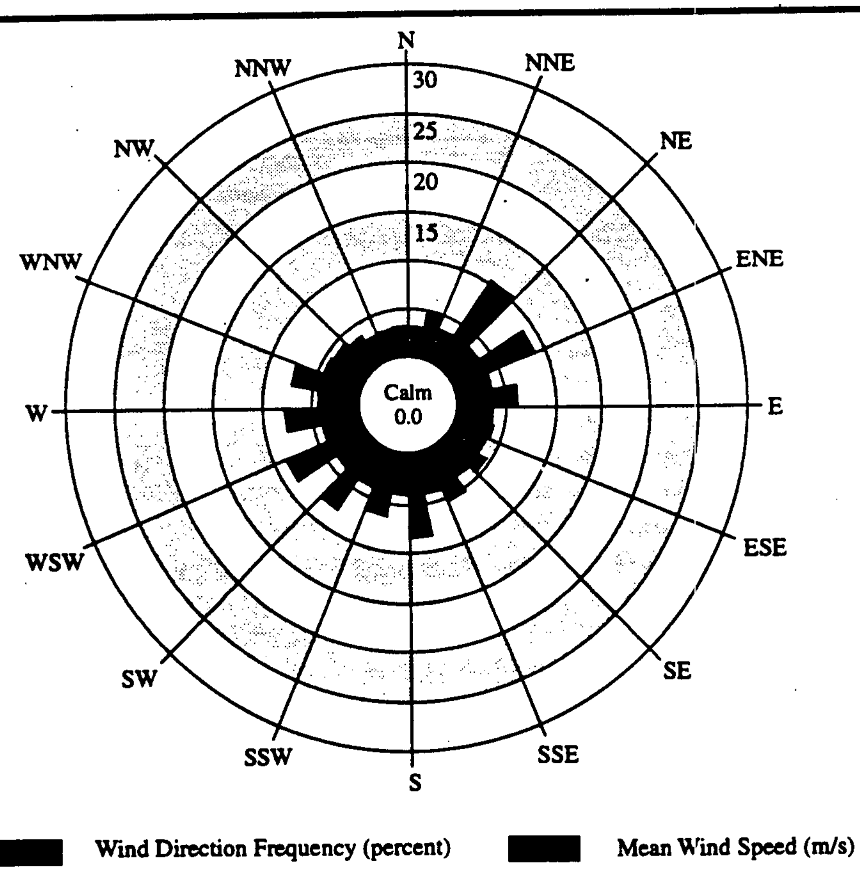
Atmospheric Dispersion Characteristics. Data collected at the ORR meteorological monitoring station (Y-12 east tower) for calendar year 1990 indicate that unstable conditions occur approximately 23 percent of the time, neutral conditions approximately 31 percent of the time, and stable conditions approximately 46 percent of the time, on an annual basis.

Annual Mean Wind Speeds and Direction Frequencies. ORR meteorological data for annual mean wind speed and direction for 1990 is presented in figure B.3.2–1 as a wind rose. As shown in this figure, the maximum wind direction frequency is from the east-northeast with a secondary maximum from the northeast. The mean wind speed from the east-northeast is 1.7 m/s (3.8 mph); from the northeast is 2.3 m/s (5.1 mph); while the maximum mean wind speed is 3.3 m/s (7.4 mph) from the southwest.

B.3.3 Savannah River Site

This section provides information on climatology and meteorology, modeling assumptions, atmospheric dispersion characteristics, and annual mean wind speed and direction frequencies (figure B.3.3–1) at SRS. Table B.3.3–1 presents emission source inventories for criteria and toxic/hazardous pollutants at SRS. This information supports data presented in the environmental impacts section for air quality.

Climatology and Meteorology. Figure B.3.3–1 shows annual mean wind speeds and wind direction frequencies for 1991 measured at the 60-m (200-ft) level of the SRS H-Area weather station. The wind data from the site indicate that there is no prevailing wind direction at SRS. The highest directional frequency is from the northeast. The average annual wind speed measured is 3.8 m/s (8.4 mph) (WSRC 1992h).



Source: WSRC 1992h.

2851/SSM

FIGURE B.3.3–1.—*Wind Distribution at Savannah River Site, 1991.*

TABLE B.3.3–1.—*Emission Rates for Proposed Management Alternatives at Savannah River Site*

Pollutant	2005 No Action (kg/yr)		Pit Fabrication (kg/yr)
Criteria Pollutant			
Carbon monoxide	404,449		685
Hydrogen fluoride	16,690		[a]
Nitrogen dioxide	4,278,380		15,666
Particulate matter	1,963,180		968
Sulfur dioxide	9,454,199		32,552
Total suspended particulates	4,430,890		[a]
Hazardous and Other Toxic Compounds	**Point and Volume Source (kg/yr)**	**Area Source (kg/yr/m²)**	
Acrolein	[a]	1.94×10^{-3}	[a]
Benzene	129,772.3	0.21	[a]
Bis (chloromethyl) ether	211.0	[a]	[a]
Cadium oxide	243.0	[a]	[a]
Chlorine	21,146.7	10.11	[a]
Chloroform	1,035,006	13.6	[a]
Cobalt	5,970.2	4.58×10^{-4}	[a]
3, 3-Dichlorobenzidine	211.0	[a]	[a]
Formic acid	46,949.5	[a]	[a]
Manganese	27,882.1	2.61	[a]
Mercury	917.5	1.15×10^{-3}	[a]
Nickel	23,022.5	6.02	[a]
Nitric acid	1,150,525.8	[a]	[a]
Parathion	[b]	[b]	[a]
Phosphoric acid	14,859.8	[a]	[a]

[a] No sources indicated.
[b] Data not available.
Source: SRS 1993a:4; SRS 1995a:10; WSRC 1995c.

The average annual temperature at SRS is 17.3 °C (63.2 °F); temperatures vary from an average daily minimum of 0.0 °C (32 °F) in January to an average daily maximum of 33.2 °C (91.7 °F) in July. Relative humidity readings taken 4 times per day range from 45 percent in April to 92 percent in August and September (NOAA 1994c:3).

The average annual precipitation at SRS is 113.4 cm (44.66 in). Precipitation is distributed fairly evenly throughout the year, with the highest precipitation in summer, 32.7 cm (12.87 in) and the lowest in autumn, 21.2 cm (8.34 in). Although snow can fall from November through April, the average annual snowfall is only 2.8 cm (1.1 in); large snowfalls are rare (NOAA 1994c:3).

Winter storms in the SRS area occasionally bring strong and gusty surface winds with speeds as high as 22.8 m/s (51 mph). Thunderstorms can generate winds with speeds as high as 21.5 m/s (48.1 mph) and even stronger gusts. The fastest 1-minute wind speed recorded at Augusta between 1952 and 1993 was 27.7 m/s (62 mph) (NOAA 1994c:3).

The average number of thunderstorm days per year at SRS is 56. From 1954 to 1983, 37 tornadoes were reported for a 1-degree square of latitude and longitude that includes SRS. This frequency of occurrence amounts to an average of about one tornado per year. The estimated probability of a tornado striking a point at SRS is 7.1×10^{-5} per year. Since operations began at SRS in 1953, nine tornadoes have been confirmed on or near SRS. Nothing more than light damage was reported in any of these storms, with the exception of a tornado in October 1989. That tornado caused considerable damage to timber resources in an undeveloped wooded area of SRS (WSRC 1990b:1).

From 1899 to 1980, 13 hurricanes occurred in Georgia and South Carolina, for an average frequency of about 1 hurricane every 6 years. Three hurricanes were classified as major. Because SRS is about 160 km (99.4 mi) inland, the winds associated with hurricanes have usually diminished below hurricane force (greater than or equal to a sustained speed of 33.5 m/s (75 mph) before reaching the site (DOE 1992e:4-115).

Emission Rates. SRS exceeds the applicable 250-ton-per-year emissions criterion for carbon monoxide, nitrogen dioxide, PM_{10}, and sulfur dioxide and is therefore classified as an existing major source for these pollutants. The classification of SRS as a major source may require further prevention of significant deterioration review than sites not classified as a major source. Table B.3.3–1 presents the emission rates for criteria and toxic/hazardous pollutants at SRS. The toxic/hazardous pollutant emissions presented in the table represent those pollutants with estimated concentrations at or beyond the SRS boundary that exceed 1 percent of the state air quality standards. These emission rates were used as input into the Industrial Source Complex Short-Term model, version 2, to estimate pollutant concentrations.

Modeling Assumptions. Emission rates for criteria and toxic/hazardous pollutants were based upon site actual emissions data for the year 1990. Additional model input used to estimate maximum criteria and toxic/hazardous pollutant concentrations at or beyond the SRS site boundary include pollutant emissions modeled from actual stack heights, actual effective stack diameters, actual exit velocity, and actual exit temperature.

Atmospheric Dispersion Characteristics. Data collected at the SRS meteorological monitoring station for 1991 indicate that unstable conditions occur approximately 38 percent of the time, neutral conditions approximately 43 percent of the time, and stable conditions approximately 19 percent of the time, on an annual basis.

Annual Mean Wind Speeds and Direction Frequencies. The SRS meteorological data for annual mean wind speed and direction for 1991 is presented in figure B.3.3–1 as a wind rose. As shown in this figure, the maximum wind direction frequency is from the northeast with a secondary maximum from the east-northeast. The mean wind speed from the northeast is 3.8 m/s (8.5 mph); from the east-northeast, 3.8 m/s (8.5 mph); while the maximum mean wind speed is 4.1 m/s (9.2 mph) from the west-northwest.

B.3.4 Kansas City Plant

This section provides information on meteorology and climatology, emission rates, modeling assumptions, atmospheric dispersion characteristics, and annual mean wind speed and direction frequencies (figure B.3.4–1) at KCP. Table B.3.4–1 presents emission source inventories for criteria and toxic/hazardous pollutants at KCP. This information supports data presented in the environmental impacts section for air quality.

Climatology and Meteorology. Figure B.3.4–1 shows annual mean wind speeds and wind direction frequencies for 1991 measured at the 10-m (32.8-ft) level of the Kansas City, Missouri National Weather Service station. The wind data from the Kansas City National Weather Service station indicate that the predominant wind direction frequency is from the south. The average annual wind speed measured is 4.8 m/s (10.8 mph). Average monthly wind speeds range from 5.6 m/s (12.6 mph) in March, to 4.1 m/s (9.1 mph) in August.

The average annual temperature at KCP is 12.0 °C (53.6 °F); temperatures vary from an average daily minimum of -8.5 °C (16.7 °F) in January to a daily mean maximum of 31.5 °C (88.7 °F) in July. Relative humidity readings taken four times per day range from 53 percent in April to 86 percent in August and September (NOAA 1994a:3).

The average annual precipitation at KCP is 95.6 cm (37.62 in). The highest precipitation occurs in the

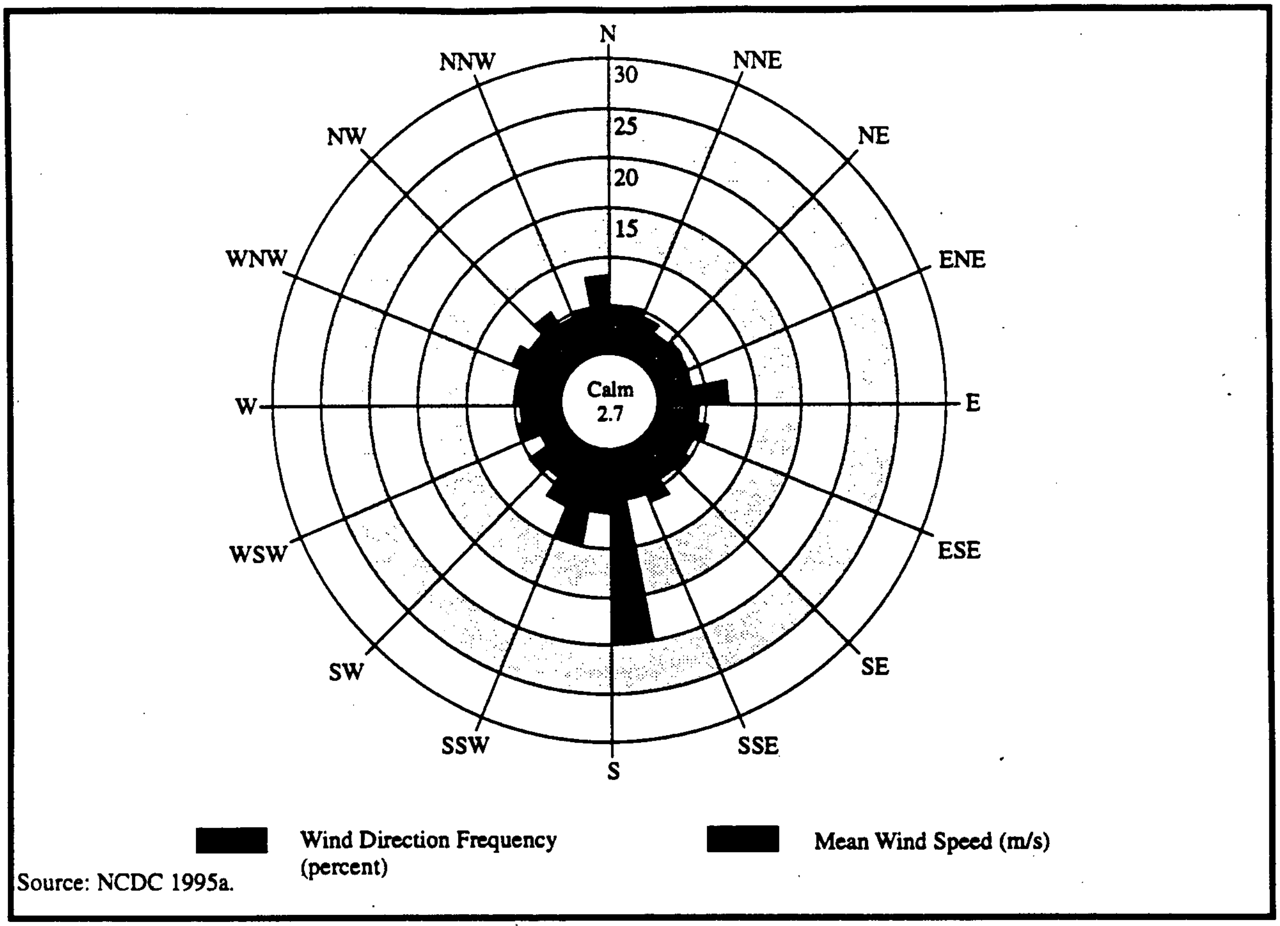


FIGURE B.3.4–1.—***Wind Distribution at Kansas City Plant, 1991.***

summer months, May through September, and the lowest in winter. Snow can fall from November through April, with the average annual snowfall being 51.1 cm (20.1 in) (NOAA 1994a:3).

Winter storms in the KCP area occasionally bring strong and gusty surface winds with speeds as high as 25.9 m/s (58 mph). Thunderstorms can generate winds with speeds as high as 33.5 m/s (75 mph) and even stronger gusts. The fastest 1-minute wind speed recorded at Kansas City National Weather Service station was 21.5 m/s (48 mph) (NOAA 1994a:3).

The average number of thunderstorm days per year at KCP is 51.8. The estimated probability of a tornado striking a point at KCP is 7.5×10^{-4} per year (NRC 1986a:32).

Emission Rates. Table B.3.4–1 presents the emission rates for criteria and toxic/hazardous pollutants at the KCP. These emission rates were used as input into the Industrial Source Complex Short-Term model, version 2, to estimate pollutant concentrations.

Modeling Assumptions. Additional model input used to estimate maximum pollutant concentrations at or beyond the KCP site boundary include the following: criteria pollutant emissions were modeled from actual stack locations using actual stack heights, stack diameter, exit velocity, and exit temperature, taken from operating permits; toxic/hazardous pollutant emissions were modeled from a centrally located stack in the KCP complex at a height of 10 m (32.8 ft), stack diameter of 0.3 m (1.0 ft), exit velocity of 0.03 m/s (0.1 ft/s), and exit temperature equal to ambient temperature.

Atmospheric Dispersion Characteristics. Data collected at the Kansas City National Weather Service station for calendar year 1991 indicate that unstable conditions occur approximately 15 percent

TABLE B.3.4–1.—*Emission Rates for Proposed Management Alternatives at Kansas City Plant*

Pollutant	2005 No Action (kg/yr)	Downsize Nonnuclear Fabrication (kg/yr)	Phaseout of Nonnuclear Fabrication (kg/yr)
Criteria Pollutant			
Carbon monoxide	11,948	11,948	(11,948)
Nitrogen dioxide	42,574	42,574	(42,574)
Particulate matter	934	934	(934)
Sulfur dioxide	318	318	(318)
Total suspended particulates	934	934	(934)
Hazardous and Other Toxic Compounds			
Acetone	399	416	(399)
Chromium	<9	<9	(<9)
Cyanide	10.21	5.22	(10.21)
Ethyl benzene	45.4	45.4	(45.4)
Formaldehyde	<9	<9	(<9)
Hydrogen chloride	27.2	14.5	(27.2)
Isopropyl alcohol	1,470	2,538	(1,470)
Methanol	9	9	(9)
Methyl ethyl ketone	145	123.6	(145)
Methyl isobutyl ketone	27.2	27.2	(27.2)
Perchloroethylene	263	263	(363)
Toluene	454	506	(454)
Toluene-2,4-Diisocyanate	<9	<9	(<9)
Trichloroethane	36.3	36.3	(36.3)
Trichloroethylene	2,359	3,201	(2,359)
Xylene	235.9	235.9	(235.9)

Note: Parentheses indicate a net reduction in emissions.
Source: KC ASI 1995a.

of the time, neutral conditions approximately 61 percent of the time, and stable conditions approximately 24 percent of the time, on an annual basis.

Annual Mean Wind Speeds and Direction Frequencies. The Kansas City National Weather Service meteorological data for annual mean wind speed and direction for 1991 is presented in figure B.3.4–1 as a wind rose. As shown in this figure, the maximum wind direction frequency is from the south with a secondary maximum from the south-southwest. The mean wind speed from the south is 6.1 m/s (13.6 mph); while the maximum mean wind speed is 6.3 m/s (14.1 mph) from the south-southwest.

B.3.5 Pantex Plant

This section provides information on climatology and meteorology, atmospheric dispersion characteristics, and annual mean wind speed and direction frequencies (figure B.3.5–1) at Pantex. Table B.3.5–1 presents emission source inventories for criteria and toxic/hazardous pollutants at Pantex. This information supports data presented in the environmental impacts section for air quality.

Climatology and Meteorology. Figure B.3.5–1 shows annual mean wind speeds and wind direction frequencies for 1991 measured at the 6.6-m (21.6-ft) level of the Amarillo National Weather Service

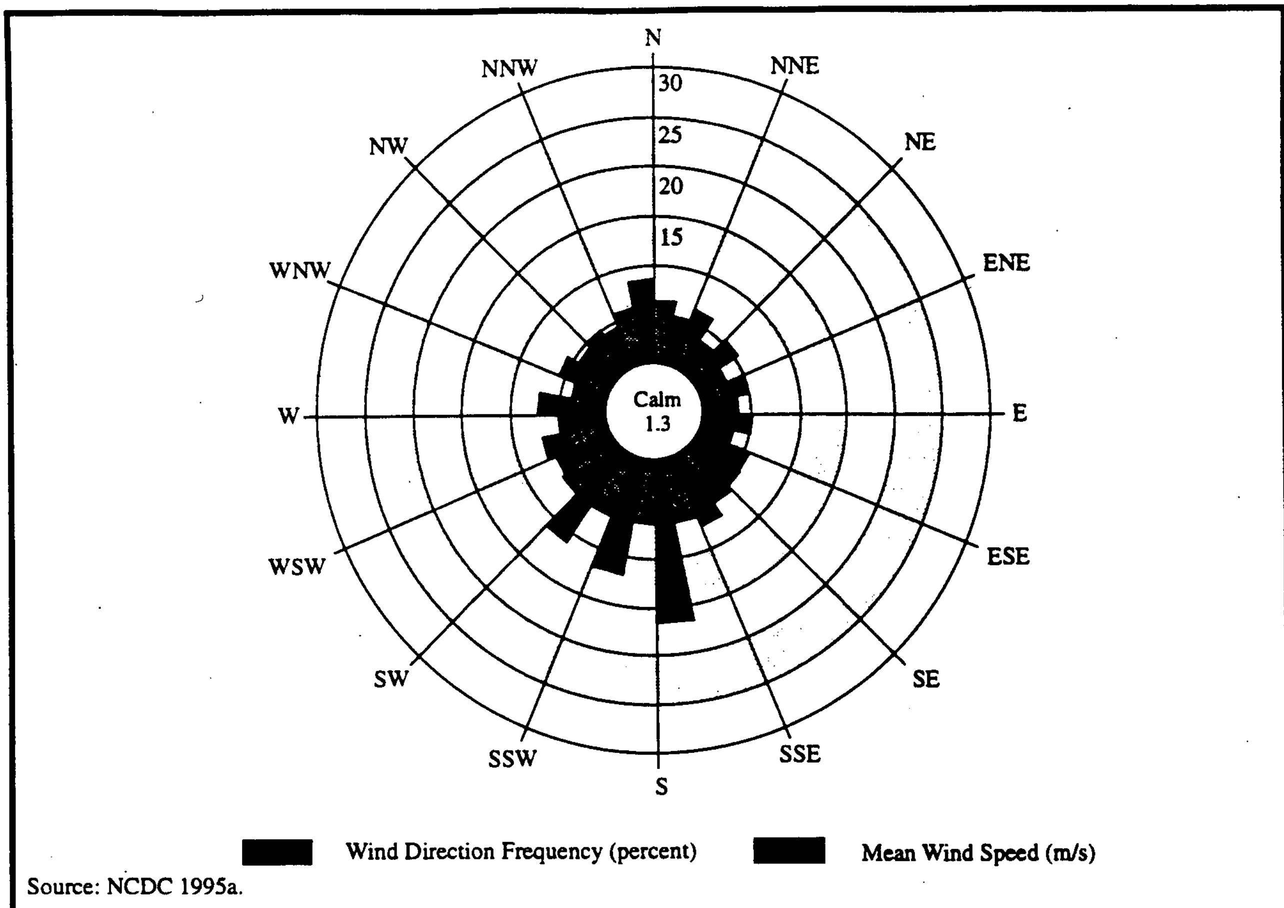


FIGURE B.3.5–1.—*Wind Distribution at Pantex Plant, 1991.*

station. Prevailing wind directions are from the south to southwest. The average annual wind speed measured is 6 m/s (13.5 mph).

The average annual temperature at Pantex is 13.8 °C (56.9 °F); average daily temperatures vary from a daily mean minimum of -5.7 °C (21.8 °F) in January to a daily mean maximum of 32.8 °C (91.1 °F) in July and August. Relative humidity readings taken four times per day range from 31 percent in April to 80 percent in September (NOAA 1994c:3).

The average annual precipitation at Pantex is 49.7 cm (19.56 in). Most of the annual precipitation falls during the months of April through October and usually occurs from thunderstorm activity and the intrusion of warm, moist tropical air form the Gulf of Mexico. Snowfall averages nearly 43 cm (16.9 in). Snowfall can occur from October through April. The maximum 24-hour rainfall with a 100-year recurrence interval is approximately 16.5 cm (6.5 in). On average, the area can expect thunderstorms about 50 days per year, hail 4 days per year, and freezing rain 8 days per year (NOAA 1994c:3). During the 30-year period between 1954 and 1983, a total of 108 tornadoes were reported within a 1-degree latitude and longitude square area which includes Pantex. On average, less than four tornadoes per year occur in an area of 10,096 km^2 (3,898 mi^2) surrounding Pantex. The estimated probability of a tornado striking a point at Pantex is 2.3×10^{-4} per year (NRC 1986a:32).

Emission Rates. Table B.3.5–1 presents the emission rates for criteria and toxic/hazardous pollutants at Pantex. These emission rates were used as input into the Industrial Source Complex Short-Term model, version 2, to estimate pollutant concentrations.

Atmospheric Dispersion Characteristics. Data collected at the Amarillo National Weather Service station for 1991 indicate that unstable conditions occur approximately 14 percent of the time, neutral conditions approximately 64 percent of the time, and stable conditions approximately 22 percent of the time, on an annual basis.

TABLE B.3.5–1.—*Emission Rates for Proposed Management Alternatives at Pantex Plant* [Page 1 of 2]

Pollutant	2005 No Action (kg/yr)	Downsize Assembly/ Disassembly and High Explosives (kg/yr)	Downsize Assembly/ Disassembly (kg/yr)	Phaseout of Assembly/ Disassembly and High Explosives (kg/yr)
Criteria Pollutant				
Carbon monoxide	22,493	5,856	5,443	(22,493)
Hydrogen fluoride	1,176.06	4.5	[a]	(1,176.06)
Lead	185	[a]	[a]	(185)
Nitrogen dioxide	54,056	22,879	21,319	(54,056)
Particulate matter	8,439	884	816	(8,439)
Sulfur dioxide	0.1	0.03	0.02	(0.1)
Hazardous and Other Toxic Compounds				
Acetonitrile	[a]	2.8	2.3	[a]
Alcohols	1,184	a	a	(1,184)
Aldehydes	[a]	6.5	4.5	[a]
Ammonia	<0.45	<0.45	<0.45	(<0.45)
Benzene	91.38	3.0	[a]	(91.38)
Carbon disulfide	27.05	[a]	[a]	(27.05)
Carbon tetrachloride	15.59	[a]	[a]	(15.59)
Chlorobenzene	1.79	[a]	[a]	(1.79)
1,1,1-Chloroethane	22.74	[a]	[a]	(22.74)
Chromium	2.14	[a]	[a]	(2.14)
Cyclohexane	[a]	2.2	0.45	[a]
Cresol	0.05	[a]	[a]	(0.05)
Cresylic acid	0.05	[a]	[a]	(0.05)
Dibensofuran	0.07	[a]	[a]	(0.07)
Dibutyl phthalate	[a]	5.4	5.4	[a]
Ester glycol ethers	0.86	[a]	[a]	(0.86)
Ethyl benzene	1.51	[a]	[a]	(1.51)
Ethylene dichloride	1.33	[a]	[a]	(1.33)
Formaldehyde	57.89	[a]	[a]	(57.89)
Hydrogen chloride	1,106.11	27.7	24.5	(1,106.11)
Hydrogen sulfide	0	21.3	21.3	(0)
Ketones	0.28	[a]	[a]	(0.28)
Mercury	<0.45	<0.45	<0.45	(<0.45)
Methanol	1,095.57	11.8	9.1	(1,095.57)
Methyl ethyl ketone	7,067.62	666.8	317.5	(7,067.62)
Methyl isobutyl ketone	0.62	[a]	[a]	(0.62)
Methylene chloride	182.07	[a]	[a]	(182.07)
Naphthalene	0.41	[a]	[a]	(0.41)
Nickel	0.16	[a]	[a]	(0.16)
Nitrobenzene	0.05	[a]	[a]	(0.05)
2-Nitropropane	1.71	[a]	[a]	(1.71)
Phenol	2.23	[a]	[a]	(2.23)
Propylglycol methyl ether	[a]	7.3	7.3	[a]

TABLE B.3.5–1.—*Emission Rates for Proposed Management Alternatives at Pantex Plant* [Page 2 of 2]

Pollutant	2005 No Action (kg/yr)	Downsize Assembly/ Disassembly and High Explosives (kg/yr)	Downsize Assembly/ Disassembly (kg/yr)	Phaseout of Assembly/ Disassembly and High Explosives (kg/yr)
Hazardous and Other Toxic Compounds (Continued)				
Tetrachloroethylene	6.44	[a]	[a]	(6.44)
Toluene	465.29	14.0	4.5	(465.29)
1,1,1-Trichloroethane	[a]	45.0	44.5	[a]
1,1,2-Trichloroethane	3.78	[a]	[a]	(3.78)
Trichloroethene	1.56	[a]	[a]	(1.56)
Trichloroethylene	19.50	5.0	4.5	(19.50)
Triethylamine	0	[a]	[a]	(0)
Xylene	222.15	166.5	158.8	(222.15)

[a] No sources indicated.

Note: Parentheses indicate a net reduction in emissions.

Source: PX 1996e:1, PX DOE 1996b; PX MH 1995a; PX MH 1995b.

Annual Mean Wind Speeds and Direction Frequencies. The Amarillo meteorological data for annual mean wind speed and direction for 1991 are presented in figure B.3.5–1 as a wind rose. As shown in this figure, the maximum wind direction frequency is from the south with a secondary maximum from the south-southwest. The mean wind speed from the south is 6.3 m/s (14.1 mph); from the south-southwest is 6.3 m/s (14.1 mph); while the maximum mean wind speed is 6.6 m/s (14.8 mph) from the west.

B.3.6 Los Alamos National Laboratory

This section provides information on climatology and meteorology, modeling assumptions, atmospheric dispersion characteristics, and annual mean wind speed and direction frequencies (figure B.3.6–1) at LANL. Table B.3.6–1 presents emission source inventories for criteria and toxic/hazardous pollutants at LANL. This information supports data presented in the environmental impacts section for air quality.

Climatology and Meteorology. Figure B.3.6–1 shows annual mean wind speed and wind direction frequencies for 1991 measured at the 11.5-m (37-ft) level of the Technical Area (TA)-6 meteorological tower. Prevailing wind directions are from the south through northwest. The average annual wind speed measured is 2.8 m/s (6.3 mph) (LANL 1995s:II-11).

The average annual temperature at LANL is 8.8 °C (47.8 °F). In July, the average daily high temperature is 27.2 °C (81 °F), and the average nighttime low temperature is 12.8 °C (55 °F). The highest recorded temperature is 35 °C (95 °F). The average daily January high is 4.4 °C (40 °F), and the average nighttime low is -8.3 °C (17 °F). The lowest recorded temperature is -27.8 °C (-18 °F). The average monthly values of the dew point temperature range from -9.4 °C (15.0 °F) in January to 8.9 °C (48 °F) in August, when moist subtropical air invades the region. Fog is rare in Los Alamos, occurring on fewer than 5 days per year (LANL 1995s:II-11).

The average annual precipitation at LANL is 47.6 cm (18.7 in). Most of the annual precipitation falls during the months of July and August and usually occurs from convective storms. Snowfall averages nearly 150 cm (59 in). The maximum 24-hour rainfall is approximately 8.8 cm (3.5 in) (LANL 1995s:II-11).

The average annual temperature at the National Weather Service station at Albuquerque, NM, is 13.4 °C (56.2 °F); temperatures vary from an average

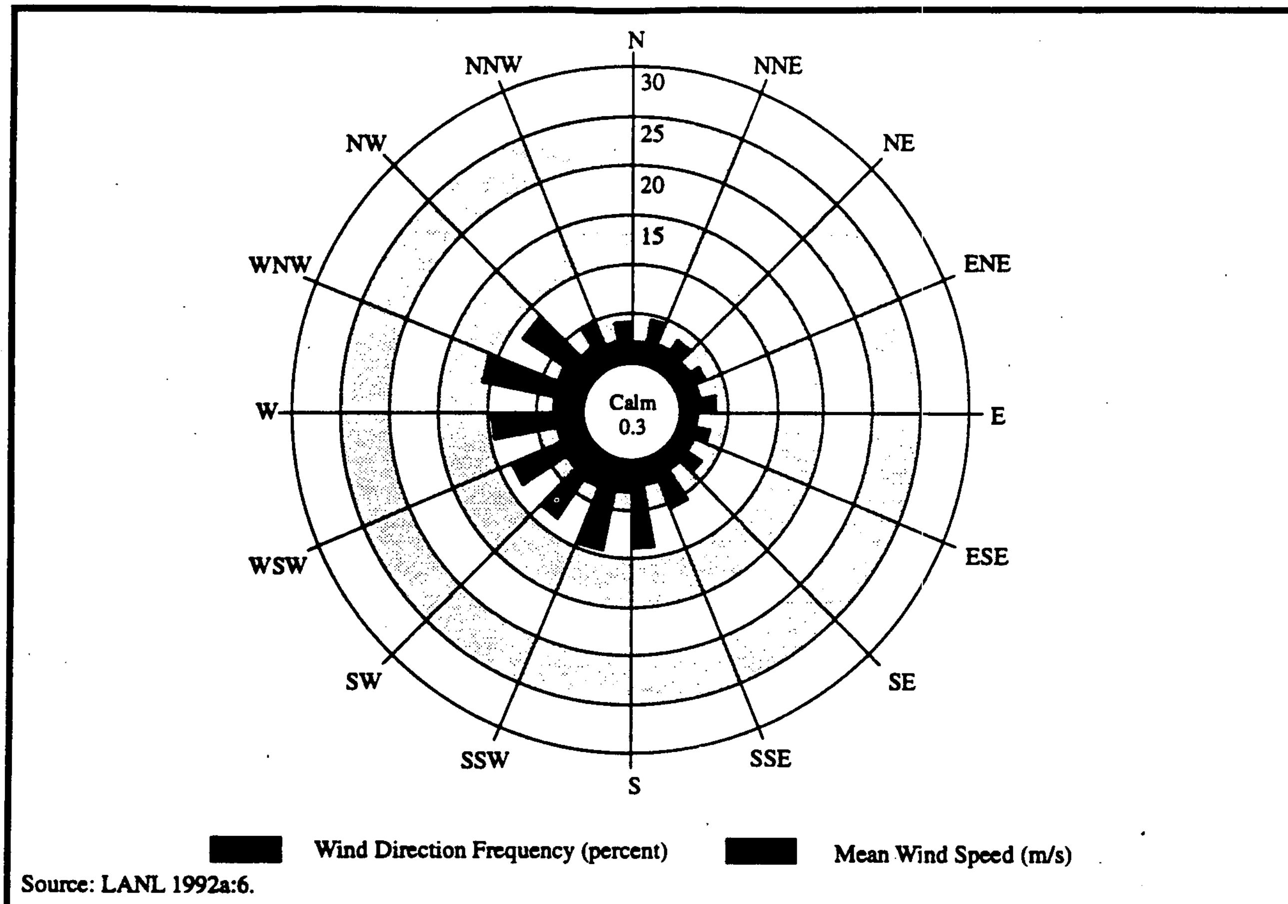


FIGURE B.3.6–1.—*Wind Distribution at Los Alamos National Laboratory, 1991.*

daily minimum of -5.7 °C (21.7 °F) in January to an average daily maximum of 33.6 °C (92.5 °F) in July. Relative humidity readings taken four times per day range from 19 percent in April and May to 71 percent in January (NOAA 1994c:3).

The average annual precipitation is 22.6 cm (8.88 in). The maximum monthly precipitation recorded was 8.5 cm (3.33 in) in July 1968, while the maximum rainfall in a 24-hour period observed was recorded in September 1955 at 4.9 cm (1.92 in). The average annual snowfall is 28.2 cm (11.1 in); all measurements are from the Albuquerque National Weather Service station (NOAA 1994c:3). The average number of thunderstorm days per year is 58, with most occurring during the summer. The estimated probability of a tornado striking a point at LANL is 2×10^{-5} per year (NRC 1986a:32). Historically, no tornadoes have been reported to have touched down in Los Alamos County (LANL 1993b:II-9).

Emission Rates. Table B.3.6–1 presents the emission rates for criteria and toxic/hazardous pollutants at LANL. These emission rates were used as input into the Industrial Source Complex Short-Term model, version 2, to estimate pollutant concentrations.

Modeling Assumptions. Additional model input used to estimate maximum pollutant concentrations at or beyond the LANL site boundary include the following: criteria pollutant emissions were modeled from actual stack locations using actual stack heights, stack diameter, exit velocity, and exit temperature, taken from operating permits; toxic/hazardous pollutant emissions were modeled from a centrally located stack in the LANL facility at a height of 10 m (32.8 ft), stack diameter of 0.3 m (1 ft), exit velocity of 0.03 m/s (0.1 ft/s), and exit temperature equal to ambient temperature.

TABLE B.3.6–1.—*Emission Rates for Proposed Stewardship and Management Alternatives at Los Alamos National Laboratory* [Page 1 of 2]

Pollutant	2005 No Action (kg/yr)	Pit Fabrication (kg/yr)	Secondary and Case Fabrication (kg/yr)	High Explosives Fabrication (kg/yr)	Nonnuclear Fabrication (kg/yr)	Atlas Facility (kg/yr)	National Ignition Facility (kg/yr)
Criteria Pollutant							
Carbon monoxide	21,583	a	4,500	4,536	a	a	460
Lead	26	a	100	a	a	<0.1	a
Nitrogen dioxide	55,314	a	117,000	22,680	a	a	1,910
Particulate matter	2,983	a	300	227	a	a	180
Sulfur dioxide	704.6	a	48,000	a	a	a	30
Total suspended particulates[b]	2,983	a	300	227	a	a	180
Hazardous and Other Toxic Compounds							
Acetic acid	537	a	a	a	a	a	a
Ammonia	799	a	a	454	a	a	a
2-Butoxyethanol	123	a	a	a	a	a	a
Chlorine	13	340	a	a	a	a	a
Chloroform	533	a	a	a	a	a	a
Ethyl acetate	89	a	a	a	a	a	a
Ethylene glycol	72	a	a	a	a	a	a
Formaldehyde	49	a	a	a	a	a	a
Heavy metals	114	a	a	a	a	a	a
Heptane (n-heptane)	1,849	a	a	a	a	a	a
Hexane (n-hexane)	77	a	a	a	a	a	a
Hydrogen chloride	638	11	a	113	a	a	a
Hydrogen fluoride (as F)	242	a	a	45.4	a	a	a
Isopropyl alcohol	539	a	a	a	a	<0.1	a
Kerosene	260	a	a	a	a	a	a
Methyl alcohol	589	a	a	a	a	a	a
Methyl ethyl ketone	1,864	a	a	22.7	a	a	a
Methylene chloride	1,104	a	a	a	a	a	a
Nickel	55	a	a	a	a	a	a
Nitric acid	661	a	a	a	a	a	a
Nitrogen oxide	428	a	a	a	a	a	a
Nonmethane hydrocarbons	2,893	a	a	a	a	a	a
Propane sultone	205	a	a	a	a	a	a
Stoddard solvent	264	a	a	a	a	a	a
Toluene	2,483	a	a	22.7	a	a	a
1, 1, 2-Trichloroethane	927	a	a	a	a	<0.1	a

TABLE B.3.6–1.—*Emission Rates for Proposed Stewardship and Management Alternatives at Los Alamos National Laboratory* [Page 2 of 2]

Pollutant	2005 No Action (kg/yr)	Pit Fabrication (kg/yr)	Secondary and Case Fabrication (kg/yr)	High Explosives Fabrication (kg/yr)	Nonnuclear Fabrication (kg/yr)	Atlas Facility (kg/yr)	National Ignition Facility (kg/yr)
Hazardous and Other Toxic Compounds (Continued)							
Trichloroethylene	210	a	a	a	a	<0.1	a
Tungsten (as W) (insoluble)	109	a	a	a	a	a	a
VM&P naptha	613	a	a	a	a	a	a
Welding fumes	511	a	a	a	a	a	a
Xylene (o-, m-, p-isomers)	1,762	a	a	a	a	a	a

[a] No sources indicated.
[b] It is assumed that PM^{10} emissions are total suspended particulates emissions.
Source: LANL 1995c; LANL 1995d; LANL 1995e; LANL 1995g; appendix I; appendix K.

Atmospheric Dispersion Characteristics. Data collected at the TA-6 meteorological tower for 1991 indicate that unstable conditions occur approximately 45 percent of the time, neutral conditions approximately 21 percent of the time, and stable conditions approximately 34 percent of the time, on an annual basis.

Annual Mean Wind Speeds and Direction Frequencies. The TA-6 meteorological data for wind speed and direction for 1991 is presented in figure B.3.6–1 as a wind rose. As shown in this figure, the maximum wind direction frequency is from the west-northwest with a secondary maximum from the west. The mean wind speed from the west-northwest is 3.2 m/s (7.2 mph), which is also the maximum mean wind speed. The mean wind speed from the west is 3 m/s (6.7 mph).

B.3.7 Lawrence Livermore National Laboratory

This section provides information on climatology and meteorology, modeling assumptions, atmospheric dispersion characteristics, and annual mean wind speeds and direction frequencies (figures B.3.7–1 and B.3.7–2) at the Livermore Site and Site 300. Table B.3.7–1 presents emission source inventories for criteria and toxic/hazardous pollutants at the Livermore Site and Site 300. This information supports data presented in the environmental impacts section for air quality.

Climatology and Meteorology. Figures B.3.7–1 and B.3.7–2 show annual mean wind speed and wind direction frequencies for 1991 measured at the 10-m (32.8-ft) level of the Livermore Site and Site 300 meteorological monitoring sites. Prevailing wind directions at the Livermore Site are from the south-southwest through west while at Site 300 the prevailing wind direction is from the west-southwest. The average annual wind speed measured at the Livermore Site is 2.5 m/s (5.7 mph) while at Site 300 the average annual wind speed is 5.9 m/s (13.1 mph).

The annual mean temperature at the Livermore Site is 12.5 °C (54.5 °F); temperatures range from a minimum of 0 °C (32 °F) in the winter to 38 °C (100.4 °F) in summer (LLNL 1993b:1-2).

The average annual precipitation at the Stockton, CA National Weather Service station is 35.4 cm (13.95 in). Most of the annual precipitation falls from October through April. Snowfall is rare in the Livermore Site area. The maximum 24-hour rainfall is approximately 7.65 cm (3.01 in). On the average, the area can expect thunderstorms about 3.1 days per year (NOAA 1994d:3).

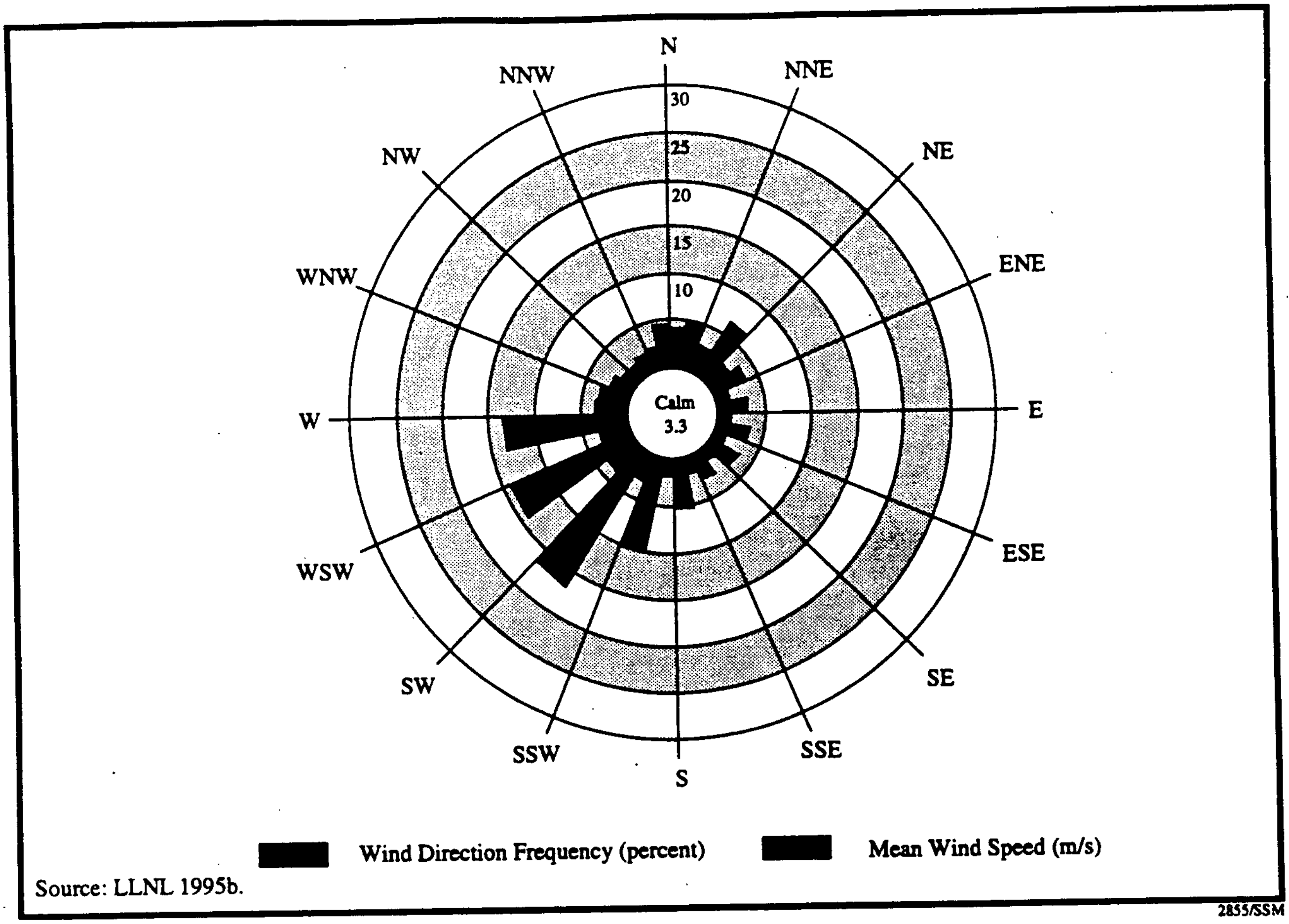


FIGURE B.3.7–1.—*Wind Distribution at the Livermore Site, 1991.*

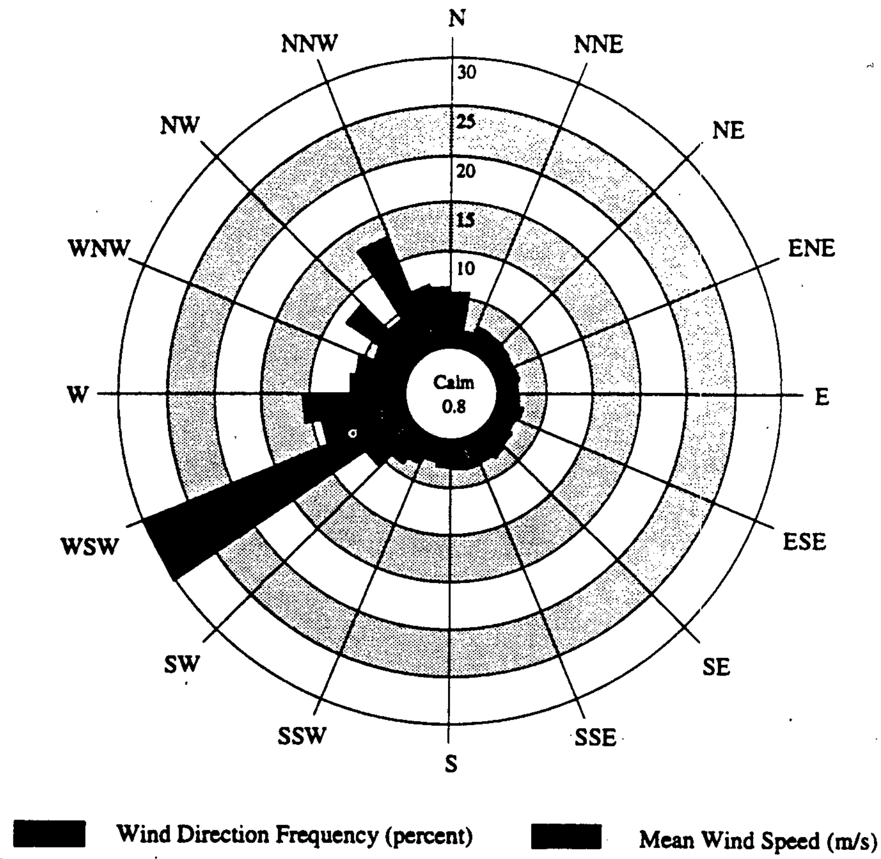
The climate at Site 300, while generally similar to the Livermore Site, is modified by higher elevation and more pronounced relief. The temperature range is somewhat more extreme than the Livermore Site, and topography significantly influences surface wind patterns (LLNL 1993b:1-3).

Emission Rates. Table B.3.7–1 presents the emission rates for criteria and toxic/hazardous pollutants at the Livermore Site and Site 300. These emission rates were used as input into the Industrial Source Complex Short-Term model, version 2, to estimate pollutant concentrations.

Modeling Assumptions. Additional model input used to estimate maximum pollutant concentrations at or beyond the site boundary include the following: criteria pollutant emissions were modeled from actual stack locations using actual stack heights, stack diameter, exit velocity, and exit temperature, taken from operating permits; toxic/hazardous pollutant emissions were modeled from a centrally located stack in the facility at a height of 10 m (32.8 ft), stack diameter of 0.3 m (1.0 ft), exit velocity of 0.03 m/s (0.1 ft/s), and exit temperature equal to ambient temperature.

Atmospheric Dispersion Characteristics. Data collected at the Livermore Site and Site 300 for 1991 indicate that unstable conditions occur approximately 32/37 percent of the time, neutral conditions approximately 35/34 percent of the time, and stable conditions approximately 33/29 percent of the time, on an annual basis.

Annual Mean Wind Speeds and Direction Frequencies. The 1991 meteorological data for wind speed and direction for the Livermore Site and Site 300 are presented in figures B.3.7–1 and B.3.7–2 as wind roses. As shown in the figures, the maximum



Source: LLNL 1995b.

2858/SSM

FIGURE B.3.7–2.—*Wind Distribution at Site 300, 1991.*

TABLE B.3.7–1.—*Emission Rates for Proposed Stewardship and Management Alternatives at the Livermore Site and Site 300* [Page 1 of 2]

	2005 No Action						
Pollutant	**Livermore Site (kg/yr)**	**Site 300 (kg/yr)**	**Secondary and Case Fabrication (kg/yr)**	**High Explosives Fabrication (kg/yr)**	**Nonnuclear Fabrication (kg/yr)**	**Contained Firing Facility (kg/yr)[a]**	**National Ignition Facility (kg/yr)**
Criteria Pollutant							
Beryllium	0.002	0.279	c	c	b	-	c
Carbon monoxide	5,629	1,854	1000	113.4	b	-	430
Lead	0.0068	0.059	c	c	b	-	c
Nitrogen dioxide	32,450	8,576	1,900	249.5	b	-	1,790
Particulate matter[d]	4,636	993	100	22.7	b	-	160
Sulfur dioxide	430	99	20	13.6	b	-	30
Total suspended particulates	4,636	993	3,200	22.7	b	-	160

TABLE B.3.7–1.—*Emission Rates for Proposed Stewardship and Management Alternatives at the Livermore Site and Site 300* [Page 2 of 2]

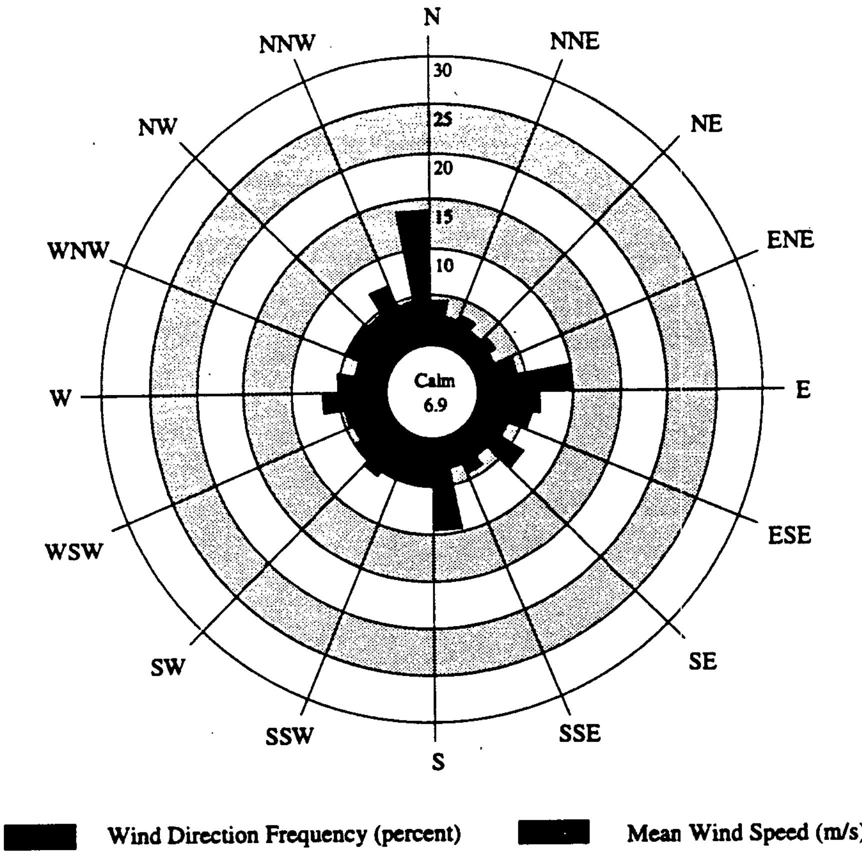
Pollutant	2005 No Action Livermore Site (kg/yr)	2005 No Action Site 300 (kg/yr)	Secondary and Case Fabrication (kg/yr)	High Explosives Fabrication (kg/yr)	Nonnuclear Fabrication (kg/yr)	Contained Firing Facility (kg/yr)[a]	National Ignition Facility (kg/yr)
Hazardous and Other Toxic Compounds							
Acetone	818.7	45.4	c	c	b	-	c
Benzene	100.2	0.082	c	c	b	-	c
2-Butoxyethanol	153.8	c	c	c	b	-	c
Carbon tetrachloride	204.6	c	c	c	b	-	c
Chlorine	c	c	50	c	b	-	c
Chlorofluorocarbons	8,705.3	163.7	c	c	b	-	c
Chloroform	188.7	0.054	c	c	b	-	c
Ethanol	322.1	<0.45	c	c	b	-	c
Formaldehyde	53.52	1.91	c	c	b	-	c
Gasoline	c	367.1	c	c	b	-	c
Glycol ethers (other)	2.99	53.1	c	c	b	-	c
Hexane	59.4		c	c	b	-	c
Hydrogen chloride	64.4	60.2	1,600	45.4	b	-	c
Hydrogen fluoride	c	c	c	90.7	b	-	c
Hydrogen sulfide	c	c	c	c	b	-	c
Isopropyl alcohol	729.4	0.14	c	c	b	-	c
Methanol	949.37	c	4,500	c	b	-	c
Methyl ethyl ketone	338.4	0.27	c	6.8	b	-	c
Methylene chloride	133.81	1.72	c	c	b	-	c
Nephthalene	73.48	c	c	c	b	-	c
Nitric acid	c	c	2,300	c	b	-	c
Styrene	1,270.1	c	c	c	b	-	c
Sulfuric acid	c	c	600	c	b	-	c
Tetrohydrofuran	61.23	c	c	c	b	-	c
Toluene	384.65	18.44	c	c	b	-	c
1, 1, 1-Trichloroethane	981.6	c	c	c	b	-	c
Trichloroethylene	175.99	3.63	c	c	b	-	c
Xylene	222.26	4.99	c	2.7	b	-	c

[a] Contained Firing Facility air emissions are addressed in appendix J.
[b] No increase over No Action.
[c] No sources indicated.
[d] It is conservatively assumed that particulate matter emissions are total suspended particulates emissions.
Source: LLNL 1995e; LLNL 1995f; LLNL 1995i:5; LLNL 1995j; appendix I; appendix J.

wind direction frequency at the Livermore Site and Site 300 is from the southwest/west-southwest with a secondary maximum from the west-southwest/north-northwest. The mean wind speed from the southwest/west-southwest is 3.4/8.9 m/s (7.7/19.9 mph) and from the west-southwest/north-northwest is 3.0/6.3 m/s (6.7/14.1 mph).

B.3.8 Sandia National Laboratories

This section provides information on climatology and meteorology, modeling assumptions, atmospheric dispersion characteristics, and annual mean wind speeds and direction frequencies (figure B.3.8–1) at SNL. Table B.3.8–1 presents emission source inven-



Source: LANL 1992a:6.

2856/SSM

FIGURE B.3.8–1.—*Wind Distribution at Albuquerque, New Mexico, 1991.*

tories for criteria and toxic/hazardous pollutants at SNL. This information supports data presented in the environmental impacts section for air quality.

Climatology and Meteorology. Figure B.3.8–1 shows annual mean wind speeds and wind direction frequencies for 1991 measured at the 10-m (32.8-ft) level of the Albuquerque National Weather Service station. Prevailing wind directions are from the north. The average annual wind speed measured is 4 m/s (9 mph).

The average annual temperature at SNL is 13.4 °C (56.2 °F); average daily temperatures vary from a minimum of -5.7 °C (21.7 °F) in January to a maximum of 33.6 °C (92.5 °F) in July (NOAA 1994c:3).

The average annual precipitation at SNL is 22.6 cm (8.88 in). Most of the annual precipitation falls during the months of July through October and usually occurs from thunderstorm activity and the intrusion of warm, moist tropical air form the Gulf of Mexico. Snowfall averages nearly 28.2 cm (11.1 in). Snowfall has occurred from October through April. The maximum 24-hour rainfall was 4.9 cm (1.92 in) occurring in September 1955. On the average, the area can expect thunderstorms about 41 days per year (NOAA 1994c:3). The estimated probability of a tornado striking a point at SNL is 2.0×10^{-5} per year (NRC 1986a:32).

Emission Rates. Table B.3.8–1 presents the emission rates for criteria and toxic/hazardous pollutants at SNL. These emission rates were used as input into the Industrial Source Complex Short-Term model, version 2, to estimate pollutant concentrations.

Modeling Assumptions. Additional model input used to estimate maximum pollutant concentrations at or beyond the SNL site boundary include the follow-

TABLE B.3.8–1.—*Emission Rates for Proposed Stewardship and Management Alternatives at Sandia National Laboratories*

Pollutant	2005 No Action (kg/yr)	Nonnuclear Fabrication (kg/yr)	National Ignition Facility (kg/yr)
Criteria Pollutant			
Carbon monoxide	230[a]	b	520
Nitrogen dioxide	1,070[a]	b	2,150
Particulate matter	3,760[a]	b	200
Sulfur dioxide	70[a]	b	40
Total suspended particulates	b	b	b
Hazardous and Other Toxic Compounds			
Acetone	247	b	b
Benzene	1.1	b	b
Carbon tetrachloride	2.7	b	b
Hydrogen chloride	3,227	b	b
Isopropyl alcohol	106	b	b
Methanol	108	b	b
Methyl chloroform	703	b	b
Methylene chloride	40	b	b
Toluene	546	b	b
Trichloroethylene	103	b	b
Trichlorotrifluoroethane	151	b	b
Xylene	580	b	b

[a] Based on steam plant and stand-by steam plant emissions.
[b] No sources indicated.
Source: SNL 1991b:1; SNL 1995e; appendix I.

ing: criteria pollutant emissions were modeled from actual stack locations using actual stack heights, stack diameter, exit velocity, and exit temperature, taken from operating permits; toxic/hazardous pollutant emissions were modeled from a centrally located stack in the SNL facility at a height of 10 m (32.8 ft), stack diameter of 0.3 m (1 ft), exit velocity of 0.03 m/s (0.1 ft/s), and exit temperature equal to ambient temperature.

Atmospheric Dispersion Characteristics. Data collected at the Albuquerque National Weather Service station for 1991 indicate that unstable conditions occur approximately 28 percent of the time, neutral conditions approximately 38 percent of the time, and stable conditions approximately 34 percent of the time, on an annual basis.

Annual Mean Wind Speeds and Direction Frequencies. The Albuquerque National Weather Service meteorological data for annual mean wind speed and direction for 1991 are presented in figure B.3.8–1 as a wind rose. As shown in this figure, the maximum wind direction frequency is from the north with a secondary maximum from the east and south. The mean wind speed from the north is 4.1 m/s (9.2 mph); from the south is 4.8 m/s (10.7 mph); while the maximum mean wind speed is 6.4 m/s (14.3 mph) from the east.

B.3.9 Nevada Test Site

This section provides information on climatology and meteorology, modeling assumptions, atmospheric dispersion characteristics, and annual mean wind speeds and direction frequencies (figure B.3.9–1) at NTS. Table B.3.9–1 presents emission source inventories for criteria and toxic/hazardous pollutants at

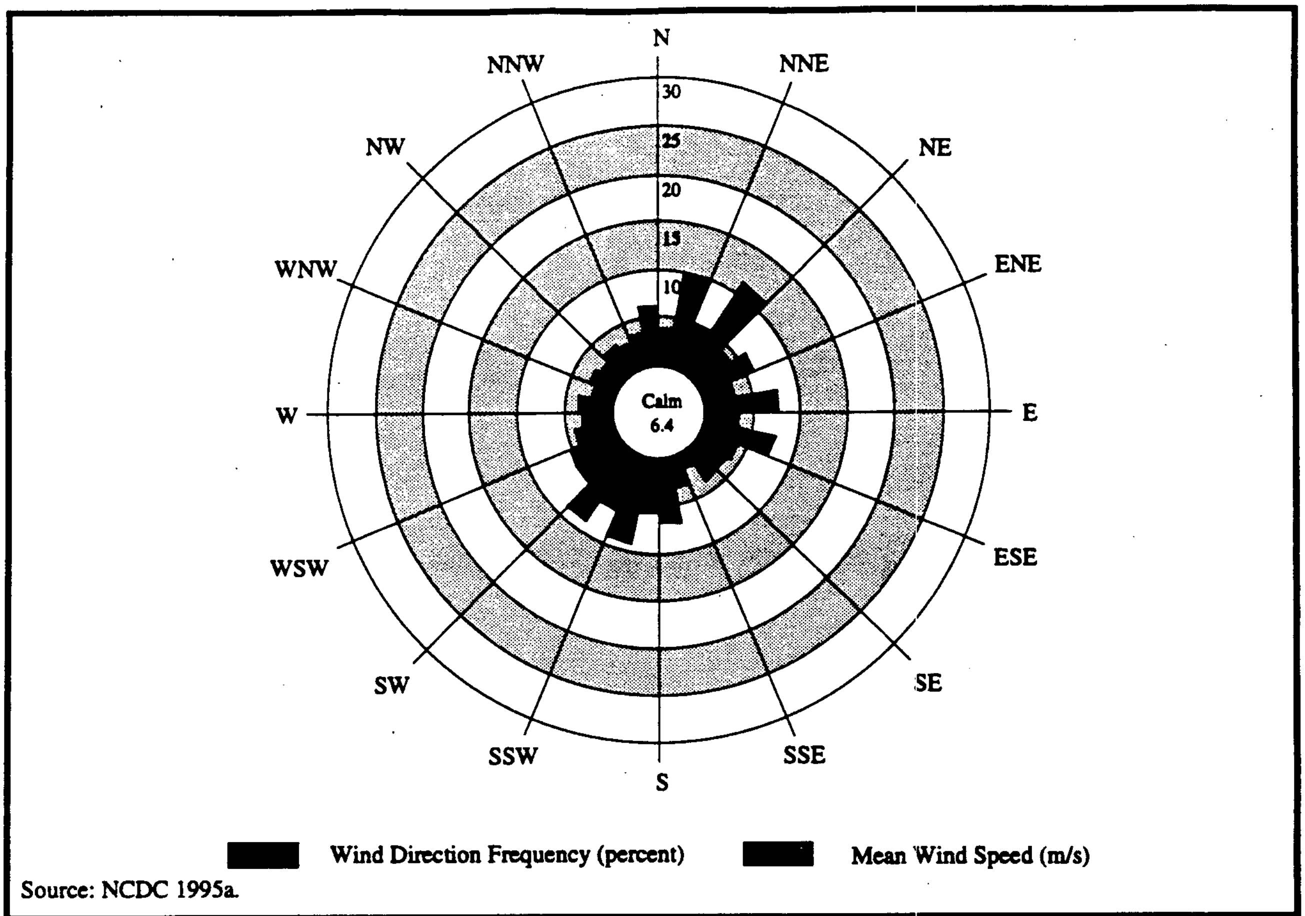


FIGURE B.3.9–1.—*Wind Distribution at Desert Rock, Nevada, 1991.*

NTS. This information supports data presented in the environmental impacts section for air quality.

Climatology and Meteorology. Figure B.3.9–1 shows annual mean wind speed and wind direction frequencies for 1991 measured at the 10-m (32.8-ft) level of the Desert Rock, Nevada National Weather Service station. Prevailing winds are southerly during summer and northerly during winter. The general downward slope in the terrain from north to south results in an intermediate scenario that is reflected in the characteristic diurnal wind reversal from southerly winds during the day to northerly winds at night. This north-to-south reversal is strongest in the summer and, on occasion, becomes intense enough to override the wind regime associated with large-scale pressure systems.

Average annual wind speeds and direction vary with location. At higher elevations on Pahute Mesa, the average annual wind speed is 4.7 m/s (10.5 mph). The prevailing wind direction during winter months is north-northeasterly, and during summer months, is southerly. In Yucca Flat the average annual wind speed is 3.1 m/s (6.9 mph). The prevailing wind direction during winter months is north-northwesterly and during summer months is south-southwesterly. At Mercury, NV, the average annual wind speed is 3.6 m/s (8.1 mph), with northwesterly prevailing winds during the winter months and southwesterly winds during the summer months (NT DOE 1994b:2-16).

Elevation influences temperatures on NTS. At an elevation of 2,000 m (6,560 ft) above mean sea level on Pahute Mesa, the average daily maximum/minimum temperatures are 4.4/-2.2 °C (40/28 °F) in January and 26.7/16.7 °C (80/62 °F) in July. In Yucca Flat, 1,195 m (3,920 ft) above mean sea level, the average daily maximum/minimum temperatures are 10.6/-6.1 °C (51/21 °F) in January and 35.6 /13.9 °C (96/57 °F) in July. The extreme temperatures at

Mercury are 20.6/-11.1 °C (69/12 °F) in January and 42.8/15 °C (109/59 °F) in July (NT DOE 1993e:2-17,2-19).

The average annual temperature at the Las Vegas National Weather Service station is 19.5 °C (67.1 °F); average daily temperature varies from a minimum of 0.9 °C (33.6 °F) in January to a maximum of 41.1 °C (105.9 °F) in July. The average annual precipitation at the Las Vegas National Weather Service station is 10.5 cm (4.13 in) (NOAA 1994d:3). Annual precipitation in southern Nevada is very light and depends largely upon elevation. On NTS, the mesas receive an average annual precipitation of 23 cm (9 in), which includes winter snow accumulations. The lower elevations receive approximately 15 cm (6 in) of precipitation annually, with occasional snow accumulations lasting only a few days (NT DOE 1993e:2-17,2-19).

Precipitation usually falls in isolated showers with large variations in precipitation amounts within a shower area. Summer precipitation occurs mainly in July and August when intense heating of the ground below moist air masses triggers thunderstorm development. On rare occasions, a tropical storm will move northeastward from the west coast of Mexico, bringing heavy precipitation during September and/or October.

Wind speeds in excess of 27 m/s (60 mph), with gusts up to 48 m/s (107 mph), may be expected to occur on a 100-year return period. Other than temperature extremes, severe weather in the region includes occasional thunderstorms, lightning, tornadoes, and sandstorms. Severe thunderstorms may produce high precipitation with durations of approximately 1 hour, and may create a potential for flash flooding (NT DOE 1983a:26). Tornadoes have been observed in the region but are infrequent. The estimated probability of a tornado striking a point at NTS is 3.0×10^{-7} per year (NRC 1986a:32).

Emission Rates. Table B.3.9–1 presents the emission rates for criteria and toxic/hazardous pollutants at NTS. These emission rates were used as input into the Industrial Source Complex Short-Term model, version 2, to estimate pollutant concentrations.

Modeling Assumptions. Additional model input used to estimate maximum pollutant concentrations at or beyond the NTS site boundary include the following: criteria pollutant emissions were modeled from actual stack locations using actual stack heights, stack diameter, exit velocity, and exit temperature, taken from operating permits; toxic/hazardous pollutant emissions were modeled from a centrally located stack in the NTS facility at a height of 10 m (32.8 ft), stack diameter of 0.3 m (1 ft), exit velocity

TABLE B.3.9–1.—*Emission Rates for Proposed Stewardship and Management Alternatives at Nevada Test Site*

Pollutant	2005 No Action[a] (kg/yr)	Assembly/ Disassembly (kg/yr)	National Ignition Facility (kg/yr)
Criteria Pollutant			
Carbon monoxide	[b]	454	370
Hydrogen sulfide	[b]	[b]	[b]
Nitrogen dioxide	[b]	6,350	2,010
Particulate matter	86,820	136	80
Sulfur dioxide	71,125	6,804	4
Total suspended particulates	[c]	[c]	[c]
Hazardous and Other Toxic Compounds	[b]	[b]	[b]

[a] Based on permitted sources.
[b] No sources indicated.
[c] No data available.
Source: NT DOE 1995b; NV DCNR 1992a; appendix I.

of 0.03 m/s (0.1 ft/s), and exit temperature equal to ambient temperature.

Atmospheric Dispersion Characteristics. Data collected at the NTS meteorological monitoring station for 1991 indicate that unstable conditions occur approximately 26 percent of the time, neutral conditions approximately 37 percent of the time, and stable conditions approximately 37 percent of the time, on an annual basis.

Annual Mean Wind Speeds and Direction Frequencies. The NTS meteorological data for annual mean wind speed and direction for 1991 are presented in figure B.3.9–1 as a wind rose. As shown in this figure, the maximum wind direction frequency is from the northeast with a secondary maximum from the north-northeast. The mean wind speed from the northeast is 4.2 m/s (9.4 mph); from the north-northeast is 4.7 m/s (10.5 mph); while the maximum mean wind speed is 6.3 m/s (14.1 mph) from the south-southwest.

APPENDIX C

Appendix C

APPENDIX C: THREATENED, ENDANGERED, AND SPECIAL STATUS SPECIES

This appendix contains tables C-1 through C-7 that present flora and fauna identified by the U.S. Fish and Wildlife Service (USFWS) and state governments as threatened, endangered, or other special status. Special status species include Federal candidate species and state classifications such as species of concern or species in need of management. The threatened, endangered, and special status lists include all such species which could potentially occur in a site area regardless of their residence status (i.e., breeding, year round, summer, winter, or migratory) or likelihood of being affected by project actions.

TABLE C-1.—*Federal- and State-Listed Threatened, Endangered, and Other Special Status Species That May Be Found at or in the Vicinity of Oak Ridge Reservation* [Page 1 of 3]

Common Name	Scientific Name	Status[a]	
		Federal	State
Mammals			
Alleghany woodrat	*Neotoma magister*	NL	D
Eastern cougar[b]	*Felis concolor couguar*	E	E
Eastern small-footed bat	*Myotis leibii*	NL	D
Gray bat[b]	*Myotis grisescens*	E	E
Indiana bat[b]	*Myotis sodalis*	E	E
Rafinesque's big-eared bat	*Plecotus rafinesquii*	NL	D
River otter	*Lutra canadensis*	NL	T
Smoky shrew	*Sorex fumeus*	NL	D
Southeastern shrew	*Sorex longirostris*	NL	D
Birds			
American peregrine falcon[b]	*Falco peregrinus anatum*	E	E
Appalachian Bewick's wren	*Thryomanes bewickii altus*	NL	T
Arctic peregrine falcon	*Falco peregrinus tundrius*	E(S/A)	E
Bachman's sparrow	*Aimophila aestivalis*	NL	E
Bald eagle[b,c]	*Haliaeetus leucocephalus*	T	T
Barn owl[d]	*Tyto alba*	NL	D
Cooper's hawk[d,e]	*Accipiter cooperii*	NL	D
Grasshopper sparrow	*Ammodramus savannarum*	NL	D
Northern harrier	*Circus cyaneus*	NL	D
Osprey[d]	*Pandion haliaetus*	NL	T
Red-cockaded woodpecker	*Picoides borealis*	E	E
Sharp-shinned hawk[d,e]	*Accipiter striatus*	NL	D
Swainson's warbler	*Limnothlypis swainsonii*	NL	D
Reptiles			
Eastern slender glass lizard	*Ophisaurus attenuatus longicaudus*	NL	D
Northern pine snake	*Pituophis melanoleucus melanoleucus*	NL	T
Amphibians			
Hellbender[d,e]	*Cryptobranchus alleganiensis*	NL	D
Tennessee cave salamander[f]	*Gyrinophilus palleucus*	NL	T

TABLE C–1.—*Federal- and State-Listed Threatened, Endangered, and Other Special Status Species That May Be Found at or in the Vicinity of Oak Ridge Reservation* [Page 2 of 3]

Common Name	Scientific Name	Status[a] Federal	State
Fish			
Alabama shad	*Alosa alabamae*	NL	D
Amber darter[b]	*Percina antesella*	E	E
Blue sucker	*Cycleptus elongatus*	NL	T
Flame chub	*Hemitremia flammea*	NL	D
Frecklebelly madtom	*Noturus munitus*	NL	T
Highfin carpsucker	*Carpiodes velifer*	NL	D
Spotfin chub[b]	*Cyprinella monacha*	T	E
Tennessee dace[d,e]	*Phoxinus tennesseensis*	NL	D
Yellowfin madtom[b]	*Noturus flavipinnis*	T	E
Invertebrates			
Alabama lampmussel[b]	*Lampsilis virescens*	E	E
Appalachian monkeyface pearlymussel[b]	*Quadrula sparsa*	E	E
Birdwing pearlymussel[b]	*Conradilla caelata*	E	E
Cumberland bean pearlymussel[b]	*Villosa trabalis*	E	E
Cumberland monkeyface pearlymussel[b]	*Quadrula intermedia*	E	E
Dromedary pearlymussel[b]	*Dromus dromas*	E	E
Fine-rayed pigtoe[b]	*Fusconaia cuneolus*	E	E
Green-blossom pearlymussel[b]	*Epioblasma torulosa gubernaculum*	E	E
Orange-footed pearlymussel[b]	*Plethobasus cooperianus*	E	E
Painted snake coiled forest snail	*Anguispira picta*	T	E
Pale lilliput pearlymussel[b]	*Toxolasma cylindrellus*	E	E
Pink mucket pearlymussel[b]	*Lampsilis abrupta*	E	E
Rough pigtoe[b]	*Pleurobema plenum*	E	E
Shiny pigtoe[b]	*Fusconaia cor*	E	E
Tan riffle shell[b]	*Epioblasma walkeri*	E	E
Tubercled-blossom pearlymussel[b]	*Epioblasma torulosa torulosa*	E	E
Turgid-blossom pearlymussel[b]	*Epioblasma turgidula*	E	E
White wartyback pearlymussel[b]	*Plethobasus cicatricosus*	E	E
Yellow-blossom pearlymussel[b]	*Epioblasma florentina florentina*	E	E
Plants			
American barberry	*Berberis canadensis*	NL	S
American ginseng[d,e]	*Panax quinquefolius*	NL	T
Appalachian bugbane[d]	*Cimicifuga rubifolia*	NL	T
Auriculate false-foxglove	*Tomanthera auriculata*	NL	E
Branching whitlowgrass	*Draba ramosissima*	NL	S
Butternut[d]	*Juglans cinerea*	NL	T
Canada (wild yellow) lily[d,e]	*Lilium canadense*	NL	T
Carey's saxifrage[d]	*Saxifraga careyana*	NL	S
Fen orchid[d,e]	*Liparis loeselii*	NL	E
Golden seal[d,e]	*Hydrastis canadensis*	NL	T
Gravid sedge[d,e]	*Carex gravida*	NL	S

TABLE C–1.—*Federal- and State-Listed Threatened, Endangered, and Other Special Status Species That May Be Found at or in the Vicinity of Oak Ridge Reservation* [Page 3 of 3]

Common Name	Scientific Name	Status[a] Federal	State
Plants (Continued)			
Heartleaf meehania	*Meehania cordata*	NL	T
Heller's catfoot	*Gnaphalium helleri*	NL	S
Lesser ladies' tresses[d]	*Spiranthes ovalis*	NL	S
Michigan lily[d,e]	*Lilium michiganense*	NL	T
Mountain honeysuckle	*Lonicera dioica*	NL	S
Mountain witch alder[d]	*Fothergilla major*	NL	T
Northern bush honeysuckle[d]	*Diervilla lonicera*	NL	T
Nuttall waterweed[d]	*Elodea nuttallii*	NL	S
Pink lady's-slipper[d,e]	*Cypripedium acaule*	NL	E
Prairie goldenrod	*Solidago ptarmicoides*	NL	E
Purple fringeless orchid[d,e]	*Platanthera peramoena*	NL	T
Slender blazing star	*Liatris cylindracea*	NL	E
Spreading false foxglove[d]	*Aureolaria patula*	NL	T
Swamp lousewort	*Pedicularis lanceolata*	NL	T
Tall larkspur[d]	*Delphinium exaltatum*	NL	E
Tennessee purple coneflower[b]	*Echinacea tennesseenis*	E	E
Tubercled rein-orchid[d,e]	*Platanthera flava var. herbiola*	NL	T
Virginia spiraea	*Spiraea virginiana*	T	E
Whorled mountainmint	*Pycnanthemum verticillatum*	NL	E-P

[a] Status codes: D - deemed in need of management; E - endangered; NL - not listed; P - possibly extirpated; S - species of special concern; S/A - protected under the similarity of appearances provision of the *Endangered Species Act*; T - threatened.

[b] USFWS Recovery Plan exists for this species.

[c] Observed near Oak Ridge Reservation (ORR) on Melton Hill and Watts Bar Lakes.

[d] Recent record of species occurrence on ORR.

[e] Species known to occur on or near proposed project site.

[f] Species collected on ORR in 1964.

Source: 50 CFR 17.11; 50 CFR 17.12; DOE 1995w; OR DOE 1990a; OR FWS 1992b; OR NERP 1993a; ORNL 1981a; ORNL 1984b; ORNL 1988c; TN DEC 1995a; TN DEC 1995b; TN DEC 1995c; TN DEC 1995d; TN WRC 1991a; TN WRC 1991b.

TABLE C–2.—*Federal- and State-Listed Threatened, Endangered, and Other Special Status Species That May Be Found at or in the Vicinity of Savannah River Site* [Page 1 of 2]

Common Name	Scientific Name	Status[a]	
		Federal	State
Mammals			
Meadow vole	*Microtus pennsylvanicus*	NL	SC
Rafinesque's big-eared bat[b]	*Plecotus rafinesquii*	NL	SE
Southern Appalachian eastern woodrat[b]	*Neotoma floridana haematoreia*	NL	SC
Spotted skunk[b]	*Spilogale putorius*	NL	SC
Star-nosed mole[b]	*Condylura cristata parva*	NL	SC
Swamp rabbit	*Sylvilagus aquaticus*	NL	SC
Birds			
American peregrine falcon[b,c]	*Falco peregrinus anatum*	E	SE
American swallow-tailed kite	*Elanoides forficatus*	NL	SE
Appalachian Bewick's wren[b]	*Thryomanes bewickii altus*	NL	ST
Arctic peregrine falcon[b]	*Falco peregrinus tundrius*	E (S/A)	ST
Bald eagle[b,c]	*Haliaeetus leucocephalus*	T	SE
Barn owl[b]	*Tyto alba*	NL	SC
Common ground dove[b]	*Columbina passerina*	NL	ST
Cooper's hawk[b]	*Accipiter cooperii*	NL	SC
Kirtland's warbler[b]	*Dendroica kirtlandii*	E	SE
Mississippi kite[b]	*Ictinia mississippiensis*	NL	SC
Red-cockaded woodpecker[b,c]	*Picoides borealis*	E	SE
Red-headed woodpecker[b]	*Melanerpes erythrocephalus*	NL	SC
Swainson's warbler[b]	*Limnothlypis swainsonii*	NL	SC
Wood stork[b,d]	*Mycteria americana*	E	SE
Reptiles			
American alligator[b]	*Alligator mississippiensis*	T (S/A)	NL
Carolina swamp snake[b]	*Seminatrix pygaea*	NL	SC
Eastern coral snake[b]	*Micrurus fulvius fulvius*	NL	SC
Green water snake[b]	*Nerodia cyclopion*	NL	SC
Spotted turtle[b]	*Clemmys guttata*	NL	SC
Amphibians			
Carolina crawfish frog[b]	*Rana areolata capito*	NL	SC
Eastern bird-voiced treefrog[b]	*Hyla avivoca ogechiensis*	NL	SC
Eastern tiger salamander[b,d]	*Ambystoma tigrinum tigrinum*	NL	SC
Northern cricket frog[b]	*Acris crepitans crepitans*	NL	SC
Pickerel frog[b,d]	*Rana palustris*	NL	SC
Upland chorus frog[b]	*Pseudacris triseriata feriarum*	NL	SC
Fish			
Shortnose sturgeon[b,c,d]	*Acipenser brevirostrum*	E	SE
Invertebrates			
Brother spike mussel	*Elliptio fraterna*	NL	SE

TABLE C–2.—*Federal- and State-Listed Threatened, Endangered, and Other Special Status Species That May Be Found at or in the Vicinity of Savannah River Site* [Page 2 of 2]

Common Name	Scientific Name	Status[a]	
		Federal	State
Plants			
Beak-rush[b,d]	*Rhynchospora inundata*	NL	SC
Bog spice bush[b]	*Lindera subcoriacea*	NL	RC
Cypress stump sedge[b,d]	*Carex decomposita*	NL	SC
Durand's white oak[b]	*Quercus durandii*	NL	SC
Dwarf bladderwort[b]	*Utricularia olivacea*	NL	SC
Dwarf burhead[b]	*Echinodorus parvulus*	NL	SC
Elliott's croton[b]	*Croton elliottii*	NL	SC
Few-fruited sedge[b]	*Carex oligocarpa*	NL	SC
Florida bladderwort[b]	*Utricularia floridana*	NL	SC
Florida false loosestrife[b]	*Ludwigia spathulata*	NL	SC
Gaura[b]	*Gaura biennis*	NL	SC
Green-fringed orchid[b,d]	*Platanthera lacera*	NL	SC
Leafy pondweed[b]	*Potamogeton foliosus*	NL	SC
Loose water-milfoil[b]	*Myriophyllum laxum*	NL	RC
Milk-pea[b]	*Astragalus villosus*	NL	SC
Nailwort[b,d]	*Paronychia americana*	NL	SC
Nestronia[b]	*Nestronia umbellula*	NL	SC
Nutmeg hickory[b]	*Carya myristiciformis*	NL	RC
Oconee azalea[b]	*Rhododendron flammeum*	NL	SC
Pink tickseed[b]	*Coreopsis rosea*	NL	RC
Quill-leaved swamp potato[b]	*Sagittaria isoetiformis*	NL	SC
Sandhill lily[b]	*Nolina georgiana*	NL	SC
Smooth coneflower[b]	*Echinacea laevigata*	E	—[e]
Trepocarpus[b]	*Trepocarpus aethusae*	NL	SC
Wild water-celery[b]	*Vallisneria americana*	NL	SC
Yellow cress[b]	*Rorippa sessiliflora*	NL	SC
Yellow wild indigo[b]	*Baptisia lanceolata*	NL	SC

[a] Status codes: E - endangered; NL - not listed; RC - regional of concern (unofficial plants only); S/A - protected under the similarity of appearance provision of the *Endangered Species Act*; SC - state of concern; SE - state endangered (official state-listed animals only); ST - state threatened (official state-list animals only); and T - threatened.

[b] Species occurrence recorded on Savannah River Site (SRS).

[c] USFWS Recovery Plan exists for this species.

[d] Species known to occur on Upper Three Runs Creek downstream from the proposed project site or in areas affected by the project.

[e] There is no official state threatened or endangered status for plants; defer to Federal status.

Source: 50 CFR 17.11; 50 CFR 17.12; DOE 1992e; SC WD 1995a; SR NERP 1990b; WSRC 1989e; WSRC 1993b.

TABLE C–3.—*Federal- and State-Listed Threatened, Endangered, and Other Special Status Species That May Be Found at or in the Vicinity of Pantex Plant*

Common Name	Scientific Name	Status[a] Federal	Status[a] State
Mammals			
Swift fox[b]	*Vulpes velox*	C	NL
Birds			
American peregrine falcon[c]	*Falco peregrinus anatum*	E	E
Arctic peregrine falcon	*Falco peregrinus tundrius*	E (S/A)	T
Bald eagle[b, c]	*Haliaeetus leucocephalus*	T	E
Interior least tern[c]	*Sterna antillarum athalassos*	E	E
Mountain plover	*Charadrius montanus*	C	NL
White-faced ibis[b]	*Plegadis chihi*	NL	T
Whooping crane[b,c]	*Grus americana*	E	E
Reptiles			
Smooth green snake	*Opheodrys vernalis*	NL	E
Texas horned lizard[b]	*Phrynosoma cornutum*	NL	T

[a] Status codes: C - Federal candidate; E - endangered; NL - not listed; S/A - protected under the similarity of appearances provision of the *Endangered Species Act*; T - threatened.

[b] Species observed on Pantex Plant.

[c] USFWS Recovery Plan exists for this species.

Source: 50 CFR 17.11; 50 CFR 17.12; 61 FR 7596; PX DOE 1996b; PX MH 1994c; TX PWD 1993a; TX PWD 1995a; TX PWD 1995b.

TABLE C–4.—*Federal- and State-Listed Threatened, Endangered, and Other Special Status Species That May Be Found at or in the Vicinity of Los Alamos National Laboratory* [Page 1 of 2]

Common Name	Scientific Name	Status[a] Federal	Status[a] State
Mammals			
New Mexican meadow jumping mouse	*Zapus hudsonius luteus*	NL	T
Spotted bat	*Euderma maculatum*	NL	T
Birds			
Baird's sparrow	*Ammodvamus bairdii*	NL	T
Bald eagle[b,c]	*Haliaeetus leucocephalus*	T	T
Broad-billed hummingbird	*Cynanthus latirostris*	NL	T
Common black-hawk	*Beuteogallus anthracinus*	NL	T
Gray vireo	*Vireo vicinior*	NL	T
Mexican spotted owl[c]	*Strix occidentalis lucida*	T	NL
Peregrine falcon[b,c]	*Falcon peregrinus*	E (S/A)	E
Southwestern willow flycatcher	*Empidonax traillii extimus*	E	T
Whooping crane[b]	*Grus americana*	E	E
Amphibians			
Jemez Mountain salamander[c]	*Plethodon neomexicanus*	NL	T
Fish			
Rio Grande silvery minnow	*Hybognathus amarus*	E	T
Invertebrates			
Say's pond snail	*Lymnaea caperata*	NL	E

TABLE C–4.—*Federal- and State-Listed Threatened, Endangered, and Other Special Status Species That May Be Found at or in the Vicinity of Los Alamos National Laboratory* [Page 2 of 2]

Common Name	Scientific Name	Status[a]	
		Federal	State
Plants			
Checker lily	*Fritillaria atropurpurea*	NL	R
Giant helleborine orchid	*Epipactis gigantea*	NL	RS
Golden lady's slipper	*Cypripedium pubesceas*	NL	E
Sandia alumroot	*Heuchera pulchella*	NL	RS
Santa Fe cholla	*Opuntia viridiflora*	NL	E
Wood lily	*Lilium philadelphicum var. andinum*	NL	E

[a] Status codes: E - endangered; NL - not listed; R - state rare plant review list; RS - state rare and sensitive plant species; S/A - protected under the similarity of appearances provision of the *Endangered Species Act*; T - threatened.

[b] USFWS Recovery Plan exists for this species.

[c] Species recorded on Los Alamos National Laboratory (LANL).

Source: 50 CFR 17.11; 50 CFR17.12; DOE 1995hh; LANL 1996e:2; NM DGF 1990b; NM DGF 1995a; NM FRCD 1995a.

TABLE C–5.—*Federal- and State-Listed Threatened, Endangered, and Other Special Status Species That May Be Found at or in the Vicinity of the Livermore Site and Site 300* [Page 1 of 2]

Common Name	Scientific Name	Status[a] Federal	Status[a] State
Mammals			
American badger[b]	*Taxidea taxus*	NL	SC
Greater western mastiff-bat	*Eumops perotis californicus*	NL	SC
Pacific Townsend's big-eared bat	*Plecotus townsendii townsendii*	NL	SC
Riparian brush rabbit	*Sylvilagus bachmani riparius*	C	E
San Francisco dusky-footed woodrat	*Neotoma fuscipes annectens*	NL	SC
San Joaquin kit fox[c]	*Vulpes macrotis mutica*	E	T
San Joaquin pocket mouse[b]	*Perognathus inoratus inoratus*	NL	SC
San Joaquin Valley woodrat	*Neotoma fuscipes riparia*	C	SC
Birds			
American peregrine falcon[b,c]	*Falco peregrinus anatum*	E	E
Bald eagle[c,d]	*Haliaeetus leucocephalus*	T	E
Bell's sage sparrow	*Amphispiza belli belli*	NL	SC
California horned lark[b]	*Eremophila alpestris actia*	NL	SC
Coopers hawk[b,d]	*Accipiter cooperii*	NL	SC
Double-crested cormorant[d]	*Phalacrocorax auritus*	NL	SC
Ferruginous hawk[b,d]	*Buteo regalis*	NL	SC
Golden eagle[b,d]	*Aquila chrysaetos*	NL	SC
Long-eared owl[b]	*Asio otus*	NL	SC
Merlin[b,d]	*Falco columbarius*	NL	SC
Mountain plover	*Charadrius montanus*	C	NL
Northern harrier[b,d]	*Circus cyaneus*	NL	SC
Prairie falcon[b,d]	*Falco mexicanus*	NL	SC
Sharp-shinned hawk[d]	*Accipiter striatus*	NL	SC
Short-eared owl	*Asio flammeus*	NL	SC
Swainson's hawk[b]	*Buteo swainsoni*	NL	T
Tricolored blackbird[b]	*Agelaius tricolor*	NL	SC
Western burrowing owl[b,d]	*Athene cunicularia hypugea*	NL	SC
Reptiles			
Alameda whipsnake[b]	*Masticophis lateralis euryxanthus*	PE	T
California horned lizard[b]	*Phrynosoma coronatum frontale*	NL	SC
Giant garter snake	*Thamnophis gigas*	T	T
Northwestern pond turtle	*Clemmys marmorata marmorata*	NL	SC
San Joaquin whipsnake[b]	*Masticophis flagellum ruddocki*	NL	SC
Silvery legless lizard	*Anniella pulchra pulchra*	NL	SC
Southwestern pond turtle	*Clemmys marmorata pallida*	NL	SC
Amphibians			
California red-legged frog[b]	*Rana aurora draytoni*	PE	SC
California tiger salamander[b]	*Ambystoma californiense*	C	SC
Western spadefoot toad[b]	*Scaphiopus hammondii*	NL	SC

TABLE C–5.—*Federal- and State-Listed Threatened, Endangered, and Other Special Status Species That May Be Found at or in the Vicinity of the Livermore Site and Site 300* [Page 2 of 2]

Common Name	Scientific Name	Status[a]	
		Federal	State
Invertebrates			
Longhorn fairy shrimp	*Branchinecta longiantenna*	E	NL
Valley elderberry longhorn beetle[b]	*Desmocerus californicus dimorphus*	T	SC
Vernal pool fairy shrimp	*Branchinecta lynchi*	T	NL
Vernal pool tadpole shrimp[c]	*Lepidurus packardi*	E	NL
Plants			
Alkali milkvetch	*Astragalus tener tener*	NL	SC
Big scale balsamroot	*Balsamorhiza macrolepis var. macrolepis*	NL	SC
Congdon's tarplant	*Hemizonia parryi congdonii*	NL	SC
Large-flowered fiddleneck[b]	*Amsinckia grandiflora*	E	E
Palmate-bracted bird's beak	*Cordylanthus palmatus*	E	E
Showy Indian clover	*Trifolium amoenum*	PE	NL
Stinkbells	*Fritillaria agrestis*	NL	SC

[a] Status codes: C - Federal candidate; E - endangered species; NL - not listed; PE - proposed endangered; SC - state species of special concern; T - threatened.

[b] Species considered only for Site 300.

Source: 50 CFR 17.11; 50 CFR 17.12; 61 FR 7596; CA DFG 1994a; CA DFG 1995a; CA DFG 1995b; CA DFG 1995c; LL DOE 1992c; LLNL 1996i:3.

TABLE C–6.—*Federal- and State-Listed Threatened, Endangered, and Other Special Status Species That May Be Found at or in the Vicinity of Sandia National Laboratories* [Page 1 of 2]

Common Name	Scientific Name	Status[a]	
		Federal	State
Mammals			
New Mexican meadow jumping mouse	*Zapus hudsonius luteus*	NL	T
Spotted bat	*Euderma maculatum*	NL	T
Birds			
Bald eagle[b]	*Haliaeetus leucocephalus*	T	T
Baird's sparrow	*Ammodramus bairdii*	NL	T
Bell's vireo	*Vireo bellii*	NL	T
Common black hawk	*Beuteogallus anthracinus*	NL	T
Gray vireo[c]	*Vireo vicinior*	NL	T
Mexican spotted owl	*Strix occidentalis lucida*	T	NL
Mountain plover	*Charadrius montanus*	C	NL
Northern beardless-tyrannulet	*Camptostoma imperbe*	NL	E
Peregrine falcon[b]	*Falco peregrinus*	E (S/A)	E
Southwestern willow flycatcher	*Empidonax traillii extimus*	E	T
Whooping crane[b]	*Grus americana*	E	E
Fish			
Rio Grande silvery minnow	*Hybognathus amarus*	E	T
Plants			
Great Plains lady tresses	*Spiranthes magnicamporum*	NL	E
Plank's catchfly	*Silene plankii*	NL	RS

TABLE C–6.—*Federal- and State-Listed Threatened, Endangered, and Other Special Status Species That May Be Found at or in the Vicinity of Sandia National Laboratories* [Page 2 of 2]

Common Name	Scientific Name	Status[a]	
		Federal	State
Santa Fe milkvetch	*Astragalus feensis*	NL	RS
Strong prickly pear	*Opuntia valida*	NL	R

[a] Status codes: C - Federal candidate; E - endangered; NL - not listed; R - state rare plant review list; RS - state rare and sensitive plant species; S/A - protected under the similarity of appearance provision of the *Endangered Species Act*; T - threatened.

[b] USFWS Recovery Plan exists for this species.

[c] Species observed on Sandia National Laboratory (SNL).

Source: 50 CFR 17.11; 50 CFR 17.12; 61 FR 7596; NM DGF 1990b; NM DGF 1995a; NM FRCD 1995a; SNL 1990a; SNL 1992c; SNL 1995h; appendix I.

TABLE C–7.—*Federal- and State-Listed Threatened, Endangered, and Other Special Status Species That May Be Found at or in the Vicinity of Nevada Test Site*

Common Name	Scientific Name	Status[a]	
		Federal	State
Mammals			
Spotted bat[b]	*Euderma maculatum*	NL	T
Birds			
American peregrine falcon[c,d]	*Falco peregrinus anatum*	E	E
Arctic peregrine falcon[c]	*Falco peregrinus tundrius*	E (S/A)	E
Bald eagle[b,d]	*Haliaeetus leucocephalus*	T	T
Mountain plover[b]	*Charadrius montanus*	C	NL
Reptiles			
Desert tortoise[b,e]	*Gopherus agassizii*	T	T
Fish			
Devils Hole pupfish[d,f]	*Cyprinodon diabolis*	E	E
Plants			
Beatley milkvetch[b]	*Astragalus beatleyae*	NL	CE
Mojave fishhook cactus[b]	*Sclerocactus polyancistrus*	NL	CY

[a] Status codes: C - Federal candidate; CE - critically endangered by authority of NRS 527.270 (State Division of Forestry); CY - protected by authority of NRS 522.60–.120 (Nevada Cacti and Yucca Law); E - endangered; NL - not listed; S/A - protected under the similarity of appearances provision of the *Endangered Species Act*; T - threatened.

[b] Species recorded on Nevada Test Site (NTS).

[c] Peregrine falcon seen on NTS; however not identified to subspecies level.

[d] USFWS Recovery Plan exists for this species.

[e] Species known to occur on the proposed project site.

[f] Only known location of this species is outside NTS approximately 55 km (34 mi) southwest of the proposed project site. This species is included here due to offsite groundwater concerns.

Source: 50 CFR 17.11; 50 CFR 17.12; 61 FR 7596; DOE 1995w; NT DOE 1995j; NT DOE 1996c; NT DOI 1995a; NT ERDA 1976a; NV FWS 1989a; NV NHP 1995a.

APPENDIX D

Appendix D

APPENDIX D: SOCIOECONOMICS

D.1 INTRODUCTION

This appendix includes the methodologies, models. assumptions, and supporting data used to assess potential impacts in the socioeconomics sections of this programmatic environmental impact statement. Section D.2 presents the methods and assumptions used to evaluate the potential socioeconomic effects of the proposed alternatives of the Stockpile Stewardship and Management Program. The socioeconomic analysis involved two major steps: (1) characterizing and projecting existing social, economic, and infrastructure conditions surrounding each of the candidate sites (i.e., the affected environment); and (2) evaluating potential changes in socioeconomic conditions that could result from operating the proposed alternatives in the regions addressed (i.e., the environmental consequences).

For each site, socioeconomic impacts were estimated using two geographic areas. First, a region of influence (ROI) was identified based on the distribution of residences for current Department of Energy (DOE) and contractor employees. The ROI is defined as those counties where approximately 90 percent of the workforce lives. This residential distribution reflects existing commuting patterns and attractiveness of area communities for people employed at each site. and was used to estimate the future distribution of direct workers associated with the proposed alternatives.

As an example, table D.1–1 displays the residential distribution by city and county for approximately 90 percent of all personnel employed at Oak Ridge Reservation (ORR). Data on residential locations of a large portion of facility employees were obtained from ORR personnel offices. Similar data were provided by the other locations and are given in tables D.1–2 through D.1–8.

A second geographical area, referred to as a regional economic area, was also identified for estimating socioeconomic impacts. The regional economic area encompasses a broad market that involves trade among regional industrial and service sectors and is characterized by strong economic links between the communities located in the region. These links determine the nature and magnitude of multiplier effects of economic activity at each candidate site. Regional economic areas, as defined by the U.S. Bureau of Economic Analysis, consist of an economic node that serves as the center of economic activity, and surrounding counties that are economically related and include the places of work and residence of its labor force. The regional economic

TABLE D.1–1.—*Distribution of Employees by Place of Residence in the Oak Ridge Reservation Region of Influence, 1991*

County/City	Number of Employees	Total Site Employment (percent)
Anderson County	5,053	33.1
Clinton	1,035	6.8
Oak Ridge	3,292	21.6
Knox County	5,490	36.0
Knoxville	4,835	31.7
Loudon County	848	5.6
Lenoir City	638	4.2
Roane County	2.537	16.6
Harriman	802	5.3
Kingston	1.033	6.8
Total ROI	13.928	91.3

Note: City values are included within county totals.
Source: ORR 1991a:4.

TABLE D.1–2.—*Distribution of Employees by Place of Residence in the Savannah River Site Region of Influence, 1991*

County/City	Number of Employees	Total Site Employment (percent)
Aiken County	9,978	51.9
Aiken	4,928	25.7
North Augusta	2,666	13.9
Barnwell County	1,401	7.3
Columbia County	2,036	10.6
Richmond County	3,358	17.5
Augusta	2,780	14.5
Total ROI	16,773	87.3

Note: City values are included within county totals.
Source: SRS 1991a:3.

TABLE D.1–3.—*Distribution of Employees by Place of Residence in the Kansas City Plant Region of Influence, 1991*

County/City	Number of Employees	Total Site Employment (percent)
Cass County	761	14.0
Belton	237	4.4
Harrisonville	150	2.8
Jackson County	3,246	59.8
Kansas City	1,499	27.6
Lee's Summit	609	11.2
Johnson County	915	16.9
Overland Park	376	6.9
Wyandotte County	135	2.3
Total ROI	5,057	93.2

Note: City values are included within county totals.
Source: KCP 1993a:1.

TABLE D.1–4.—*Distribution of Employees by Place of Residence in the Pantex Plant Region of Influence, 1994*

County/City	Number of Employees	Total Site Employment (percent)
Armstrong County	46	1.3
Carson County	380	10.7
Potter County	1,217	34.2
Amarillo	196	5.5
Randall County	1,783	50.2
Total ROI	3,426	96.4

Note: City values are included within county totals.
Source: PX 1994a:2.

TABLE D.1–5.—*Distribution of Employees by Place of Residence in the Los Alamos National Laboratory Region of Influence, 1991*

County/City	Number of Employees	Total Site Employment (percent)
Los Alamos County	4,697	48.3
Rio Arriba County	2,027	20.8
Espanõla	944	9.7
Santa Fe County	1,851	19.0
Santa Fe	1,548	15.9
Total ROI	8,575	88.1

Note: City values are included within county totals.
Source: LANL 1991b:6.

TABLE D.1–6.—*Distribution of Employees by Place of Residence in the Lawrence Livermore National Laboratory Region of Influence, 1995*

County/City	Number of Employees	Total Site Employment (percent)
Alameda County	4,746	57.1
Livermore	3,215	38.7
Pleasanton	642	7.7
Contra Costa County	1,098	13.2
San Joaquin County	1,327	16.0
Manteca	372	4.5
Tracy	656	7.9
Total ROI	7,171	86.3

Note: City values are included within county totals.
Source: LLNL 1995i:1.

TABLE D.1–7.—*Distribution of Employees by Place of Residence in the Sandia National Laboratories Region of Influence, 1994*

County/City	Number of Employees	Total Site Employment (percent)
Bernalillo County	6,463	88.0
Albuquerque	6,030	82.1
Sandoval County	333	4.5
Valencia County	334	4.5
Total ROI	7,130	97.0

Note: City values are included within county totals.
Source: SNL 1995b:1.

TABLE D.1–8.—*Distribution of Employees by Place of Residence in the Nevada Test Site Region of Influence, 1991*

County/City	Number of Employees	Total Site Employment (percent)
Clark County	6,270	81.7
Henderson	357	4.7
Las Vegas	5,352	69.7
North Las Vegas	505	6.6
Nye County	1,173	15.3
Total ROI	7,443	97.0

Note: City values are included within county totals.
Source: NTS 1991a:1.

area is used to analyze the primary economic impacts on employment, spending, earnings, and personal income. Table D.1–9 displays the counties found in each site's regional economic area.

Data for the year 1992 or later were obtained from sources such as the U.S. Bureau of Census, the U.S. Bureau of Economic Analysis (BEA), state and local government publications, and telephone interviews with state and local government officials and planners.

D.2 METHODOLOGIES AND MODELS

D.2.1 Employment and Population

The description of socioeconomic conditions includes indicators, such as population, civilian labor force, employment, unemployment rate, and income. These indicators provide a basis for comparing baseline projections of the affected regions to estimates of project-induced impacts. These baseline projections depict the No Action alternative. The baseline projections are derived from forecasts for the project period developed with data from BEA.

An analysis of the existing labor availability was performed to determine the number of workers that would be needed to come from outside the region. In addition to jobs created directly by the proposed project alternatives, other jobs and opportunities are created indirectly within the region. These indirect jobs and resulting income are measured by employing the most recent version of the Regional Input-Output Modeling System developed by BEA. For this analysis, direct effect multipliers were used to determine project-related additional indirect workers and earnings increases. Final demand multipliers were not used because there were not sufficient data on purchases. Population increases due to the in-migration of new workers and their families are estimated by the number of new workers and the national average household size because this new population would come from unknown places outside the region.

Total employment and local economic data for all the sites are given in tables D.2.1–1 through D.2.1–8. Population data for all the sites are given in tables D.2.1–9 through D.2.1–16.

TABLE D.1-9.—*Candidate Sites' Regional Economic Areas*

ORR	SRS	KCP			Pantex		LANL	LLNL		SNL	NTS
Tennessee	**Georgia**	**Kansas**	**Missouri (Con't)**	**Missouri (Con't)**	**New Mexico**	**Texas (Con't)**	**New Mexico**	**California**	**California (Con't)**	**Arizona**	**Arizona**
Anderson	Burke	Anderson	Caldwell	Livingston	Curry	Gray	Guadalupe	Alameda	Stanislaus	Apache	Mohave
Blount	Columbia	Atchison	Carroll	Macon	Debaca	Hall	Los Alamos	Calaveras	Trinity		
Campbell	Glascock	Bourbon	Cass	Mercer	Harding	Hansford	Mora	Contra Costa	Tuolumne		
Cocke	Jefferson	Doniphan	Cedar	Nodaway	Quay	Hartley	Rio Arriba	Humboldt		**New Mexico**	**Nevada**
Grainger	Jenkins	Douglas	Chariton	Pettis	Roosevelt	Hemphill	San Miguel	Lake		Bernalillo	Clark
Hamblen	Lincoln	Franklin	Clay	Platte	Union	Hutchinson	Santa Fe	Marin		Catron	Esmeralda
Hancock	McDuffie	Johnson	Clinton	Putnam		Lipscomb	Taos	Mariposa		Cibola	Lincoln
Jefferson	Richmond	Leavenworth	Davies	Ray		Moore		Mendocino		McKinley	Mineral
Knox	Warren	Linn	De Kalb	Saline	**Texas**	Ochiltree		Merced		Sandoval	Nye
Loudon	Wilkes	Miami	Gentry	Schuyler	Armstrong	Oldham		Monterey		Socorro	
Morgan		Wyandotte	Grundy	St. Clair	Bailey	Parmer		Napa		Torrance	
Roane			Harrison	Sullivan	Carson	Potter		San Benito		Valencia	**Utah**
Scott	**South Carolina**		Henry	Vernon	Castro	Randall		San Francisco			Beaver
Sevier	Aiken	**Missouri**	Holt	Worth	Childress	Roberts		San Joaquin			Garfield
Union	Allendale	Adair	Jackson		Collingsworth	Sherman		San Mateo			Iron
	Bamberg	Andrew	Johnson		Cottle	Wheeler		Santa Clara			Piute
	Barnwell	Bates	Knox		Dallam			Santa Cruz			Washington
	Edgefield	Benton	Lafayette		Deaf Smith			Solano			
		Buchanan	Linn		Donley			Sonoma			

Source: DOC 1995a.

TABLE D.2.1-1.—*Employment and Local Economy for the Oak Ridge Reservation Regional Economic Area, No Action Alternative, 1995-2030*

Regional Economic Area	1995	2000	2005	2010	2020	2030
Civilian labor force	486,400	513,600	535,800	555,300	594,000	601,300
Total employment	462,900	488,700	509,800	528,400	565,200	572,100
Unemployment rate (percentage)	4.9	4.9	4.9	4.9	4.9	4.9
Total personal income (thousand dollars)	16,498,303	18,391,177	20,017,623	21,498,098	24,601,119	25,206,968
Per capita income (dollars per person)	18,198	19,214	20,046	20,774	22,223	22,494

Source: Census 1993a; Census 1993b; DOC 1990c; DOC 1990d; DOC 1994j; DOC 1995a; DOL 1991a; DOL 1995a; OR LMES 1996i; ORR 1995a:1.

TABLE D.2.1–2.— *Employment and Local Economy for the Savannah River Site Regional Economic Area, No Action Alternative, 1995-2030*

Regional Economic Area	1995	2000	2005	2010	2020	2030
Civilian labor force	261,400	278,100	292,300	306,100	335,600	338,500
Total employment	243,800	259,400	272,700	285,500	313,000	315,800
Unemployment rate (percentage)	6.7	6.7	6.7	6.7	6.7	6.7
Total personal income (thousand dollars)	10,608,794	12,013,250	13,269,987	14,550,516	17,487,856	17,798,751
Per capita income (dollars per person)	17,789	18,930	19,895	20,833	22,839	23,041

Source: Census 1993a; Census 1993c; Census 1993e; DOC 1990c; DOC 1990d; DOC 1994j; DOC 1995a; DOE 1995p; DOL 1991a; DOL 1995a; SR DOE 1995b; SRS 1995a:1.

TABLE D.2.1–3.—*Employment and Local Economy for the Kansas City Plant Regional Economic Area, No Action Alternative, 1995-2030*

Regional Economic Area	1995	2000	2005	2010	2020	2030
Civilian labor force	1,215,800	1,255,900	1,296,200	1,338,900	1,428,200	1,444,000
Total employment	1,156,200	1,194,400	1,232,700	1,273,400	1,358,300	1,373,300
Unemployment rate (percentage)	4.9	4.9	4.9	4.9	4.9	49
Total personal income (thousand dollars)	46,020,762	49,151,226	52,309,800	55,815,538	63,506,729	64,919,757
Per capita income (dollars per person)	20,004	20,683	21,327	22,030	23,499	23,759

Source: Census 1993a; Census 1993q; Census 1993t; DOC 1990c; DOC 1990d; DOC 1994j; DOC 1995a; DOL 1991a; DOL 1995a; KCP 1995a:1.

TABLE D.2.1–4.—*Employment and Local Economy for the Pantex Plant Regional Economic Area, No Action Alternative, 1995-2030*

Regional Economic Area	1995	2000	2005	2010	2020	2030
Civilian labor force	234,700	247,800	261,100	274,800	302,300	302,000
Total employment	223,300	235,800	248,400	261,500	287,700	287,400
Unemployment rate (percentage)	4.8	4.8	4.8	4.8	4.8	4.8
Total personal income (thousand dollars)	9,622,309	10,728,135	11,908,766	13,190,906	15,965,800	15,933,429
Per capita income (dollars per person)	19,987	21,104	22,235	23,401	25,745	25,719

Source: Census 1993a; Census 1993m; Census 1993w; DOC 1990c; DOC 1990d; DOC 1994j; DOC 1995a; DOL 1991a; DOL 1995a; PX 1995a:2.

TABLE D.2.1–5.—*Employment and Local Economy for the Los Alamos National Laboratory Regional Economic Area, No Action Alternative, 1995-2030*

Regional Economic Area	1995	2000	2005	2010	2020	2030
Civilian labor force	119,700	130,800	140,900	150,400	169,400	175,200
Total employment	112,300	122,700	132,200	141,100	158,900	164,400
Unemployment rate (percentage)	6.2	6.2	6.2	6.2	6.2	6.2
Total personal income (thousand dollars)	4,218,781	5,034,646	5,845,041	6,655,720	8,440,189	9,034,538
Per capita income (dollars per person)	18,314	20,007	21,557	23,003	25,904	26,801

Source: Census 1993a; Census 1993m; DOC 1990c; DOC 1990d; DOC 1994j; DOC 1995a; DOL 1991a; DOL 1995a; LANL 1995b:1.

TABLE D.2.1–6.— *Employment and Local Economy for the Lawrence Livermore National Laboratory Regional Economic Area, No Action Alternative, 1995-2030*

Regional Economic Area	1995	2000	2005	2010	2020	2030
Civilian labor force	4,556,000	5,004,100	5,448,100	5,917,500	6,992,100	7,097,200
Total employment	4,208,100	4,621,900	5,032,000	5,465,600	6,458,200	6,555,300
Unemployment rate (percentage)	7.6	7.6	7.6	7.6	7.6	7.6
Total personal income (thousand dollars)	236,627,513	285,131,842	337,968,862	398,727,427	556,687,763	573,557,669
Per capita income (dollars per person)	26,716	29,310	31,910	34,660	40,954	41,570

Source: Census 1993a; Census 1993x; DOC 1990c; DOC 1990d; DOC 1994j; DOC 1995a; DOL 1991a; DOL 1995a; LLNL 1995i:1.

TABLE D.2.1–7.—*Employment and Local Economy for the Sandia National Laboratories Regional Economic Area, No Action Alternative, 1995-2030*

Regional Economic Area	1995	2000	2005	2010	2020	2030
Civilian labor force	408,300	446,100	480,600	512,900	577,500	597,500
Total employment	385,200	420,900	453,500	483,900	544,900	563,800
Unemployment rate (percentage)	5.7	5.7	5.7	5.7	5.7	5.7
Total personal income (thousand dollars)	14,923,362	17,809,373	20,676,034	23,543,700	29,856,016	31,958,442
Per capita income (dollars per person)	17,676	19,310	20,806	22,202	25,002	25,867

Source: Census 1993a; Census 1993f; Census 1993m; DOC 1990c; DOC 1990d; DOC 1994j; DOC 1995a; DOL 1991a; DOL 1995a; SNL 1995b:1.

TABLE D.2.1–8.—*Employment and Local Economy for the Nevada Test Site Regional Economic Area, No Action Alternative, 1995-2030*

Regional Economic Area	1995	2000	2005	2010	2020	2030
Civilian labor force	648,600	747,100	814,100	861,900	959,500	993,200
Total employment	608,900	701,400	764,300	809,100	900,800	932,400
Unemployment rate (percentage)	6.1	6.1	6.1	6.1	6.1	6.1
Total personal income (thousand dollars)	27,397,938	36,357,995	43,164,854	48,380,917	59,961,996	64,253,190
Per capita income (dollars per person)	22,083	25,438	27,718	29,345	32,669	33,817

Source: Census 1993a; Census 1993f; Census 1993y; Census 1993z; DOC 1990c; DOC 1990d; DOC 1994j; DOC 1995a; DOL 1991a; DOL 1995a; NTS 1995a:1.

TABLE D.2.1–9.—*Population for the Oak Ridge Reservation Region of Influence, No Action Alternative, 1995-2030*

County/City	1995	2000	2005	2010	2020	2030
Anderson County	73,300	77,400	80,800	83,700	89,500	90,600
Clinton	9,900	10,400	10,900	11,300	12,000	12,200
Oak Ridge	26,300	27,800	29,000	30,000	32,100	32,500
Knox County	361,400	381,500	398,100	412,500	441,300	446,700
Knoxville	173,900	183,600	191,600	198,500	212,400	215,000
Loudon County	34,600	36,500	38,100	39,500	42,200	42,700
Lenoir City	7,100	7,500	7,800	8,100	8,600	8,700
Roane County	50,000	52,800	55,100	57,100	61,100	61,800
Harriman	7,400	7,900	8,200	8,500	9,100	9,200
Kingston	4,800	5,100	5,300	5,500	5,900	6,000
Total ROI	519,300	548,200	572,100	592,800	634,100	641,800

Note: City values are included in county totals.

Source: Census 1993a; Census 1993b; DOC 1990c; DOC 1990d; DOC 1994j.

TABLE D.2.1–10.—*Population for the Savannah River Site Region of Influence, No Action Alternative, 1995-2030*

County/City	1995	2000	2005	2010	2020	2030
Aiken County	135,300	144,000	151,300	158,500	173,700	175,300
Aiken	23,600	25,100	26,400	27,600	30,300	30,600
North Augusta	17,200	18,300	19,300	20,200	22,100	22,300
Barnwell County	22,200	23,600	24,800	26,000	28,500	28,700
Columbia County	76,800	81,800	85,900	90,000	98,600	99,500
Richmond County	213,000	226,700	238,300	249,500	273,400	275,900
Augusta	46,800	49,800	52,300	54,800	60,100	60,600
Total ROI	447,300	476,100	500,300	524,000	574,200	579,400

Note: City values are included in county totals.

Source: Census 1993a; Census 1993c; Census 1993e; DOC 1990c; DOC 1990d; DOC 1994j.

TABLE D.2.1–11.—*Population for the Kansas City Plant Region of Influence, No Action Alternative, 1995-2030*

County/City	1995	2000	2005	2010	2020	2030
Cass County	68,700	70,900	73,200	75,600	80,700	81,600
Belton	19,800	20,400	21,100	21,800	23,200	23,500
Harrisonville	8,200	8,500	8,800	9,100	9,700	9,800
Jackson County	645,400	666,700	688,100	710,800	758,200	766,600
Kansas City	439,300	453,800	468,400	483,800	516,000	521,800
Lee's Summit	52,200	54,000	55,700	57,500	61,400	62,100
Johnson County	381,900	394,500	407,100	420,600	448,600	453,600
Overland Park	121,400	125,400	129,400	133,700	142,600	144,200
Wyandott County	161,600	166,900	172,200	177,900	189,800	191,900
Total ROI	1,257,600	1,299,000	1,340,600	1,384,900	1,477,300	1,493,700

Note: City values are included in county totals.

Source: Census 1993a; Census 1993q; Census 1993t; DOC 1990c; DOC 1990d; DOC 1994j.

TABLE D.2.1–12.—*Population for the Pantex Plant Region of Influence, No Action Alternative, 1995-2030*

County/City	1995	2000	2005	2010	2020	2030
Armstrong County	2,100	2,200	2,300	2,500	2,700	2,700
Carson County	6,800	7,200	7,600	8,000	8,800	8,800
Potter County	105,000	110,900	116,800	122,900	135,200	135,100
Amarillo	169,500	179,000	188,600	198,500	218,400	218,100
Randall County	96,700	102,100	107,600	113,200	124,500	124,400
Total ROI	210,600	222,400	234,300	246,600	271,200	271,000

Note: Amarillo is divided across Potter and Randall Counties. The population shown for Amarillo is for the whole city. Potter and Randall County totals represent their share of Amarillo.

Source: Census 1993a; Census 1993w; DOC 1990c; DOC 1990d; DOC 1994j.

TABLE D.2.1–13.—*Population for the Los Alamos National Laboratory Region of Influence, No Action Alternative, 1995-2030*

County/City	1995	2000	2005	2010	2020	2030
Los Alamos County	19,200	21,000	22,600	24,200	27,200	28,200
Rio Arriba County	36,900	40,300	43,500	46,400	52,200	54,000
Espanola	9,600	10,400	11,200	12,000	13,500	14,000
Santa Fe County	111,300	121,600	131,000	139,800	157,500	162,900
Santa Fe	62,500	68,200	73,500	78,400	88,300	91,400
Total ROI	167,400	182,900	197,100	210,400	236,900	245,100

Note: City values are included in county totals.

Source: Census 1993a; Census 1993m; DOC 1990c; DOC 1990d; DOC 1994j.

TABLE D.2.1–14.—*Population for the Lawrence Livermore National Laboratory Region of Influence, No Action Alternative, 1995-2030*

County/City	1995	2000	2005	2010	2020	2030
Alameda County	1,400,700	1,536,800	1,673,100	1,817,300	2,147,300	2,179,600
Livermore	64,300	70,600	76,800	83,500	98,600	100,100
Pleasanton	58,100	63,700	69,400	75,400	89,000	90,400
Contra Costa County	900,500	987,900	1,075,600	1,168,200	1,380,400	1,401,200
San Joaquin County	540,000	592,400	645,000	700,600	827,800	840,300
Manteca	45,500	49,900	54,300	59,000	69,700	70,800
Tracy	41,900	46,000	50,100	54,400	64,300	65,200
Total ROI	2,841,200	3,117,100	3,393,700	3,686,100	4,355,500	4,421,000

Note: City values are included in county totals.

Source: Census 1993a; Census 1993x; DOC 1990c; DOC 1990d; DOC 1994j.

TABLE D.2.1–15.—*Population for the Sandia National Laboratories Region of Influence, No Action Alternative, 1995-2030*

County/City	1995	2000	2005	2010	2020	2030
Bernalillo County	529,000	577,900	622,600	664,400	748,200	774,100
Albuquerque	422,200	461,200	497,000	530,300	597,200	617,800
Sandoval County	72,900	79,600	85,800	91,500	103,100	106,600
Valencia County	51,200	55,900	60,200	64,300	72,400	74,900
Total ROI	653,100	713,400	768,600	820,200	923,700	955,600

Note: City values are included in county totals.

Source: Census 1993a; Census 1993m; DOC 1990c; DOC 1990d; DOC 1994j.

TABLE D.2.1–16.—*Population for the Nevada Test Site Region of Influence, No Action Alternative, 1995-2030*

County/City	1995	2000	2005	2010	2020	2030
Clark County	941,100	1,084,100	1,181,200	1,250,500	1,392,900	1,441,100
Henderson	93,900	108,100	117,800	124,800	139,000	143,800
Las Vegas	328,900	378,800	412,800	437,000	486,800	503,600
North Las Vegas	61,800	71,200	77,600	82,200	91,500	94,700
Nye County	21,700	25,000	27,300	28,900	32,100	33,300
Total ROI	962,800	1,109,100	1,208,500	1,279,400	1,425,000	1,474,400

Note: City values are included in county totals.

Source: Census 1993a; Census 1993y; DOC 1990c; DOC 1990d; DOC 1994j.

D.2.2 Housing

No action housing characteristics are presented in tables D.2.2–1 through D.2.2–8. Projected housing needs are based upon housing unit and population data obtained from the 1990 Census of Population and Housing for each ROI. Future housing units needed for cities and counties in each ROI were developed by estimating the household size from the current population and housing unit ratios. The household size to population ratios were then applied to the estimated future population trends to obtain the number of housing units needed to accommodate the projected population for a No Action alternative future baseline.

Projected housing needs for the proposed alternatives were derived by a similar method, but a national average population-to-housing ratio was used. The additional housing needed for the estimated in-migrating workforce and their families are calculated after vacancy rates for the affected region are reduced to the lowest historical level. Past housing construction trends are also evaluated to assess potential impacts.

LE D.2.2–1.—*Owner and Renter Housing Units for the Oak Ridge Reservation Region of Influence, No Action Alternative, 1995-2030*

County/City	1995	2000	2005	2010	2020	2030
Anderson County	30,500	32,200	33,600	34,900	37,300	37,700
Clinton	4,300	4,600	4,700	4,900	5,300	5,300
Oak Ridge	11,000	11,600	12,100	12,600	13,500	13,600
Knox County	150,400	158,800	165,600	171,700	183,600	185,900
Knoxville	78,000	82,400	86,000	89,100	95,300	96,500
Loudon County	13,900	14,600	15,300	15,800	16,900	17,100
Lenoir City	3,100	3,200	3,400	3,500	3,700	3,800
Roane County	20,300	21,400	22,300	23,100	24,700	25,000
Harriman	3,200	3,400	3,500	3,700	3,900	4,000
Kingston	2,100	2,300	2,400	2,500	2,600	2,700
Total ROI	215,100	227,000	236,800	245,500	262,500	265,700

Note: City values are included in county totals.
Source: Census 1991c; appendix table D.2.1–9.

TABLE D.2.2–2.—*Owner and Renter Housing Units for the Savannah River Site Region of Influence, No Action Alternative, 1995-2030*

County/City	1995	2000	2005	2010	2020	2030
Aiken County	52,600	56,000	58,800	61,600	67,500	68,100
Aiken	9,800	10,400	10,900	11,400	12,500	12,600
North Augusta	7,500	8,000	8,400	8,800	9,600	9,700
Barnwell County	8,100	8,600	9,000	9,500	10,400	10,500
Columbia County	26,400	28,000	29,500	30,900	33,800	34,100
Richmond County	81,800	87,000	91,500	95,800	105,000	105,900
Augusta	21,100	22,400	23,600	24,700	27,000	27,300
Total ROI	168,900	179,600	188,800	197,800	216,700	218,600

Note: City values are included in county totals.
Source: Census 1991a; Census 1991b; appendix table D.2.1–10.

TABLE D.2.2–3.— *Owner and Renter Housing Units for the Kansas City Plant Region of Influence, No Action Alternative, 1995-2030*

County/City	1995	2000	2005	2010	2020	2030
Cass County	25,500	26,400	27,200	28,100	30,000	30,300
Belton	7,300	7,500	7,800	8,000	8,500	8,600
Harrisonville	4,200	4,300	4,400	4,600	4,900	4,900
Jackson County	276,300	285,500	294,600	304,300	324,600	328,200
Kansas City	195,600	202,000	208,500	215,400	229,700	232,300
Lee's Summit	38,200	39,400	40,700	42,000	44,800	45,300
Johnson County	153,100	158,100	163,200	168,600	179,800	181,800
Overland Park	51,400	53,100	54,800	56,600	60,300	61,000
Wyandotte County	66,800	69,000	71,200	73,600	78,500	79,400
Total ROI	521,700	539,000	556,200	574,600	612,900	619,700

Note: City values are included in county totals.
Source: Census 1991f; Census 1991ff; appendix table D.2.1–11.

TABLE D.2.2–4.—*Owner and Renter Housing Units for the Pantex Plant Region of Influence, No Action Alternative, 1995-2030*

County/City	1995	2000	2005	2010	2020	2030
Armstrong County	800	900	900	1,000	1,100	1,100
Carson County	2,700	2,800	3,000	3,200	3,500	3,500
Potter County	44,000	46,400	48,900	51,500	56,600	56,600
Amarillo	71,300	75,200	79,300	83,400	91,800	91,700
Randall County	39,600	41,800	44,000	46,300	51,000	50,900
Total ROI	87,100	91,900	96,800	102,000	112,200	112,100

Note: Amarillo is divided across Potter and Randall Counties. The number of housing units shown for Amarillo is for the whole city. Potter and Randall County totals represent their share of Amarillo.
Source: Census 1991m; appendix table D.2.1–12.

TABLE D.2.2–5.—*Owner and Renter Housing Units for the Los Alamos National Laboratory Region of Influence, No Action Alternative, 1995-2030*

County/City	1995	2000	2005	2010	2020	2030
Los Alamos County	8,000	8,800	9,500	10,100	11,400	11,800
Rio Arriba County	15,400	16,900	18,200	19,400	21,800	22,600
Espanola	1,000	1,100	1,200	1,300	1,500	1,500
Santa Fe County	46,700	51,000	54,900	58,600	66,000	68,300
Santa Fe	27,600	30,100	32,500	34,700	39,000	40,400
Total ROI	70,100	76,700	82,600	88,100	99,200	102,700

Note: City values are included in county totals.
Source: Census 1991h; appendix table D.2.1–13.

TABLE D.2.2–6.—*Owner and Renter Housing Units for the Lawrence Livermore National Laboratory Region of Influence, No Action Alternative, 1995-2030*

County/City	1995	2000	2005	2010	2020	2030
Alameda County	543,300	596,100	649,000	704,900	832,900	845,400
Livermore	24,200	26,500	28,900	31,400	37,100	37,600
Pleasanton	22,100	24,200	26,400	28,700	33,900	34,400
Contra Costa County	347,800	381,600	415,500	451,300	533,200	541,200
San Joaquin County	183,100	200,900	218,700	237,600	280,700	284,900
Manteca	10,400	11,400	12,400	13,500	16,000	16,200
Tracy	14,900	16,300	17,800	19,300	22,800	23,200
Total ROI	1,074,200	1,178,600	1,283,200	1,393,800	1,646,800	1,671,500

Note: City values are included in county totals.
Source: Census 1991j; appendix table D.2.1–14.

TABLE D.2.2–7.—*Owner and Renter Housing Units for the Sandia National Laboratories Region of Influence, No Action Alternative, 1995-2030*

County/City	1995	2000	2005	2010	2020	2030
Bernalillo County	221,500	242,000	260,700	278,200	313,300	324,100
Albuquerque	183,100	200,000	215,500	230,000	259,000	268,000
Sandoval County	27,200	29,800	32,100	34,200	38,500	39,900
Valencia County	19,000	20,700	22,300	23,800	26,900	27,800
Total ROI	267,700	292,500	315,100	336,200	378,700	391,800

Note: City values are included in county totals.
Source: Census 1991h; appendix table D.2.1–15.

TABLE D.2.2–8.—*Owner and Renter Housing Units for the Nevada Test Site Region of Influence, No Action Alternative, 1995-2030*

County/City	1995	2000	2005	2010	2020	2030
Clark County	383,700	442,000	481,600	509,800	567,900	587,500
Henderson	35,700	41,100	44,800	47,500	52,900	54,700
Las Vegas	136,400	157,100	171,200	181,200	201,800	208,800
North Las Vegas	19,900	22,900	25,000	26,400	29,400	30,500
Nye County	8,600	9,900	10,800	11,400	12,800	13,200
Total ROI	392,300	451,900	492,400	521,200	580,700	600,700

Note: City values are included in county totals.
Source: Census 1991g; appendix table D.2.1–16.

D.2.3 Public Finance

Finances of ROI local jurisdictions were evaluated based on changes in historic revenue and expenditure levels, changes in fund balances, and reserve bonding capabilities. These historic fiscal characteristics were obtained from financial audits and budgets supplied by each jurisdiction. The analysis concentrated on each jurisdiction's governmental funds (general funds, special revenue funds, and, as applicable, capital projects, debt service, and expendable trust funds). Other funds, such as enterprise funds, which are funded principally through user charges without contributing to the general tax burden of area residents, were not included in the analysis. The analysis of local jurisdictions' public finances focused upon revenues and expenditures because no assumptions could be made for some projected fund balances (such as capital expenditures) so far into the future.

The following parameters were used to project changes in total revenues and expenditures: gains (or losses) of jobs in the region; population increases (or decreases) in each jurisdiction, including school districts; earnings and income gains (or losses); and potential changes in each jurisdiction's property tax base. Public finance and No Action characteristics are presented in tables D.2.3–1 through D.2.3–15.

TABLE D.2.3–1.—*County and City Revenues and Expenditures for the Oak Ridge Reservation Region of Influence, 1994*

Revenues and Expenditures	Anderson County	Clinton	Oak Ridge	Knox County	Knoxville	Loudon County	Lenoir City	Roane County	Harriman	Kingston
Property tax (percent)	40	62	22	54	73	37	30	40	32	60
State shared and intergovernmental (percent)	48	27	69	36	20	52	61	49	49	30
Permits, fees, fines, and investment interest (percent)	12	2	5	2	5	8	6	9	4	3
Other (percent)	0	9	4	8	2	3	3	2	15	7
Total Revenues (dollars)	50,802,902	5,320,132	41,367,745	358,355,159	118,642,146	25,630,923	10,820,645	35,658,903	13,700,152	1,978,190
General government (percent)	23	26	2	23	6	20	8	15	6	36
Public safety, health, and community services (percent)	0	19	11	0	39	0	9	0	13	62
Public works, parks, culture, and recreation (percent)	5	26	14	2	30	8	10	5	11	0
Debt services (percent)	0	15	5	6	16	11	5	6	12	2
Education (percent)	51	0	62	60	5	57	67	59	54	0
Capital outlay (percent)	21	14	6	9	4	4	1	15	4	0
Other (percent)	0	0	0	0	0	0	0	0	0	0
Total Expenditures (dollars)	58,487,767	5,768,608	45,633,111	374,478,124	103,877,538	27,201,056	10,581,424	41,289,602	13,236,429	1,784,915
End-of-Year Fund Balance (dollars)	16,460,005	4,015,490	18,299,359	50,735,073	32,350,878	4,533,445	2,122,270	7,560,278	1,758,760	511,138

Note: Financial information for ORR school districts is included in county and city financial audits.

Source: OR City 1995b; OR County 1995a.

TABLE D.2.3-2.—*County and City Revenues and Expenditures for the Savannah River Site Region of Influence, 1994*

Revenues and Expenditures	Aiken County, SC	Aiken	North Augusta	Barnwell County, SC	Columbia County, GA	Richmond County, GA	Augusta
Property tax (percent)	53	40	45	24	70	79	59
State shared and intergovernmental (percent)	31	7	10	74	4	0	20
Permits, fees, fines, and investment interest (percent)	7	49	41	0	12	14	9
Other (percent)	9	4	4	2	14	7	12
Total Revenues (dollars)	35,159,759	14,240,252	6,615,993	7,429,225	32,547,657	87,277,685	33,975,011
General government (percent)	10	7	17	40	9	11	20
Public safety, health, and community services (percent)	34	28	38	34	36	44	28
Public works, parks, culture, and recreation (percent)	20	27	32	20	22	18	18
Debt services (percent)	11	2	5	0	2	10	7
Education (percent)	5	0	0	0	0	0	0
Capital outlay (percent)	14	20	8	0	21	17	19
Other (percent)	6	16	0	6	10	0	8
Total Expenditures (dollars)	35,790,029	14,322,339	6,810,049	5,146,577	34,607,926	81,414,049	48,712,791
End-of-Year Fund Balance (dollars)	16,594,477	11,204,482	2,609,106	8,274,191	11,649,564	77,244,431	11,725,730

Source: SR City 1995a; SR County 1995a.

TABLE D.2.3–3.—*School District Revenues and Expenditures for the Savannah River Site Region of Influence, 1994*

Revenues and Expenditures	Aiken County, SC	Barnwell County #19, SC	Barnwell County #29, SC	Barnwell County #45, SC	Columbia County, GA	Richmond County, GA
Local sources (percent)	39	21	34	33	36	35
State sources (percent)	55	69	58	58	60	54
Federal sources (percent)	6	10	8	9	4	11
Other (percent)	0	0	0	0	0	0
Total Revenues (dollars)	101,336,443	5,453,008	4,627,943	11,409,161	67,786,080	162,652,868
Total instruction (percent)	52	57	39	60	57	59
Support services (percent)	27	39	24	28	26	30
Food, community, and other services (percent)	2	2	1	1	6	7
Capital assets (percent)	10	0	32	0	5	1
Debt services (percent)	9	2	4	11	6	3
Total Expenditures (dollars)	113,866,054	5,413,238	6,981,754	11,343,781	70,300,960	157,087,533
End-of-Year Fund Balance (dollars)	15,139,008	764,024	671,935	1,866,666	33,103,796	33,919,859

Source: SR School 1995b.

TABLE D.2.3–4.—*County and City Revenues and Expenditures for the Kansas City Plant Region of Influence, 1994*

Revenues and Expenditures	Cass County	Belton	Harrisonville	Jackson County	Kansas City	Lee's Summit	Johnson County	Overland Park	Wyandotte County
Property tax (percent)	NA	63	63	74	56	67	54	67	NA
State shared and intergovernmental (percent)	NA	8	1	10	9	18	19	14	NA
Permits, fees, fines, and investment interest (percent)	NA	10	31	13	28	11	19	13	NA
Other (percent)	NA	19	5	3	7	4	8	6	NA
Total Revenues (dollars)	NA	7,081,222	4,070,287	109,755,131	480,601,000	25,369,494	162,258,423	77,024,187	NA
General government (percent)	NA	11	17	54	6	9	19	10	NA
Public safety, health, and community services (percent)	NA	44	51	29	24	41	39	24	NA
Public works, parks, culture, and recreation (percent)	NA	22	28	15	33	22	16	29	NA
Debt services (percent)	NA	15	2	2	11	12	8	11	NA
Capital outlay (percent)	NA	8	0	0	11	16	18	26	NA
Other (percent)	NA	0	2	0	15	0	0	0	NA
Total Expenditures (dollars)	NA	6,498,171	3,385,267	109,901,97	459,477,00	23,522,269	157,076,221	80,500,054	NA
End-of-Year Fund Balance (dollars)	NA	3,637,533	4,301,121	60,948,809	276,086,000	20,044,897	77,735,985	60,793,238	NA

Note: NA - not available.

Source: KC City 1995a; KC County 1995a.

TABLE D.2.3–5.—*School District Revenues and Expenditures for the Kansas City Plant Region of Influence, 1994*

Revenues and Expenditures	Belton	Center	Harrisonville	Hickman Hills	Kansas City	Lee's Summit	Unified School District #229
Local sources (percent)	49	81	55	59	40	NA	65
State sources (percent)	45	15	36	36	53	NA	28
Federal sources (percent)	6	4	5	4	7	NA	1
Other (percent)	0	0	4	1	0	NA	6
Total Revenues (dollars)	18,578,226	16,923,736	11,735,893	38,744,073	371,171,282	NA	80,571,877
Total instruction (percent)	59	57	53	62	41	NA	50
Support services (percent)	26	37	32	25	35	NA	24
Food, community, and other services (percent)	10	1	5	9	11	NA	4
Capital assets (percent)	0	4	2	1	7	NA	9
Debt services (percent)	5	1	8	3	6	NA	13
Total Expenditures (dollars)	17,802,120	17,134,971	11,425,842	40,641,975	368,956,267	NA	80,034,572
End-of-Year Fund Balance (dollars)	5,261,823	6,094,505	3,268,301	9,066,453	217,966,000	NA	67,979,753

Note: NA - not available.
Source: KC School 1995a.

TABLE D.2.3–6.—*County and City Revenues and Expenditures for the Pantex Plant Region of Influence, 1994*

Revenues and Expenditures	Armstrong County	Carson County	Potter County	Amarillo	Randall County
Property tax (percent)	34	65	66	59	55
State shared and intergovernmental (percent)	17	2	9	11	13
Permits, fees, fines, and investment interest (percent)	46	26	20	18	30
Other (percent)	3	7	5	12	2
Total Revenues (dollars)	749,995	1,829,229	21,516,628	76,603,713	13,065,681
General government (percent)	31	46	15	7	18
Public safety, health, and community services (percent)	32	35	57	38	59
Public works, parks, culture, and recreation (percent)	30	5	11	45	4
Debt services (percent)	4	0	7	2	4
Capital outlay (percent)	3	9	5	8	5
Other (percent)	0	5	5	0	10
Total Expenditures (dollars)	746,983	2,585,350	19,633,506	69,837,313	11,968,123
End-of-Year Fund Balance (dollars)	593,463	18,239	20,960,491	52,263,778	5,011,059

Source: PX City 1995a; PX County 1995a.

TABLE D.2.3–7.—*School District Revenues and Expenditures for the Pantex Plant Region of Influence, 1994*

Revenues and Expenditures	Amarillo	Canyon	Claude	Groom	Highland Park	Panhandle	White Deer
Local sources (percent)	43	48	42	55	89	82	92
State sources (percent)	49	47	54	40	6	14	4
Federal sources (percent)	8	5	4	5	5	4	4
Other (percent)	0	0	0	0	0	0	0
Total Revenues (dollars)	129,782,359	27,248,718	2,196,573	1341,890	3,932,722	4,388,125	2,684,692
Total instruction (percent)	58	49	56	55	55	58	57
Support services (percent)	26	20	30	26	26	31	35
Food, community, and other services (percent)	6	6	10	18	17	7	8
Capital assets (percent)	4	16	3	1	0	0	0
Debt (percent)	6	9	1	0	2	4	0
Total Expenditures (dollars)	128,143,906	31,082,492	2,128,995	1,334,653	3,952,534	4,091,362	2,763,782
End-of-Year Fund Balance (dollars)	31,696,194	11,461,816	688,758	635,061	887,714	1,853,969	745,117

Note: 1993 and 1994 financial audit data is not available for Groom and Highland Park School District. Data presented is for 1992.
Source: PX School 1995b.

TABLE D.2.3–8.—*County and City Revenues and Expenditures for the Los Alamos National Laboratory Region of Influence, 1994*

Revenues and Expenditures	Los Alamos County	Rio Arriba County	Espanola	Santa Fe County	Santa Fe
Property tax (percent)	32	74	11	72	83
State shared and intergovernmental (percent)	61	20	89	12	8
Permits, fees, fines, and investment interest (percent)	1	2	0	6	3
Other (percent)	6	4	0	10	6
Total Revenues (dollars)	29,717,452	10,662,842	6,679,263	29,528,335	65,044,193
General government (percent)	16	36	24	25	18
Public safety, health, and community services (percent)	38	36	37	45	30
Public works, parks, culture, and recreation (percent)	23	23	20	20	16
Debt services (percent)	3	4	12	1	11
Education (percent)	0	0	0	0	3
Capital outlay (percent)	20	1	7	8	22
Other (percent)	0	0	0	1	0
Total Expenditures (dollars)	30,986,489	9,280,844	7,015,513	27,221,324	62,458,448
End-of-Year Fund Balance (dollars)	27,443,804	5,570,366	2,851,826	17,676,743	61,911,387

Source: LA City 1995a; LA County 1995a.

TABLE D.2.3–9.—*School District Revenues and Expenditures for the Los Alamos National Laboratory Region of Influence, 1994*

Revenues and Expenditures	Chama Valley	Dulce	Espanola	Jemez Mountain	Los Alamos	Pojaque Valley	Santa Fe
Local sources (percent)	12	31	6	38	6	8	21
State sources (percent)	77	40	70	50	52	69	71
Federal sources (percent)	10	28	22	11	34	13	6
Other (percent)	1	1	2	1	8	10	2
Total Revenues (dollars)	3,851,965	5,418,941	25,907,153	5,250,028	23,091,825	11,605,168	59,555,031
Total instruction (percent)	43	45	62	35	53	37	41
Support services (percent)	37	36	29	30	39	28	23
Food, community, and other services (percent)	12	5	1	15	6	11	7
Capital assets (percent)	3	6	4	0	2	19	18
Debt services (percent)	5	8	4	20	0	5	11
Total Expenditures (dollars)	3,886,197	4,535,793	25,790,674	4,034,170	21,561,064	10,673,138	66,958,009
End-of-Year Fund Balance (dollars)	824,466	1,960,709	2,729,798	2,061,502	4,511,190	1,958,054	10,345,713

Source: LA School 1995b.

TABLE D.2.3-10.—*County and City Revenues and Expenditures for the Lawrence Livermore National Laboratory Region of Influence, 1994*

Revenues and Expenditures	Alameda County	Livermore	Pleasanton	Contra Costa County	San Joaquin County	Manteca	Tracy
Property tax (percent)	27	52	59	22	15	51	32
State shared and intergovernmental (percent)	54	12	0	57	67	24	16
Permits, fees, fines, and investment interest (percent)	14	17	5	16	16	20	36
Other (percent)	5	19	36	5	2	5	16
Total Revenues (dollars)	1,111,718,000	39,977,156	44,664,303	792,483,000	505,566,121	17,848,109	32,989,112
General government (percent)	6	7	15	9	10	12	7
Public safety, health, and community services (percent)	90	26	32	65	66	44	22
Public works, parks, culture, and recreation (percent)	2	9	23	20	19	25	28
Debt services (percent)	1	10	8	3	4	9	3
Capital outlay (percent)	1	35	21	2	1	2	40
Other (percent)	0	13	1	1	0	8	0
Total Expenditures (dollars)	1,150,106,000	58,087,750	45,191,452	777,803,000	522,340,513	16,405,126	33,796,549
End-of-Year Fund Balance (dollars)	362,808,000	34,291,803	38,104,992	161,995,000	106,530,027	16,254,955	52,444,145

Note: 1993 and 1994 financial audit data are not available for Alameda County. Data presented is for 1992.

Source: LL City 1995a; LL County 1995a.

TABLE D.2.3–11.—*School District Revenues and Expenditures for the Lawrence Livermore National Laboratory Region of Influence, 1994*

Revenues and Expenditures	Livermore	Manteca	Pleasanton	Tracy
Local sources (percent)	25	NA	43	54
State sources (percent)	18	NA	2	3
Federal sources (percent)	4	NA	16	21
Other (percent)	53	NA	39	22
Total Revenues (dollars)	45,153,012	NA	41,647,514	10,492,709
Total instruction (percent)	61	NA	64	67
Support services (percent)	10	NA	9	10
Food, community, and other services (percent)	15	NA	6	6
Capital assets (percent)	12	NA	13	14
Debt services (percent)	2	NA	8	3
Total Expenditures (dollars)	61,710,651	NA	62,763,588	17,080,415
End-of-Year Fund Balance (dollars)	20,793,153	NA	47,224,057	2,989,001

Note: NA - not available.
Source: LL School 1995b.

TABLE D.2.3–12.—*County and City Revenues and Expenditures for the Sandia National Laboratories Region of Influence, 1994*

Revenues and Expenditures	Bernalillo County	Albuquerque	Sandoval County	Valencia County
Property tax (percent)	55	39	28	53
State shared and intergovernmental (percent)	34	42	40	22
Permits, fees, fines, and investment interest (percent)	5	12	23	8
Other (percent)	6	7	9	17
Total Revenues (dollars)	93,822,427	385,722,000	16,098,094	8,637,085
General government (percent)	33	10	21	47
Public safety, health, and community services (percent)	31	38	51	39
Public works, parks, culture, and recreation (percent)	11	18	21	14
Debt services (percent)	9	15	3	0
Education (percent)	0	0	0	0
Capital outlay (percent)	16	19	4	0
Other (percent)	0	0	0	0
Total Expenditures (dollars)	104,033,393	402,203,000	15,833,145	7,891,026
End-of-Year Fund Balance (dollars)	100,227,840	165,534,000	8,984,259	3,858,325

Source: SN City 1995a; SN County 1995a.

TABLE D.2.3–13.—*School District Revenues and Expenditures for the Sandia National Laboratories Region of Influence, 1994*

Revenues and Expenditures	Albuquerque	Belen	Bernalillo	Cuba	Jemez Valley	Los Lunas
Local sources (percent)	15	12	9	7	10	9
State sources (percent)	77	78	68	68	84	82
Federal sources (percent)	8	10	22	23	6	9
Other (percent)	0	0	1	2	0	0
Total Revenues (dollars)	440,575,033	20,666,616	18,255,208	5,607,902	15,271,490	29,715,373
Total instruction (percent)	70	60	44	35	27	55
Support services (percent)	11	19	30	39	18	15
Food, community, and other services (percent)	7	11	9	17	7	10
Capital assets (percent)	9	4	12	6	10	15
Debt services (percent)	3	6	5	3	38	5
Total Expenditures (dollars)	431,378,717	21,036,713	19,110,291	5,585,793	15,989,616	30,399,901
End-of-Year Fund Balance (dollars)	65,734,673	6,535,537	1,507,421	350,155	727,740	6,925,651

Source: SN School 1995b.

TABLE D.2.3–14.—*County and City Revenues and Expenditures for the Nevada Test Site Region of Influence, 1994*

Revenues and Expenditures	Clark County	Henderson	Las Vegas	North Las Vegas	Nye County
Property tax (percent)	20	16	16	15	28
State shared and intergovernmental (percent)	42	47	54	54	54
Permits, fees, fines, and investment interest (percent)	30	12	19	25	8
Other (percent)	8	25	11	6	10
Total Revenues (dollars)	728,952,912	70,207,217	254,132,758	52,451,349	26,331,990
General government (percent)	19	11	16	11	29
Public safety, health, and community services (percent)	39	25	40	52	37
Public works, parks, culture, and recreation (percent)	8	10	16	15	18
Debt services (percent)	8	13	4	5	0
Capital outlay (percent)	22	41	24	17	16
Other (percent)	4	0	0	0	0
Total Expenditures (dollars)	768,785,508	90,878,941	257,883,768	54,111,779	26,150,708
End-of-Year Fund Balance (dollars)	809,371,503	131,125,991	165,467,135	13,390,894	16,984,705

Note: 1994 financial audit for Clark County was not available. Data presented are for 1993.
Source: NT City 1995a; NT County 1995b.

TABLE D.2.3-15.—*School District Revenues and Expenditures for the Nevada Test Site Region of Influence, 1994*

Revenues and Expenditures	Clark County	Nye County
Local sources (percent)	65	53
State sources (percent)	32	44
Federal sources (percent)	3	3
Other (percent)	0	0
Total Revenues (dollars)	716,416,150	24,079,470
Total instruction (percent)	54	48
Support services (percent)	28	21
Food, community, and other services (percent)	0	6
Capital assets (percent)	11	9
Debt services (percent)	7	16
Total Expenditures (dollars)	776,079,680	25,176,765
End-of-Year Fund Balance (dollars)	82,578,235	5,060,909

Source: NT School 1995b.

D.2.4 Environmental Justice in Minority and Low-Income Populations

DOE is committed, and required by law, to incorporate environmental justice principles into its operations. Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*, requires Federal agencies to identify and address appropriately disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. DOE is in the process of finalizing its Environmental Justice Strategy and issued its first document in April 1995, which provides a structured framework. This strategy will be finalized once stakeholders' comments, concerns, and opinions are received, reviewed, and incorporated as appropriate. Because DOE is still in the process of developing guidance, the approach taken in this analysis may depart somewhat from the guidance that is eventually issued.

Any disproportionately high and adverse human health effects on minority populations and low-income populations that could result from the alternatives being considered are assessed for an 80 km (50 mi) area surrounding each site. The shaded areas in figures D.2.4–1 through D.2.4–8 show Census tracts where racial or ethnic minorities comprise 50 percent or more (simple majority) of the total population, and where racial or ethnic minorities comprise less than 50 but greater than 25 percent of the total population in the Census tract. Figures D.2.4–9 through D.2.4–16 show low income communities generally defined as those where 25 percent or more of the population is characterized as living in poverty (income of less than $8,076 for a family of two). Socioeconomic impacts are assessed for the ROI of each site, since the impacts result from economic linkages rather than geographic proximity. Selected demographic characteristics of the ROI for each of the seven candidates sites are presented in tables D.2.4–1 through D.2.4–8. An assessment of any potential disproportionately high and adverse human health or environmental effects on minority and low-income populations that could result from the alternatives being considered is presented in chapter 4.

TABLE D.2.4–1.—*Selected Demographic Characteristics for the Oak Ridge Reservation Region of Influence*

Characteristic/Area	Anderson County (number)	Knox County (number)	Loudon County (number)	Roane County (number)	Total Region of Influence (number)	Total Region of Influence (percent)
Persons by Race/Ethnicity						
Non-Hispanic, White	64,320	300,040	30,668	45,274	440,302	91.3
Hispanic	381	2,067	83	212	2,743	0.6
Non-Hispanic, American Indian	236	775	52	95	1,158	0.2
Non-Hispanic, Black	2,753	29,483	400	1,456	34,092	7.1
Non-Hispanic, Asian/Pacific Islander	537	3,263	49	186	4,035	0.8
Non-Hispanic, Other	23	121	3	4	151	0.0
Total 1990 Population	68,250	335,749	31,255	47,227	482,481	
Total Number of Households	27,384	133,639	12,155	18,453	191,631	
1989 Low Income						
Persons Below Poverty						
Number	9,664	45,608	4,192	7,467	66,931	
Percent[a]	14.3	14.1	13.6	16.0	14.3	

[a] In calculating percentages, certain categories of individuals are not included as part of the county population including: inmates of institutions, armed forces members, and unrelated individuals under 15 years of age.

Source: Census 1993s; Census 1994o.

TABLE D.2.4–2.—*Selected Demographic Characteristics for the Savannah River Site Region of Influence*

	South Carolina		Georgia		Total Region of Influence	
Characteristic/Area	**Aiken County (number)**	**Barnwell County (number)**	**Columbia County (number)**	**Richmond County (number)**	**(number)**	**(percent)**
Persons by Race/Ethnicity						
Non-Hispanic, White	90,130	11,421	56,141	103,009	270,727	63.6
Hispanic	867	146	962	3,707	5,918	1.4
Non-Hispanic, American Indian	213	31	150	491	918	0.2
Non-Hispanic, Black	29,176	8,677	7,239	79,221	142,608	33.5
Non-Hispanic, Asian/Pacific Islander	528	17	1,518	3,186	5,276	1.2
Non-Hispanic, Other	26	1	21	105	160	0.0
Total 1990 Population	120,940	20,293	66,031	189,719	425,607	99.9
Total Number of Households	44,883	7,100	21,841	68,675	151,877	
1989 Low Income						
Persons Below Poverty						
Number	16,671	4,367	4,255	32,590	66,267	
Percent[a]	14.0	21.8	6.6	18.2	17.3	

[a] In calculating percentages, certain categories of individuals are not included as part of the county population including: inmates of institutions, armed forces members, and unrelated individuals under 15 years of age.

Source: Census 1993s; Census 1994o.

TABLE D.2.4-3.—*Selected Demographic Characteristics for the Kansas City Plant Region of Influence*

Characteristic/Area	Missouri		Kansas		Total Region of Influence	
	Cass County (number)	Jackson County (number)	Johnson County (number)	Wyandotte County (number)	(number)	(percent)
Persons by Race/Ethnicity						
Non-Hispanic, White	61,689	470,011	334,167	103,955	969,822	79.9
Hispanic	829	18,890	7,005	10,997	37,721	3.1
Non-Hispanic, American Indian	355	2,825	160	966	4,306	0.4
Non-Hispanic, Black	672	134,828	6,809	44,131	186,440	15.4
Non-Hispanic, Asian/Pacific Islander	251	6,145	5,739	787	12,922	1.1
Non-Hispanic, Other	12	533	174	157	876	0.1
Total 1990 Population	63,808	633,232	355,054	161,993	1,214,087	100
Total Number of Households	22,892	252,852	136,433	61,514	473,691	
1989 Low Income						
Persons Below Poverty						
Number	5,164	81,142	12,667	27,371	126,344	
Percent[a]	8.2	13.0	3.6	17.1	10.5	

[a] In calculating percentages, certain categories of individuals are not included as part of the county population including: inmates of institutions, armed forces members, and unrelated individuals under 15 years of age.

Source: Census 1993s; Census 1994o.

TABLE D.2.4–4.—*Selected Demographic Characteristics for the Pantex Plant Region of Influence*

Characteristic/Area	Armstrong County (number)	Carson County (number)	Potter County (number)	Randall County (number)	Total Region of Influence (number)	Total Region of Influence (percent)
Persons by Race/Ethnicity						
Non-Hispanic, White	1,951	6,158	66,877	81,364	156,350	79.7
Hispanic	55	354	19,246	6,144	25,799	13.1
Non-Hispanic, American Indian	9	41	709	414	1,173	0.6
Non-Hispanic, Black	0	11	8,460	1,082	9,553	4.9
Non-Hispanic, Asian/Pacific Islander	5	9	2,431	626	3,071	1.6
Non-Hispanic, Other	1	3	151	43	198	0.1
Total 1990 Population	2,021	6,576	97,874	89,673	196,144	100.0
Total Number of Households	768	2,402	37,344	34,553	75,067	
1989 Low Income						
Persons Below Poverty						
Number	232	583	21,619	7,819	30,253	
Percent[a]	11.8	9.0	22.5	8.9	15.7	

[a] In calculating percentages, certain categories of individuals are not included as part of the county population including: inmates of institutions, armed forces members, and unrelated individuals under 15 years of age.

Source: Census 1993s; Census 1994o.

TABLE D.2.4-5.—*Selected Demographic Characteristics for the Los Alamos National Laboratory Region of Influence*

Characteristic/Area	Los Alamos County (number)	Rio Arriba County (number)	Santa Fe County (number)	Total Region of Influence (number)	Total Region of Influence (percent)
Persons by Race/Ethnicity					
Non-Hispanic, White	15,467	4,375	46,450	66,292	43.8
Hispanic	2,008	24,955	48,939	75,902	50.1
Non-Hispanic, American Indian	112	4,830	2,284	7,226	4.8
Non-Hispanic, Black	88	117	505	710	0.5
Non-Hispanic, Asian/Pacific Islander	421	40	439	900	0.6
Non-Hispanic, Other	19	48	311	378	0.2
Total 1990 Population	18,115	34,365	98,928	151,408	100
Total Number of Households	7,213	11,461	37,840	56,514	
1989 Low Income					
Persons Below Poverty					
Number	433	9,372	12,564	22,369	
Percent[a]	2.4	27.5	13	15.0	

[a] In calculating percentages, certain categories of individuals are not included as part of the county population including: inmates of institutions, armed forces members, and unrelated individuals under 15 years of age.

Source: Census 1993s; Census 1994o.

TABLE D.2.4–6.—*Selected Demographic Characteristics for the Lawrence Livermore National Laboratory Region of Influence*

Characteristic/Area	Alameda County (number)	Contra Costa County (number)	San Joaquin County (number)	Total Region of Influence (number)	Total Region of Influence (percent)
Persons by Race/Ethnicity					
Non-Hispanic, White	680,017	560,146	282,766	1,522,929	59.4
Hispanic	181,805	91,282	112,673	385,760	15
Non-Hispanic, American Indian	6,763	4,441	3,807	15,011	0.6
Non-Hispanic, Black	222,873	72,799	24,791	320,463	12.5
Non-Hispanic, Asian/Pacific Islander	184,813	73,810	55,774	314,397	12.3
Non-Hispanic, Other	2,911	1,254	817	4,982	0.2
Total 1990 Population	1,279,182	803,732	480,628	2,563,542	100
Total Number of Households	479,518	300,288	158,156	937,962	
1989 Low Income					
Persons Below Poverty					
Number	132,011	57,867	73,163	263,041	
Percent[a]	10.6	7.3	15.7	10.5	

[a] In calculating percentages, certain categories of individuals are not included as part of the county population including: inmates of institutions, armed forces members, and unrelated individuals under 15 years of age.

Source: Census 1993s; Census 1994o.

TABLE D.2.4–7.—*Selected Demographic Characteristics for the Sandia National Laboratories Region of Influence*

Characteristic/Area	Bernalillo County (number)	Sandoval County (number)	Valencia County (number)	Total Region of Influence (number)	Total Region of Influence (percent)
Persons by Race/Ethnicity					
Non-Hispanic, White	267,965	32,390	20,659	321,014	54.5
Hispanic	178,310	17,372	22,733	218,415	37.1
Non-Hispanic, American Indian	14,191	12,176	1,169	27,536	4.7
Non-Hispanic, Black	11,862	844	448	13,154	2.2
Non-Hispanic, Asian/Pacific Islander	6,692	455	139	7,286	1.2
Non-Hispanic, Other	1,557	82	87	1,726	0.3
Total 1990 Population	480,577	63,319	45,235	589,131	100
Total Number of Households	185,582	20,867	15,170	221,619	
1989 Low Income					
Persons Below Poverty					
Number	68,845	9,852	8,288	86,985	
Percent[a]	14.6	15.6	19	15.0	

[a] In calculating percentages, certain categories of individuals are not included as part of the county population including: inmates of institutions, armed forces members, and unrelated individuals under 15 years of age.

Source: Census 1993s; Census 1994o.

TABLE D.2.4–8.—*Selected Demographic Characteristics for the Nevada Test Site Region of Influence*

Characteristic/Area	Clark County (number)	Nye County (number)	Total Region of Influence (number)	Total Region of Influence (percent)
Persons by Race/Ethnicity				
Non-Hispanic, White	558,875	15,635	574,510	75.7
Hispanic	82,904	1,237	84,141	11.1
Non-Hispanic, American Indian	5,514	475	5,989	0.8
Non-Hispanic, Black	68,858	274	69,132	9.1
Non-Hispanic, Asian/Pacific Islander	24,483	148	24,631	3.2
Non-Hispanic, Other	825	12	837	0.1
Total 1990 Population	741,459	17,781	759,240	100.0
Total Number of Households	287,025	6,664	293,689	
1989 Low Income				
Persons Below Poverty				
Number	76,737	1,840	78,577	
Percent[a]	10.5	10.5	10.5	

[a] In calculating percentages, certain categories of individuals are not included as part of the county population including: inmates of institutions, armed forces members, and unrelated individuals under 15 years of age.

Source: Census 1993s; Census 1994o.

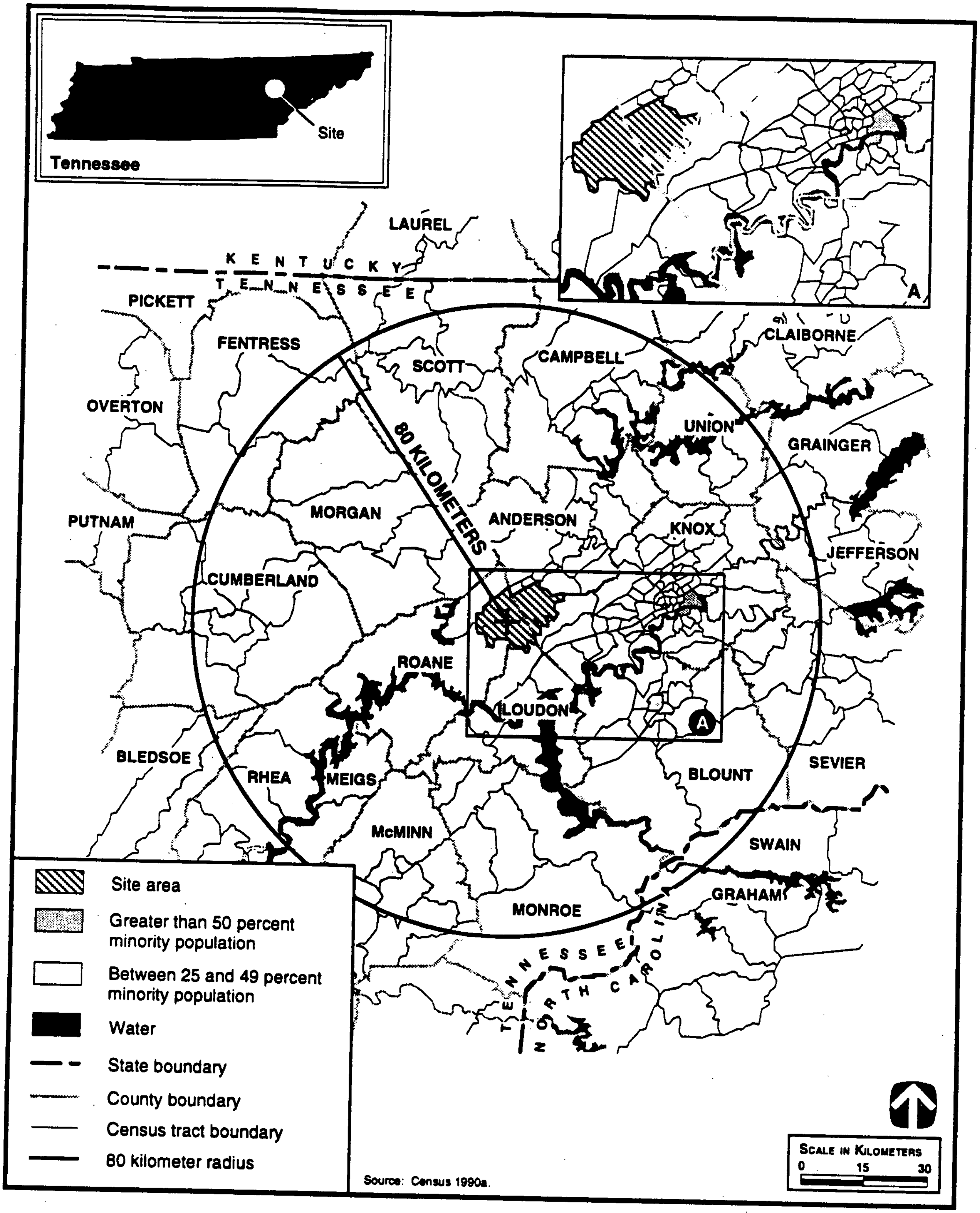


FIGURE D.2.4–1.—*Minority Population Distribution for Oak Ridge Reservation and Surrounding Area.*

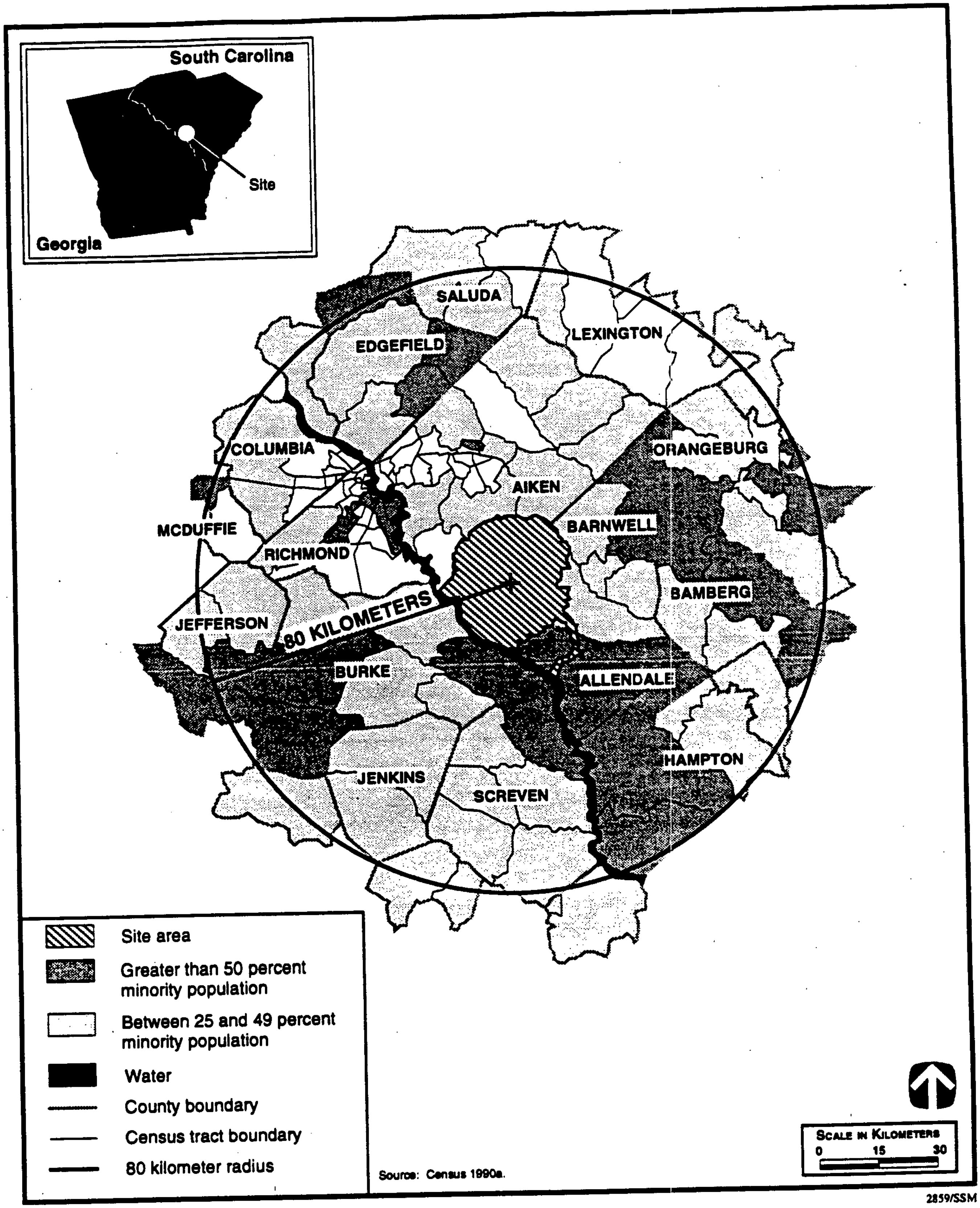


Figure D.2.4–2.—*Minority Population Distribution for Savannah River Site and Surrounding Area.*

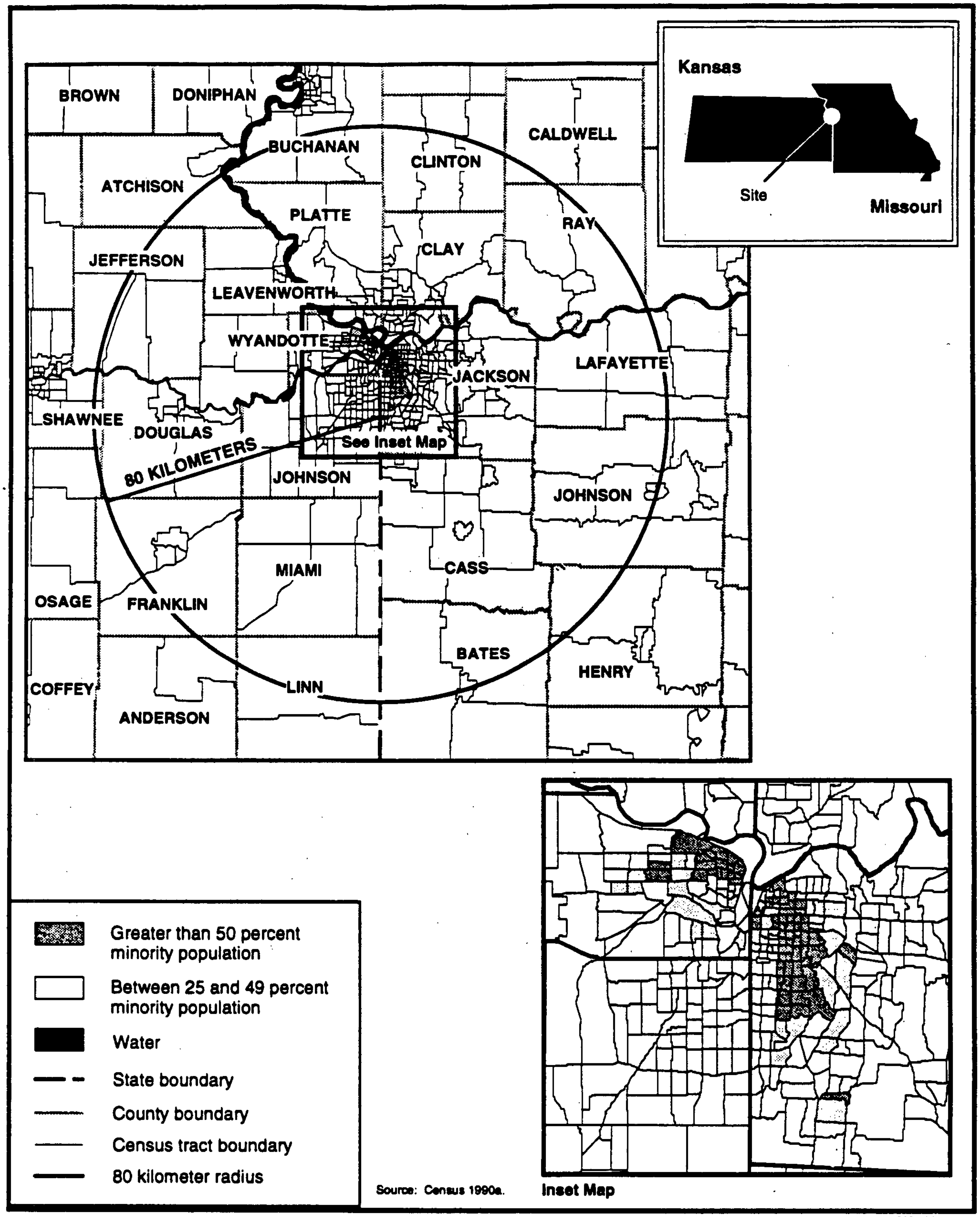


FIGURE D.2.4–3.—*Minority Population Distribution for Kansas City Plant and Surrounding Area.*

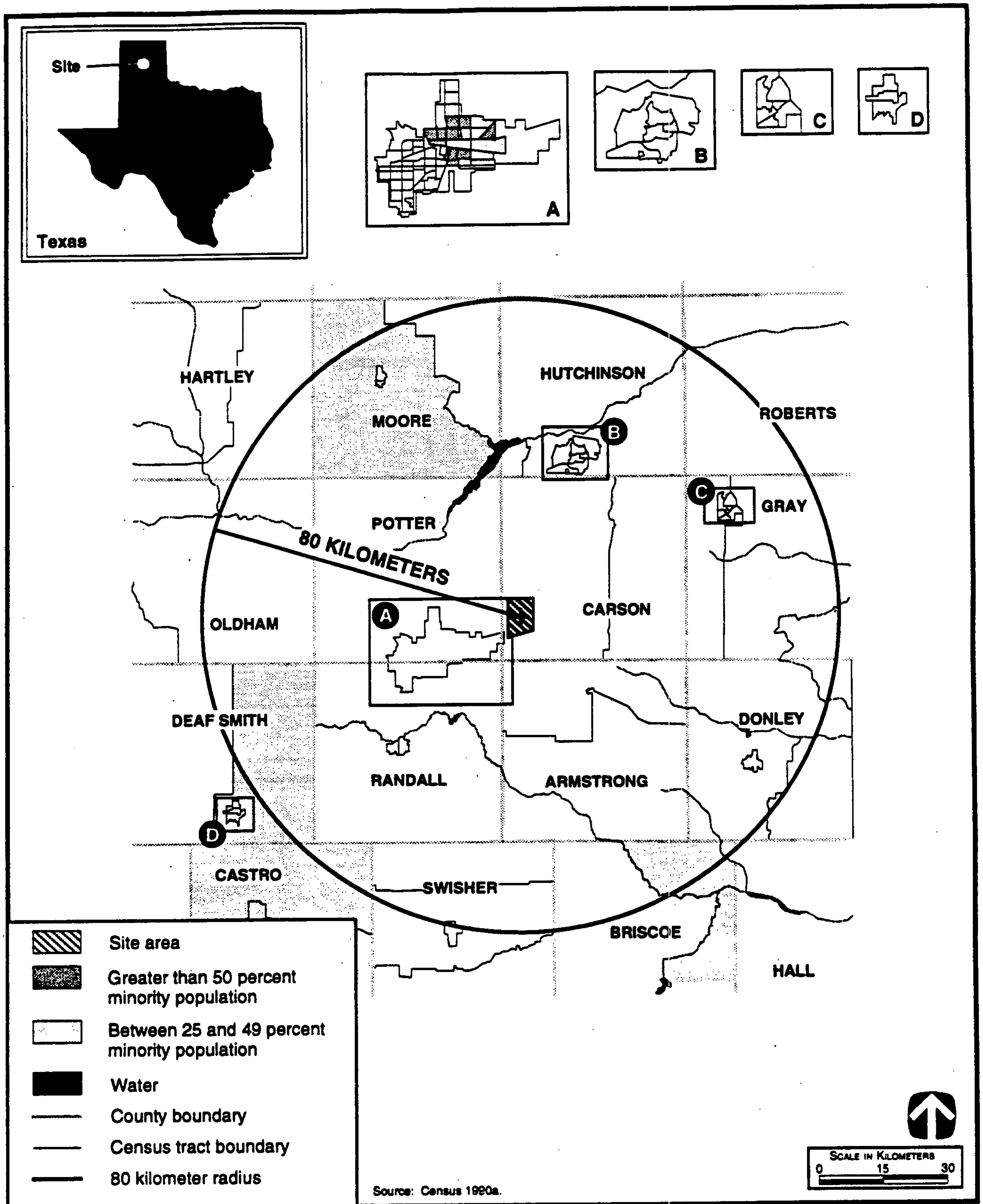
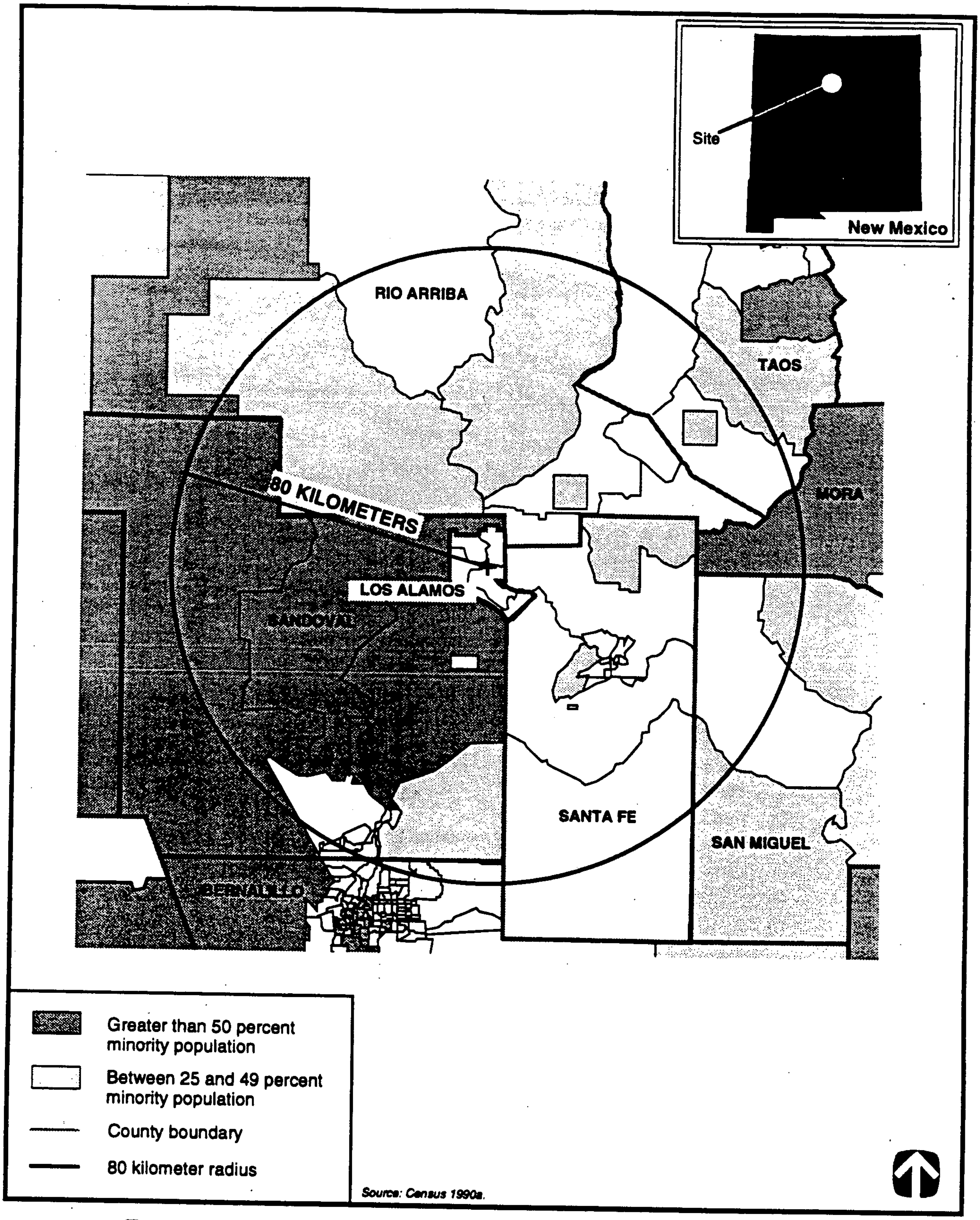


FIGURE D.2.4–4.—*Minority Population Distribution for Pantex Plant and Surrounding Area.*



2873/SSM

FIGURE D.2.4–5.—*Minority Population Distribution for Los Alamos National Laboratory and Surrounding Area.*

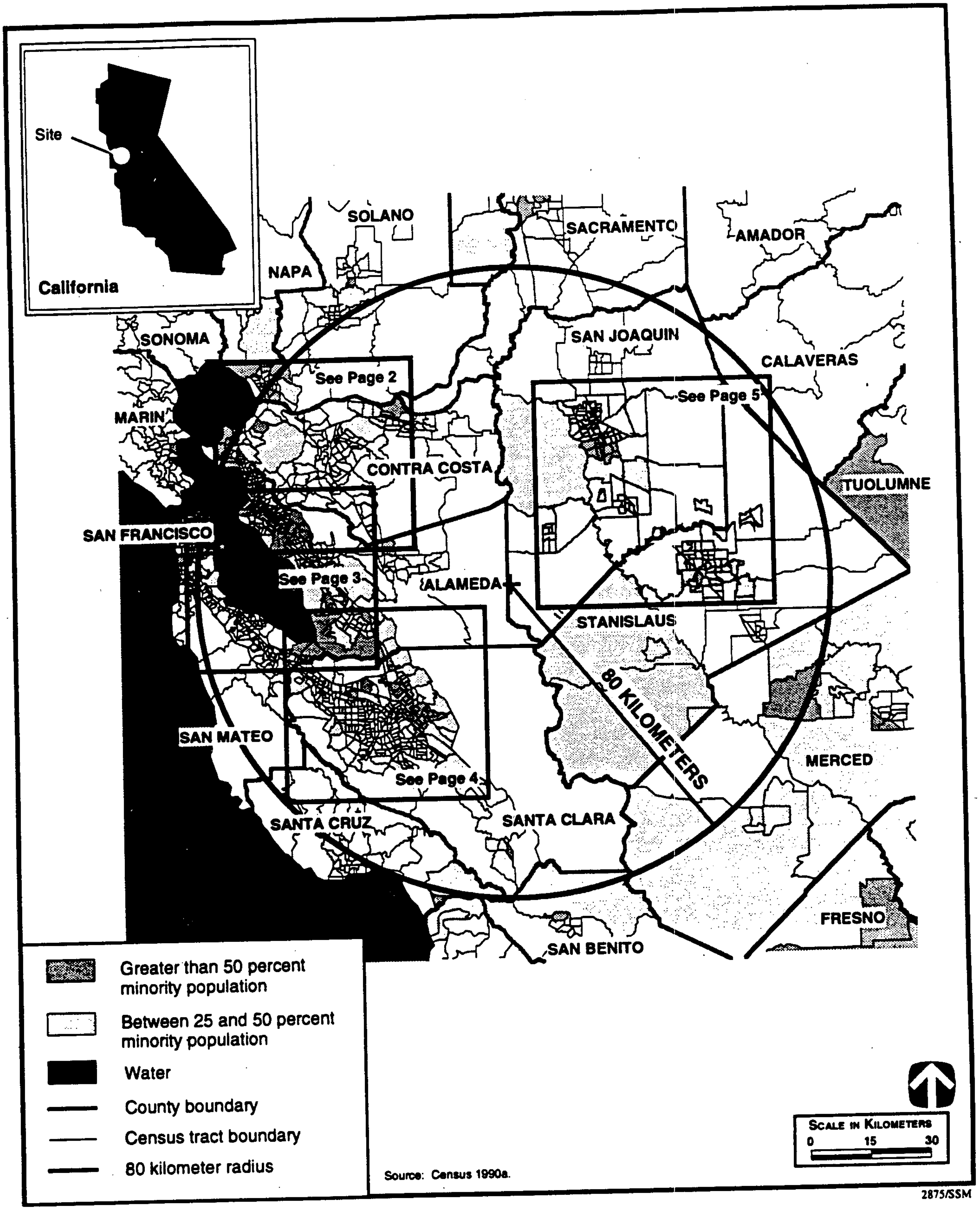
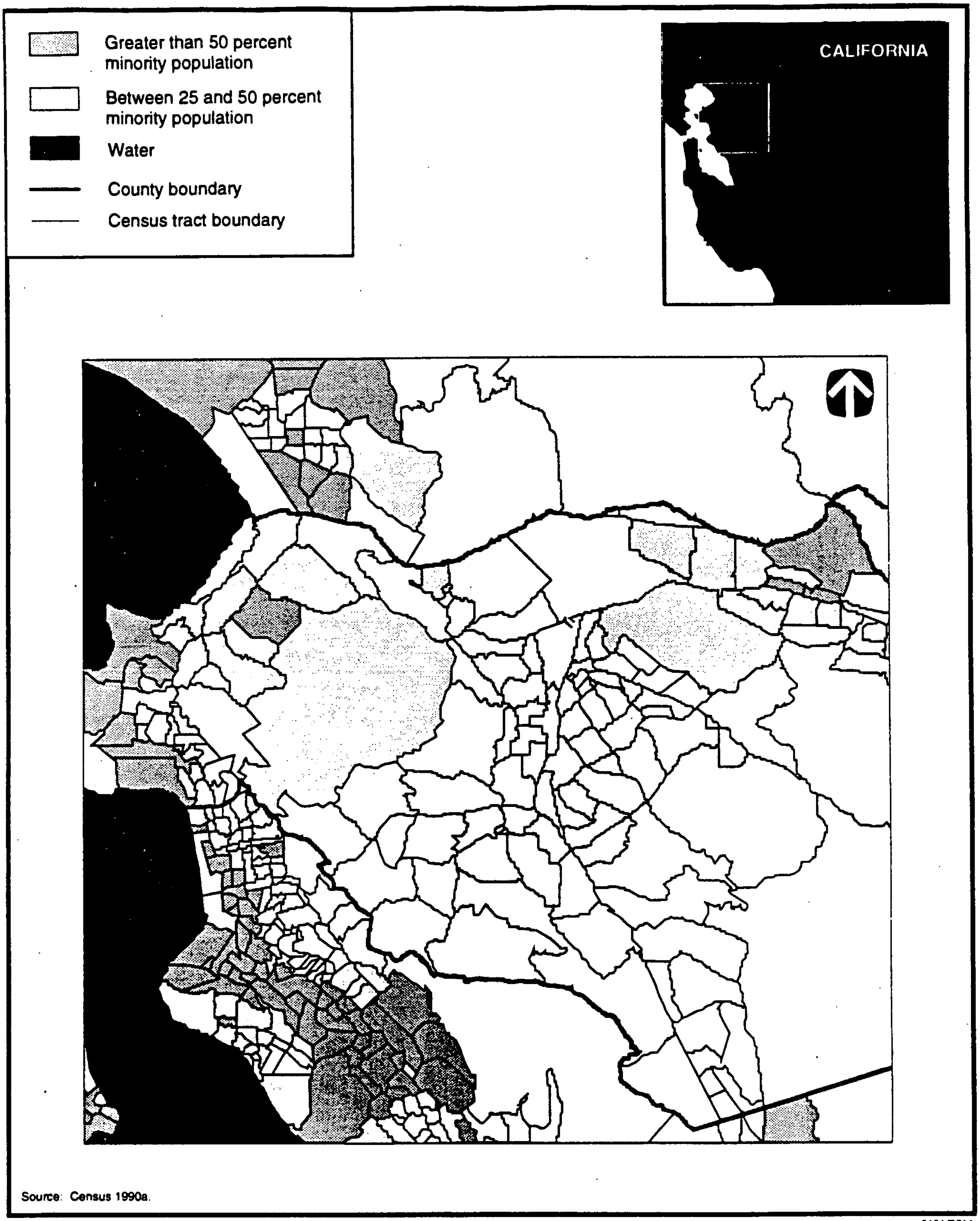


FIGURE D.2.4–6.—*Minority Population Distribution for Lawrence Livermore National Laboratory and Surrounding Area* [Page 1 of 5].



3121/SSM

FIGURE D.2.4–6.—*Minority Population Distribution for Lawrence Livermore National Laboratory and Surrounding Area* [Page 2 of 5].

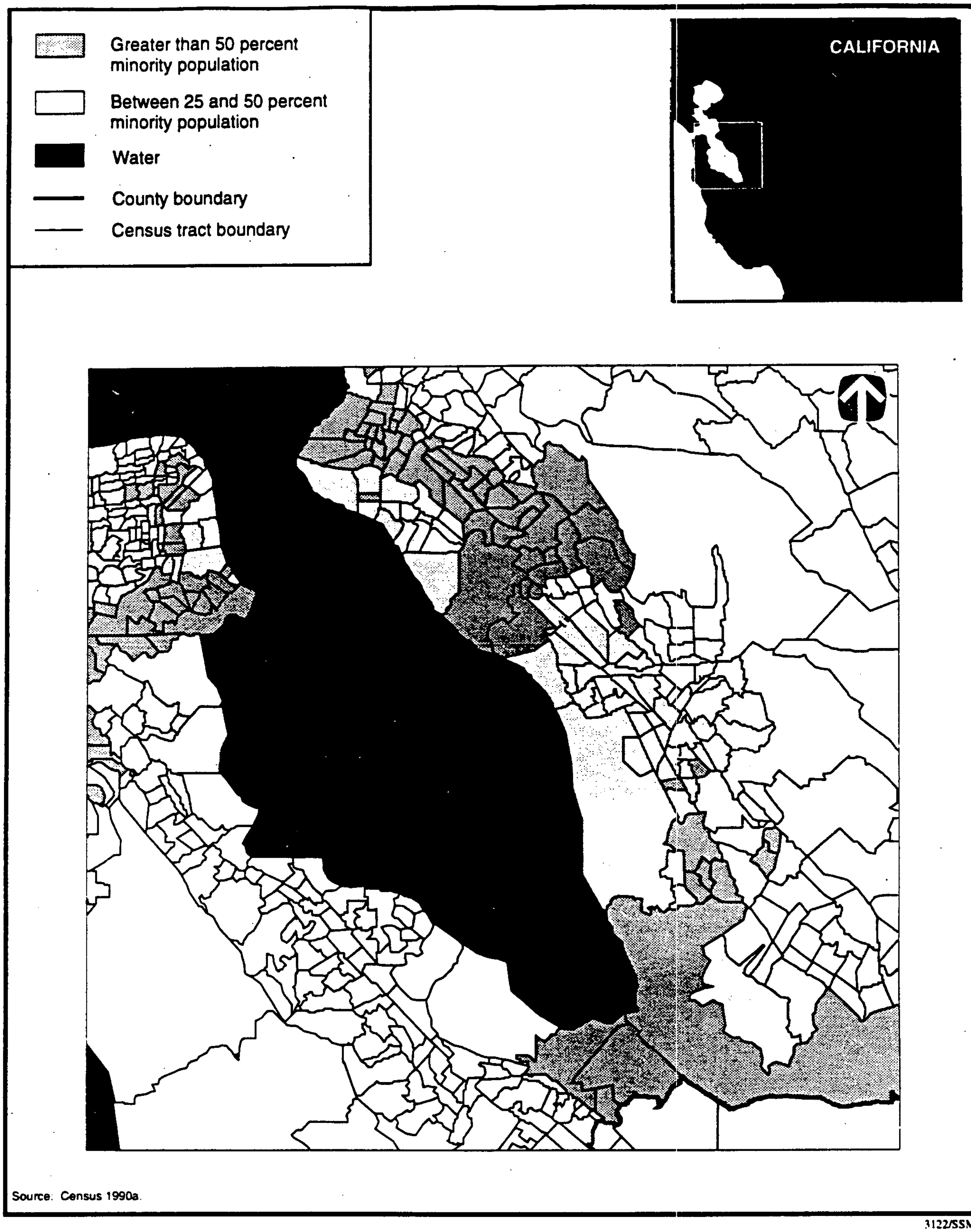


FIGURE D.2.4–6.—*Minority Population Distribution for Lawrence Livermore National Laboratory and Surrounding Area* [Page 3 of 5].

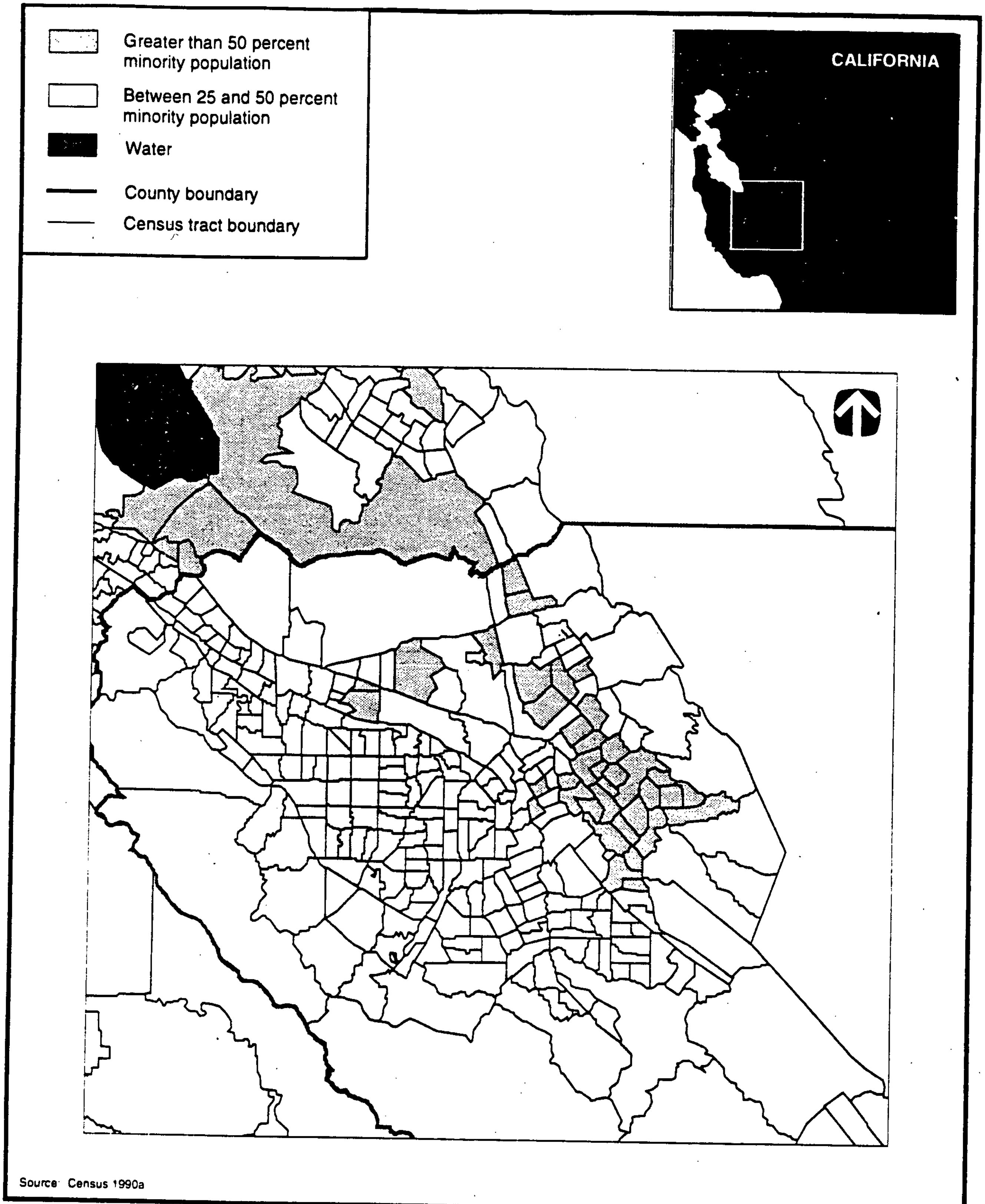


FIGURE D.2.4–6.—*Minority Population Distribution for Lawrence Livermore National Laboratory and Surrounding Area* [Page 4 of 5].

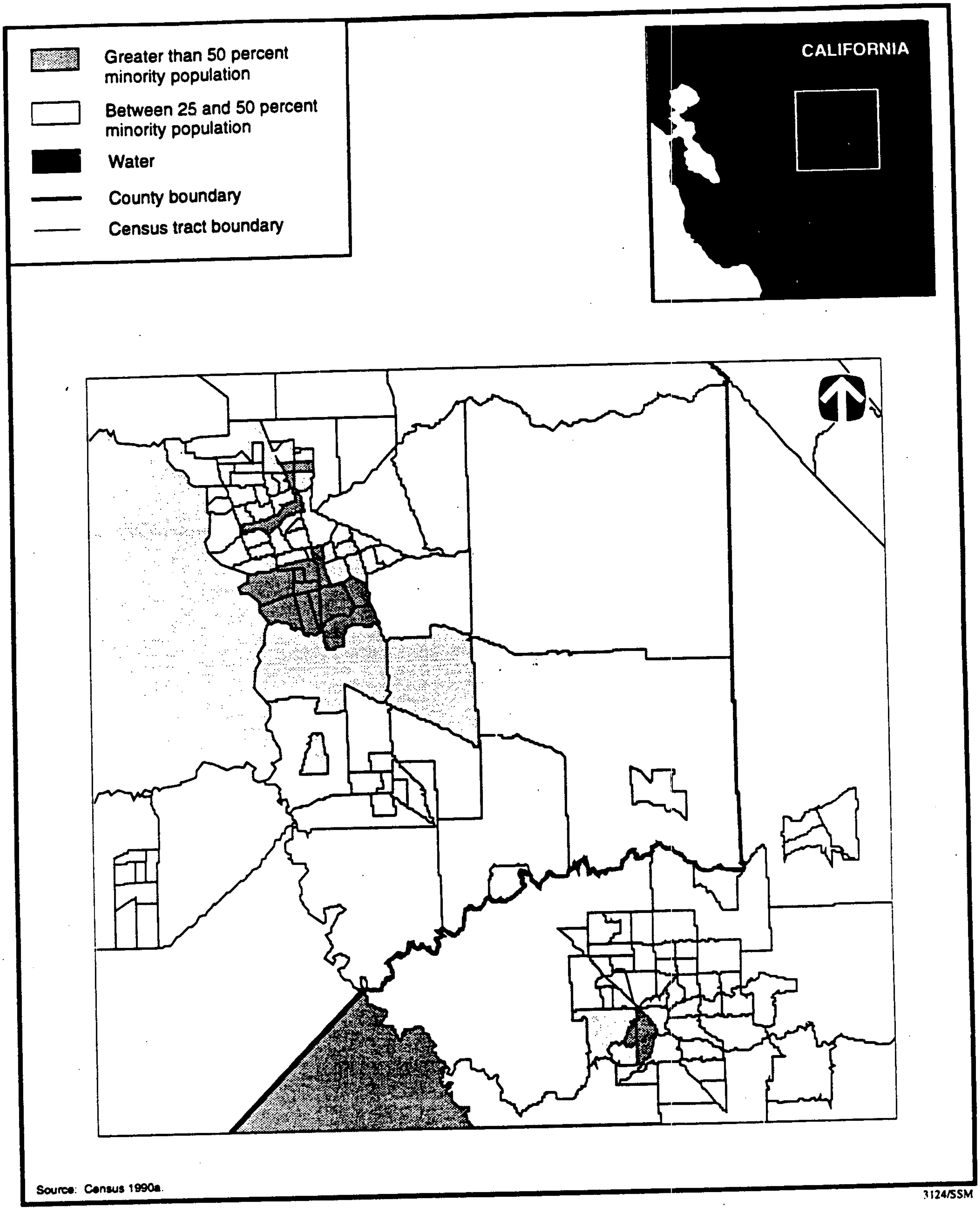


FIGURE D.2.4–6.—*Minority Population Distribution for Lawrence Livermore National Laboratory and Surrounding Area* [Page 5 of 5].

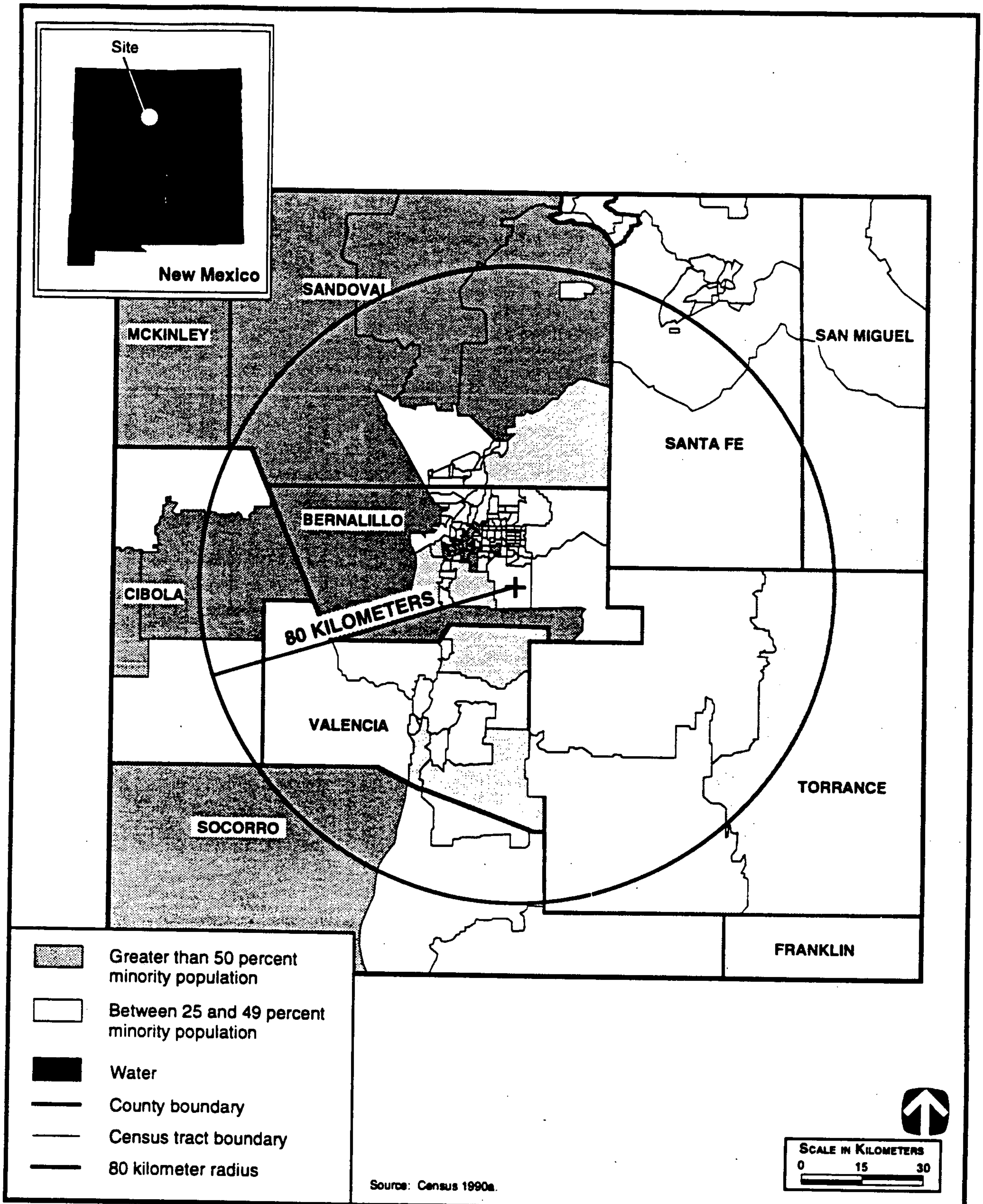


FIGURE D.2.4–7.—*Minority Population Distribution for Sandia National Laboratories and Surrounding Area.*

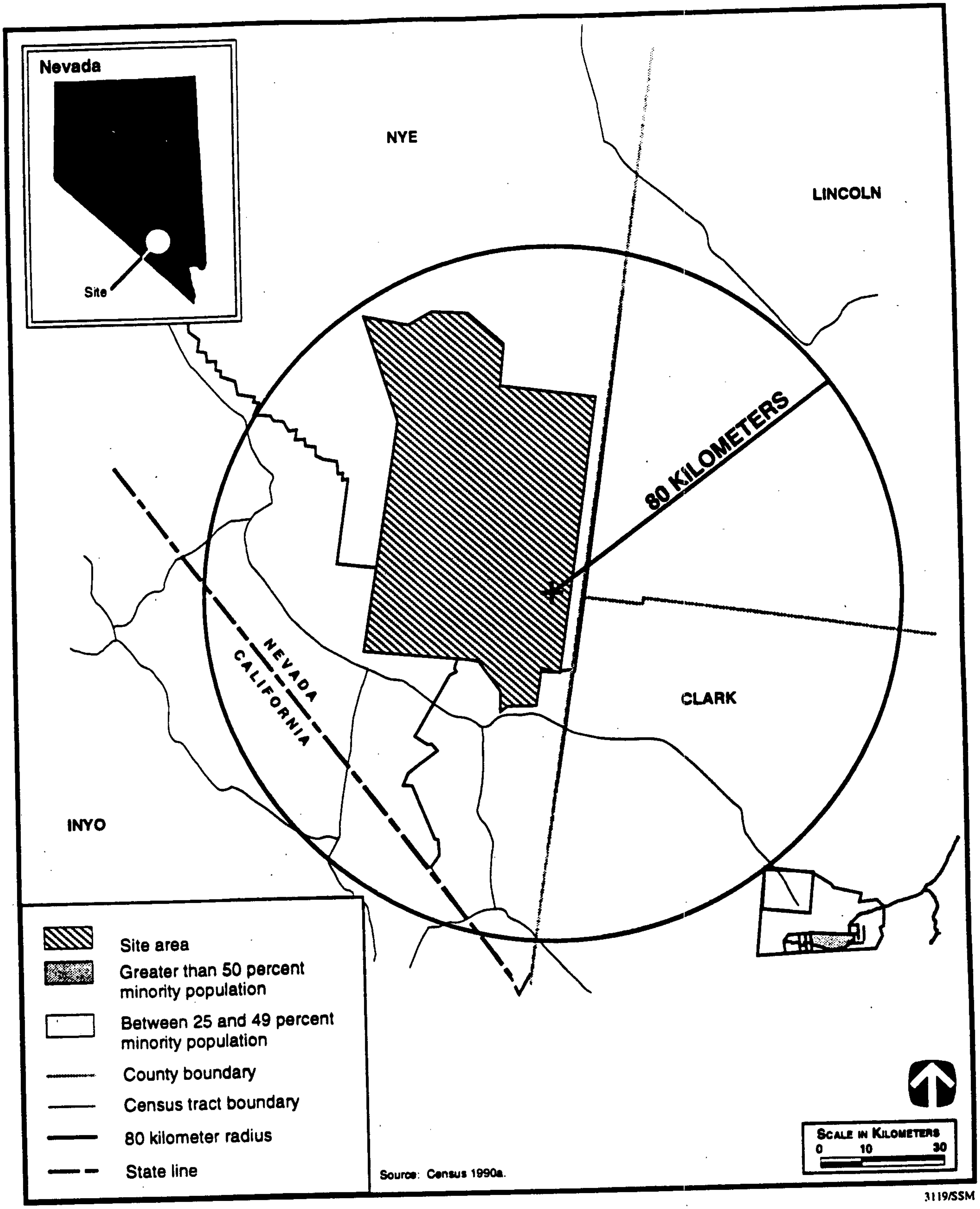


FIGURE D.2.4–8.—*Minority Population Distribution for Nevada Test Site and Surrounding Area.*

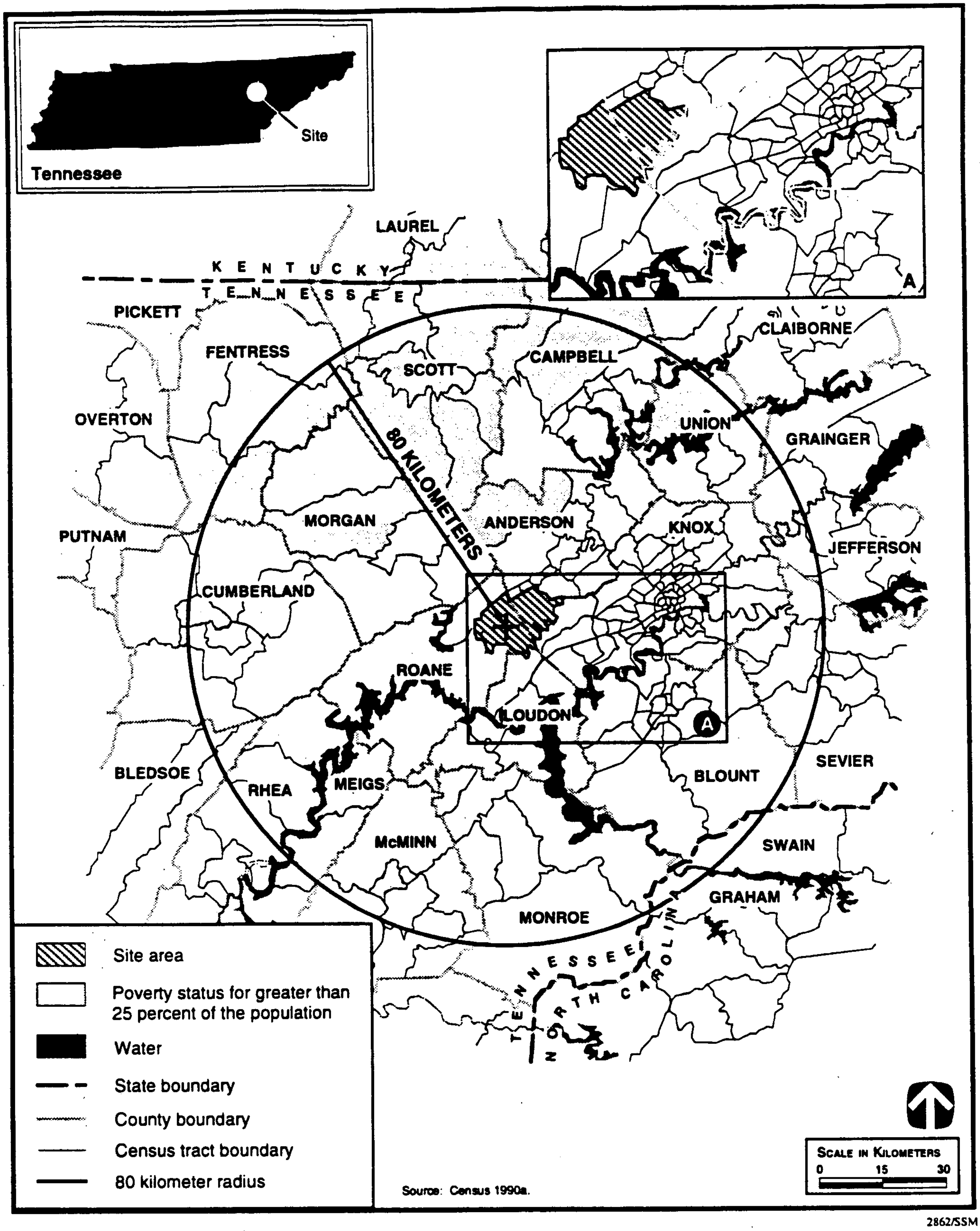


FIGURE D.2.4–9.—*Low-Income Population Distribution by Poverty Status for Oak Ridge Reservation and Surrounding Area.*

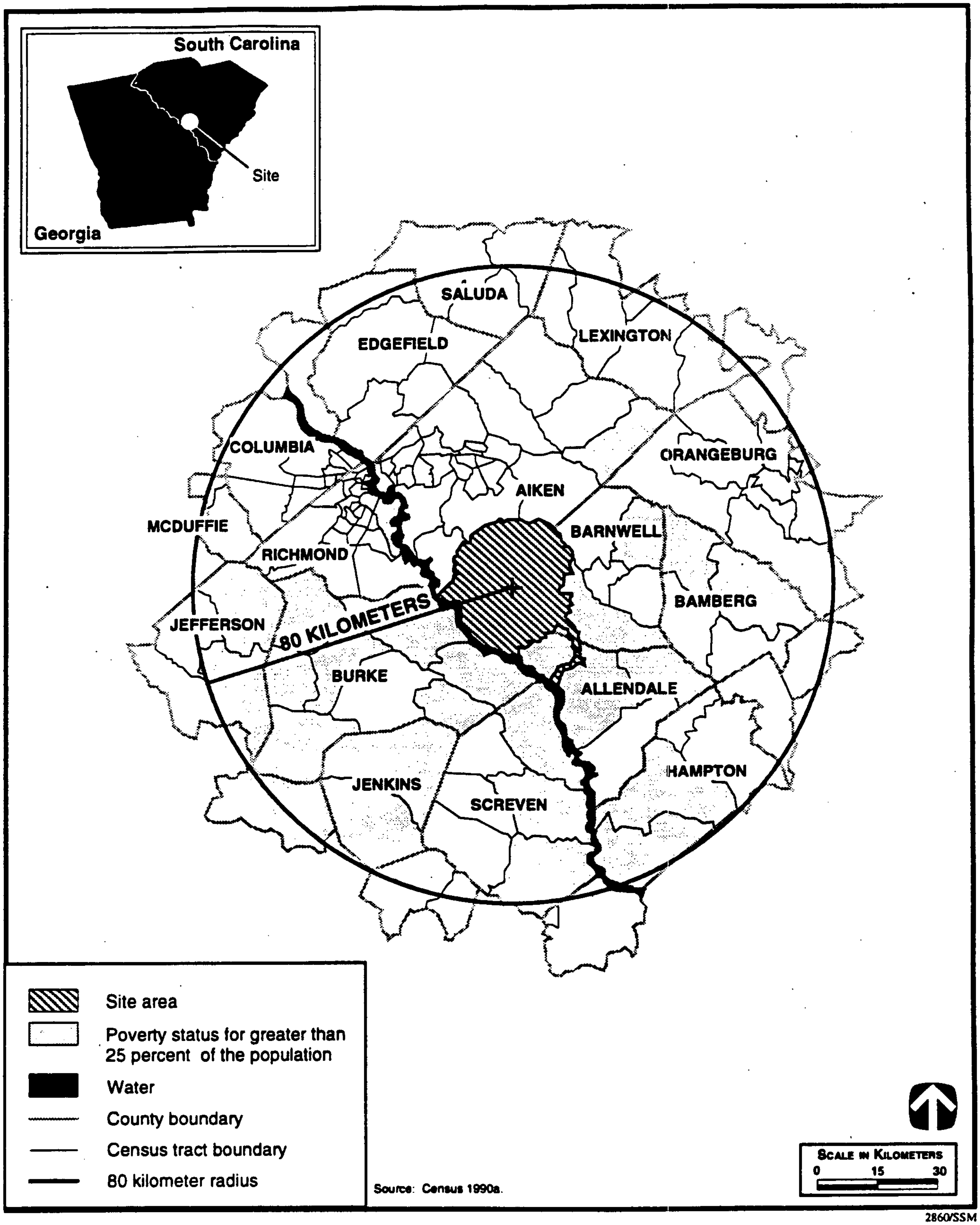
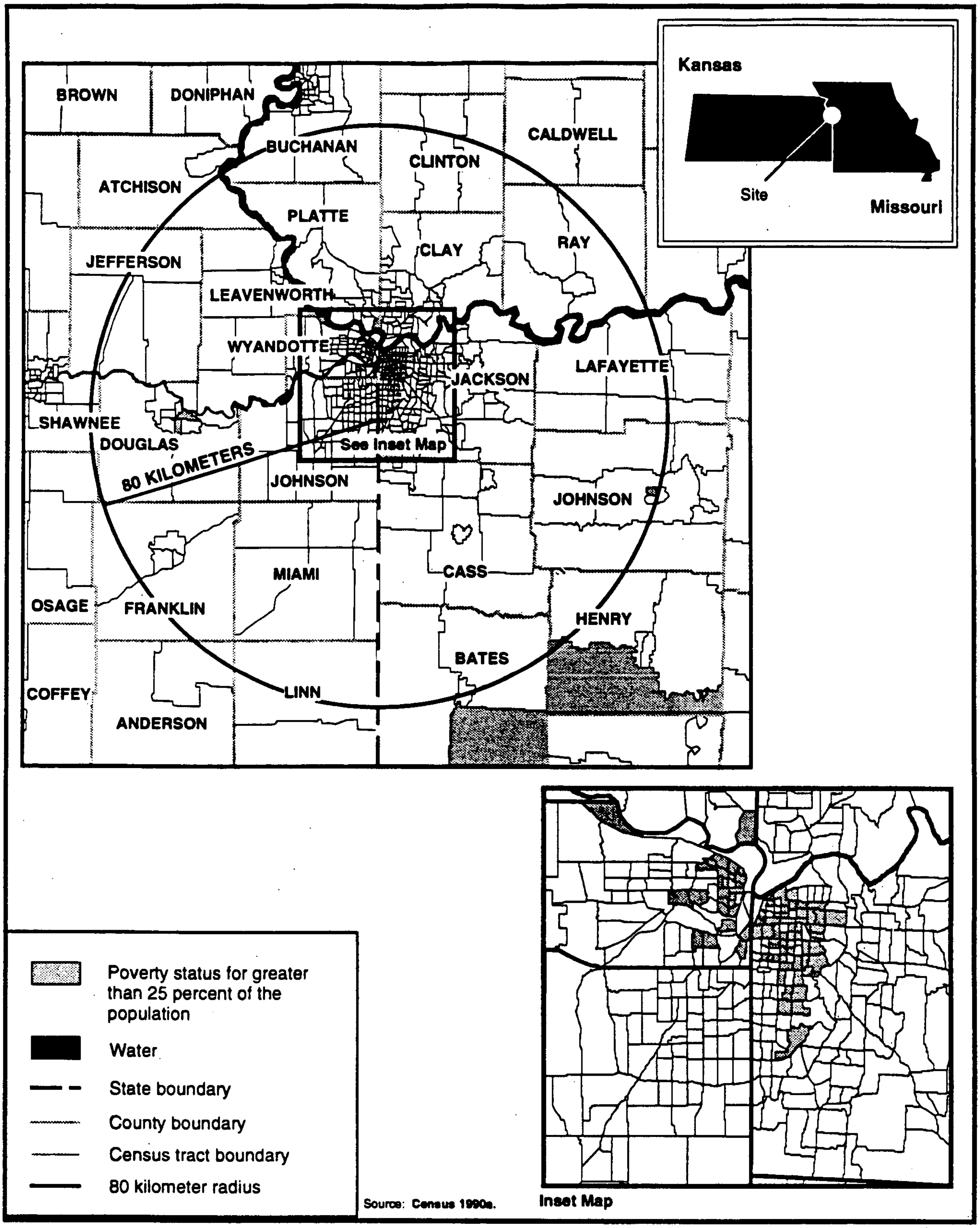


FIGURE D.2.4–10.—*Low-Income Population Distribution by Poverty Status for Savannah River Site and Surrounding Area.*



2872/SSM

FIGURE D.2.4–11.—*Low-Income Population Distribution by Poverty Status for Kansas City Plant and Surrounding Area.*

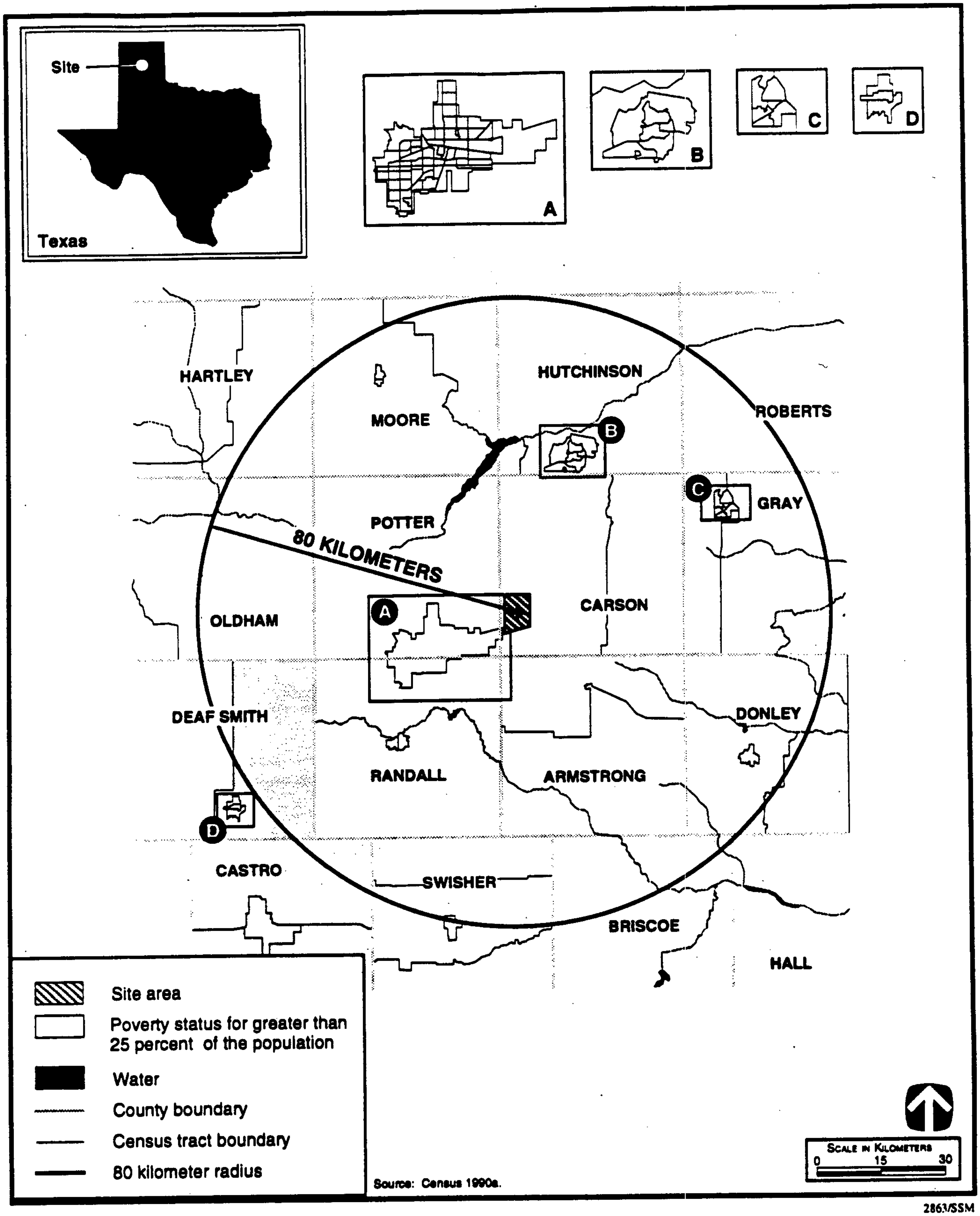


FIGURE D.2.4–12.—*Low-Income Population Distribution by Poverty Status for Pantex Plant and Surrounding Area.*

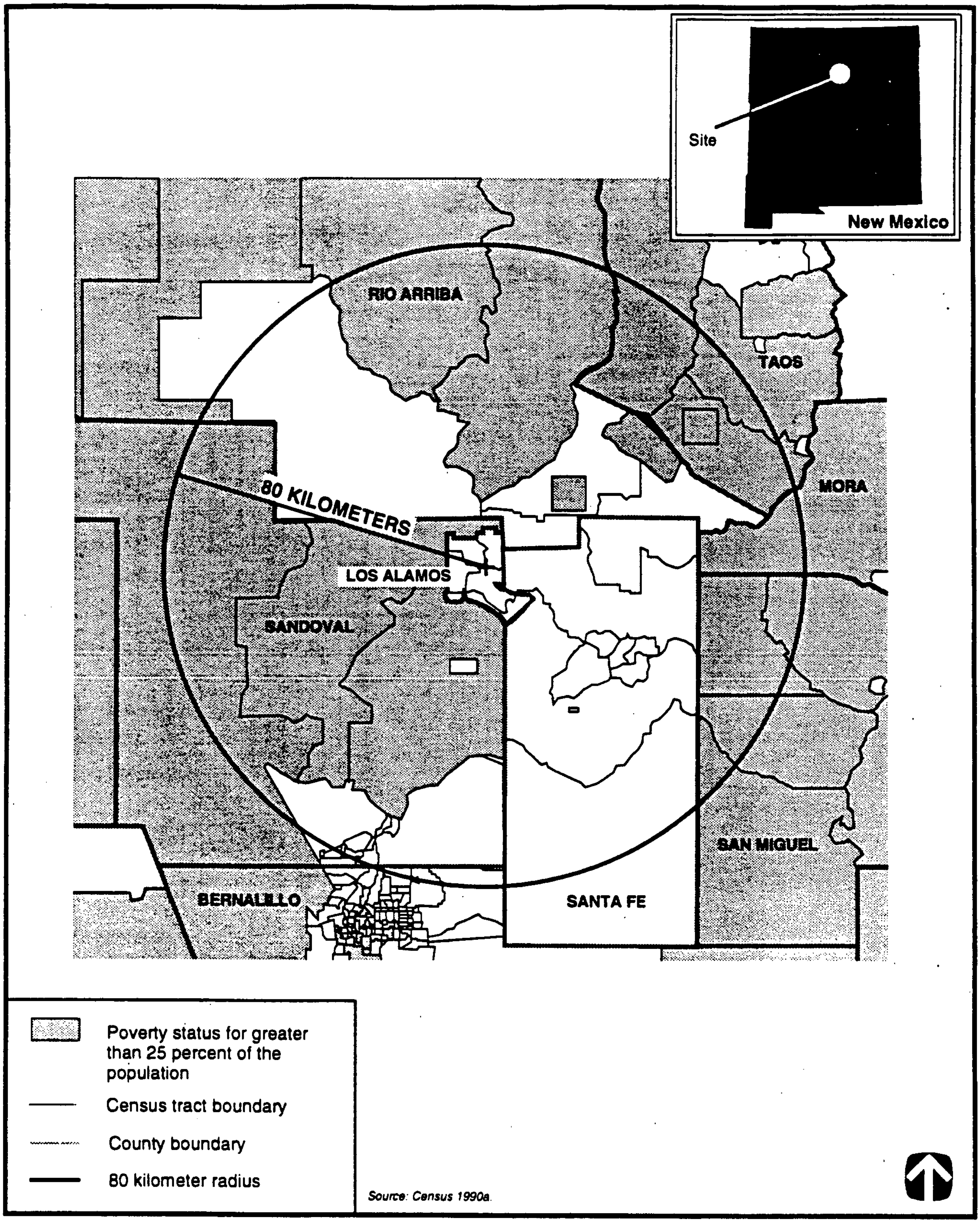


FIGURE D.2.4–13.—*Low-Income Population Distribution by Poverty Status for Los Alamos National Laboratory and Surrounding Area.*

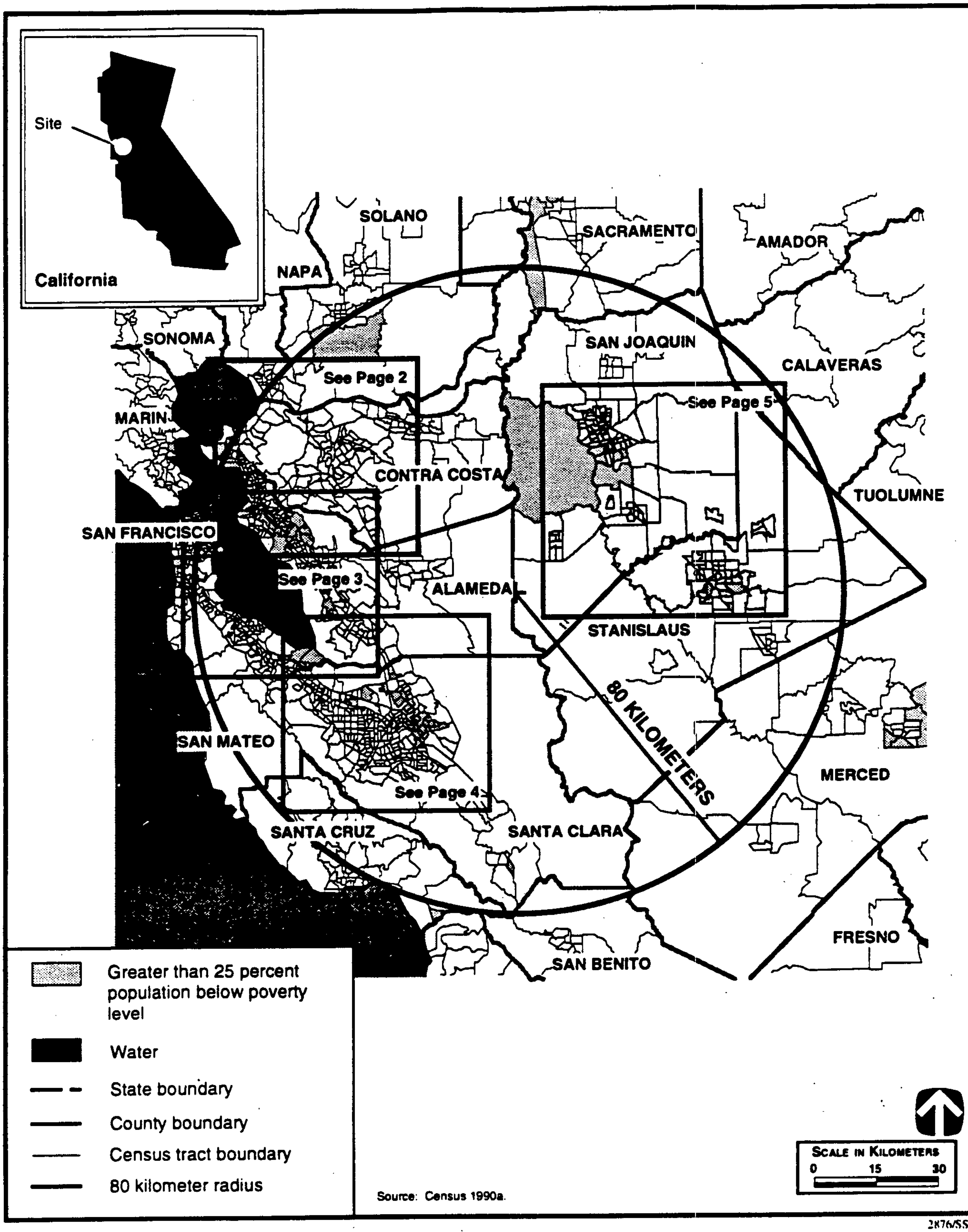


FIGURE D.2.4–14.—*Low-Income Distribution by Poverty Status for Lawrence Livermore National Laboratory and Surrounding Area* [Page 1 of 5].

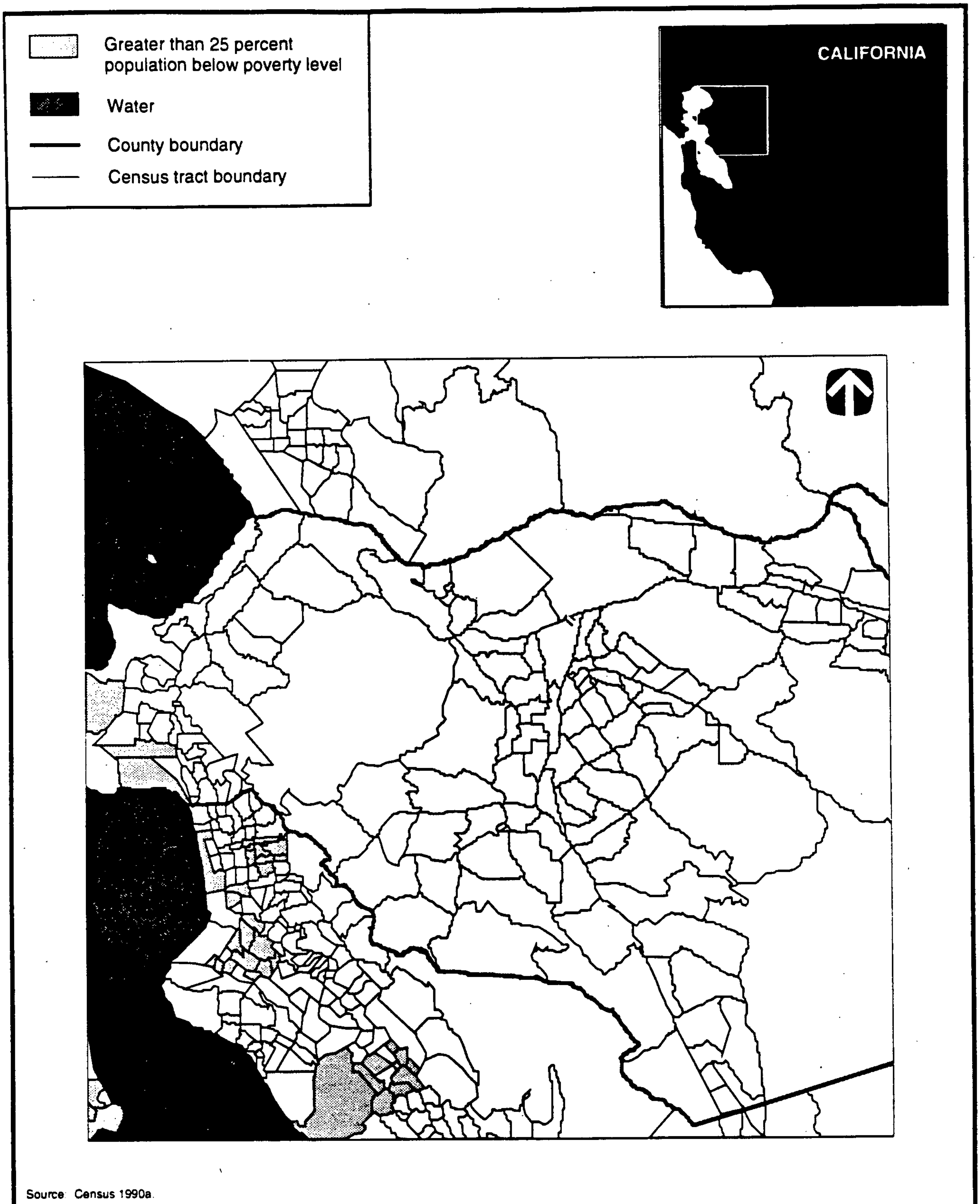


FIGURE D.2.4–14.—*Low-Income Population Distribution by Poverty Status for Lawrence Livermore National Laboratory and Surrounding Area* [Page 2 of 5].

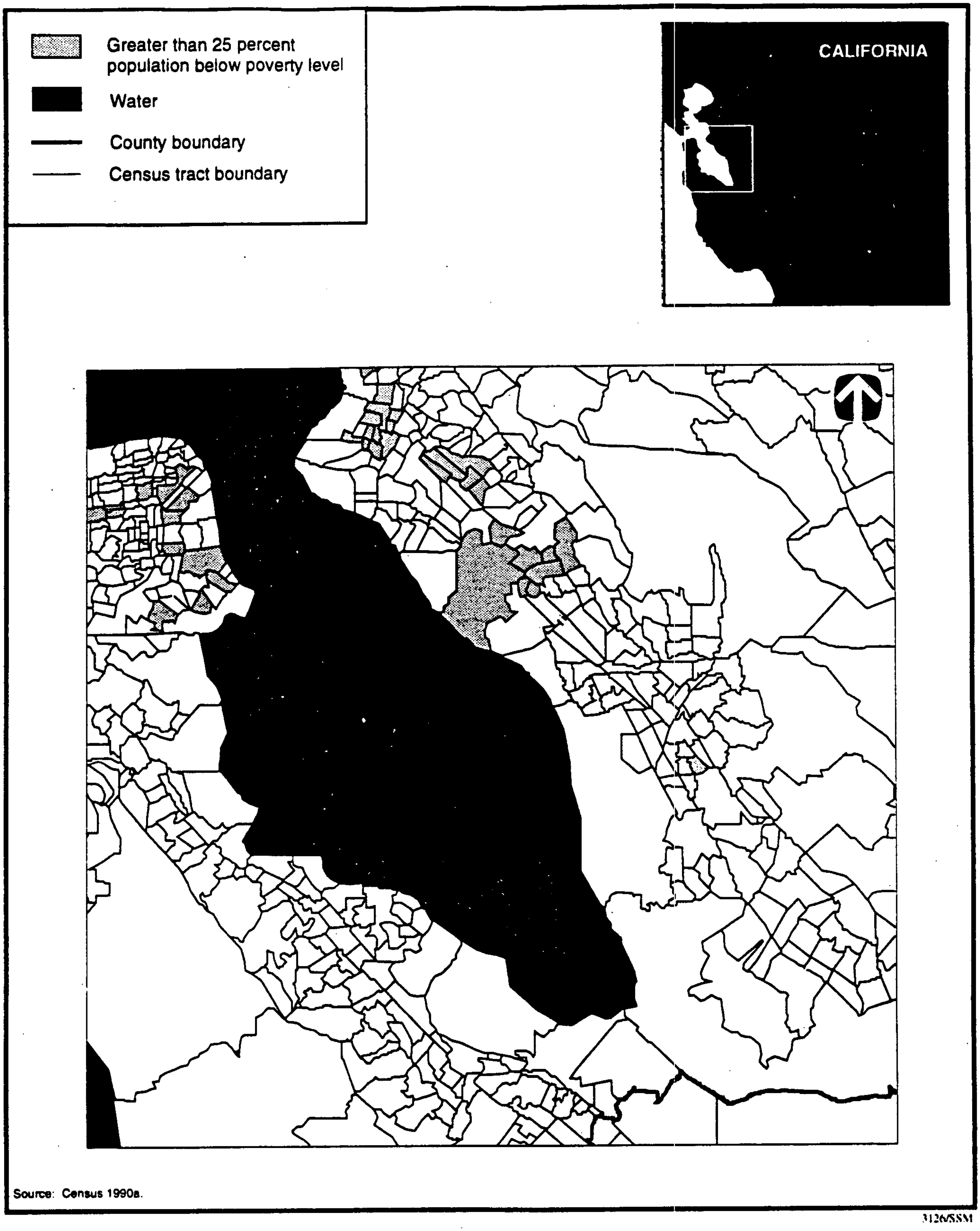


FIGURE D.2.4–14.—*Low-Income Population Distribution by Poverty Status for Lawrence Livermore National Laboratory and Surrounding Area* **[Page 3 of 5].**

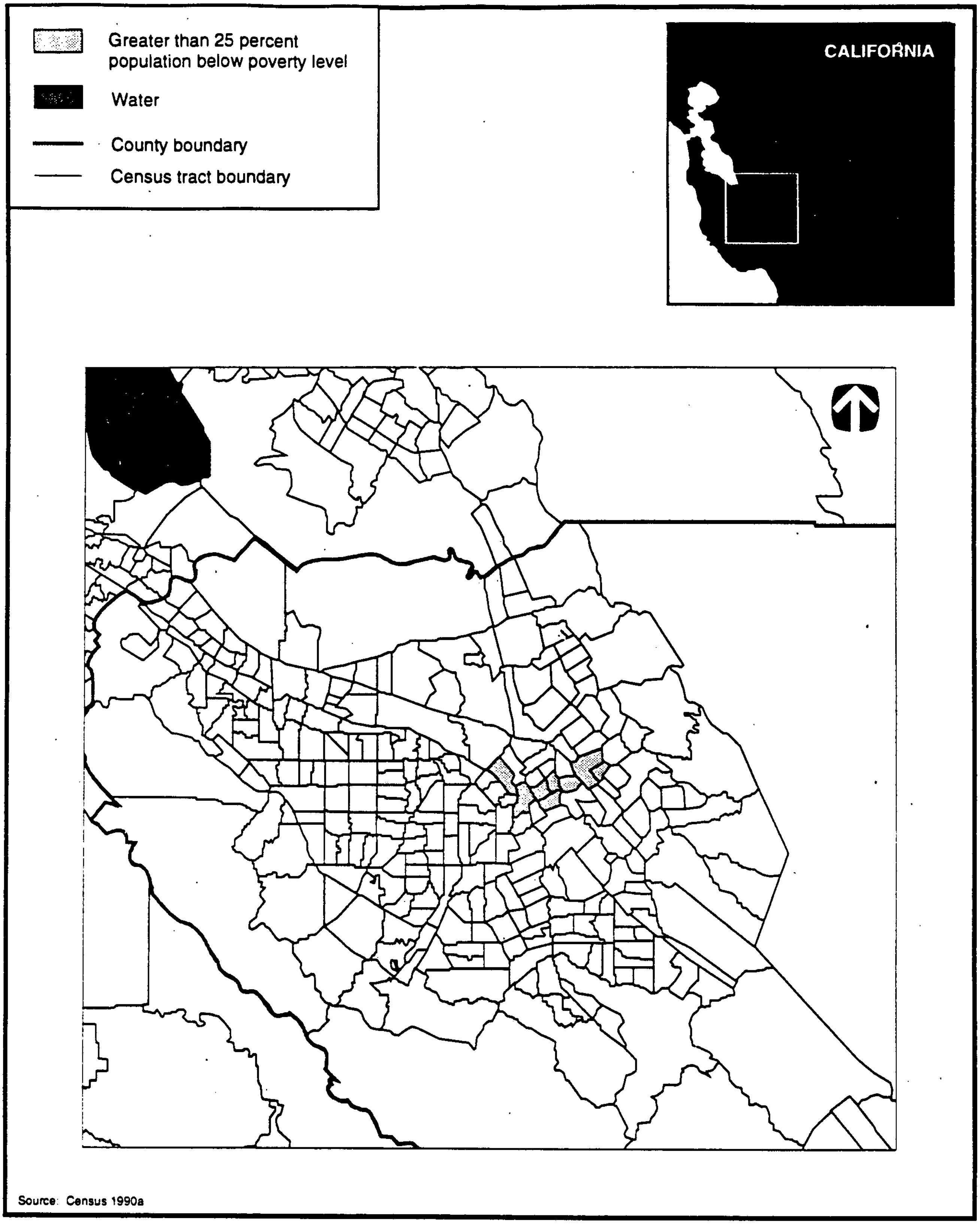


FIGURE D.2.4–14.—*Low-Income Population Distribution by Poverty Status for Lawrence Livermore National Laboratory and Surrounding Area* [Page 4 of 5].

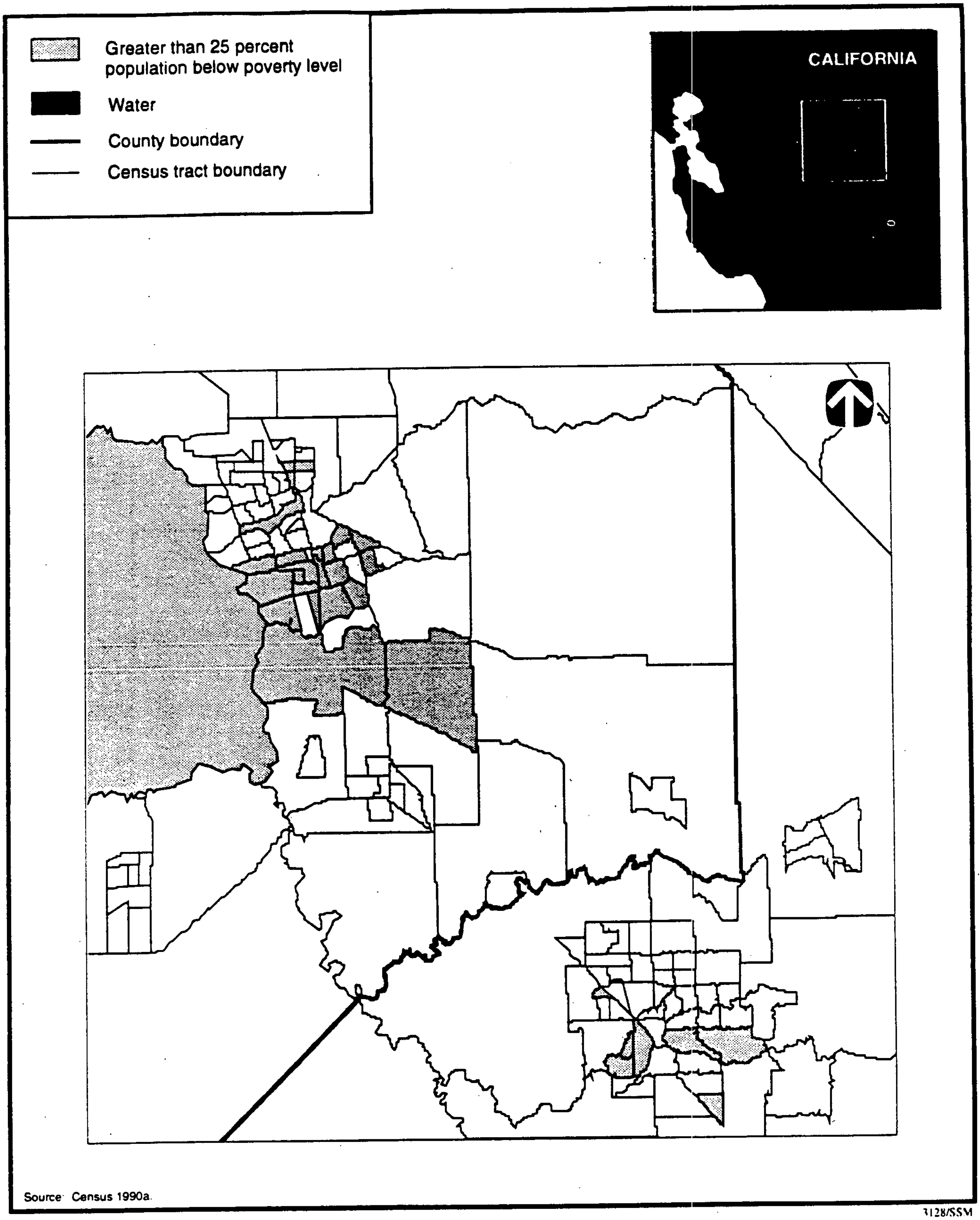


FIGURE D.2.4–14.—*Low-Income Population Distribution by Poverty Status for Lawrence Livermore National Laboratory and Surrounding Area* [Page 5 of 5].

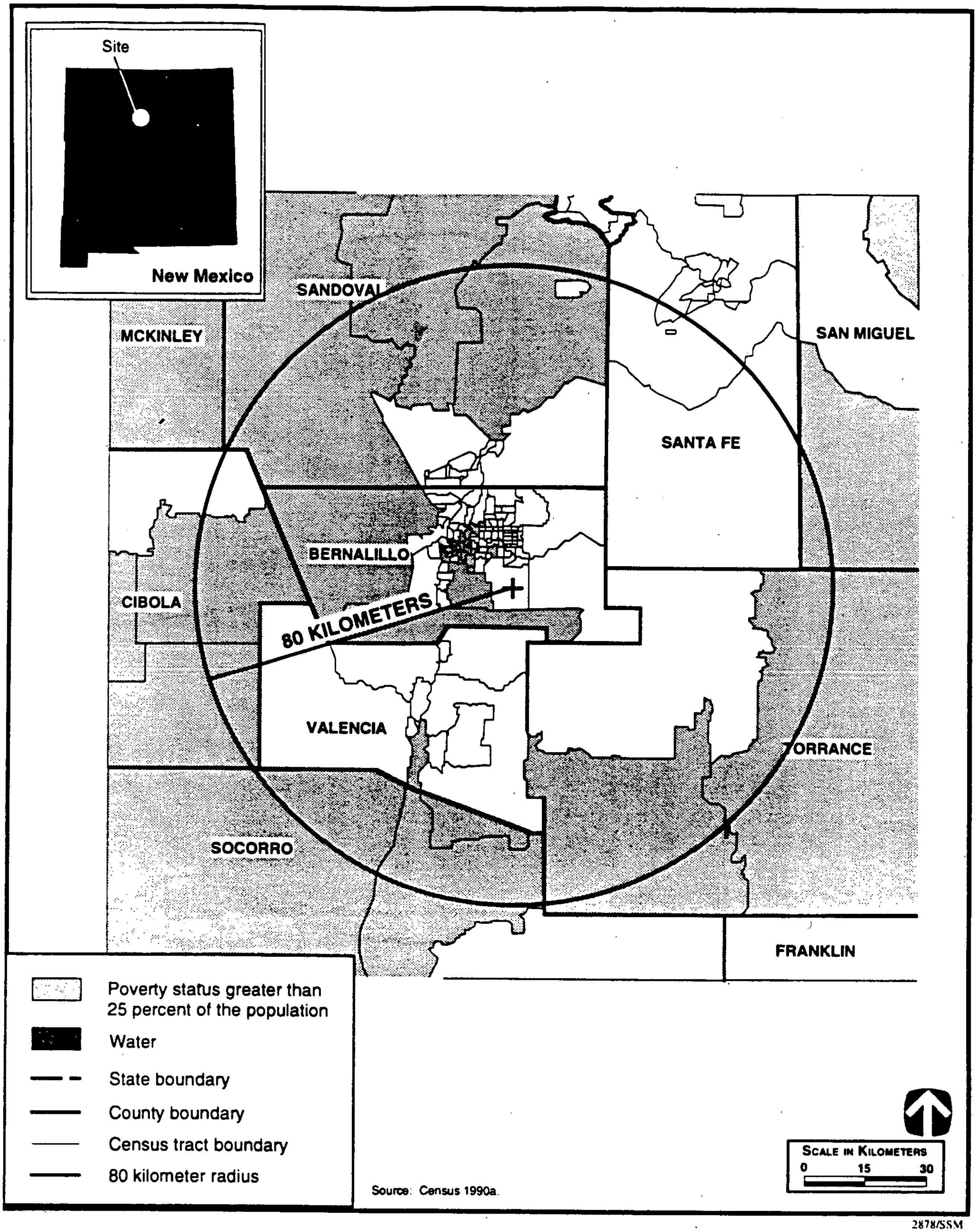


FIGURE D.2.4–15.—*Low-Income Population Distribution by Poverty Status for Sandia National Laboratories and Surrounding Area.*

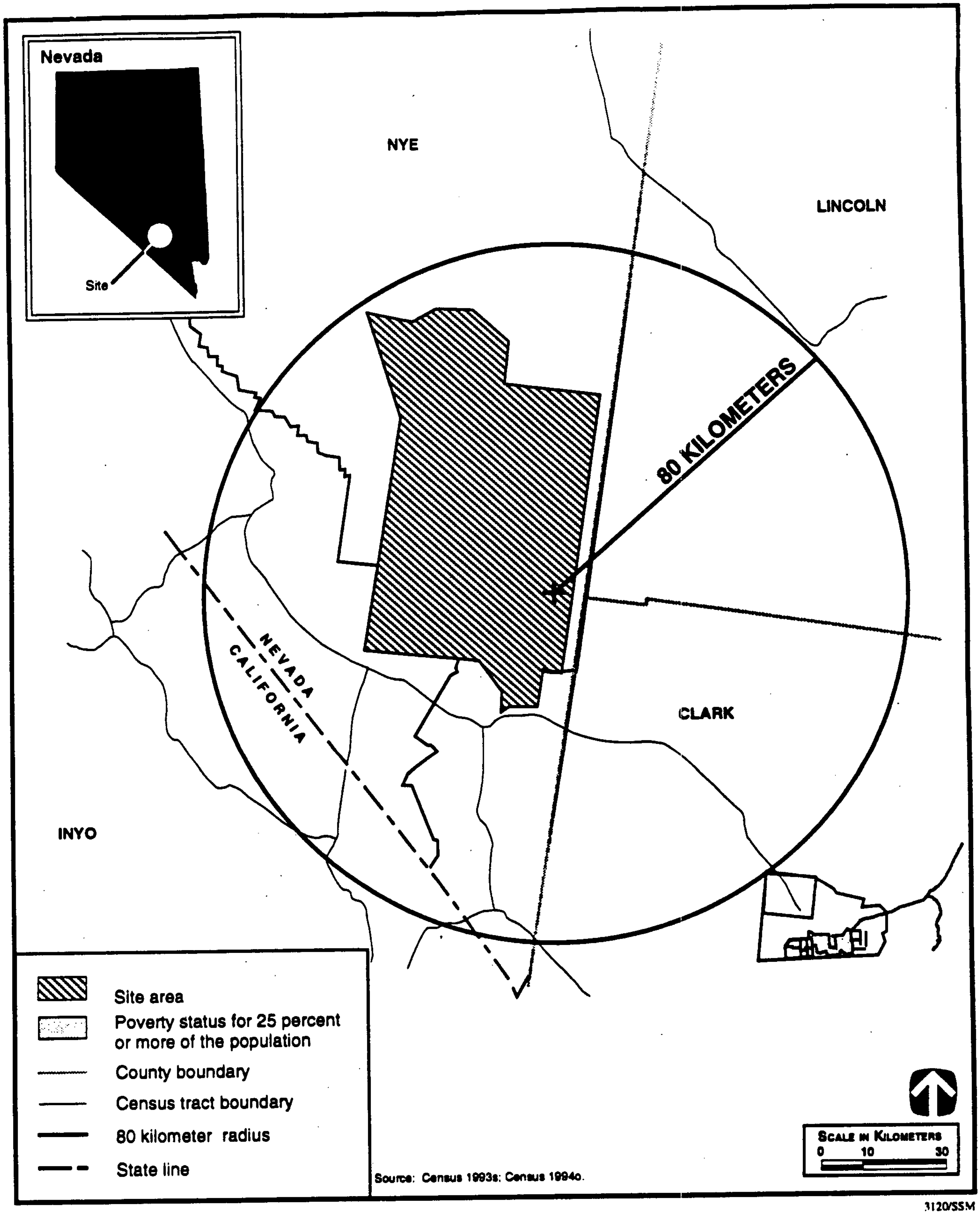


FIGURE D.2.4–16.—*Low-Income Population Distribution by Poverty Status for Nevada Test Site and Surrounding Area.*

APPENDIX E

Appendix E

APPENDIX E: HUMAN HEALTH

E.1 INTRODUCTION

Supplemental information is presented in this appendix on the potential impacts to humans from the normal operational releases of radioactivity and hazardous chemicals from the Stockpile Stewardship and Management Program facilities. This information is intended to support assessments of normal operation for the management and stewardship facilities described in sections 4.2.3.9, 4.3.3.9, 4.4.3.9, 4.5.3.9, 4.6.3.9, 4.7.3.9, 4.8.3.9, and 4.9.3.9 of this programmatic environmental impact statement (PEIS). Section E.2 provides information on radiological impacts while section E.3 provides information on hazardous chemical impacts.

E.2 RADIOLOGICAL IMPACTS TO HUMAN HEALTH

Section E.2 presents supporting information on the potential radiological impacts to humans during normal operation of the PEIS alternatives. This section provides the reader with background information on the nature of radiation (section E.2.1), the methodology used to calculate radiological impacts (section E.2.2), and radiological releases from stockpile management facilities (section E.2.3). Releases associated with the No Action alternative for each site can be found in the referenced site environmental reports.

E.2.1 Background

E.2.1.1 *Nature of Radiation and Its Effects on Humans*

What is Radiation? Humans are constantly exposed to radiation from the solar system and from the earth's rocks and soil. This radiation contributes to the natural background radiation that has always surrounded us. But there are also manmade sources of radiation, such as medical and dental x rays, household smoke detectors, and materials released from nuclear and coal-fired powerplants.

All matter in the universe is composed of atoms, and radiation comes from the activity of these tiny particles. Atoms are made up of even smaller particles (protons, neutrons, and electrons). The number and arrangement of these particles distinguishes one atom from another.

Atoms of different types are known as elements. There are over 100 natural and manmade elements. Some of these elements, such as uranium, radium, plutonium, and thorium, share a very important quality: they are unstable. As they change into more stable forms, invisible waves of energy or particles, known as ionizing radiation, are released. Radioactivity is the emitting of this radiation.

Ionizing radiation refers to the fact that this energy force can ionize, or electrically charge atoms by stripping off electrons. Ionizing radiation can cause a change in the chemical composition of many things, including living tissue (organs), which can affect the way they function.

The effects on people of radiation that is emitted during disintegration (decay) of a radioactive substance depends on the kind of radiation (alpha and beta particles and gamma and x rays) and the total amount of radiation energy absorbed by the body. Alpha particles are the heaviest of these direct types of ionizing radiation, and despite a speed of about 16,100 kilometers (km) per second(s) (kps) (10,000 miles [mi] per second [mps]), they can travel only a few inches in the air. Alpha particles lose their energy almost as soon as they collide with anything. They can easily be stopped by a sheet of paper or the skin's surface.

Beta particles are much lighter than alpha particles. They can travel as fast as 161,000 kps (100,000 mps) and can travel in the air for a distance of about 3 meters (m) (10 feet [ft]). Beta particles can pass through a sheet of paper but may be stopped by a thin sheet of aluminum foil or glass.

Gamma and x rays, unlike alpha or beta particles, are waves of pure energy. Gamma rays travel at the speed of light (300,000 kps [186,000 mps]). Gamma radiation is very penetrating and requires a thick wall of concrete, lead, or steel to stop it.

The neutron is another particle that contributes to radiation exposure, both directly and indirectly. Indirect exposure is associated with the gamma rays and alpha particles that are emitted following neutron capture in matter. A neutron has about one quarter the weight of an alpha particle and can travel at speeds of up to 38,600 kps (24,000 mps). Neutrons are more penetrating than beta particles, but less penetrating than gamma rays. They can effectively be shielded by water, graphite, paraffin, or concrete.

The radioactivity of a material decreases with time. The time it takes a material to lose half of its original radioactivity is its half-life. For example, a quantity of iodine-131, a material that has a half-life of 8 days, will lose half of its radioactivity in that amount of time. In 8 more days, half of the remaining radioactivity will be lost, and so on. Eventually, the radioactivity will essentially disappear. Each radioactive element has a characteristic half-life. The half-lives of various radioactive elements may vary from millionths of a second to millions of years.

As a radioactive element gives up its radioactivity, it often changes to an entirely different element, one that may or may not be radioactive. Eventually, a stable element is formed. This transformation may take place in several steps and is known as a decay chain. Radium, for example, is a naturally occurring radioactive element with a half-life of 1,622 years. It emits an alpha particle and becomes radon, a radioactive gas with a half-life of only 3.8 days. Radon decays to polonium and, through a series of steps, to bismuth and ultimately to lead.

Units of Radiation Measure. Scientists and engineers use a variety of units to measure radiation. These different units can be used to determine the amount, type, and intensity of radiation. Just as heat can be measured in terms of its intensity or its effects, using units of calories or degrees, amounts of radiation can be measured in curies, rads, or rems.

The curie, named after the French scientists Marie and Pierre Curie, describes the "intensity" of a sample of radioactive material. The rate of decay of 1 gram of radium is the basis of this unit of measure. It is equal to 3.7×10^{10} disintegrations (decays) per second.

The total energy absorbed per unit quantity of tissue is referred to as absorbed dose. The rad is the unit of measurement for the physical absorption of radiation. Much like sunlight heats the pavement by giving up an amount of energy to it, radiation gives up rads of energy to objects in its path. One rad is equal to the amount of radiation that leads to the deposition of 0.01 joule of energy per kilogram (kg) of absorbing material.

A rem is a measurement of the dose from radiation based on its biological effects. The rem is used to measure the effects of radiation on the body, much like degrees Celsius can be used to measure the effects of sunlight heating pavement. Thus, 1 rem of one type of radiation is presumed to have the same biological effects as 1 rem of any other type of radiation. This standard allows comparison of the biological effects of radionuclides that emit different types of radiation.

An individual may be exposed to ionizing radiation externally from a radioactive source outside the body and/or internally from ingesting radioactive material. An external dose is delivered only during the actual time of exposure to the external radiation source. An internal dose, however, continues to be delivered as long as the radioactive source is in the body, although both radioactive decay and elimination of the radionuclide by ordinary metabolic processes decrease the dose rate with the passage of time. The dose from internal exposure is calculated over 50 years following the initial exposure.

The three types of doses calculated in this PEIS include an external dose, an internal dose, and a combined external and internal dose. Each type of dose is discussed below.

External Dose. The external dose can arise from several different pathways. All these pathways are similar because the radiation causing the exposure is external to the body. In this PEIS, these pathways include being exposed to a cloud of radiation passing over the receptor, standing on ground that is contaminated with radioactivity, swimming in contaminated water, and boating in contaminated water. The appropriate measure of dose is called the effective dose equivalent. It should be noted that if the receptor departs from the source of radiation exposure, his dose rate will be reduced. It is assumed that external exposure occurs uniformly during the year.

Internal Dose. The internal dose arises from a radiation source entering the human body through ingestion of contaminated food and water or inhalation of contaminated air. In this PEIS, pathways for internal exposure include ingestion of crops contaminated by airborne radiation that has been deposited on the crops or by irrigation of crops using contaminated water sources, ingestion of animal products from animals that ingested contaminated food, ingestion of contaminated water, inhalation of contaminated air, and absorption of contaminated water through the skin during swimming. Unlike external exposures, once radioactive material enters the body, it remains there for various periods of time depending on decay and biological elimination rates. The unit of measure for internal doses is the committed dose equivalent. It is the internal dose that each body organ receives from 1 "year intake" (ingestion plus inhalation). Normally, a 50- or 70-year dose-commitment period is used (i.e., the 1-year intake period plus 49 or 69 years). The dose rate increases during the 1 year of intake. The dose rate, after the 1 year of intake, slowly declines as the radioactivity in the body continues to produce a dose. The integral of the dose rate over the 50 or 70 years gives the committed dose equivalent. In this PEIS, a 50-year dose-commitment period was used.

The various organs of the body have different susceptibilities to harm from radiation. The committed effective dose equivalent takes these different susceptibilities into account and provides a broad indicator of the risk to the health of an individual from radiation. It is obtained by multiplying the committed dose equivalent in each major organ or tissue by a weighting factor associated with the risk susceptibility of the tissue or organ, then summing the totals.

The committed dose equivalent to an organ is larger than the committed effective dose equivalent because the organ has a weighting factor of less than one. The concept of committed effective dose equivalent applies only to internal pathways.

Differences in radionuclide characteristics lead to different internal doses. For example, for the same amount of radioactivity, in curies, taken into the body, the dose from tritium is much less than from uranium or plutonium. Tritium emits a weak beta particle and is biologically eliminated from the body over several weeks. Uranium and plutonium emit relatively high-energy alpha particles and are retained in the body for periods of several months to many years.

Combined External and Internal Dose. For convenience, the sum of the committed effective dose equivalent from internal pathways and the effective dose equivalent from external pathways is also called the committed effective dose equivalent in this PEIS (note that in DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, this quantity is called the effective dose equivalent).

The units used in this PEIS for committed dose equivalent, effective dose equivalent, and committed effective dose equivalent to an individual are the rem and millirem (mrem) (1/1000 of 1 rem). The corresponding unit for the collective dose to a population (the sum of the doses to members of the population, or the product of the number of exposed individuals and their average dose) is the person-rem.

Sources of Radiation. The average American receives a total of about 350 mrem per year from all sources of radiation, both natural and manmade. The sources of radiation can be divided into six different categories: cosmic radiation, terrestrial radiation, internal radiation, consumer products, medical diagnosis and therapy, and other sources. Each category is discussed below.

Cosmic radiation is ionizing radiation resulting from energetic charged particles from space continuously hitting the earth's atmosphere. These particles and the secondary particles and photons they create are cosmic radiation. Because the atmosphere provides some shielding against cosmic radiation, the intensity of this radiation increases with altitude above sea level. For the sites considered in this PEIS, the cosmic radiation ranged from about 30 to 50 mrem per year. The average annual dose to people in the United States is about 27 mrem.

External terrestrial radiation is the radiation emitted from the radioactive materials in the earth's rocks and soils. The average annual dose from external terrestrial radiation is about 28 mrem. The external terrestrial radiation for the sites in this PEIS ranged from about 30 to 75 mrem per year.

Internal radiation arises from the human body metabolizing natural radioactive material that has entered the body by inhalation or ingestion. Natural radionuclides in the body include isotopes of uranium, thorium, radium, radon, polonium, bismuth, potassium, rubidium, and carbon. The major contributors to the annual dose equivalent for internal radioactivity are the short-lived decay products of radon which contribute about 200 mrem per year. The average dose from other internal radionuclides is about 39 mrem per year.

Consumer products also contain sources of ionizing radiation. In some products, like smoke detectors and airport x-ray machines, the radiation source is essential to the products' operation. In other products, such as televisions and tobacco products, the radiation occurs incidentally to the product function. The average annual dose is about 10 mrem.

Radiation is an important diagnostic medical tool and cancer treatment. Diagnostic x rays result in an average annual exposure of 39 mrem. Nuclear medical procedures result in an average annual exposure of 14 mrem.

There are a few additional sources of radiation that contribute minor doses to individuals in the United States. The doses from nuclear fuel cycle facilities, such as uranium mines, mills, and fuel processing plants; nuclear power plants; and transportation routes has been estimated to be less than 1 mrem per year. Radioactive fallout from atmospheric atomic bomb tests, emissions of radioactive material from Department of Energy (DOE) facilities, emissions from certain mineral extraction facilities, and transportation of radioactive materials contributes less than 1 mrem per year to the average dose to an individual. Air travel contributes approximately 1 mrem per year to the average dose.

The collective (or population) dose to an exposed population is calculated by summing the estimated doses received by each member of the exposed population. This total dose received by the exposed population is measured in person-rem. For example, if 1,000 people each received a dose of 1 mrem (0.001 rem), the collective dose is 1,000 persons x 0.001 rem = 1.0 person-rem. Alternatively, the same collective dose (1.0 person-rem) results from 500 people, each of whom received a dose of 2 mrem (500 persons x 2 mrem = 1 person-rem).

Limits of Radiation Exposure. The amount of manmade radiation that the public may be exposed to is limited by Federal regulations. Although most scientists believe that radiation absorbed in small doses over several years is not harmful, U.S. Government regulations assume that the effects of all radiation exposures are cumulative.

The exposure to a member of the general public from DOE facility releases into the atmosphere is limited by the Environmental Protection Agency (EPA) to an annual dose of 10 mrem, in addition to the natural background and medical radiation normally received (40 *Code of Federal Regulations* [CFR] 61, Subpart H). DOE also limits to 10 mrem, the dose annually received from material released into the atmosphere (DOE Order 5400.5). EPA and DOE also limit the annual dose to the general public from radioactive releases to drinking water to 4 mrem (40 CFR 141; DOE Order 5400.5). The DOE annual limit of radiation dose to a member of the general public from all DOE facilities is 100 mrem total from all pathways (DOE Order 5400.5). For people working in an occupation that involves radiation, DOE and the Nuclear Regulatory Commission (NRC) limit doses to 5 rem (5,000 mrem) in any one year (10 CFR 20; 10 CFR 835).

E.2.1.2 *Health Effects*

Radiation exposure and its consequences are topics of interest to the general public. For this reason, this PEIS places much emphasis on the consequences of exposure to radiation, even though the effects of radiation exposure under most circumstances evaluated in this PEIS are small. This section explains the basic concepts used in the evaluation of radiation effects in order to provide the background for later discussion of impacts.

Radiation can cause a variety of ill-health effects in people. The most significant ill-health effects that result from environmental and occupational radiation exposure are cancer fatalities. These ill-health effects are referred to as "latent" cancer fatalities because the cancer may take many years to develop and for death to occur and may not actually be the cause of death. In the discussions that follow, it should be noted that all fatal cancers are latent; therefore, the term "latent" is not used.

Health impacts from radiation exposure, whether from sources external or internal to the body, generally are identified as "somatic" (affecting the individual exposed) or "genetic" (affecting descendants of the exposed individual). Radiation is more likely to produce somatic effects rather than genetic effects. Therefore, for this PEIS, only the somatic risks are presented. The somatic risks of most importance are the induction of cancers. Except for leukemia, which can have an induction period (time between exposure to carcinogen and cancer diagnosis) of as little as 2 to 7 years, most cancers have an induction period of more than 20 years.

For a uniform irradiation of the body, the incidence of cancer varies among organs and tissues. The thyroid and skin demonstrate a greater sensitivity than other organs; however, such cancers also produce relatively low mortality rates because they are relatively amenable to medical treatment. Because of the readily available data for cancer mortality rates and the relative scarcity of prospective epidemiologic studies, somatic effects leading to cancer fatalities rather than cancer incidence are presented in this PEIS. The numbers of cancer fatalities can be used to compare the risks among the various alternatives.

The fatal cancer risk estimators presented in this appendix for radiation technically apply only to low-Linear Energy Transfer radiation (gamma rays and beta particles). However, on a per rem rather than a per rad basis, the fatal risk estimators are higher for this type of radiation than for high-Linear Energy Transfer radiation (alpha particles). In this PEIS, the low-Linear Energy Transfer risk estimators are conservatively assumed to apply to all radiation exposures.

The National Research Council's Committee on the Biological Effects of Ionizing Radiations (BEIR) has prepared a series of reports to advise the U.S. Government on the health consequences of radiation exposure. The latest of these reports, *Health Effects of Exposure to Low Levels of Ionizing Radiation BEIR V*, published in 1990, provides the most current estimates for excess mortality from leukemia and cancers other than leukemia expected to result from exposure to ionizing radiation. The BEIR V Report updates the models and risk estimates provided in the earlier report of the BEIR III Committee, *The Effects of Exposure of Populations to Low-Levels of Ionizing Radiation*, published in 1980. BEIR V models were developed for application to the U.S. population.

BEIR V provides estimates that are consistently higher than those in BEIR III. This is attributed to several factors, including the use of a linear dose response model for cancers other than leukemia, revised dosimetry for the Japanese atomic bomb survivors, and additional followup studies of the atomic bomb survivors and other cohorts. BEIR III employs constant relative and absolute risk models, with separate coefficients for each sex and several age-at-exposure groups, while BEIR V develops models in which the excess relative risk is expressed as a function of age at exposure, time after exposure, and sex for each of several cancer categories. BEIR III models were based on the assumption that absolute risks are comparable between the atomic bomb survivors and the U.S. population, while BEIR V models were based on the assumption that the relative risks are comparable. For a disease such as lung cancer, where baseline risks in the United States are much larger than those in Japan, the BEIR V approach leads to larger risk estimates than the BEIR III approach.

The models and risk coefficients in BEIR V were derived through analyses of relevant epidemiologic data, including the Japanese atomic bomb survivors, ankylosis spondylitis patients, Canadian and Massachusetts fluoroscopy patients (breast cancer), New York postpartum mastitis patients (breast cancer), Israel tinea capitis patients (thyroid cancer), and Rochester thymus patients (thyroid cancer). Models for leukemia, respiratory cancer, digestive cancer, and other cancers used only the atomic bomb survivor data, although results of analyses of the ankylosis spondylitis patients were considered. Atomic bomb survivor analyses were based on revised dosimetry with an assumed Relative Biological Effectiveness of 20 for neutrons and were restricted to doses of less than 400 rads. Estimates of risks of fatal cancers other than leukemia were obtained by totaling the estimates for breast cancer, respiratory cancer, digestive cancer, and other cancers.

Risk Estimates for Doses Received During an Accident. BEIR V includes risk estimates for a single exposure of 10 rem to a population of 100,000 people (10^6 person-rem). In this case, fatality estimates for leukemia, breast cancer, respiratory cancer, digestive cancer, and other cancers are given for both sexes and nine age-at-exposure groups. These estimates, based on the linear model, are summarized in table E.2.1.2–1. The average risk estimate from all ages and both sexes is 885 excess cancer fatalities per million person-rem. This value has been conservatively rounded up to 1,000 excess cancer fatalities per million person-rem.

TABLE E.2.1.2–1.—*Lifetime Risks per 100,000 Persons Exposed to a Single Exposure of 10 Rem*

	Type of Fatal Cancer		
Gender	Leukemia[a]	Cancers Other Than Leukemia	Total Cancers
Male	220	660	880
Female	160	730	890
Average	190	695	885[b]

[a] These are the linear estimates and are double the linear-quadratic estimates provided in BEIR V for leukemia at low doses and dose-rates.

[b] This value has been rounded up to 1,000 excess cancer fatalities per million person-rem.

Source: NAS 1990a.

Although values for other health effects are not presented in this PEIS, the risk estimators for nonfatal cancers and for genetic disorders in future generations are estimated to be approximately 200 and 260 per million person-rem, respectively. These values are based on information presented in the *1990 Recommendations of the International Commission on Radiological Protection* (ICRP Publication 60) and are seen to be 20 and 26 percent, respectively, of the fatal cancer estimator (ICRP 1991a:22). Thus, if the number of excess fatal cancers is projected to be "Z", the number of excess genetic disorders would be 0.26xZ.

Risk Estimates for Doses Received During Normal Operation. For low doses and dose rates, a linear-quadratic model was found to provide a significantly better fit to the data for leukemia than a linear one, and leukemia risks were based on a linear-quadratic function. This reduces the effects by a factor of two over estimates that are obtained from the linear model. For other cancers, linear models were found to provide an adequate fit to the data, and were used for extrapolation to low doses. However, the BEIR V Committee recommended reducing these linear estimates by a factor between 2 and 10 for doses received at low dose rates. For this PEIS, a risk reduction factor of 2 was adopted for conservatism.

Based on the above discussion, the resulting dose-to-risk conversion factor would be equal to half the value observed for accident situations or approximately 500 excess fatal cancers per million person-rem (0.0005 excess fatal cancers per person-rem). This is the risk value used in this PEIS to calculate fatal cancers to the general public during normal operation. For workers, a dose-to-risk conversion factor of 400 excess fatal cancers per million person-rem (0.0004 excess fatal cancers per person-rem) is used in this PEIS. This lower value reflects the absence of children in the workforce. Again, based on information provided in ICRP Publication 60, the health risk estimators for nonfatal cancers and genetic disorders among the public are 20 percent and 26 percent, respectively, of the fatal cancer dose-to-risk conversion factor. For workers, the health risk estimators for nonfatal cancers and genetic disorders are both 20 percent of the fatal cancer dose-to-risk conversion factor. For this PEIS, only fatal cancers are presented.

The risk estimates may be applied to calculate the effects of exposing a population to radiation. For example, in a population of 100,000 people exposed only to natural background radiation (0.3 rem per year), 15 cancer fatalities per year would be inferred to be caused by the radiation (100,000 persons x 0.3 rem per year x 0.0005 cancer fatalities per person-rem = 15 cancer fatalities per year).

Sometimes, calculations of the number of excess cancer fatalities associated with radiation exposure do not yield whole numbers and, especially in environmental applications, may yield numbers less than 1.0. For example, if a population of 100,000 were exposed as above, but to a total dose of only 0.001 rem, the collective dose would be 100 person-rem, and the corresponding estimated number of cancer fatalities would be 0.05 (100,000 persons x 0.001 rem x 0.0005 cancer fatalities/person-rem = 0.05 fatal cancers).

How should one interpret a nonintegral number of cancer fatalities such as 0.05? The answer is to interpret the result as a statistical estimate. That is, 0.05 is the average number of deaths that would result if the same exposure situation were applied to many different groups of 100,000 people. In most groups, no person (0 people) would incur a cancer fatality from the 0.001 rem dose each member would have received. In a small fraction of the groups, one fatal cancer would result; in exceptionally few groups, two or more fatal cancers would occur. The average number of deaths over all the groups would be 0.05 fatal cancers (just as the average of 0, 0, 0, and 1 is 1/4, or 0.25). The most likely outcome is 0 cancer fatalities.

These same concepts apply to estimating the effects of radiation exposure on a single individual. Consider the effects, for example, of exposure to background radiation over a lifetime. The "number of cancer fatalities" corresponding to a single individual's exposure over a (presumed) 72-year lifetime to 0.3 rem per year is the following:

> 1 person x 0.3 rem/year x 72 years x 0.0005 cancer fatalities/person-rem = 0.011 cancer fatalities.

Again, this should be interpreted in a statistical sense; that is, the estimated effect of background radiation exposure on the exposed individual would produce a 1.1-percent chance that the individual might incur a fatal cancer caused by the exposure. Presented another way, this method estimates that approximately 1.1 percent of the population might die of cancers induced by the background radiation.

E.2.2 Methodology for Estimating Radiological Impacts of Normal Operation

The radiological impacts of normal operation of alternatives were calculated using Version 1.485 of the GENII computer code. Site-specific and technology-specific input data were used, including location, meteorology, population, food production and consumption, and source terms. The GENII code was used for analysis of normal operations and design basis accidents. Section E.2.2.1 briefly describes GENII and outlines the approach used for normal operations.

E.2.2.1 *GENII Computer Code*

The GENII computer model, developed by Pacific Northwest Laboratory for DOE, is an integrated system of various computer modules that analyze environmental contamination resulting from acute or chronic releases to, or initial contamination in, air, water, or soil. The model calculates radiation doses to individuals and populations. The GENII computer model is well documented for assumptions, technical approach, methodology, and quality assurance issues (*GENII — The Hanford Environmental Radiation Dosimetry Software System* [December 1988]). The GENII computer model has gone through extensive quality assurance and quality control steps. These include the comparison of results from model computations against those from hand calculations, and the performance of internal and external peer reviews. Recommendations given in these reports were incorporated into the final GENII computer model, as deemed appropriate.

For this PEIS only the ENVIN, ENV, and DOSE computer modules were used. The codes are connected through data transfer files. The output of one code is stored in a file that can be used by the next code in the system. In addition, a computer code called CREGENII was prepared to aid the user with the preparation of input files into GENII.

CREGENII. The CREGENII code helps the user, through a series of interactive menus and questions, prepare a text input file for the environmental dosimetry programs. In addition, CREGENII prepares a batch processing file to manage the file handling needed to control the operations of subsequent codes and to prepare an output report.

ENVIN. The ENVIN module of the GENII code controls the reading of the input files prepared by CREGENII and organizes the input for optimal use in the environmental transport and exposure module, ENV. The ENVIN code interprets the basic input, reads the basic GENII data libraries and other optional input files, and organizes the input into sequential segments on the basis of radionuclide decay chains.

A standardized file that contains scenario, control, and inventory parameters is used as input to ENVIN. Radionuclide inventories can be entered as functions of releases to air or water, concentrations in basic environmental media (air, soil, or water), or concentrations in foods. If certain atmospheric dispersion options have been selected, this module can generate tables of atmospheric dispersion parameters that will be used in later calculations. If the finite plume air submersion option is requested in addition to the atmospheric dispersion calculations, preliminary energy-dependent finite plume dose factors also are prepared. The ENVIN module prepares the data transfer files that are used as input by the ENV module; ENVIN generates the first portion of the calculation documentation—the run input parameters report.

ENV. The ENV module calculates the environmental transfer, uptake, and human exposure to radionuclides that result from the chosen scenario for the user-specified source term. The code reads the input files from ENVIN and then, for each radionuclide chain, sequentially performs the precalculations to establish the conditions at the start of the exposure scenario. Environmental concentrations of radionuclides are established at the beginning of the scenario by assuming decay of preexisting sources, considering biotic transport of existing subsurface contamination, and defining soil contamination from continuing atmospheric or irrigation depositions. Then, for each year of postulated exposure, the code estimates air, surface soil, deep soil, groundwater, and surface water concentrations of each radionuclide in the chain. Human exposures and intakes of each radionuclide are calculated for pathways of external exposure from finite atmospheric plumes, inhalation, external exposure from contaminated soil, sediments, and water, external exposure from special geometries, and internal exposures from consumption of terrestrial foods, aquatic foods, drinking water, animal products, and inadvertent intake of soil. The intermediate information on annual media concentrations and intake rates are written to data transfer files. Although these may be accessed directly, they are usually used as input to the DOSE module of GENII.

GENII is a general purpose computer code used to model dispersion, transport, and long-term exposure effects of specific radionuclides and pathways. Sophisticated codes such as UFOTRI and ETMOD (Environmental Tritium Model) are used exclusively for modeling tritium transport and dosimetry. The UFOTRI and ETMOD codes were not chosen for use in this PEIS because of the lack of information on detailed facility design and on the breakdown of tritium into elemental and tritiated water forms, and because these codes cannot be used for modeling the exposure effects of radionuclides other than tritium. GENII was chosen because it can model both air and surface transport pathways and is not restricted to any radionuclides.

DOSE. The DOSE module reads the annual intake and exposure rates defined by the ENV module and converts the data to radiation dose. External dose is calculated with precalculated factors from the EXTDF module or from a data file prepared outside of GENII. Internal dose is calculated with precalculated factors from the INTDF module.

EXTDF. The EXTDF module calculates the external dose-rate factors for submersion in an infinite cloud of radioactive materials, immersion in contaminated water, and direct exposure to plane or slab sources of radionuclides. EXTDF was not used. Instead, the dose rate factors listed in *External Dose Rate Factors for Calculation of Dose to the Public* (DOE/EH-0070) were used for this PEIS.

INTDF. Using the *Limits for Intakes of Radionuclides by Workers* (ICRP Publication 30) model, the INTDF module calculates the internal (inhalation and ingestion) dose conversion factors of radionuclides for specific organs. The factors generated by INTDF were used for the calculations presented in this PEIS.

E.2.2.2 *Data and Assumptions*

In order to perform the dose assessments for this PEIS, different types of data must be collected and/or generated. In addition, calculational assumptions have to be made. This section discusses the data collected and/or generated for use in the dose assessment and assumptions made for this PEIS.

Meteorological Data. The meteorological data used for all applicable DOE sites were in the form of joint frequency data files. A joint frequency data file is a table listing the fractions of time the wind blows in a certain direction, at a certain speed, and within a certain stability class. The joint frequency data files were based on measurements over a 1-year period at various locations and at different heights at the sites. Average meteorological conditions (averaged over the 1-year period) were used for normal operation. For use in design basis accidents, the 50 percentile option was used.

Population Data. Population distributions were based on *1990 Census of Population and Housing* data. Projections were determined for the year 2030 for areas within 80 km (50 mi) of the proposed facilities at each candidate site. This year of analysis was selected as conservatively representative of the population over the operational period evaluated, and was used in the impact assessments. The population was spatially distributed on a circular grid with 16 directions and 10 radial distances up to 80 km (50 mi). The grid was centered on the facility from which the radionuclides were assumed to be released.

Source Term Data. The source terms (quantities of radionuclides released into the environment over a given period) were estimated on the basis of latest conceptual designs of facilities and experience with similar facilities. The source terms used to generate the estimated impacts of normal operation are provided in section E.2.3.

Food Production and Consumption Data. Data from the *1987 Census of Agriculture* were used to generate site-specific data for food production. Food production was spatially distributed on the same circular grid as was used for the population distributions. The consumption rates were those used in GENII for the maximum individual and average individual. People living within the 80 km (50 mi) assessment area were assumed to consume only food grown in that area.

Calculational Assumptions. Dose assessments were performed for members of the general public and workers. Dose assessments for members of the public were performed for two different types of receptors considered in this PEIS: a maximally exposed offsite individual and the general population living within 80 km (50 mi) of the facility. It was assumed that the maximally exposed individual was located at a position on the site boundary that would yield the highest impacts during normal operation of a given alternative. If more than one facility was assumed to be operating at a site, the dose to the individual from each facility was calculated. The doses were then summed to give the total dose to the individual. A 80 km (50 mi) population dose was calculated for each operating facility at a site. These doses were then added to give the total population dose at that site.

To estimate the radiological impacts from normal operation of Stockpile Stewardship and Management alternatives, additional assumptions and factors were considered in using GENII:

- No prior deposition of radionuclides on ground surfaces was assumed.
- For the maximally exposed offsite individual, the annual exposure time to the plume and to soil contamination was 0.7 years (NRC 1977b:1.109-68).
- For the population, the annual exposure time to the plume and to soil contamination was 0.5 years (NRC 1977b:1.109-68).
- A semi-infinite/finite plume model was used for air immersion doses. Other pathways evaluated were ground exposure, inhalation, ingestion of food crops and animal products contaminated by either deposition of radioactivity from the air or irrigation, ingestion of fish and other aquatic food raised in contaminated water, exposure through swimming and boating in contaminated surface water, and ingestion of contaminated water. It should be noted that not all pathways were available at every site.
- For atmospheric releases, it was assumed that ground-level releases would occur for all stockpile stewardship and management designated facilities. For site-dependent facilities, reported release heights were used and assumed to be the effective stack height. Use of the effective stack height negates plume rise, thereby making the resultant doses conservative.
- The calculated doses were 50-year committed doses from 1 year of intake.

Resuspension of particulates was not considered because prior calculations of dust loading in the atmosphere showed that this pathway was negligible compared with others. The exposure, uptake, and usage parameters used in the GENII model are provided in tables E.2.2.2–1 through E.2.2.2–4.

Annual average doses to workers for No Action at all DOE sites were based on measured values received by radiation workers during the 1992 time period. The average No Action dose received by a worker at these sites in future years was assumed to remain the same as the annual average during the 1992 period. The total workforce dose in future years was calculated by multiplying the average worker dose by a projected number of future workers.

Doses to workers directly associated with stewardship and management facilities were taken either from data reports prepared by the DOE Complex sites or from occupational dose histories for similar operations. To obtain the total workforce dose at a site with particular stewardship and/or management facilities in operation, the site dose from No Action was added to that from the facilities being evaluated. The average dose to a site worker was then calculated by dividing this dose by the total number of workers at the site. All doses to workers include a component associated with the intake of radioactivity into the body and another component resulting from external exposure to direct radiation.

E.2.2.3 *Health Effects Calculations*

Doses calculated by GENII were used to estimate health effects using the risk estimators presented in section E.2.1.2. The incremental cancer fatalities in the general population and groups of workers due to radiation exposure were therefore estimated by multiplying the collective combined effective dose equivalent by 0.0005 and 0.0004 fatal cancers/person-rem, respectively. In this PEIS, the collective combined effective dose equivalent is the sum of the collective committed effective dose equivalent (internal dose) and the collective effective dose equivalent (external dose), section E.2.1.1.

Although health risk factors are statistical factors and therefore not strictly applicable to individuals, they have been used in the past to estimate the incremental risk to an individual from exposure to radiation. Therefore, the factors of 0.0005 and 0.0004 per rem of individual committed effective dose equivalent for a member of the public and for a worker, respectively, have also been used in this PEIS to calculate the individual's incremental fatal cancer risk from exposure to radiation.

For the public, the health effects expressed in this PEIS are the risk of fatal cancers for the maximally exposed individual and the number of fatal cancers in the 80 km (50 mi) population from exposure to radioactivity released from any site over the 25-year operational period. For workers, the health effects expressed are the risk to the average worker at a site and the number of fatal cancers to all workers at the site from 25 years of site operation.

E.2.3 Normal Operation Releases

This section presents source terms (i.e., radiological releases) to the environment from the normal operation of stockpile management alternatives at each of the applicable proposed sites (Oak Ridge Reservation [ORR], table E.2.3–1; Savannah River Site [SRS], table E.2.3–2; Pantex Plant [Pantex], table E.2.3–3; Los Alamos National Laboratory [LANL], tables E.2.3–4 and E.2.3–5; Lawrence Livermore National Laboratory [LLNL], table E.2.3–6; and Nevada Test Site [NTS], table E.2.3–7). These source terms were used in the GENII dose model calculations, which were ultimately used in estimating the most conservative radiological impacts at each site from each of the applicable management alternatives presented in this PEIS. These resultant incremental doses (and associated cancer risks) can be found in sections 4.2.3.9, 4.3.3.9, 4.5.3.9, 4.6.3.9, 4.7.3.9, and 4.9.3.9, respectively, by subtracting the applicable site's No Action impacts from each management alternative's impact total. Only atmospheric releases have been presented because liquid radiological discharges are not expected from any of the alternatives at any of the sites.

TABLE E.2.2.2–1.—*GENII Annual Exposure Parameters to Plumes and Soil Contamination*

Maximally Exposed Individual				General Population			
External Exposure (hours)		Inhalation of Plume		External Exposure (hours)		Inhalation of Plume	
Plume	Soil Contamination	Exposure Time (hours)	Breathing Rate (cc/s)	Plume	Soil Contamination	Exposure Time (hours)	Breathing Rate (cc/s)
6,136	6,136	6,136	270	4,383	4,383	4,383	270

Source: HNUS 1995a.

TABLE E.2.2.2–2.—*GENII Annual Usage Parameters for Consumption of Terrestrial Food*

	Maximally Exposed Individual				General Population			
Food Type	Growing Time (days)	Yield (kg/m^2)	Holdup Time (days)	Consumption Rate (kg/yr)	Growing Time (days)	Yield (kg/m^2)	Holdup Time (days)	Consumption Rate (kg/yr)
Leafy vegetables	90.0	1.5	1.0	30.0	90.0	1.5	14.0	15.0
Root vegetables	90.0	4.0	5.0	220.0	90.0	4.0	14.0	140.0
Fruit	90.0	2.0	5.0	330.0	90.0	2.0	14.0	64.0
Grains/cereals	90.0	0.8	180.0	80.0	90.0	0.8	180.0	72.0

Source: HNUS 1995a.

TABLE E.2.2.2–3.—*GENII Annual Usage Parameters for Consumption of Animal Products*

	Maximally Exposed Individual									
	Human Consumption		Stored Feed				Fresh Forage			
Food Type	Consumption Rate (kg/yr)	Holdup Time (days)	Diet Fraction	Growing Time (days)	Yield (kg/m^3)	Storage Time (days)	Diet Fraction	Growing Time (days)	Yield (kg/m^3)	Storage Time (days)
Beef	80.0	15.0	0.25	90.0	0.80	180.0	0.75	45.0	2.00	100.0
Poultry	18.0	1.0	1.00	90.0	0.80	180.0				
Milk	270.0	1.0	0.25	45.0	2.00	100.0	0.75	30.0	1.50	0.0
Eggs	30.0	1.0	1.00	90.0	0.80	180.0				
	General Population									
Beef	70.0	34.0	0.25	90.0	0.80	180.0	0.75	45.0	2.00	100.0
Poultry	8.5	34.0	1.00	90.0	0.80	180.0				
Milk	230.0	4.0	0.25	45.0	2.00	100.0	0.75	30.0	1.50	0.0
Eggs	20.0	18.0	1.00	90.0	0.80	180.0				

Source: HNUS 1995a.

TABLE E.2.2.2–4.—*GENII Annual Usage Parameters for Aquatic Activities*

	Maximally Exposed Individual			General Population		
Activity	Transit Time to Usage Point (days)	Holdup Time (days)	Usage Rate (per year)	Transit Time to Usage Point (days)	Holdup Time (days)	Usage Rate
Drinking water	0.0	0.0	730 L	0.0	0.0	Site dependent
Swimming	0.0	0.0	100 hours	0.0	0.0	Site dependent
Boating	0.0	0.0	100 hours	0.0	0.0	Site dependent
Shoreline	0.0	0.0	500 hours	0.0	0.0	Site dependent
Ingestion of fish	0.0	0.0	40 kg	0.0	0.0	Site dependent
Ingestion of mollus	0.0	0.0	6.9 kg	0.0	0.0	Site dependent
Ingestion of crusta	0.0	0.0	6.9 kg	0.0	0.0	Site dependent
Ingestion of plants	0.0	0.0	6.9 kg	0.0	0.0	Site dependent

Source: HNUS 1995a.

TABLE E.2.3–1.—*Normal Operational Atmospheric Releases for the Y-12 Downsize Secondary and Case Fabrication Alternative*

Isotope	Release (Ci)
Uranium-235	4.2×10^{-4}
Uranium-238	1.5×10^{-3}

Source: OR MMES 1996j.

TABLE E.2.3–2.—*Normal Operational Atmospheric Releases for the Savannah River Site Pit Fabrication Alternative*

Isotope	Release (Ci)
Plutonium-238	1.9×10^{-8}
Plutonium-239	1.3×10^{-7}
Plutonium-240	3.0×10^{-8}
Plutonium-241	9.0×10^{-7}
Americium-241	2.8×10^{-8}
Total	1.1×10^{-6}

Note: Representative of unclassified isotopic distribution associated with weapons-grade plutonium.

Source: LANL1995g.

TABLE E.2.3–3.—*Normal Operational Atmospheric Releases for the Pantex Plant Downsize Assembly/Disassembly Alternative*

Isotope	Release (Ci)
Hydrogen-3	0.45

Source: PX MH 1995a.

TABLE E.2.3–4.—*Normal Operational Atmospheric Releases for the Los Alamos National Laboratory Pit Fabrication Alternative*

Isotope	Release (Ci)
Plutonium-238	1.9×10^{-8}
Plutonium-239	1.3×10^{-7}
Plutonium-240	3.0×10^{-8}
Plutonium-241	9.0×10^{-7}
Americium-241	2.8×10^{-8}
Total	1.1×10^{-6}

Note: Representative of unclassified complete isotopic distribution associated with weapons-grade plutonium.

Source: LANL 1995g.

TABLE E.2.3–5.—*Normal Operational Atmospheric Releases for the Los Alamos National Laboratory Secondary and Case Fabrication Alternative*

Isotope	Release (Ci)
Uranium-235	$4.9x10^{-4}$
Uranium-238	$1.8x10^{-3}$

Source: LANL 1995e.

TABLE E.2.3–6.—*Normal Operational Atmospheric Releases for the Lawrence Livermore National Laboratory Secondary and Case Fabrication Alternative*

Isotope	Release (Ci)
Uranium-235	$1.4x10^{-4}$
Uranium-238	$4.8x10^{-4}$

Source: LLNL 1995c.

TABLE E.2.3–7.—*Normal Operational Atmospheric Releases for the Nevada Test Site Assembly/Disassembly Alternative*

Isotope	Release (Ci)
Hydrogen-3	0.45

Source: PX MH 1995a.

E.3 HAZARDOUS CHEMICAL IMPACTS TO HUMAN HEALTH

E.3.1 Background

Two general types of adverse human health effects are assessed for hazardous chemical exposure in this PEIS. These are carcinogenic and noncarcinogenic effects. A *Chemical Health Effects Technical Reference* (TTI 1996b) was developed to assist the risk assessor in the evaluation process. Part I of the Technical Reference contains a table of chemical toxicity profiles which characterizes each chemical in terms of physical properties, potential exposure routes, and the effects on target tissues/organs that might be expected. It is to be used qualitatively by the risk assessor to determine how exposure might occur (exposure route), what tissue or organ system might be impacted (e.g., central nervous system dysfunction, or liver cancer), and whether the chemical might possess other properties affecting its bioavailability in a given matrix (e.g., air, water, or soil). Part II of the Technical Reference contains a table of exposure limits which provides the risk assessor with the necessary information to calculate risk or expected adverse effects should an individual be exposed to a hazardous chemical for a long time at low levels (chronic exposure) or to higher concentrations for a short-term (acute) exposure. Where a dose effect calculation is required (milligram [mg]/kg/day), the reference dose is applicable, and where an inhalation concentration effect is required, the reference concentration (i.e., RfC in mg/m^3) is applicable for chronic exposures. The permissible exposure limit values, which regulate worker exposures over 8-hour periods, determine the concentration allowed for occupational exposures that would be without adverse acute effects. Other values, such as the threshold limit value (TLV), are presented because they are prepared by the American Conference of Governmental Industrial Hygienists for guidance on exposures of 8-hour periods, and can be used to augment permissible exposure limits or serve as exposure levels in the absence of a permissible exposure limit. All currently regulated chemicals associated with each site and every hazardous chemical are presented in the *Chemical Health Effects Technical Reference*.

It was assumed that under normal operation conditions members of the public would only receive chronic exposures at low levels in the form of air emissions from a centrally located source term at each site. Since hazardous chemicals are not released into surface or groundwaters or onto soil, inhalation is assumed to be the only route of exposure. However, all chemical quantities are accounted for as air emissions which are several orders of magnitude greater than all other possible routes combined. It was further assumed that the maximally exposed individual member of the public would be at the site boundary, and this assumption was used when calculating all public exposures, which under normal operating conditions are expected to be chronic and at very low levels. For worker exposures to hazardous chemicals, it was assumed that individuals were exposed only to low air emission concentrations during an 8-hour day for a 40-hour week for a maximum working lifetime of 40 years. The point of exposure chosen was 100 meters from a centrally located source term, since the precise placement of source terms onsite could not be made. Further, it could not be determined where the involved and noninvolved workers would be relative to the emission sources.

For every site involved in the analysis, hazard indexes (HIs) were calculated for every alternative action relative to the site. The exposure concentrations of hazardous chemicals for the public and the onsite workers were developed using the industrial source complex short-term model recommended for point, area, and volume sources. This model, which estimates dispersion of emissions from these sources, has been field-tested and recommended by the EPA. The modeled concentrations were compared to the reference concentration and permissible exposure limit values unique to each chemical to yield hazard quotients (HQs) for the public and onsite workers, respectively. The HQs were summed to give the HIs for each alternative action at each site, as well as total HIs (i.e., No Action HI + alternative HI). For cancer risk estimation, the inhaled concentrations were converted to doses in mg/kg/day, which were then multiplied by the slope factors unique to each identified carcinogen. The risks for all carcinogens associated with each alternative (incremental risk) at each site were summed, and the No Action cancer risk for each site was added in order to show the total risk should that alternative action be implemented at a given site. This PEIS does not purport to provide the level of detail needed to go beyond a conservative screening process for hazardous chemicals. As such, the analysis in this PEIS for the No Action alternative should not be relied upon as a basis for judging the sites as having a hazardous chemical health concern.

E.3.2 Chemical Toxicity Profiles

Part I of the *Chemical Health Effects Technical Reference* provides the pertinent facts about each chemical that is included in the risk assessment of this PEIS. This reference includes the chemical abstracts service number, which aids in a search for information available on any specific chemical and ensures a positive identity regardless of which name or synonym is used. It also contains physical information (i.e., solubility, vapor pressure, and flammability), as well as incompatibility data that is useful in determining whether a hazard might exist and the nature of the hazard. The route of exposure, target organs/tissues, and carcinogenicity provide an abbreviated summary on how individuals may get exposed, what body functions could be affected, and whether chronic exposure could lead to increased cancer incidence in an exposed population.

E.3.3 Regulated Exposure Limits

Hazardous chemicals are regulated by various agencies in order to provide protection to the public (EPA regulated) and to workers (Occupational Safety and Health Administration [OSHA]), while others (National Institute for Occupational Safety and Health and the American Conference of Governmental Industrial Hygienists) provide guidelines. The reference doses and reference concentrations set by EPA represent exposure limits for long–term (chronic) exposure at low doses and concentrations, respectively, that can be considered safe from adverse noncancer effects. The permissible exposure limit represents concentration levels set by OSHA that are safe for 8-hour exposures without causing noncancer adverse effects. The slope factor or the unit risk is used to convert the daily uptake of a carcinogenic chemical averaged over a lifetime to the incremental risk of an individual developing cancer. Part II of the *Chemical Health Effects Technical Reference* presents the information on exposure limits used to develop HQs for each of the hazardous chemicals and the HIs derived from their summation and the slope factors used to calculate cancer risk for each chemical at the exposure concentrations identified at the various sites or associated with a proposed alternative action.

E.3.4 Hazardous Chemical Risks/Effects Calculations

Tables E.3.4–1 through E.3.4–30 show the chemicals associated with the various activities and the various sites considered for each alternative. The increment added by each activity to the site is totalled to show how much the risk at the site would increase should that alternative be implemented. Calculations used to derive the hazard indices for workers and for the public are presented as footnotes to each of the appendix tables. In addition, the slope factor used to calculate the cancer risk for workers and for the public are presented as footnotes in the appendix tables, and the footnotes to the tables show how the cancer risk was performed.

TABLE E.3.4–1.—*Risk Assessments from Exposure to Hazardous Chemicals from No Action at Oak Ridge Reservation*

Chemical	Regulated Exposure Limits/ Risk Factors			Emissions Inventory		Hazard Quotient		Cancer Risk	
	RfC (mg/m^3)	PEL[a] (mg/m^3)	Slope Factor (mg/kg/day)	Boundary Annual MEI[b] (mg/m^3)	Worker 100 m 8 hours (mg/m^3)	Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
Acetic acid	0.6125	25	None	3.30×10^{-8}	1.98×10^{-5}	5.39×10^{-8}	7.93×10^{-7}	0	0
Carbon monoxide	1.35	55	None	3.14×10^{-3}	1.88	2.32×10^{-3}	3.42×10^{-2}	0	0
Chlorine	0.35	3	None	5.78×10^{-5}	3.47×10^{-2}	1.65×10^{-4}	1.16×10^{-2}	0	0
Hydrogen chloride	0.0070	7.0	None	2.12×10^{-4}	1.27×10^{-1}	3.03×10^{-2}	1.82×10^{-2}	0	0
Hydrogen fluoride	0.21	2.49	None	2.31×10^{-6}	1.39×10^{-3}	1.10×10^{-5}	5.57×10^{-4}	0	0
Methyl alcohol	1.75	260	None	8.72×10^{-4}	5.23×10^{-1}	4.98×10^{-4}	2.01×10^{-3}	0	0
Nitric acid	0.1225	5	None	3.14×10^{-4}	1.88×10^{-1}	2.56×10^{-3}	3.76×10^{-2}	0	0
Sulfuric acid	0.0245	1	None	8.25×10^{-5}	4.95×10^{-2}	3.37×10^{-3}	4.95×10^{-2}	0	0
1,1,1-Trichloroethane (TCA)	1.000	1,900	None	7.26×10^{-6}	4.36×10^{-3}	5.93×10^{-5}	2.29×10^{-6}	0	0
Volatile organic compounds (toluene)	0.4	766	None	1.22×10^{-4}	7.33×10^{-2}	3.05×10^{-4}	9.57×10^{-5}	0	0
Hazard Index[g]						3.95×10^{-2}	1.54×10^{-1}		
Total Cancer Risk[h]								0	0

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.
[b] MEI - maximally exposed individual of the public.
[c] Hazard Quotient for MEI - boundary annual emissions/reference concentration (RfC).
[d] Hazard Quotient for workers - 100-m, 8-hr emissions/permissible exposure limit (PEL).
[e] Cancer risk for MEI - (emissions concentrations) x (0.286 [converts concentration to dose]) x (slope factor [SF]).
[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor)
[g] Hazard index - sum of individual hazard quotients.
[h] Total cancer risk - sum of individual cancer risks.
Source: OR LMES 1995e.

TABLE E.3.4–2.—*Risk Assessments from Exposure to Hazardous Chemicals from Downsize/Consolidate Secondary and Case Fabrication at Oak Ridge Reservation*

	Regulated Exposure Limits/ Risk Factors			Emissions Inventory		Hazard Quotient		Cancer Risk	
Chemical	RfC (mg/m^3)	PEL[a] (mg/m^3)	Slope Factor (mg/kg/day)	Boundary Annual MEI[b] (mg/m^3)	Worker 100 m 8 hours (mg/m^3)	Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
Carbon monoxide	1.35	55	None	4.85×10^{-4}	2.91×10^{-1}	3.59×10^{-4}	5.30×10^{-3}	0	0
Chlorine	0.35	3	None	8.91×10^{-6}	5.35×10^{-3}	2.55×10^{-5}	1.78×10^{-3}	0	0
Hydrogen chloride	0.0070	7.0	None	3.17×10^{-4}	1.90×10^{-1}	4.53×10^{-2}	2.72×10^{-2}	0	0
Methyl alcohol	1.75	260	None	9.57×10^{-4}	5.75×10^{-1}	5.47×10^{-4}	2.21×10^{-3}	0	0
Nitric acid	0.1225	5	None	4.62×10^{-4}	2.77×10^{-1}	3.77×10^{-3}	5.65×10^{-2}	0	0
Ozone	0.0049	0.2	None	4.62×10^{-6}	2.77×10^{-3}	9.43×10^{-4}	1.39×10^{-2}	0	0
Sulfuric acid	0.0245	1	None	1.19×10^{-4}	7.13×10^{-2}	4.85×10^{-3}	7.13×10^{-2}	0	0
Uranium-235	0.0105	0.25	None	6.60×10^{-9}	3.96×10^{-6}	6.29×10^{-7}	1.59×10^{-5}	0	0
Uranium-238	0.0105	0.25	None	1.32×10^{-7}	7.93×10^{-5}	1.22×10^{-5}	3.17×10^{-4}	0	0
Volatile organic compounds (toluene)	0.4	766	None	7.92×10^{-5}	4.76×10^{-2}	1.98×10^{-4}	6.21×10^{-5}	0	0
Hazard Index[g]						5.60×10^{-2}	1.78×10^{-1}		
Total Cancer Risk[h]								0	0

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.
[b] MEI - maximally exposed individual of the public.
[c] Hazard Quotient for MEI - boundary annual emissions/reference concentration (RfC).
[d] Hazard Quotient for workers - 100-m, 8-hr emissions/permissible exposure limit (PEL).
[e] Cancer risk for MEI - (emissions concentrations) x (0.286 [converts concentration to dose]) x (slope factor [SF]).
[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).
[g] Hazard index - sum of individual hazard quotients.
[h] Total cancer risk - sum of individual cancer risks.
Source: OR MMES 1996j.

TABLE E.3.4–3.—*Risk Assessments from Exposure to Hazardous Chemicals from Phaseout of Secondary and Case Fabrication at Oak Ridge Reservation*

Chemical	Regulated Exposure Limits/ Risk Factors			Emissions Inventory		Hazard Quotient		Cancer Risk	
	RfC (mg/m^3)	PEL[a] (mg/m^3)	Slope Factor (mg/kg/day)	Boundary Annual MEI[b] (mg/m^3)	Worker 100 m 8 hours (mg/m^3)	Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
Carbon monoxide	1.35	55	None	$1.36x10^{-2}$	2.60	$1.01x10^{-2}$	$4.73x10^{-2}$	0	0
Chlorine	0.35	3	None	$2.63x10^{-4}$	$5.04x10^{-2}$	$7.51x10^{-4}$	$1.68x10^{-2}$	0	0
Hydrogen chloride	0.0070	7.0	None	$1.12x10^{-4}$	$2.16x10^{-2}$	$1.61x10^{-2}$	$3.08x10^{-3}$	0	0
Methyl alcohol	1.75	260	None	$4.30x10^{-4}$	$8.24x10^{-2}$	$2.46x10^{-4}$	$3.17x10^{-4}$	0	0
Nitric acid	0.1225	5	None	$1.65x10^{-4}$	$3.17x10^{-2}$	$1.35x10^{-3}$	$6.34x10^{-3}$	0	0
Sulfuric acid	0.0245	1	None	$5.29x10^{-5}$	$1.01x10^{-2}$	$2.16x10^{-3}$	$1.01x10^{-2}$	0	0
1,1,1-Trichloroethane (TCA)	0.1225	1,900	None	$3.31x10^{-6}$	$6.34x10^{-4}$	$2.70x10^{-5}$	$3.34x10^{-7}$	0	0
Volatile organic compounds (toluene)	0.4	766	None	$3.80x10^{-4}$	$7.29x10^{-2}$	$9.51x10^{-4}$	$9.52x10^{-5}$	0	0
Hazard Index[g]						$3.16x10^{-2}$	$8.41x10^{-2}$		
Total Cancer Risk[h]								0	0

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.
[b] MEI - maximally exposed individual of the public.
[c] Hazard Quotient for MEI - boundary annual emissions/reference concentration (RfC).
[d] Hazard Quotient for workers - 100-m, 8-hr emissions/permissible exposure limit (PEL).
[e] Cancer risk for MEI - (emissions concentrations) x (0.286 [converts concentration to dose]) x (slope factor [SF]).
[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).
[g] Hazard index - sum of individual hazard quotients.
[h] Total cancer risk - sum of individual cancer risks.
Source: OR LMES 1996i.

TABLE E.3.4–4.—*Risk Assessments from Exposure to Hazardous Chemicals from No Action at Savannah River Site*

Chemical	Regulated Exposure Limits/ Risk Factors			Emissions Inventory		Hazard Quotient		Cancer Risk	
	RfC (mg/m^3)	PEL[a] (mg/m^3)	Slope Factor (mg/kg/day)	Boundary Annual MEI[b] (mg/m^3)	Worker 100 m 8 hours (mg/m^3)	Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
Benzene	0.0796	3.25	0.029	$1.25x10^{-6}$	$1.37x10^{-2}$	$1.57x10^{-5}$	$4.2x10^{-3}$	$1.04x10^{-8}$	$1.53x10^{-5}$
Benzene	0.0796	3.25	0.029	$1.23x10^{-5}$	$1.35x10^{-1}$	$1.55x10^{-4}$	$4.15x10^{-2}$	$1.02x10^{-7}$	$1.51x10^{-4}$
Carbon Monoxide	1.35	55	None	$5.41x10^{-3}$	$5.91x10^{-1}$	$4.01x10^{-3}$	1.07	0	0
Chlorine	0.35	3	None	$9.27x10^{-9}$	$1.01x10^{-4}$	$2.65x10^{-8}$	$3.37x10^{-5}$	0	0
Chloroform	0.035	240	0.0061	$4.79x10^{-6}$	$5.24x10^{-2}$	$1.37x10^{-4}$	$2.18x10^{-4}$	$8.36x10^{-9}$	$1.24x10^{-5}$
Cobalt	0.00245	0.1	None	$7.46x10^{-9}$	$8.15x10^{-5}$	$3.05x10^{-6}$	$8.15x10^{-4}$	0	0
Hydrogen Fluoride	0.21	2.49	None	$4.29x10^{-8}$	$4.69x10^{-4}$	$2.04x10^{-7}$	$1.88x10^{-4}$	0	0
Hydrogen Fluoride	0.21	2.49	None	$8.39x10^{-12}$	$9.16x10^{-8}$	$3.99x10^{-11}$	$3.68x10^{-8}$	0	0
Mercury	0.0003	0.1	None	$5.17x10^{-8}$	$5.65x10^{-4}$	$1.72x10^{-4}$	$5.65x10^{-3}$	0	0
Mercury (vapor)	0.0003	0.1	None	$1.89x10^{-7}$	$2.06x10^{-3}$	$6.29x10^{-4}$	$2.06x10^{-2}$	0	0
Mercury oxide	0.0003	0.1	None	$6.36x10^{-18}$	$6.95x10^{-14}$	$2.12x10^{-14}$	$6.95x10^{-13}$	0	0
Nickel compounds	0.0245	1	0.84	$3.16x10^{-16}$	$3.45x10^{-12}$	$1.29x10^{-14}$	$3.45x10^{-12}$	$7.6x10^{-17}$	$1.12x10^{-13}$
Nickel (vapor and compounds)	0.0245	1	0.84	$4.31x10^{-8}$	$4.7x10^{-4}$	$1.76x10^{-6}$	$4.7x10^{-4}$	$1.03x10^{-8}$	$1.53x10^{-5}$
Nitric acid	0.1225	5	None	$3.73x10^{-6}$	$4.07x10^{-2}$	$3.04x10^{-5}$	$8.15x10^{-3}$	0	0
Phosphoric acid	0.0245	1	None	$1.5x10^{-7}$	$1.63x10^{-3}$	$6.11x10^{-6}$	$1.63x10^{-3}$	0	0
Hazard Index[g]						$5.16x10^{-3}$	1.16		
Total Cancer Risk[h]								$1.31x10^{-7}$	$1.94x10^{-4}$

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.
[b] MEI - maximally exposed individual of the public.
[c] Hazard Quotient for MEI - boundary annual emissions/reference concentration (RfC).
[d] Hazard Quotient for workers - 100-m, 8-hr emissions/permissible exposure limit (PEL).
[e] Cancer risk for MEI - (emissions concentrations) x (0.286 [converts concentration to dose]) x (slope factor [SF]).
[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).
[g] Hazard index - sum of individual hazard quotients.
[h] Total cancer risk - sum of individual cancer risks.

Source: SRS 1995a:2.

TABLE E.3.4–5.—*Risk Assessments from Exposure to Hazardous Chemicals from Pit Fabrication at Savannah River Site*

Chemical	Regulated Exposure Limits/ Risk Factors: RfC (mg/m^3)	PEL[a] (mg/m^3)	Slope Factor (mg/kg/day)	Emissions Inventory: Boundary Annual MEI[b] (mg/m^3)	Worker 100 m 8 hours (mg/m^3)	Hazard Quotient: Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Cancer Risk: Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
Carbon monoxide	1.35	55	None	1.06×10^{-6}	1.55×10^{-2}	7.82×10^{-7}	2.10×10^{-4}	0	0
Carbon dioxide	221	9,000	None	6.99×10^{-5}	7.64×10^{-1}	3.16×10^{-7}	8.48×10^{-5}	0	0
Volatile organic compounds (toluene)	0.4	766	None	2.94×10^{-7}	3.21×10^{-3}	7.34×10^{-7}	4.19×10^{-6}	0	0
Hazard Index[g]						1.83×10^{-6}	2.99×10^{-4}		
Total Cancer Risk[h]								0	0

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.
[b] MEI - maximally exposed individual of the public.
[c] Hazard Quotient for MEI - boundary annual emissions/reference concentration (RfC).
[d] Hazard Quotient for workers - 100-m, 8-hr emissions/permissible exposure limit (PEL).
[e] Cancer risk for MEI - (emissions concentrations) x (0.286 [converts concentration to dose]) x (slope factor [SF]).
[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).
[g] Hazard index - sum of individual hazard quotients.
[h] Total cancer risk - sum of individual cancer risks.
Source: WSRC 1995c.

TABLE E.3.4–6.—*Risk Assessments from Exposure to Hazardous Chemicals from No Action at Kansas City Plant*

Chemical	Regulated Exposure Limits/ Risk Factors			Emissions Inventory		Hazard Quotient		Cancer Risk	
	RfC (mg/m^3)	PEL[a] (mg/m^3)	Slope Factor (mg/kg/day)	Boundary Annual MEI[b] (mg/m^3)	Worker 100 m 8 hours (mg/m^3)	Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
Acetone	0.35	2,400	None	1.10×10^{-4}	5.71×10^{-3}	3.63×10^{-4}	2.38×10^{-6}	0	0
Carbon monoxide	1.35	55	None	5.31×10^{-3}	2.77×10^{-1}	3.93×10^{-3}	5.03×10^{-3}	0	0
Chromium (trivalent)	3.5	0.05	None	3.66×10^{-6}	1.90×10^{-4}	1.04×10^{-6}	3.81×10^{-3}	0	0
Cyanide (hydrogen cyanide)	0.07	11	None	4.11×10^{-6}	2.14×10^{-4}	5.88×10^{-5}	1.95×10^{-5}	0	0
Ethyl benzene	1	435	None	2.19×10^{-5}	1.14×10^{-3}	2.19×10^{-5}	2.63×10^{-6}	0	0
Formaldehyde	0.7	0.9375	None	3.66×10^{-6}	1.90×10^{-4}	5.22×10^{-6}	2.03×10^{-4}	0	0
Hydrogen chloride	0.007	7	None	1.10×10^{-5}	5.71×10^{-4}	1.57×10^{-3}	8.16×10^{-5}	0	0
Isopropyl alcohol	24.01	980	None	6.22×10^{-4}	3.24×10^{-2}	2.59×10^{-5}	3.30×10^{-5}	0	0
Methyl alcohol	1.75	260	None	3.66×10^{-6}	1.90×10^{-4}	2.09×10^{-6}	7.32×10^{-7}	0	0
Methyl ethyl ketone (MEK)	1	590	None	6.22×10^{-5}	3.24×10^{-3}	6.22×10^{-5}	5.49×10^{-6}	0	0
Methyl isobutyl ketone (MIBK)	0.28	410	None	1.10×10^{-5}	5.71×10^{-4}	3.92×10^{-5}	1.39×10^{-6}	0	0
Perchloroethylene	0.035	689	0.002	1.17×10^{-4}	6.09×10^{-3}	3.34×10^{-3}	8.84×10^{-6}	6.69×10^{-8}	4.72×10^{-7}
Toluene	0.4	766	None	1.79×10^{-4}	9.33×10^{-3}	4.48×10^{-4}	1.22×10^{-5}	0	0
Toluene-2,4-diisocyanate (TDI)	0.00343	0.14	None	3.66×10^{-6}	1.90×10^{-4}	1.07×10^{-3}	1.36×10^{-3}	0	0
1,1,1-Trichloroethane (TCA)	0.1225	1,900	None	1.46×10^{-5}	7.62×10^{-4}	1.19×10^{-4}	4.01×10^{-7}	0	0
Trichloroethylene (TCE)	13.377	546	0.006	6.22×10^{-4}	3.24×10^{-2}	4.65×10^{-5}	5.93×10^{-5}	1.07×10^{-6}	7.52×10^{-6}
Volatile organic compounds (toluene)	0.4	766	None	3.20×10^{-3}	1.67×10^{-1}	8.00×10^{-3}	2.18×10^{-4}	0	0
Xylene	7	434	None	1.02×10^{-4}	5.33×10^{-3}	1.46×10^{-5}	1.23×10^{-5}	0	0
Hazard Index[g]						1.90×10^{-2}	1.08×10^{-2}		
Total Cancer Risk[h]								1.13×10^{-6}	7.99×10^{-6}

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.

[b] MEI - maximally exposed individual of the public.

[c] Hazard Quotient for MEI - boundary annual emissions/reference concentration (RfC).

[d] Hazard Quotient for workers - 100-m, 8-hr emissions/permissible exposure limit (PEL).

[e] Cancer risk for MEI - (emissions concentrations) x (0.286 [converts concentration to dose]) x (slope factor [SF]).

[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).

[g] Hazard index - sum of individual hazard quotients.

[h] Total cancer risk - sum of individual cancer risks.

Source: KCP 1995a:1.

TABLE E.3.4–7.—*Risk Assessments from Exposure to Hazardous Chemicals from Nonnuclear Fabrication at Kansas City Plant*

	Regulated Exposure Limits/ Risk Factors			Emissions Inventory		Hazard Quotient		Cancer Risk	
Chemical	RfC (mg/m^3)	PEL[a] (mg/m^3)	Slope Factor (mg/kg/day)	Boundary Annual MEI[b] (mg/m^3)	Worker 100 m 8 hours (mg/m^3)	Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
Acetone	0.35	2,400	None	$1.19x10^{-4}$	$6.07x10^{-3}$	$3.33x10^{-4}$	$2.53x10^{-6}$	0	0
Isopropyl alcohol	24.01	980	None	$1.05x10^{-3}$	$5.48x10^{-2}$	$4.38x10^{-5}$	$5.59x10^{-5}$	0	0
Methyl ethyl ketone (MEK)	1	590	None	$7.08x10^{-5}$	$3.69x10^{-3}$	$7.08x10^{-5}$	$6.25x10^{-6}$	0	0
Toluene	0.4	766	None	$2.00x10^{-4}$	$1.04x10^{-2}$	$5.00x10^{-4}$	$1.36x10^{-5}$	0	0
Trichloroethylene (TCE)	13.377	546	0.006	$9.61x10^{-4}$	$5.00x10^{-2}$	$2.18x10^{-5}$	$9.17x10^{-5}$	$1.65x10^{-6}$	$1.16x10^{-5}$
Hazard Index[g]						$1.02x10^{-3}$	$1.70x10^{-4}$		
Total Cancer Risk[h]								$1.65x10^{-6}$	$1.16x10^{-5}$

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.
[b] MEI - maximally exposed individual of the public.
[c] Hazard Quotient for MEI - boundary annual emissions/reference concentration (RfC).
[d] Hazard Quotient for workers - 100-m, 8-hr emissions/permissible exposure limit (PEL).
[e] Cancer risk for MEI - (emissions concentrations) x (0.286 [converts concentration to dose]) x (slope factor [SF]).
[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).
[g] Hazard index - sum of individual hazard quotients.
[h] Total cancer risk - sum of individual cancer risks.
Source: KC ASI 1995a.

TABLE E.3.4–8.—*Risk Assessments from Exposure to Hazardous Chemicals from Phaseout of Nonnuclear Fabrication at Kansas City Plant*

	Regulated Exposure Limits/ Risk Factors			Emissions Inventory		Hazard Quotient		Cancer Risk	
Chemical	**RfC (mg/m^3)**	**PEL[a] (mg/m^3)**	**Slope Factor (mg/kg/day)**	**Boundary Annual MEI[b] (mg/m^3)**	**Worker 100 m 8 hours (mg/m^3)**	**Boundary Annual MEI[b,c]**	**Worker 100 m 8 hours[d]**	**Boundary Annual MEI[b,e]**	**Worker 100 m 8 hours[f]**
None	0	0	None	0	0	0	0	0	0
Hazard Index[g]						0	0		
Total Cancer Risk[h]								0	0

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.
[b] MEI - maximally exposed individual of the public.
[c] Hazard Quotient for MEI - boundary annual emissions/reference concentration (RfC).
[d] Hazard Quotient for workers - 100-m, 8-hr emissions/permissible exposure limit (PEL).
[e] Cancer risk for MEI - (emissions concentrations) x (0.286 [converts concentration to dose]) x (slope factor [SF]).
[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).
[g] Hazard index - sum of individual hazard quotients.
[h] Total cancer risk - sum of individual cancer risks.
Source: KC ASI 1995a.

TABLE E.3.4–9.—*Risk Assessments from Exposure to Hazardous Chemicals from No Action at Pantex Plant* [Page 1 of 2]

Chemical	Regulated Exposure Limits/ Risk Factors			Emissions Inventory		Hazard Quotient[a,b]		Cancer Risk[c,d]	
	RfC (mg/m³)	PEL[a] (mg/m³)	Slope Factor (mg/kg/day)	Boundary Annual MEI[e] (mg/m³)	Worker 100 m 8 hours (mg/m³)	Boundary Annual MEI[b]	Worker 100 m 8 hours[f]	Boundary Annual MEI[b]	Worker 100 m 8 hours
Benzene[f]	0.0796	3.25	None						
Carbon disulfide	0.35	63.2	None	8.53×10^{-7}	2.56×10^{-4}	2.44×10^{-6}	4.05×10^{-6}	0	0
Carbon tetrachloride	0.00245	63.9	0.053	4.91×10^{-7}	1.48×10^{-4}	2.01×10^{-4}	2.31×10^{-6}	7.45×10^{-9}	3.03×10^{-7}
Chlorobenzene	0.07	350	None	5.63×10^{-8}	1.69×10^{-5}	8.05×10^{-7}	4.83×10^{-8}	0	0
1,1,1-Chloroethane (Trichloroethane) (TCA)	1	1,900	None	7.17×10^{-7}	2.15×10^{-4}	7.17×10^{-7}	1.13×10^{-7}	0	0
Chromium (hexavalent)[f]	0.0175	1	None						
Cresol	0.539	22	None	1.57×10^{-9}	4.72×10^{-7}	2.92×10^{-9}	2.15×10^{-8}	0	0
Cresylic acid	0.539	22	None	1.57×10^{-9}	4.72×10^{-7}	2.92×10^{-9}	2.15×10^{-8}	0	0
Dibenzofuran	None	None	None	2.29×10^{-9}	6.87×10^{-7}	None	None	0	0
Ester glycol ethers (2-ethoxyethanol)	0.2	740	None	2.70×10^{-8}	8.12×10^{-6}	1.35×10^{-7}	1.10×10^{-8}	0	0
Ethyl benzene	1	435	None	4.78×10^{-8}	1.43×10^{-5}	4.78×10^{-8}	3.30×10^{-8}	0	0
Ethylene dichloride	5.03	205.5	0.091	4.19×10^{-8}	1.26×10^{-5}	8.33×10^{-9}	6.12×10^{-8}	1.09×10^{-9}	4.43×10^{-8}
Formaldehyde[f]	0.7	0.9375	0.045						
Hydrogen chloride	0.007	7	None	3.49×10^{-5}	1.05×10^{-2}	4.98×10^{-3}	1.50×10^{-3}	0	0
Hydrogen fluoride	0.21	2.49	None	3.71×10^{-5}	1.11×10^{-2}	1.77×10^{-4}	4.47×10^{-3}	0	0
Ketones (acetone)	0.35	2,400	None	8.72×10^{-9}	2.62×10^{-6}	2.49×10^{-8}	1.09×10^{-9}	0	0
Methyl alcohol	1.75	260	None	3.45×10^{-5}	1.04×10^{-2}	1.97×10^{-5}	3.98×10^{-5}	0	0
Methyl ethyl ketone (MEK)	1	590	None	2.23×10^{-4}	6.69×10^{-2}	2.23×10^{-4}	1.13×10^{-4}	0	0
Methylene chloride[f]	3	1,765	0.075						
Methyl isobutyl ketone (MIBK)	0.28	410	None	1.94×10^{-8}	5.84×10^{-6}	6.94×10^{-8}	1.42×10^{-8}	0	0
Naphthalene	0.014	50	None	1.29×10^{-8}	3.87×10^{-6}	9.19×10^{-7}	7.73×10^{-8}	0	0
Nickel	0.0245	1	0.84	5.15×10^{-9}	1.55×10^{-6}	2.10×10^{-7}	1.55×10^{-6}	1.24×10^{-9}	5.03×10^{-8}
Nitrobenzene	0.00175	5	None	1.57×10^{-9}	4.72×10^{-7}	8.99×10^{-7}	9.45×10^{-8}	0	0
2-Nitropropane[f]	0.02	90	9.4						

TABLE E.3.4–9.—*Risk Assessments from Exposure to Hazardous Chemicals from No Action at Pantex Plant* [Page 2 of 2]

	Regulated Exposure Limits/ Risk Factors			Emissions Inventory		Hazard Quotient[a,b]		Cancer Risk[c,d]	
Chemical	**RfC (mg/m^3)**	**PEL[a] (mg/m^3)**	**Slope Factor (mg/kg/day)**	**Boundary Annual MEI[e] (mg/m^3)**	**Worker 100 m 8 hours (mg/m^3)**	**Boundary Annual MEI[b]**	**Worker 100 m 8 hours[f]**	**Boundary Annual MEI[b]**	**Worker 100 m 8 hours**
Phenol	2.1	19	None	7.03×10^{-8}	2.11×10^{-5}	3.35×10^{-8}	1.11×10^{-6}	0	0
Tetrachloroethylene	0.035	689	0.002	2.03×10^{-7}	6.09×10^{-5}	5.80×10^{-6}	8.85×10^{-8}	1.16×10^{-10}	4.72×10^{-9}
Toluene	0.4	766	None	1.47×10^{-5}	4.41×10^{-3}	3.67×10^{-5}	5.76×10^{-6}	0	0
1,1,2-Trichloroethane[f]	1.014	45	None						
Trichloroethene (trichloroethylene, TCE)	13.377	546	0.006	6.15×10^{-7}	1.85×10^{-4}	4.60×10^{-8}	3.38×10^{-7}	1.06×10^{-9}	4.29×10^{-8}
Xylene	7	435	None	7.0×10^{-6}	2.1×10^{-3}	1×10^{-6}	4.84×10^{-6}	0	0
Hazard Index[g]						5.65×10^{-3}	6.14×10^{-3}		
Total Cancer Risk[h]								1.09×10^{-8}	4.45×10^{-7}

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.

[b] MEI - maximally exposed individual of the public.

[c] Hazard Quotient for MEI - boundary annual emissions/reference concentration (RfC).

[d] Hazard Quotient for workers - 100-m, 8-hr emissions/permissible exposure limit (PEL).

[e] Cancer risk for MEI - (emissions concentrations) x (0.237 [fraction of year exposed]]) x (o.572 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).

[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).

[g] The following chemicals have not been subjected to hazard quotient or cancer risk analysis. They were contained in a list of chemicals used at Pantex for reporting to the State of Texas under SARA Title III. In all cases, the emissions were estimated using product throughput for 1993. They do not represent employee exposure. Therefore, the chemicals remain listed, but are not included in calculations for hazard index and cancer risk to the public and the onsite worker.

[h] Hazard index - sum of individual hazard quotients.

Source: PX 1995a:4.

TABLE E.3.4–10.—***Risk Assessments from Exposure to Hazardous Chemicals from Assembly/Disassembly and High Explosives Fabrication at Pantex Plant*** **[Page 1 of 2]**

	Regulated Exposure Limits/ Risk Factors			Emissions Inventory		Hazard Quotient		Cancer Risk	
Chemical	**RfC (mg/m^3)**	**PEL[a] (mg/m^3)**	**Slope Factor (mg/kg/day)**	**Boundary Annual MEI[b] (mg/m^3)**	**Worker 100 m 8 hours (mg/m^3)**	**Boundary Annual MEI[b,c]**	**Worker 100 m 8 hours[d]**	**Boundary Annual MEI[b,e]**	**Worker 100 m 8 hours[f]**
Acetonitrile	0.021	70	None	1.43×10^{-8}	4.29×10^{-6}	6.81×10^{-7}	6.14×10^{-8}	0	0
Aldehydes (formaldehyde)	0.7	0.9375	None	6.43×10^{-8}	1.93×10^{-5}	9.19×10^{-8}	2.06×10^{-5}	0	0
Ammonia	0.1	35	None	5.72×10^{-10}	1.72×10^{-7}	5.72×10^{-9}	4.91×10^{-9}	0	0
Benzene	0.0796	3.25	0.029	9.44×10^{-8}	2.83×10^{-5}	1.19×10^{-6}	8.72×10^{-6}	7.83×10^{-10}	3.18×10^{-8}
Carbon monoxide	1.35	55	None	1.30×10^{-5}	3.91×10^{-3}	9.64×10^{-6}	7.11×10^{-5}	0	0
Cresylic acid	0.539	22	None	4.29×10^{-11}	1.29×10^{-8}	7.96×10^{-11}	6.86×10^{-10}	0	0
Cyclohexane	25.725	1,050	None	5.43×10^{-8}	1.63×10^{-5}	2.11×10^{-10}	1.55×10^{-8}	0	0
1,2-Dichloroethane (ethylene dichloride)	10.069	411	0.091	1.00×10^{-9}	3.01×10^{-7}	9.94×10^{-11}	7.32×10^{-10}	2.60×10^{-11}	1.06×10^{-9}
Dimethylformamide (DMF)	0.03	30	None	2.86×10^{-10}	8.59×10^{-8}	9.53×10^{-8}	2.86×10^{-9}	0	0
Dioxane	8.82	360	0.011	1.29×10^{-9}	3.87×10^{-7}	1.46×10^{-9}	1.07×10^{-9}	4.05×10^{-12}	1.65×10^{-10}
Hexane	0.2	1,800	None	2.86×10^{-9}	8.59×10^{-7}	1.43×10^{-8}	4.77×10^{-10}	0	0
Hydrogen chloride	0.007	7	None	1.00×10^{-7}	3.01×10^{-5}	1.43×10^{-6}	4.29×10^{-6}	0	0
Hydrogen fluoride	0.21	2.49	None	1.43×10^{-7}	4.29×10^{-5}	6.81×10^{-7}	1.72×10^{-5}	0	0
Mercury (vapor)	0.0003	0.1	None	5.72×10^{-16}	1.72×10^{-13}	1.91×10^{-12}	1.72×10^{-12}	0	0
Methyl alcohol	1.75	260	None	8.58×10^{-8}	2.58×10^{-5}	4.90×10^{-8}	9.91×10^{-8}	0	0

TABLE E.3.4–10.—*Risk Assessments from Exposure to Hazardous Chemicals from Assembly/Disassembly and High Explosives Fabrication at Pantex Plant* [Page 2 of 2]

	Regulated Exposure Limits/ Risk Factors			Emissions Inventory		Hazard Quotient		Cancer Risk	
Chemical	RfC (mg/m^3)	PEL[a] (mg/m^3)	Slope Factor (mg/kg/day)	Boundary Annual MEI[b] (mg/m^3)	Worker 100 m 8 hours (mg/m^3)	Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
Methyl ethyl ketone (MEK)	1	590	None	1.10×10^{-5}	3.31×10^{-3}	1.10×10^{-5}	5.61×10^{-6}	0	0
Toluene	0.4	766	None	3.00×10^{-7}	9.02×10^{-4}	7.51×10^{-7}	1.18×10^{-7}	0	0
1,1,1-Trichloroethane (TCA)	0.1225	1,900	None	1.72×10^{-8}	5.15×10^{-6}	1.40×10^{-7}	2.71×10^{-9}	0	0
Trichloroethylene (TCE)	13.377	546	0.006	1.43×10^{-8}	4.29×10^{-6}	1.07×10^{-9}	7.87×10^{-9}	2.45×10^{-11}	9.97×10^{-10}
Volatile organic compounds (toluene)	0.4	766	None	3.86×10^{-6}	1.16×10^{-3}	9.65×10^{-6}	1.51×10^{-6}	0	0
Xylene	7	434	None	2.43×10^{-7}	7.30×10^{-4}	3.47×10^{-8}	1.68×10^{-7}	0	0
Hazard Index[g]						4.82×10^{-5}	1.30×10^{-4}		
Total Cancer Risk[h]								8.37×10^{-10}	3.40×10^{-8}

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.
[b] MEI - maximally exposed individual of the public.
[c] Hazard Quotient for MEI - boundary annual emissions/reference concentration (RfC).
[d] Hazard Quotient for workers - 100-m, 8-hr emissions/permissible exposure limit (PEL).
[e] Cancer risk for MEI - (emissions concentrations) x (0.286 [converts concentration to dose]) x (slope factor [SF]).
[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).
[g] Hazard Index - Sum of Individual Hazard Quotients.
[h] Total Cancer Risk - Sum of Individual Cancer Risks.
Source: PX DOE 1995e; PX MH 1995a.

TABLE E.3.4–11.—*Risk Assessments from Exposure to Hazardous Chemicals from Downsize Assembly/Disassembly at Pantex Plant*
[Page 1 of 2]

Chemical	Regulated Exposure Limits/ Risk Factors			Emissions Inventory		Hazard Quotient		Cancer Risk	
	RfC (mg/m^3)	PEL[a] (mg/m^3)	Slope Factor (mg/kg/day)	Boundary Annual MEI[b] (mg/m^3)	Worker 100 m 8 hours (mg/m^3)	Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
Acetonitrile	0.021	70	None	$7.15x10^{-8}$	$2.15x10^{-5}$	$3.40x10^{-6}$	$3.07x10^{-7}$	0	0
Aldehydes (formaldehyde)	0.7	0.9375	None	$1.43x10^{-7}$	$4.29x10^{-5}$	$2.04x10^{-7}$	$4.58x10^{-5}$	0	0
Ammonia	0.1	35	None	$1.43x10^{-5}$	$4.29x10^{-3}$	$1.43x10^{-4}$	$1.23x10^{-4}$	0	0
Benzene	0.0796	3.25	0.029	$1.43x10^{-8}$	$4.29x10^{-6}$	$1.80x10^{-7}$	$1.32x10^{-6}$	$1.19x10^{-10}$	$4.82x10^{-9}$
Bisphenol-alpha-epichlorohydrin (epich)	0.1225	5	None	$1.43x10^{-8}$	$4.29x10^{-6}$	$1.17x10^{-7}$	$8.59x10^{-7}$	0	0
n-Butyl glyucidyl ether (BGE)	6.615	270	None	$1.43x10^{-8}$	$4.29x10^{-6}$	$2.16x10^{-9}$	$1.59x10^{-8}$	0	0
Carbon monoxide	1.35	55	None	$1.72x10^{-4}$	$5.15x10^{-2}$	$1.27x10^{-4}$	$9.37x10^{-4}$	0	0
Chloroform	0.035	240	0.0061	$1.43x10^{-8}$	$4.29x10^{-6}$	$4.09x10^{-7}$	$1.79x10^{-8}$	$2.49x10^{-11}$	$1.01x10^{-9}$
Cresylic acid	0.539	22	None	$1.43x10^{-8}$	$4.29x10^{-6}$	$2.65x10^{-8}$	$1.95x10^{-7}$	0	0
Cyclohexane	25.725	1,050	None	$1.43x10^{-8}$	$4.29x10^{-6}$	$5.56x10^{-10}$	$4.09x10^{-9}$	0	0
Dibutyl phthalate	0.35	5	None	$1.72x10^{-7}$	$5.15x10^{-5}$	$4.90x10^{-7}$	$1.03x10^{-5}$	0	0
1,2-Dichloroethane (ethylene dichloride)	10.069	411	0.091	$1.43x10^{-8}$	4.29x10	1.42x10	1.05x10	$3.72x10^{-10}$	$1.51x10^{-8}$
Dioxane	8.82	360	0.011	$1.43x10^{-8}$	$4.29x10^{-6}$	$1.62x10^{-9}$	$1.19x10^{-8}$	$4.50x10^{-11}$	$1.83x10^{-9}$
Dimethylformamide (DMF)	0.03	30	None	$1.43x10^{-8}$	$4.29x10^{-6}$	$4.77x10^{-7}$	$1.43x10^{-7}$	0	0
Ferric ferrocyanide	0.0245	1	None	$1.43x10^{-8}$	$4.29x10^{-6}$	$5.84x10^{-7}$	$4.29x10^{-6}$	0	0
Hexane	0.2	1,800	None	$1.43x10^{-8}$	$4.29x10^{-6}$	$7.15x10^{-8}$	$2.39x10^{-9}$	0	0
Hydrogen chloride	0.007	7	None	$7.72x10^{-7}$	$2.32x10^{-4}$	$1.10x10^{-4}$	$3.31x10^{-5}$	0	0
Hydrogen sulfide	0.0009	28.4	None	$6.72x10^{-7}$	$2.02x10^{-4}$	$7.47x10^{-4}$	$7.11x10^{-6}$	0	0
Mercury (vapor)	0.0003	0.1	None	$8.58x10^{-8}$	$2.58x10^{-5}$	$2.86x10^{-4}$	$2.58x10^{-4}$	0	0
Methyl alcohol	1.75	260	None	$2.86x10^{-7}$	$8.59x10^{-5}$	$1.63x10^{-7}$	$3.30x10^{-7}$	0	0
Methyl ethyl ketone (MEK)	1	590	None	$1.00x10^{-5}$	$3.01x10^{-3}$	$1.00x10^{-5}$	$5.10x10^{-6}$	0	0
Propylglycol methyl ether	2	368	None	$2.29x10^{-7}$	$6.87x10^{-5}$	$1.14x10^{-7}$	$1.87x10^{-7}$	0	0
Toluene	0.4	766	None	$1.43x10^{-7}$	$4.29x10^{-5}$	$3.57x10^{-7}$	$5.61x10^{-8}$	0	0

TABLE E.3.4–11.—*Risk Assessments from Exposure to Hazardous Chemicals from Downsize Assembly/Disassembly at Pantex Plant* [Page 2 of 2]

	Regulated Exposure Limits/ Risk Factors			Emissions Inventory		Hazard Quotient		Cancer Risk	
Chemical	RfC (mg/m³)	PEL[a] (mg/m³)	Slope Factor (mg/kg/day)	Boundary Annual MEI[b] (mg/m³)	Worker 100 m 8 hours (mg/m³)	Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
1,1,1-Trichloroethane (TCA)	0.014	1,900	None	1.40×10^{-6}	4.21×10^{-4}	1.00×10^{-4}	2.22×10^{-7}	0	0
Trichloroethylene (TCE)	13.377	546	0.006	1.43×10^{-7}	4.29×10^{-5}	1.07×10^{-8}	7.87×10^{-7}	2.45×10^{-10}	9.97×10^{-9}
Triethylamine	2.45	100	None	1.43×10^{-8}	4.29×10^{-6}	5.84×10^{-9}	4.29×10^{-8}	0	0
2,2,4-Trimethyl-1,3-pentane-diol-isobutyrate	-	-	None	1.43×10^{-8}	4.29×10^{-6}	None	None	0	0
Volatile organic compounds (toluene)	0.4	766	None	3.57×10^{-4}	1.07×10^{-1}	8.94×10^{-4}	1.40×10^{-4}	0	0
Xylene	7	434	None	5.00×10^{-6}	1.50×10^{-3}	7.15×10^{-7}	3.46×10^{-6}	0	0
Hazard Index[g]						2.42×10^{-3}	1.57×10^{-3}		
Total Cancer Risk[h]								8.06×10^{-10}	3.28×10^{-8}

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.
[b] MEI - maximally exposed individual of the public.
[c] Hazard Quotient for MEI - boundary annual emissions/reference concentration (RfC).
[d] Hazard Quotient for workers - 100-m, 8-hr emissions/permissible exposure limit (PEL).
[e] Cancer risk for MEI - (emissions concentrations) x (0.286 [converts concentration to dose]) x (slope factor [SF]).
[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).
[g] Hazard index - sum of individual hazard quotients.
[h] Total cancer risk - sum of individual cancer risks.
Source: PX MH 1995a.

TABLE E.3.4–12.—*Risk Assessments from Exposure to Hazardous Chemicals from Phaseout of Assembly/Disassembly and High Explosives Fabrication at Pantex Plant*

Chemical	Regulated Exposure Limits/ Risk Factors: RfC (mg/m^3)	PEL[a] (mg/m^3)	Slope Factor (mg/kg/day)	Emissions Inventory: Boundary Annual MEI[b] (mg/m^3)	Worker 100 m 8 hours (mg/m^3)	Hazard Quotient: Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Cancer Risk: Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
None	0	0	None	0	0	0	0	0	0
Hazard Index[g]						0	0		
Total Cancer Risk[h]								0	0

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.
[b] MEI - maximally exposed individual of the public.
[c] Hazard Quotient for MEI - boundary annual emissions/reference concentration (RfC).
[d] Hazard Quotient for workers - 100-m, 8-hr emissions/permissible exposure limit (PEL).
[e] Cancer risk for MEI - (emissions concentrations) x (0.286 [converts concentration to dose]) x (slope factor [SF]).
[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).
[g] Hazard Index - Sum of Individual Hazard Quotients.
[h] Total Cancer Risk - Sum of Individual Cancer Risks.
Source: PX DOE 1995e; PX MH 1995a.

TABLE E.3.4–13.—*Risk Assessments from Exposure to Hazardous Chemicals from No Action at Los Alamos National Laboratory* [Page 1 of 2]

Chemical	Regulated Exposure Limits/ Risk Factors			Emissions Inventory		Hazard Quotient		Cancer Risk	
	RfC (mg/m^3)	PEL[a] (mg/m^3)	Slope Factor (mg/kg/day)	Boundary Annual MEI[b] (mg/m^3)	Worker 100 m 8 hours (mg/m^3)	Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
Acetic acid	0.6125	25	None	$5.95x10^{-5}$	$1.3x10^{-2}$	$9.7x10^{-5}$	$5.26x10^{-4}$	0	0
Aluminum (metal and oxide)	0.368	15	None	$4.43x10^{-6}$	$9.79x10^{-4}$	$1.20x10^{-5}$	$6.53x10^{-5}$	0	0
Aluminum welding fumes	0.125	5	None	$1.36x10^{-5}$	$3.01x10^{-3}$	$1.11x10^{-4}$	$6.02x10^{-4}$	0	0
Ammonia	0.1	35	None	$8.85x10^{-5}$	$1.96x10^{-2}$	$8.85x10^{-4}$	$5.59x10^{-4}$	0	0
2-Butoxyethanol	5.88	240	None	$1.36x10^{-5}$	$3.0x10^{-3}$	$2.32x10^{-6}$	$1.25x10^{-5}$	0	0
Carbon monoxide	1.35	55	None	$2.39x10^{-5}$	0.528	$1.77x10^{-3}$	$9.61x10^{-3}$	0	0
Chlorine	0.35	3	None	$1.46x10^{-6}$	$3.23x10^{-4}$	$4.17x10^{-6}$	$1.08x10^{-4}$	0	0
Chloroform	0.035	240	0.081	$1.44x10^{-6}$	$3.18x10^{-4}$	$4.11x10^{-6}$	$1.06x10^{-4}$	$1.37x10^{-6}$	$4.09x10^{-5}$
Cyclohexane	25.725	1050	None	$3.01x10^{-6}$	$6.86x10^{-4}$	$1.21x10^{-7}$	$6.53x10^{-7}$	0	0
Dichlorodifluoromethane (Freon 12)	0.7	4950	None	$1.88x10^{-6}$	$4.16x10^{-4}$	$2.69x10^{-6}$	$8.41x10^{-8}$	0	0
Ethyl acetate	3.15	1400	None	$9.85x10^{-6}$	$2.18x10^{-3}$	$3.13x10^{-6}$	$1.56x10^{-6}$	0	0
Ethyl ether	0.7	1200	None	$1.88x10^{-6}$	$4.16x10^{-4}$	$2.69x10^{-6}$	$3.47x10^{-7}$	0	0
Ethylene glycol	7	127	None	$7.97x10^{-6}$	$1.76x10^{-3}$	$1.14x10^{-6}$	$1.39x10^{-5}$	0	0
Formaldehyde	0.7	0.9375	0.045	$5.43x10^{-6}$	$1.20x10^{-3}$	$7.75x10^{-6}$	$1.28x10^{-3}$	$6.98x10^{-8}$	$2.09x10^{-6}$
Heavy metals	1.06	42.9	None	$1.26x10^{-5}$	$2.79x10^{-3}$	$1.20x10^{-5}$	$6.51x10^{-5}$	0	0
Heptane	49	2000	None	$2.05x10^{-4}$	$4.53x10^{-2}$	$4.18x10^{-6}$	$2.26x10^{-5}$	0	0
Hexane	0.2	1800	None	$8.53x10^{-6}$	$1.89x10^{-3}$	$4.26x10^{-5}$	$1.05x10^{-6}$	0	0
Hexane (other isomers)	0.2	1800	None	$1.33x10^{-6}$	$2.94x10^{-4}$	$6.64x10^{-6}$	$1.63x10^{-7}$	0	0
Hydrocarbons (hexane)	0.2	1800	None	$3.20x10^{-4}$	$7.08x10^{-2}$	$1.60x10^{-3}$	$3.94x10^{-5}$	0	0
Hydrogen chloride	0.007	7	None	$7.06x10^{-5}$	$1.56x10^{-2}$	$1.01x10^{-2}$	$2.23x10^{-3}$	0	0
Hydrogen fluoride	0.21	2.49	None	$2.68x10^{-5}$	$5.93x10^{-3}$	$1.28x10^{-4}$	$2.38x10^{-3}$	0	0
Hydrogen peroxide	0.0343	1.4	None	$2.21x10^{-6}$	$4.90x10^{-4}$	$6.46x10^{-5}$	$3.50x10^{-4}$	0	0
Isobutyl acetate	17.15	700	None	$1.99x10^{-6}$	$4.41x10^{-4}$	$1.16x10^{-7}$	$6.30x10^{-7}$	0	0
Isopropyl alcohol	15	980	None	$5.97x10^{-5}$	$1.32x10^{-2}$	$3.98x10^{-6}$	$1.35x10^{-5}$	0	0
Kerosene	2.45	100	None	$2.88x10^{-5}$	$6.37x10^{-3}$	$1.18x10^{-5}$	$6.37x10^{-5}$	0	0
Lead	0.001225	0.05	None	$2.88x10^{-6}$	$6.37x10^{-4}$	$2.35x10^{-3}$	$1.27x10^{-2}$	0	0
Lead chromate	0.001225	0.05	None	$1.77x10^{-6}$	$3.92x10^{-4}$	$1.45x10^{-3}$	$7.84x10^{-3}$	0	0
Methanol	1.75	260	None	$6.52x10^{-5}$	$1.44x10^{-2}$	$3.73x10^{-5}$	$5.55x10^{-5}$	0	0

TABLE E.3.4–13.—*Risk Assessments from Exposure to Hazardous Chemicals from No Action at Los Alamos National Laboratory* [Page 2 of 2]

	Regulated Exposure Limits/ Risk Factors			Emissions Inventory		Hazard Quotient		Cancer Risk	
Chemical	RfC (mg/m^3)	PEL[a] (mg/m^3)	Slope Factor (mg/kg/day)	Boundary Annual MEI[b] (mg/m^3)	Worker 100 m 8 hours (mg/m^3)	Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
Methyl chloride	5.145	210	None	2.88×10^{-6}	6.37×10^{-4}	5.60×10^{-7}	3.03×10^{-6}	0	0
Methyl ethyl ketone (MEK)	1	590	None	2.06×10^{-4}	4.56×10^{-2}	2.06×10^{-4}	7.74×10^{-5}	0	0
Methylene chloride	3	1,765	0.0075	1.22×10^{-4}	2.70×10^{-2}	4.07×10^{-5}	1.53×10^{-5}	2.62×10^{-7}	7.85×10^{-6}
Nickel (metal)	0.0245	1	0.84	6.09×10^{-6}	1.35×10^{-3}	2.49×10^{-4}	1.35×10^{-3}	1.46×10^{-6}	4.38×10^{-5}
Nitric acid	0.1225	5	None	7.32×10^{-5}	1.62×10^{-2}	5.97×10^{-4}	3.24×10^{-3}	0	0
Phosgene	0.0098	0.4	None	2.55×10^{-6}	5.63×10^{-4}	2.60×10^{-4}	1.41×10^{-3}	0	0
Propylene oxide	0.03	240	0.241	3.99×10^{-6}	8.81×10^{-4}	1.33×10^{-4}	3.67×10^{-6}	2.75×10^{-7}	8.22×10^{-6}
Stoddard solvent	71.05	2,900	None	2.92×10^{-5}	6.46×10^{-3}	4.11×10^{-7}	2.23×10^{-6}	0	0
Sulfuric acid	0.0245	1	None	2.44×10^{-6}	5.39×10^{-4}	9.94×10^{-5}	5.39×10^{-4}	0	0
Tetrahydrofuran (THF)	14.455	590	None	1.88×10^{-6}	4.16×10^{-4}	1.30×10^{-7}	7.06×10^{-7}	0	0
Toluene	0.4	766	None	2.75×10^{-4}	6.08×10^{-2}	6.87×10^{-4}	7.94×10^{-5}	0	0
1,1,2-Trichloroethane	0.014	45	0.057	1.03×10^{-4}	2.27×10^{-2}	7.33×10^{-3}	5.04×10^{-4}	1.67×10^{-6}	5.01×10^{-5}
Trichloroethylene (TCE)	13.377	546	0.006	2.33×10^{-5}	5.14×10^{-3}	1.74×10^{-6}	9.42×10^{-6}	3.99×10^{-8}	1.19×10^{-6}
Tungsten	0.1225	5	None	1.21×10^{-5}	2.67×10^{-3}	9.85×10^{-5}	5.34×10^{-4}	0	0
VM&P naphtha	8.575	350	None	6.79×10^{-5}	1.50×10^{-2}	7.92×10^{-6}	4.29×10^{-5}	0	0
Welding fumes (acetylene)	65.219	2,662	None	5.66×10^{-5}	1.25×10^{-2}	8.68×10^{-7}	4.70×10^{-6}	0	0
Xylene	7	435	None	1.95×10^{-4}	4.32×10^{-2}	2.79×10^{-5}	9.94×10^{-5}	0	0
Hazard Index[g]						3.01×10^{-2}	4.65×10^{-2}		
Total Cancer Risk[h]								5.15×10^{-6}	1.54×10^{-5}

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.

[b] MEI - maximally exposed individual of the public.

[c] Hazard Quotient for MEI - boundary annual emissions/reference concentration (RfC).

[d] Hazard Quotient for workers - 100-m, 8-hr emissions/permissible exposure limit (PEL).

[e] Cancer risk for MEI - (emissions concentrations) x (0.286 [converts concentration to dose]) x (slope factor [SF]).

[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).

[g] HI - sum of individual HQ.

[h] Total cancer risk - sum of individual cancer risks.

Source: LANL 1994a.

TABLE E.3.4–14.—*Risk Assessments from Exposure to Hazardous Chemicals from Pit Fabrication at Los Alamos National Laboratory*

Chemical	Regulated Exposure Limits/Risk Factors: RfC (mg/m^3)	PEL[a] (mg/m^3)	Slope Factor (mg/kg/day)	Emissions Inventory: Boundary Annual MEI[b] (mg/m^3)	Worker 100 m 8 hours (mg/m^3)	Hazard Quotient: Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Cancer Risk: Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
Carbon monoxide	1.35	55	None	3.76×10^{-5}	8.33×10^{-3}	2.79×10^{-5}	1.51×10^{-4}	0	0
Lead	0.00123	0.05	None	7.05×10^{-10}	1.56×10^{-7}	5.75×10^{-7}	3.12×10^{-6}	0	0
Volatile organic compounds (toluene)	0.4	766	None	7.24×10^{-5}	1.60×10^{-2}	1.81×10^{-4}	2.09×10^{-5}	0	0
Hazard Index[g]						2.10×10^{-4}	1.75×10^{-4}	0	0
Total Cancer Risk[h]								0	0

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.

[b] MEI - maximally exposed individual of the public.

[c] HQ for MEI - boundary annual emissions/reference concentration (RfC).

[d] HQ for workers - 100-m, 8-hr emissions/permissible exposure limit (PEL).

[e] Cancer risk for MEI - (emissions concentrations) x (0.286 [converts concentration to dose]) x (slope factor [SF]).

[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).

[g] HI - sum of individual HQ.

[h] Total cancer risk - sum of individual cancer risks.

Source: LANL 1995g.

TABLE E.3.4–15.—*Risk Assessments from Exposure to Hazardous Chemicals from Secondary and Case Fabrication at Los Alamos National Laboratory*

	Regulated Exposure Limits/Risk Factors			Emissions Inventory		Hazard Quotient		Cancer Risk	
Chemical	RfC (mg/m^3)	PEL[a] (mg/m^3)	Slope Factor (mg/kg/day)	Boundary Annual MEI[b] (mg/m^3)	Worker 100 m 8 hours (mg/m^3)	Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
Carbon monoxide	1.35	55	None	1.69×10^{-4}	3.75×10^{-2}	1.25×10^{-4}	6.81×10^{-4}	0	0
Lead	0.00123	0.05	None	3.17×10^{-9}	7.01×10^{-7}	2.59×10^{-6}	1.40×10^{-5}	0	0
Volatile organic compounds (toluene)	0.4	766	None	3.26×10^{-4}	7.21×10^{-2}	8.15×10^{-4}	9.41×10^{-5}	0	0
Hazard Index[g]						9.43×10^{-4}	7.89×10^{-4}		
Total Cancer Risk[h]								0	0

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.
[b] MEI - maximally exposed individual of the public.
[c] HQ for MEI - boundary annual emissions/reference concentration (RfC).
[d] HQ for workers - 100-m, 8-hr emissions/permissible exposure limit (PEL).
[e] Cancer risk for MEI - (emissions concentrations) x (0.286 [converts concentration to dose]) x (slope factor [SF]).
[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).
[g] HI - sum of individual HQ.
[h] Total cancer risk - sum of individual cancer risks.
Source: LANL 1995e.

TABLE E.3.4–16.—*Risk Assessments from Exposure to Hazardous Chemicals from High Explosives Fabrication at Los Alamos National Laboratory*

Chemical	Regulated Exposure Limits/Risk Factors			Emissions Inventory		Hazard Quotient		Cancer Risk	
	RfC (mg/m^3)	PEL[a] (mg/m^3)	Slope Factor (mg/kg/day)	Boundary Annual MEI[b] (mg/m^3)	Worker 100 m 8 hours (mg/m^3)	Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
Acetonitrile	0.021	70	None	$5.03x10^{-7}$	$1.11x10^{-4}$	$2.40x10^{-5}$	$1.59x10^{-6}$	0	0
Ammonia	0.1	35	None	$5.03x10^{-5}$	$1.11x10^{-2}$	$5.03x10^{-4}$	$3.18x10^{-4}$	0	0
Carbon monoxide	1.35	55	None	$5.03x10^{-4}$	$1.11x10^{-1}$	$3.73x10^{-4}$	$2.02x10^{-3}$	0	0
Cyclohexane	25.725	1,050	None	$2.52x10^{-7}$	$5.56x10^{-5}$	$9.78x10^{-9}$	$5.30x10^{-8}$	0	0
Dioxane	8.82	360	None	$2.52x10^{-7}$	$5.56x10^{-5}$	$2.85x10^{-8}$	$1.55x10^{-7}$	0	0
Hydrogen chloride	0.007	7	None	$1.26x10^{-5}$	$2.78x10^{-3}$	$1.80x10^{-3}$	$3.97x10^{-4}$	0	0
Hydrogen fluoride	0.21	2.49	None	$5.03x10^{-6}$	$1.11x10^{-3}$	$2.40x10^{-5}$	$4.47x10^{-4}$	0	0
Methyl ethyl ketone (MEK)	1	590	None	$2.52x10^{-6}$	$5.56x10^{-4}$	$2.52x10^{-6}$	$9.43x10^{-7}$	0	0
Toluene	0.4	766	None	$2.52x10^{-6}$	$5.56x10^{-4}$	$6.29x10^{-6}$	$7.26x10^{-7}$	0	0
Volatile organic compounds (toluene)	0.4	766	None	$5.03x10^{-4}$	$1.11x10^{-1}$	$1.26x10^{-3}$	$1.45x10^{-4}$	0	0
Hazard Index[g]						$3.99x10^{-3}$	$3.33x10^{-3}$		
Total Cancer Risk[h]								0	0

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.
[b] MEI - maximally exposed individual of the public.
[c] HQ for MEI - boundary annual emissions/reference concentration (RfC).
[d] HQ for workers - 100-m, 8-hr emissions/permissible exposure limit (PEL).
[e] Cancer risk for MEI - (emissions concentrations) x (0.286 [converts concentration to dose]) x (slope factor [SF]).
[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).
[g] HI - sum of individual HQ.
[h] Total cancer risk - sum of individual cancer risks.
Source: LANL 1995d.

TABLE E.3.4–17.—*Risk Assessments from Exposure to Hazardous Chemicals from Nonnuclear Fabrication at Los Alamos National Laboratory*

Chemical	Regulated Exposure Limits/Risk Factors: RfC (mg/m^3)	Regulated Exposure Limits/Risk Factors: PEL[a] (mg/m^3)	Regulated Exposure Limits/Risk Factors: Slope Factor (mg/kg/day)	Emissions Inventory: Boundary Annual MEI[b] (mg/m^3)	Emissions Inventory: Worker 100 m 8 hours (mg/m^3)	Hazard Quotient: Boundary Annual MEI[b,c]	Hazard Quotient: Worker 100 m 8 hours[d]	Cancer Risk: Boundary Annual MEI[b,e]	Cancer Risk: Worker 100 m 8 hours[f]
Carbon dioxide	221	9,000	None	5.94×10^{-6}	1.31×10^{-3}	2.69×10^{-8}	1.46×10^{-7}	0	0
Volatile organic compounds (toluene)	0.4	766	None	1.04×10^{-5}	2.30×10^{-3}	2.60×10^{-5}	3.01×10^{-6}	0	0
Hazard Index[g]						2.61×10^{-5}	3.15×10^{-6}		
Total Cancer Risk[h]								0	0

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.
[b] MEI - maximally exposed individual of the public.
[c] HQ for MEI - boundary annual emissions/reference concentration (RfC).
[d] HQ for workers - 100-m, 8-hr emissions/permissible exposure limit (PEL).
[e] Cancer risk for MEI - (emissions concentrations) x (0.286 [converts concentration to dose]) x (slope factor [SF]).
[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).
[g] HI - sum of individual HQ.
[h] Total cancer risk - sum of individual cancer risks.
Source: LANL 1995c.

TABLE E.3.4–18.—*Risk Assessments from Exposure to Hazardous Chemicals from Operation of Atlas Facility at Los Alamos National Laboratory*

	Regulated Exposure Limits/Risk Factors			Emissions Inventory		Hazard Quotient		Cancer Risk	
Chemical	**RfC (mg/m^3)**	**PEL[a] (mg/m^3)**	**Slope Factor (mg/kg/day)**	**Boundary Annual MEI[b] (mg/m^3)**	**Worker 100 m 8 hours (mg/m^3)**	**Boundary Annual MEI[b,c]**	**Worker 100 m 8 hours[d]**	**Boundary Annual MEI[b,e]**	**Worker 100 m 8 hours[f]**
None	0	0	None	0	0	0	0	0	0
Hazard Index[g]						0	0		
Total Cancer Risk[h]								0	0

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.
[b] MEI - maximally exposed individual of the public.
[c] HQ for MEI - boundary annual emissions/reference concentration (RfC).
[d] HQ for workers - 100-m, 8-hr emissions/permissible exposure limit (PEL).
[e] Cancer risk for MEI - (emissions concentrations) x (0.286 [converts concentration to dose]) x (slope factor [SF]).
[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).
[g] HI - sum of individual HQ.
[h] Total cancer risk - sum of individual cancer risks.
Source: Appendix K.

TABLE E.3.4–19.—*Risk Assessments from Exposure to Hazardous Chemicals from Operation of National Ignition Facility at Los Alamos National Laboratory*

Chemical	Regulated Exposure Limits/Risk Factors			Emissions Inventory		Hazard Quotient		Cancer Risk	
	RfC (mg/m^3)	PEL[a] (mg/m^3)	Slope Factor (mg/kg/day)	Boundary Annual MEI[b] (mg/m^3)	Worker 100 m 8 hours (mg/m^3)	Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
None	0	0	None	0	0	0	0	0	0
Hazard Index[g]						0	0		
Total Cancer Risk[h]								0	0

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.
[b] MEI - maximally exposed individual of the public.
[c] HQ for MEI - boundary annual emissions/reference concentration (RfC).
[d] HQ for workers - 100-m, 8-hr emissions/permissible exposure limit (PEL).
[e] Cancer risk for MEI - (emissions concentrations) x (0.286 [converts concentration to dose]) x (slope factor [SF]).
[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).
[g] HI - sum of individual HQ.
[h] Total cancer risk - sum of individual cancer risks.

Source: Appendix I.

TABLE E.3.4–20.—*Risk Assessments from Exposure to Hazardous Chemicals from No Action at Lawrence Livermore National Laboratory* [Page 1 of 6]

Chemical	Regulated Exposure Limits/ Risk Factors			Emissions Inventory		Hazard Quotient		Cancer Risk	
	RfC (mg/m^3)	PEL[a] (mg/m^3)	Slope Factor (mg/kg/day)	Boundary Annual MEI[b] (mg/m^3)	Worker 100 m 8 hours (mg/m^3)	Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
Acetone	0.35	2,400	None	$1.11x10^{-4}$	$8.16x10^{-3}$	$3.17x10^{-4}$	$3.40x10^{-6}$	0	0
Aliphatic hydrocarbon (cyclohexane)	25.725	1,050	None	$1.05x10^{-6}$	$7.73x10^{-5}$	$4.08x10^{-8}$	$7.36x10^{-8}$	0	0
Aluminum (fume and dust)	0.368	15	None	$1.02x10^{-5}$	$7.52x10^{-4}$	$2.78x10^{-5}$	$5.01x10^{-5}$	0	0
Ammonia	0.1	35	None	$3.91x10^{-6}$	$2.88x10^{-4}$	$3.91x10^{-5}$	$8.23x10^{-6}$	0	0
Ammonium hydroxide	0.0499	2	None	$3.49x10^{-6}$	$2.57x10^{-4}$	$7.00x10^{-5}$	$1.28x10^{-4}$	0	0
Amyl acetate	12.8625	525	None	$9.38x10^{-10}$	$6.90x10^{-8}$	$7.29x10^{-11}$	$1.31x10^{-10}$	0	0
Aromatic 150 (light aromatic naptha)	-	-	None	$3.36x10^{-6}$	$2.45x10^{-4}$	None	None	0	0
Aromatic hydrocarbons (pyrene)	0.105	4.57	None	$1.60x10^{-4}$	$1.18x10^{-2}$	$1.53x10^{-3}$	$2.58x10^{-3}$	0	0
Arsenic (inorganic compounds)	0.00105	0.01	50	$5.73x10^{-10}$	$4.22x10^{-8}$	$5.46x10^{-7}$	$4.22x10^{-6}$	$8.20x10^{-9}$	$8.16x10^{-8}$
Benzene	0.0796	3.25	0.029	$1.70x10^{-5}$	$1.25x10^{-3}$	$2.14x10^{-4}$	$3.85x10^{-4}$	$1.41x10^{-7}$	$1.41x10^{-6}$
Berylium	0.0175	0.002	None	$3.36x10^{-10}$	$2.47x10^{-8}$	$1.92x10^{-8}$	$1.24x10^{-5}$	0	0
Bromine	0.01715	0.7	None	$2.52x10^{-15}$	$1.85x10^{-13}$	$1.47x10^{-13}$	$2.65x10^{-13}$	0	0
2-Butoxyethanol	5.88	240	None	$2.92x10^{-5}$	$2.14x10^{-3}$	$4.96x10^{-6}$	$8.94x10^{-6}$	0	0
t-Butyl alcohol	7.35	300	None	$6.97x10^{-7}$	$5.13x10^{-5}$	$9.49x10^{-8}$	$1.71x10^{-7}$	0	0
1-Butanol	0.35	300	None	$8.60x10^{-7}$	$6.33x10^{-5}$	$2.46x10^{-6}$	$2.11x10^{-7}$	0	0
Cadmium	0.00175	0.005	$1.8x10^{-6}$	$1.43x10^{-9}$	$1.05x10^{-7}$	$8.19x10^{-7}$	$2.11x10^{-5}$	$7.38x10^{-16}$	$7.34x10^{-15}$
Carbon monoxide	1.35	55	None	$6.78x10^{-4}$	$4.99x10^{-2}$	$5.02x10^{-4}$	$9.06x10^{-4}$	0	0
Carbon tetrachloride	0.00245	63.9	0.013	$3.44x10^{-5}$	$2.53x10^{-3}$	$1.40x10^{-2}$	$3.96x10^{-5}$	$1.28x10^{-7}$	$1.27x10^{-6}$
Carbon tetrafluoride	-	-	None	$1.76x10^{-12}$	$1.29x10^{-10}$	None	None	0	0
CFC-113	105	7,600	None	$4.03x10^{-8}$	$2.96x10^{-6}$	$3.83x10^{-10}$	$3.90x10^{-10}$	0	0
CFC-13 (chlorotrifluoromethane)	-	-	None	$1.03x10^{-3}$	$7.59x10^{-7}$	None	None	0	0
Chlorine	.35	3	None	$6.44x10^{-7}$	$4.74x10^{-5}$	$1.84x10^{-6}$	$1.58x10^{-5}$	0	0
Chlorobenzene	0.07	350	None	$6.34x10^{-8}$	$4.66x10^{-6}$	$9.06x10^{-7}$	$1.33x10^{-8}$	0	0

TABLE E.3.4–20.—*Risk Assessments from Exposure to Hazardous Chemicals from No Action at Lawrence Livermore National Laboratory* [Page 2 of 6]

Chemical	Regulated Exposure Limits/ Risk Factors			Emissions Inventory		Hazard Quotient		Cancer Risk	
	RfC (mg/m³)	PEL[a] (mg/m³)	Slope Factor (mg/kg/day)	Boundary Annual MEI[b] (mg/m³)	Worker 100 m 8 hours (mg/m³)	Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
Chloroform	0.035	240	0.0061	$3.13x10^{-5}$	$2.30x10^{-3}$	$8.94x10^{-4}$	$9.59x10^{-6}$	$5.46x10^{-8}$	$5.44x10^{-7}$
Chromium (hexavalent)	0.0175	1	41	$2.97x10^{-11}$	$2.18x10^{-9}$	$1.69x10^{-9}$	$2.18x10^{-9}$	$3.48x10^{-10}$	$3.46x10^{-9}$
Copper (particulates)	0.0245	1	None	$3.36x10^{-7}$	$2.47x10^{-5}$	$1.37x10^{-5}$	$2.47x10^{-6}$	0	0
Cyclohexane	25.725	1,050	None	$1.96x10^{-5}$	$1.44x10^{-3}$	$7.61x10^{-7}$	$1.37x10^{-6}$	0	0
Cyclohexanone	17.5	200	None	$1.53x10^{-5}$	$1.13x10^{-3}$	$8.74x10^{-7}$	$5.63x10^{-6}$	0	0
Diacetone alcohol	5.88	240	None	$1.20x10^{-6}$	$8.81x10^{-5}$	$2.04x10^{-7}$	$3.67x10^{-7}$	0	0
Dibutyl phthalate	0.35	5	None	$2.93x10^{-6}$	$2.16x10^{-5}$	$8.38x10^{-6}$	$4.32x10^{-5}$	0	0
1,1-Dichloroethane	9.8	400	None	$2.56x10^{-11}$	$1.89x10^{-9}$	$2.62x10^{-12}$	$4.72x10^{-12}$	0	0
1,1-Dichloroethylene (vinylidene chloride)	0.0315	20	0.6	$7.07x10^{-10}$	$5.20x10^{-8}$	$2.24x10^{-8}$	$2.60x10^{-9}$	$1.21x10^{-10}$	$1.21x10^{-9}$
1,2-Dichloroethylene	0.07	790	None	$5.29x10^{-11}$	$3.89x10^{-9}$	$7.55x10^{-10}$	$4.92x10^{-12}$	0	0
Diethyleneglycol monobutyl ether	-	-	None	$8.41x10^{-7}$	$6.19x10^{-5}$	None	None	0	0
Diglycol monomethyl ether	-	-	None	$1.17x10^{-8}$	$8.59x10^{-7}$	None	None	0	0
1,4-Dioxane	8.82	360	0.011	$1.51x10^{-7}$	$1.11x10^{-5}$	$1.71x10^{-8}$	$3.08x10^{-8}$	$4.75x10^{-10}$	$4.73x10^{-9}$
Dipropyleneglycol methyl ether	14.84	600	None	$1.45x10^{-6}$	$1.07x10^{-4}$	$9.79x10^{-8}$	$1.78x10^{-7}$	0	0
Epichlorohydrin	0.001	19	0.0099	$1.17x10^{-8}$	$8.59x10^{-7}$	$1.17x10^{-5}$	$4.52x10^{-8}$	$3.31x10^{-11}$	$3.29x10^{-10}$
Epoxy resins (toluene-2,4-diisocyanate)	0.00343	0.14	None	$4.81x10^{-7}$	$3.54x10^{-5}$	$1.40x10^{-4}$	$2.53x10^{-4}$	0	0
Ethanol	46.55	1,900	None	$5.47x10^{-5}$	$4.03x10^{-3}$	$1.18x10^{-6}$	$2.12x10^{-6}$	0	0
1-Methoxy-2-propanal acetate	-	-	None	$2.71x10^{-7}$	$1.99x10^{-5}$	None	None	0	0
Ethanolamine	0.147	6	None	$5.23x10^{-6}$	$3.85x10^{-4}$	$2.56x10^{-5}$	$6.41x10^{-5}$	0	0
2-Ethoxyethyl acetate	13.23	540	None	$3.77x10^{-8}$	$2.78x10^{-6}$	$2.85x10^{-9}$	$5.14x10^{-9}$	0	0
Ethyl acrylate	2.45	100	None	$1.65x10^{-12}$	$1.81x10^{-10}$	$6.72x10^{-13}$	$1.21x10^{-12}$	0	0
Ethyl benzene	1	435	None	$4.40x10^{-7}$	$3.23x10^{-5}$	$4.40x10^{-7}$	$7.43x10^{-8}$	0	0
Ethylene dichloride	10.069	411	None	$5.06x10^{-10}$	$3.73x10^{-8}$	$5.03x10^{-11}$	$9.06x10^{-11}$	0	0
Ethylene glycol	7	286	None	$1.89x10^{-6}$	$1.39x10^{-4}$	$2.69x10^{-7}$	$4.85x10^{-7}$	0	0

TABLE E.3.4–20.—*Risk Assessments from Exposure to Hazardous Chemicals from No Action at Lawrence Livermore National Laboratory* [Page 3 of 6]

Chemical	Regulated Exposure Limits/ Risk Factors			Emissions Inventory		Hazard Quotient		Cancer Risk	
	RfC (mg/m^3)	PEL[a] (mg/m^3)	Slope Factor (mg/kg/day)	Boundary Annual MEI[b] (mg/m^3)	Worker 100 m 8 hours (mg/m^3)	Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
Ethylene glycol monoethyl ether	18.13	740	None	$5.60x10^{-7}$	$4.12x10^{-5}$	$3.09x10^{-8}$	$5.56x10^{-8}$	0	0
Ethylene glycol monomethyl ether	0.02	80	None	$5.60x10^{-7}$	$4.12x10^{-5}$	$2.80x10^{-5}$	$5.15x10^{-7}$	0	0
Ethyltriacetoxysilane	-	-	None	$8.71x10^{-9}$	$6.41x10^{-7}$	None	None	0	0
Ferric chloride (iron, salts)	0.0245	1	None	$4.20x10^{-12}$	$3.09x10^{-10}$	$1.71x10^{-10}$	$3.09x10^{-10}$	0	0
Fiberglass particles (fibrous glass dust)	0.1225	5	None	$7.63x10^{-14}$	$5.61x10^{-12}$	$6.23x10^{-13}$	$1.12x10^{-12}$	0	0
Fluoride	0.061	2.5	None	$1.91x10^{-7}$	$1.40x10^{-5}$	$3.13x10^{-6}$	$5.61x10^{-6}$	0	0
Folpet	0.35	14.3	0.0035	$2.81x10^{-8}$	$2.07x10^{-6}$	$8.02x10^{-8}$	$1.44x10^{-7}$	$2.81x10^{-11}$	$2.80x10^{-10}$
Formaldehyde	0.7	0.9375	None	$9.65x10^{-6}$	$7.10x10^{-4}$	$1.38x10^{-5}$	$7.57x10^{-4}$	0	0
Freon 113	105	7,600	None	$2.05x10^{-4}$	$1.84x10^{-2}$	$2.38x10^{-6}$	$2.42x10^{-6}$	0	0
Freon 14 (gas) (carbon tetrafluoride)	-	-	None	$5.76x10^{-6}$	$4.24x10^{-4}$	None	None	0	0
Glass, fibrous or dust (fibrous glass dust)	0.1225	5	None	$1.98x10^{-7}$	$1.46x10^{-5}$	$1.62x10^{-6}$	$2.92x10^{-6}$	0	0
Gasoline	21.805	890	None	$2.77x10^{-4}$	$2.03x10^{-2}$	$1.27x10^{-5}$	$2.29x10^{-5}$	0	0
Hexane	0.2	1,800	None	$1.12x10^{-5}$	$8.25x10^{-4}$	$5.61x10^{-5}$	$4.58x10^{-7}$	0	0
Hydrochloric acid	0.007	7	None	$5.60x10^{-7}$	$4.12x10^{-5}$	$8.00x10^{-5}$	$5.88x10^{-6}$	0	0
Hydrogen bromide	0.245	10	None	$2.67x10^{-7}$	$1.96x10^{-5}$	$1.09x10^{-6}$	$1.96x10^{-6}$	0	0
Hydrogen chloride	0.007	7	None	$1.18x10^{-5}$	$8.67x10^{-4}$	$1.68x10^{-3}$	$1.24x10^{-4}$	0	0
Hydrogen cyanide	0.07	11	None	$2.69x10^{-7}$	$1.98x10^{-5}$	$3.84x10^{-6}$	$1.80x10^{-6}$	0	0
Hydrogen fluoride	0.21	2.49	None	$1.61x10^{-6}$	$1.19x10^{-4}$	$7.67x10^{-6}$	$4.76x10^{-5}$	0	0
Hydrogen sulfide	0.0009	28.4	None	$4.88x10^{-7}$	$3.59x10^{-5}$	$5.43x10^{-4}$	$1.27x10^{-6}$	0	0
Hydrotreated heavy naptha	9.8	400	None	$6.21x10^{-6}$	$4.57x10^{-4}$	$6.34x10^{-7}$	$1.14x10^{-6}$	0	0
Isoamyl acetate	12.8625	525	None	$9.38x10^{-10}$	$6.90x10^{-8}$	$7.29x10^{-11}$	$1.31x10^{-10}$	0	0
Isobutanol	1.05	300	None	$2.71x10^{-8}$	$1.99x10^{-6}$	$2.58x10^{-8}$	$6.64x10^{-9}$	0	0
Isobutyl isobutyrate	1.79	73.1	None	$4.81x10^{-5}$	$3.53x10^{-3}$	$2.68x10^{-5}$	$4.84x10^{-5}$	0	0

TABLE E.3.4-20.—*Risk Assessments from Exposure to Hazardous Chemicals from No Action at Lawrence Livermore National Laboratory* [Page 4 of 6]

	Regulated Exposure Limits/ Risk Factors			Emissions Inventory		Hazard Quotient		Cancer Risk	
Chemical	RfC (mg/m³)	PEL[a] (mg/m³)	Slope Factor (mg/kg/day)	Boundary Annual MEI[b] (mg/m³)	Worker 100 m 8 hours (mg/m³)	Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
Isopropropyl acetate	23.275	950	None	$7.02x10^{-6}$	$5.17x10^{-4}$	$3.02x10^{-7}$	$5.44x10^{-7}$	0	0
Isopropropyl alcohol	24.01	980	None	$9.39x10^{-5}$	$6.90x10^{-3}$	$3.91x10^{-6}$	$7.05x10^{-6}$	0	0
Kerosene	$2.45x10^{-5}$	0.001	None	$3.22x10^{-5}$	$2.37x10^{-3}$	1.32	2.37	0	0
Lacquer thinner (no solvent indicated)	-	-	None	$5.34x10^{-12}$	$3.93x10^{-10}$	None	None	0	0
Lead	0.001225	0.05	None	$2.66x10^{-8}$	$1.96x10^{-6}$	$2.17x10^{-5}$	$3.91x10^{-5}$	0	0
Lithium	-	-	None	$7.63x10^{-9}$	$5.61x10^{-7}$	None	None	0	0
Manganese (compounds)	0.00005	5	None	$1.91x10^{-10}$	$1.40x10^{-8}$	$3.82x10^{-6}$	$2.81x10^{-9}$	0	0
Mercury (vapor)	0.0003	0.1	None	$4.05x10^{-10}$	$2.98x10^{-8}$	$1.35x10^{-6}$	$2.98x10^{-7}$	0	0
Methane	-	-	None	$8.24x10^{-8}$	$6.06x10^{-6}$	None	None	0	0
Methanol	1.75	260	None	$1.14x10^{-4}$	$8.39x10^{-3}$	$6.51x10^{-5}$	$3.23x10^{-5}$	0	0
Methyl chloroform (TCA)	0.1225	1,900	None	$4.10x10^{-5}$	$3.02x10^{-3}$	$3.35x10^{-4}$	$1.59x10^{-6}$	0	0
Methyl ethyl ketone (MEK)	1	590	None	$4.02x10^{-5}$	$2.96x10^{-3}$	$4.02x10^{-5}$	$5.01x10^{-6}$	0	0
Methylene chloride	3	1,765	0.0075	$3.74x10^{-5}$	$2.75x10^{-3}$	$1.25x10^{-5}$	$1.56x10^{-6}$	$8.03x10^{-8}$	$7.99x10^{-7}$
Methylene diphenyl diisocyanate	-	-	None	$5.6x10^{-7}$	$4.12x10^{-5}$	None	None	0	0
Methyl cyclohexane	49	2,000	None	$1.96x10^{-5}$	$1.44x10^{-3}$	$3.99x10^{-7}$	$7.20x10^{-7}$	0	0
Methyl isobutyl ketone (MIBK)	0.28	410	None	$2.43x10^{-5}$	$1.79x10^{-3}$	$8.68x10^{-5}$	$4.36x10^{-6}$	0	0
Methyl-n-amyl ketone	11.3925	465	None	$2.41x10^{-5}$	$1.78x10^{-3}$	$2.12x10^{-6}$	$3.82x10^{-6}$	0	0
Methyltriacetoxysilane	-	-	None	$5.81x10^{-9}$	$4.27x10^{-7}$	None	None	0	0
Mineral spirits (stoddard solvent)	71.05	2,900	None	$1.59x10^{-8}$	$1.17x10^{-7}$	$2.23x10^{-10}$	$4.03x10^{-10}$	0	0
N-butyl acetate	17.4	710	None	$6.26x10^{-5}$	$4.61x10^{-3}$	$3.60x10^{-6}$	$6.49x10^{-6}$	0	0
N-heptane	49	2,000	None	$2.01x10^{-5}$	$1.48x10^{-3}$	$4.11x10^{-7}$	$7.40x10^{-7}$	0	0
N-propyl alcohol	12.25	500	None	$1.02x10^{-7}$	$7.52x10^{-6}$	$8.35x10^{-9}$	$1.50x10^{-8}$	0	0
Naptha (coal tar)	9.8	400	None	$1.59x10^{-7}$	$1.17x10^{-5}$	$1.63x10^{-8}$	$2.93x10^{-8}$	0	0
Naptha	9.8	400	None	$5.60x10^{-7}$	$4.12x10^{-5}$	$5.71x10^{-8}$	$1.03x10^{-7}$	0	0

TABLE E.3.4–20.—*Risk Assessments from Exposure to Hazardous Chemicals from No Action at Lawrence Livermore National Laboratory* [Page 5 of 6]

Chemical	Regulated Exposure Limits/ Risk Factors			Emissions Inventory		Hazard Quotient		Cancer Risk	
	RfC (mg/m³)	PEL[a] (mg/m³)	Slope Factor (mg/kg/day)	Boundary Annual MEI[b] (mg/m³)	Worker 100 m 8 hours (mg/m³)	Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
Napthalene	1.225	50	None	$5.34x10^{-12}$	$3.93x10^{-10}$	$4.36x10^{-12}$	$7.86x10^{-12}$	0	0
Napthene	1.225	50	None	$1.60x10^{-4}$	$1.18x10^{-2}$	$1.31x10^{-4}$	$2.36x10^{-4}$	0	0
Napthol spirits	-	-	None	$1.29x10^{-5}$	$9.48x10^{-4}$	None	None	0	0
Nickel	0.0245	1	0.84	$2.32x10^{-8}$	$1.71x10^{-6}$	$9.48x10^{-7}$	$1.71x10^{-6}$	$5.58x10^{-9}$	$5.56x10^{-8}$
Nitric acid	0.1225	5	None	$2.65x10^{-7}$	$1.95x10^{-5}$	$2.16x10^{-6}$	$3.90x10^{-6}$	0	0
Nitrocellulose	-	-	None	$9.38x10^{-10}$	$6.90x10^{-8}$	None	None	0	0
Organics (toluene)	0.4	766	None	$2.91x10^{-5}$	$2.14x10^{-3}$	$7.27x10^{-5}$	$2.79x10^{-6}$	0	0
Pentane	72.275	2,950	None	$7.94x10^{-9}$	$5.84x10^{-7}$	$1.10x10^{-10}$	$1.98x10^{-10}$	0	0
Perchloric acid	-	-	None	$4.14x10^{-7}$	$3.05x10^{-5}$	None	None	0	0
Perchloroethylene (tetrachloroethylene)	0.035	689	None	$6.95x10^{-7}$	$5.11x10^{-5}$	$1.99x10^{-5}$	$7.42x10^{-8}$	0	0
Perfluorochemical (Freon 113)	105	7,600	None	$1.17x10^{-4}$	$8.59x10^{-3}$	$1.11x10^{-6}$	$1.13x10^{-6}$	0	0
Petroleum distillates (vm&p naptha)	49	2,000	None	$3.80x10^{-7}$	$2.80x10^{-5}$	$7.76x10^{-9}$	$1.40x10^{-8}$	0	0
Petroleum naptha	49	2,000	None	$1.69x10^{-5}$	$1.24x10^{-3}$	$3.45x10^{-7}$	$6.22x10^{-7}$	0	0
Phosphoric acid	0.0245	1	None	$2.56x10^{-7}$	$1.89x10^{-5}$	$1.05x10^{-5}$	$1.89x10^{-5}$	0	0
Polycyclic aromatic hydrocarbons (pyr)	0.105	4.57	None	$3.10x10^{-9}$	$2.23x10^{-7}$	$2.96x10^{-8}$	$5.00x10^{-8}$	0	0
Polyethylene glycol	640.5	1.83	None	$8.60x10^{-9}$	$6.33x10^{-7}$	$1.34x10^{-11}$	$3.46x10^{-9}$	0	0
Polyvinyl acetate			None	$1.03x10^{-8}$	$7.56x10^{-7}$	None	None	0	0
Potassium ferricyanide	0.07	5	None	$5.60x10^{-7}$	$4.12x10^{-5}$	$8.00x10^{-6}$	$8.23x10^{-6}$	0	0
Potassium fluoborate	-	-	None	$5.6x10^{-7}$	$4.12x10^{-5}$	None	None	0	0
Potassium fluozirconate	-	-	None	$5.6x10^{-7}$	$4.12x10^{-5}$	None	None	0	0
Propylene glycol	-	-	None	$1.75x10^{-7}$	$1.29x10^{-5}$	None	None	0	0
Radionuclide (Uranium-235 and -338)	0.0105	0.25	None	$5.73x10^{-5}$	$4.21x10^{-3}$	$5.45x10^{-3}$	$1.68x10^{-2}$	0	0
Silane (silicon tetrahydride)	0.1715	7	None	$6.87x10^{-8}$	$5.05x10^{-6}$	$4.00x10^{-7}$	$7.22x10^{-7}$	0	0

TABLE E.3.4–20.—*Risk Assessments from Exposure to Hazardous Chemicals from No Action at Lawrence Livermore National Laboratory* [Page 6 of 6]

	Regulated Exposure Limits/ Risk Factors			Emissions Inventory		Hazard Quotient		Cancer Risk	
Chemical	RfC (mg/m^3)	PEL[a] (mg/m^3)	Slope Factor (mg/kg/day)	Boundary Annual MEI[b] (mg/m^3)	Worker 100 m 8 hours (mg/m^3)	Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
Silicon tetrafluoride	-	-	None	$1.60x10^{-12}$	$1.18x10^{-10}$	None	None	0	0
Stoddard solvent	71.05	2,900	None	$7.97x10^{-6}$	$5.86x10^{-4}$	$1.12x10^{-7}$	$2.02x10^{-7}$	0	0
Styrene (monomer)	1	433	None	$2.14x10^{-4}$	$1.57x10^{-2}$	$2.14x10^{-4}$	$3.63x10^{-5}$	0	0
Sulfur hexafluoride	147	6,000	None	$5.72x10^{-8}$	$4.21x10^{-6}$	$3.89x10^{-10}$	$7.02x10^{-10}$	0	0
Sulfuric acid	0.0245	1	None	$3.95x10^{-6}$	$2.91x10^{-4}$	$1.61x10^{-4}$	$2.91x10^{-4}$	0	0
Tetraethylene pentamine	-	-	None	$1.55x10^{-8}$	$1.14x10^{-6}$	None	None	0	0
Tetrahydrofuran (THF)	14.455	590	None	$8.05x10^{-7}$	$5.92x10^{-5}$	$5.57x10^{-8}$	$1.00x10^{-7}$	0	0
Toluene	0.4	766	None	$5.28x10^{-5}$	$3.89x10^{-3}$	$1.32x10^{-4}$	$5.07x10^{-6}$	0	0
Toluene diisocyanate	0.00343	0.14	None	$3.68x10^{-7}$	$2.71x10^{-5}$	$1.07x10^{-4}$	$1.93x10^{-4}$	0	0
Trichloroethylene (TCE)	13.377	546	0.006	$2.11x10^{-5}$	$1.55x10^{-3}$	$1.57x10^{-6}$	$2.84x10^{-6}$	$3.61x10^{-8}$	$3.60x10^{-7}$
Tricresyl phosphate	0.728	29.7	None	$3.97x10^{-8}$	$2.92x10^{-6}$	$5.54x10^{-8}$	$9.83x10^{-8}$	0	0
Tripropyleneglycol methyl ether	4.62	18.9	None	$5.60x10^{-7}$	$4.12x10^{-5}$	$1.21x10^{-7}$	$2.18x10^{-7}$	0	0
Volatile Organic Compounds (toluene)	0.4	766	None	$7.52x10^{-5}$	$5.53x10^{-3}$	$1.88x10^{-4}$	$7.22x10^{-6}$	0	0
Xylene	7	435	None	$2.95x10^{-5}$	$2.17x10^{-3}$	$4.22x10^{-6}$	$5.00x10^{-6}$	0	0
Zinc	0.01	0.408	None	$2.52x10^{-15}$	$1.85x10^{-13}$	$2.52x10^{-13}$	$4.54x10^{-13}$	0	0
Hazard Index[g]						1.34	$2.39x10^{-1}$	0	0
Total Cancer Risk[h]								$4.55x10^{-7}$	$4.53x10^{-6}$

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.
[b] MEI - maximally exposed individual of the public.
[c] Hazard Quotient for MEI - boundary annual emissions/reference concentration (RfC).
[d] Hazard Quotient for workers - 100-m, 8-hr emissions/permissible exposure limit (PEL).
[e] Cancer risk for MEI - (emissions concentrations) x (0.286 [converts concentration to dose]) x (slope factor [SF]).
[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).
[g] Hazard Index - sum of individual Hazard Quotients.
[h] Total cancer risk - sum of individual cancer risks.
Source: LLNL 1995i:1.

TABLE E.3.4–21.—*Risk Assessments from Exposure to Hazardous Chemicals from Secondary and Case Fabrication at Lawrence Livermore National Laboratory*

Chemical	Regulated Exposure Limits/ Risk Factors: RfC (mg/m^3)	PEL[a] (mg/m^3)	Slope Factor (mg/kg/day)	Emissions Inventory: Boundary Annual MEI[b] (mg/m^3)	Worker 100 m 8 hours (mg/m^3)	Hazard Quotient: Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Cancer Risk: Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
Carbon dioxide	221	9,000	None	$5.34x10^{-1}$	$3.93x10^{+1}$	$2.42x10^{-3}$	$4.37x10^{-3}$	0	0
Carbon monoxide	1.35	55	None	$1.53x10^{-4}$	$1.12x10^{-2}$	$1.13x10^{-4}$	$2.04x10^{-4}$	0	0
Hydrogen fluoride	0.21	2.49	None	$5.34x10^{-5}$	$3.93x10^{-3}$	$2.54x10^{-4}$	$1.58x10^{-3}$	0	0
Hydrogen sulfide	0.0009	28.4	None	$5.57x10^{-6}$	$4.10x10^{-4}$	$6.19x10^{-3}$	$1.44x10^{-5}$	0	0
Hazard Index[g]						$8.97x10^{-3}$	$6.16x10^{-3}$	0	0
Total Cancer Risk[h]								0	0

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.
[b] MEI - maximally exposed individual of the public.
[c] Hazard Quotient for MEI - boundary annual emissions/reference concentration (RfC).
[d] Hazard Quotient for workers - 100-meter, 8-hr emissions/permissible exposure limit (PEL).
[e] Cancer risk for MEI - (emissions concentrations) x (0.286 [converts concentration to dose]) x (slope factor [SF]).
[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).
[g] Hazard Index - sum of individual Hazard Quotients.
[h] Total cancer risk - sum of individual cancer risks.
Source: LLNL 1995e.

TABLE E.3.4–22.—*Risk Assessments from Exposure to Hazardous Chemicals from High Explosives Fabrication at Lawrence Livermore National Laboratory* [Page 1 of 2]

Chemical	Regulated Exposure Limits/ Risk Factors: RfC (mg/m^3)	PEL[a] (mg/m^3)	Slope Factor (mg/kg/day)	Emissions Inventory: Boundary Annual MEI[b] (mg/m^3)	Worker 100 m 8 hours (mg/m^3)	Hazard Quotient: Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Cancer Risk: Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
Acetonitrile	0.021	70	None	$2.29x10^{-6}$	$1.68x10^{-4}$	$1.09x10^{-4}$	$2.41x10^{-6}$	0	0
Ammonia	0.1	35	None	$5.34x10^{-7}$	$3.93x10^{-5}$	$5.34x10^{-6}$	$1.12x10^{-6}$	0	0
Benzene	0.0796	3.25	0.029	$3.82x10^{-8}$	$2.81x10^{-6}$	$4.79x10^{-7}$	$8.64x10^{-7}$	$3.16x10^{-10}$	$3.15x10^{-9}$
Bisphenol-alpha-epichlorohydrin (epichloro)	0.001	19	0.0042	$7.63x10^{-8}$	$5.61x10^{-6}$	$7.63x10^{-5}$	$2.95x10^{-7}$	$9.17x10^{-11}$	$9.13x10^{-10}$
Carbon monoxide	1.35	55	None	$1.91x10^{-5}$	$1.40x10^{-3}$	$1.41x10^{-5}$	$2.55x10^{-5}$	0	0

TABLE E.3.4–22.—*Risk Assessments from Exposure to Hazardous Chemicals from High Explosives Fabrication at Lawrence Livermore National Laboratory* [Page 2 of 2]

Chemical	Regulated Exposure Limits/ Risk Factors			Emissions Inventory		Hazard Quotient		Cancer Risk	
	RfC (mg/m^3)	PEL[a] (mg/m^3)	Slope Factor (mg/kg/day)	Boundary Annual MEI[b] (mg/m^3)	Worker 100 m 8 hours (mg/m^3)	Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
Chloroform	0.0035	240	0.0061	7.63×10^{-8}	5.61×10^{-6}	2.18×10^{-6}	2.34×10^{-8}	1.33×10^{-10}	1.33×10^{-9}
Cyclohexane	25.725	1050	None	7.63×10^{-8}	5.61×10^{-6}	2.97×10^{-9}	5.35×10^{-9}	0	0
Dibutyl phthalate	0.35	5	None	7.63×10^{-9}	5.61×10^{-7}	2.18×10^{-8}	1.12×10^{-7}	0	0
1,1-Dichloroethane	9.8	400	None	1.53×10^{-7}	1.12×10^{-5}	1.56×10^{-8}	2.81×10^{-8}	0	0
Dimethyl formamide	0.03	30	None	7.63×10^{-8}	5.61×10^{-6}	2.54×10^{-6}	1.87×10^{-7}	0	0
1,4-Dioxane	8.82	360	0.011	7.63×10^{-8}	5.61×10^{-6}	8.65×10^{-9}	1.56×10^{-8}	2.40×10^{-10}	2.39×10^{-9}
Hexane	0.2	1800	None	7.63×10^{-8}	5.61×10^{-6}	3.82×10^{-7}	3.12×10^{-9}	0	0
Hydrogen chloride	0.007	7	None	7.63×10^{-6}	5.61×10^{-4}	1.09×10^{-3}	8.02×10^{-5}	0	0
Hydrogen fluoride	0.21	2.49	None	1.53×10^{-5}	1.12×10^{-3}	7.27×10^{-5}	4.51×10^{-4}	0	0
Hydrogen sulfide	0.0009	28.4	None	3.82×10^{-8}	2.81×10^{-6}	4.24×10^{-5}	9.88×10^{-8}	0	0
Methanol	1.75	260	None	7.63×10^{-8}	5.61×10^{-6}	4.36×10^{-8}	2.16×10^{-8}	0	0
Methyl ethyl ketone (MEK)	1	590	None	3.82×10^{-8}	2.81×10^{-6}	3.82×10^{-8}	4.76×10^{-9}	0	0
N-Butyl glycidyl ether	6.615	270	None	1.14×10^{-6}	8.42×10^{-5}	1.73×10^{-7}	3.12×10^{-7}	0	0
Propyl glycol methyl ether	2	360	None	3.82×10^{-8}	2.81×10^{-6}	1.91×10^{-8}	7.80×10^{-9}	0	0
Toluene	0.4	766	None	7.63×10^{-8}	5.61×10^{-6}	1.91×10^{-7}	7.33×10^{-9}	0	0
Trichloroethylene (TCE)	13.377	546	0.006	3.82×10^{-8}	2.81×10^{-6}	5.85×10^{-9}	5.14×10^{-9}	6.55×10^{-11}	6.52×10^{-10}
Triethylamine	0.007	100	None	3.82×10^{-8}	2.81×10^{-6}	5.45×10^{-6}	2.81×10^{-8}	0	0
Xylene	7	435	None	4.58×10^{-7}	3.37×10^{-5}	6.54×10^{-8}	7.74×10^{-8}	0	0
Hazard Index[g]						1.42×10^{-3}	5.62×10^{-4}		
Total Cancer Risk[h]								8.47×10^{-10}	8.43×10^{-9}

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.
[b] MEI - maximally exposed individual of the public.
[c] Hazard Quotient for MEI - boundary annual emissions/reference concentration (RfC).
[d] Hazard Quotient for workers - 100-meter, 8-hr emissions/permissible exposure limit (PEL).
[e] Cancer risk for MEI - (emissions concentrations) x (0.286 [converts concentration to dose]) x (slope factor [SF]).
[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).
[g] Hazard Index - sum of individual Hazard Quotients.
[h] Total cancer risk - sum of individual cancer risks.
Source: LLNL 1995j.

TABLE E.3.4–23.—*Risk Assessments from Exposure to Hazardous Chemicals from Nonnuclear Fabrication at Lawrence Livermore National Laboratory*

Chemical	Regulated Exposure Limits/ Risk Factors			Emissions Inventory		Hazard Quotient		Cancer Risk	
	RfC (mg/m^3)	PEL[a] (mg/m^3)	Slope Factor (mg/kg/day)	Boundary Annual MEI[b] (mg/m^3)	Worker 100 m 8 hours (mg/m^3)	Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
Acetone	0.35	2,400	None	1.53×10^{-5}	1.12×10^{-3}	4.36×10^{-5}	4.68×10^{-7}	0	0
Isopropyl alcohol	24.01	980	None	3.05×10^{-5}	2.25×10^{-3}	1.27×10^{-6}	2.29×10^{-6}	0	0
Methyl ethyl ketone (MEK)	1	590	None	1.30×10^{-6}	9.54×10^{-5}	1.30×10^{-6}	1.62×10^{-8}	0	0
Toluene	0.4	766	None	1.30×10^{-6}	9.54×10^{-5}	3.24×10^{-6}	1.25×10^{-8}	0	0
Hazard Index[g]						4.94×10^{-5}	3.05×10^{-6}		
Total Cancer Risk[h]								0	0

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.
[b] MEI - maximally exposed individual of the public.
[c] Hazard Quotient for MEI - boundary annual emissions/reference concentration (RfC).
[d] Hazard Quotient for workers - 100-meter, 8-hr emissions/permissible exposure limit (PEL).
[e] Cancer risk for MEI - (emissions concentrations) x (0.286 [converts concentration to dose]) x (slope factor [SF]).
[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).
[g] Hazard Index - sum of individual Hazard Quotients.
[h] Total cancer risk - sum of individual cancer risks.
Source: LLNL 1995f.

TABLE E.3.4–24.—*Risk Assessments from Exposure to Hazardous Chemicals from Operation of Contained Firing Facility at Lawrence Livermore National Laboratory*

Chemical	Regulated Exposure Limits/ Risk Factors: RfC (mg/m^3)	Regulated Exposure Limits/ Risk Factors: PEL[a] (mg/m^3)	Regulated Exposure Limits/ Risk Factors: Slope Factor (mg/kg/day)	Emissions Inventory: Boundary Annual MEI[b] (mg/m^3)	Emissions Inventory: Worker 100 m 8 hours (mg/m^3)	Hazard Quotient: Boundary Annual MEI[b,c]	Hazard Quotient: Worker 100 m 8 hours[d]	Cancer Risk: Boundary Annual MEI[b,e]	Cancer Risk: Worker 100 m 8 hours[f]
None	0	0	None	0	0	0	0	0	0
Hazard Index[g]						0	0		
Total Cancer Risk[h]								0	0

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.
[b] MEI - maximally exposed individual of the public.
[c] Hazard Quotients for MEI - boundary annual emissions/reference concentration (RfC).
[d] Hazard Quotients for workers - 100-meter, 8-hr emissions/permissible exposure limit (PEL).
[e] Cancer risk for MEI - (emissions concentrations) x (0.286 [converts concentration to dose]) x (slope factor [SF]).
[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).
[g] Hazard Index - sum of individual Hazard Quotients.
[h] Total cancer risk - sum of individual cancer risks.
Source: Appendix J.

TABLE E.3.4–25.—*Risk Assessments from Exposure to Hazardous Chemicals from Operation of National Ignition Facility at Lawrence Livermore National Laboratory*

Chemical	Regulated Exposure Limits/ Risk Factors: RfC (mg/m^3)	Regulated Exposure Limits/ Risk Factors: PEL[a] (mg/m^3)	Regulated Exposure Limits/ Risk Factors: Slope Factor (mg/kg/day)	Emissions Inventory: Boundary Annual MEI[b] (mg/m^3)	Emissions Inventory: Worker 100 m 8 hours (mg/m^3)	Hazard Quotient: Boundary Annual MEI[b,c]	Hazard Quotient: Worker 100 m 8 hours[d]	Cancer Risk: Boundary Annual MEI[b,e]	Cancer Risk: Worker 100 m 8 hours[f]
None	0	0	None	0	0	0	0	0	0
Hazard Index[g]						0	0		
Total Cancer Risk[h]								0	0

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.
[b] MEI - maximally exposed individual of the public.
[c] Hazard Quotients for MEI - boundary annual emissions/reference concentration (RfC).
[d] Hazard Quotients for workers - 100-meter, 8-hr emissions/permissible exposure limit (PEL).
[e] Cancer risk for MEI - (emissions concentrations) x (0.286 [converts concentration to dose]) x (slope factor [SF]).
[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).
[g] Hazard Index - sum of individual Hazard Quotients.
[h] Total cancer risk - sum of individual cancer risks.
Source: Appendix I.

TABLE E.3.4–26.—*Risk Assessments from Exposure to Hazardous Chemicals from No Action at Sandia National Laboratories*

	Regulated Exposure Limits/ Risk Factors			Emissions Inventory		Hazard Quotient		Cancer Risk	
Chemical	**RfC (mg/m^3)**	**PEL[a] (mg/m^3)**	**Slope Factor (mg/kg/day)**	**Boundary Annual MEI[b] (mg/m^3)**	**Worker 100 m 8 hours (mg/m^3)**	**Boundary Annual MEI[b,c]**	**Worker 100 m 8 hours[d]**	**Boundary Annual MEI[b,e]**	**Worker 100 m 8 hours[f]**
Chlorofluorocarbons	105	7600	None	5.49×10^{-6}	2.70×10^{-3}	5.23×10^{-8}	3.55×10^{-7}	0	0
Gasoline (vapors)	21.805	890	None	3.11×10^{-6}	1.53×10^{-3}	1.43×10^{-7}	1.72×10^{-6}	0	0
1,1,1-Trichloroethane (TCA)	0.014	1900	0.057	3.23×10^{-5}	1.59×10^{-2}	2.31×10^{-3}	8.35×10^{-6}	0	0
Hazard Index[g]						2.31×10^{-3}	1.04×10^{-5}		
Total Cancer Risk[h]								5.27×10^{-7}	3.5×10^{-5}

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.
[b] MEI - maximally exposed individual of the public.
[c] Hazard Quotients for MEI - boundary annual emissions/reference concentration (RfC).
[d] Hazard Quotients for workers - 100-meter, 8-hr emissions/permissible exposure limit (PEL).
[e] Cancer risk for MEI - (emissions concentrations) x (0.286 [converts concentration to dose]) x (slope factor [SF]).
[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).
[g] Hazard Index - sum of individual Hazard Quotients.
[h] Total cancer risk - sum of individual cancer risks.
Source: LLNL 1995i:1.

TABLE E.3.4–27.—*Risk Assessments from Exposure to Hazardous Chemicals from Nonnuclear Fabrication at Sandia National Laboratories*

Chemical	Regulated Exposure Limits/ Risk Factors			Emissions Inventory		Hazard Quotient		Cancer Risk	
	RfC (mg/m^3)	PEL[a] (mg/m^3)	Slope Factor (mg/kg/day)	Boundary Annual MEI[b] (mg/m^3)	Worker 100 m 8 hours (mg/m^3)	Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
Acetone	0.35	2,400	None	$1.16x10^{-5}$	$5.68x10^{-3}$	$3.30x10^{-5}$	$2.36x10^{-6}$	0	0
Isopropyl alcohol	24.01	980	None	$1.05x10^{-4}$	$5.17x10^{-2}$	$4.38x10^{-6}$	$5.27x10^{-5}$	0	0
Methyl ethyl ketone (MEK)	1	590	None	$7.14x10^{-6}$	$3.51x10^{-3}$	$7.14x10^{-6}$	$5.94x10^{-6}$	0	0
Toluene	0.4	766	None	$2.00x10^{-5}$	$9.83x10^{-3}$	$5.01x10^{-5}$	$1.28x10^{-5}$	0	0
Trichloroethylene (TCE)	13.377	546	0.006	$9.63x10^{-5}$	$4.73x10^{-2}$	$7.20x10^{-6}$	$8.66x10^{-5}$	$1.65x10^{-7}$	$1.10x10^{-5}$
Hazard Index[g]						$1.02x10^{-4}$	$1.60x10^{-4}$		
Total Cancer Risk[h]								$1.65x10^{-7}$	$1.10x10^{-5}$

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.
[b] MEI - maximally exposed individual of the public.
[c] Hazard Quotients for MEI - boundary annual emissions/reference concentration (RfC).
[d] Hazard Quotients for workers - 100-meter, 8-hr emissions/permissible exposure limit (PEL).
[e] Cancer risk for MEI - (emissions concentrations) x (0.286 [converts concentration to dose]) x (slope factor [SF]).
[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).
[g] Hazard Index - sum of individual Hazard Quotients.
[h] Total cancer risk - sum of individual cancer risks.
Source: KC ASI 1995a; SNL 1995e.

ƎLE E.3.4–28.—*Risk Assessments from Exposure to Haza Chemicals from Operation of National Ignition Facility at Sandia National Laboratories*

Chemical	Regulated Exposure Limits/ Risk Factors: RfC (mg/m³)	PEL[a] (mg/m³)	Slope Factor (mg/kg/day)	Emissions Inventory: Boundary Annual MEI[b] (mg/m³)	Worker 100 m 8 hours (mg/m³)	Hazard Quotient: Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Cancer Risk: Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
None	0	0	None	0	0	0	0	0	0
Hazard Index[g]						0	0		
Total Cancer Risk[h]								0	0

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.
[b] MEI - maximally exposed individual of the public.
[c] Hazard Quotients for MEI - boundary annual emissions/reference concentration (RfC).
[d] Hazard Quotients for workers - 100-meter, 8-hr emissions/permissible exposure limit (PEL).
[e] Cancer risk for MEI - (emissions concentrations) x (0.286 [converts concentration to dose]) x (slope factor [SF]).
[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).
[g] Hazard Index - sum of individual Hazard Quotients.
[h] Total cancer risk - sum of individual cancer risks.
Source: Appendix I.

TABLE E.3.4–29.—*Risk Assessments from Exposure to Hazardous Chemicals from No Action at Nevada Test Site*

Chemical	Regulated Exposure Limits/ Risk Factors: RfC (mg/m³)	PEL[a] (mg/m³)	Slope Factor (mg/kg/day)	Emissions Inventory: Boundary Annual MEI[b] (mg/m³)	Worker 100 m 8 hours (mg/m³)	Hazard Quotient: Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Cancer Risk: Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
None	0	0	None	0	0	0	0	0	0
Hazard Index[g]						0	0		
Total Cancer Risk[h]								0	0

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.
[b] MEI - maximally exposed individual of the public.
[c] Hazard Quotients for MEI - boundary annual emissions/reference concentration (RfC).
[d] Hazard Quotients for workers - 100-meter, 8-hr emissions/permissible exposure limit (PEL).
[e] Cancer risk for MEI - (emissions concentrations) x (0.286 [converts concentration to dose]) x (slope factor [SF]).
[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).
[g] Hazard Index - sum of individual Hazard Quotients.
[h] Total cancer risk - sum of individual cancer risks.
Source: NT DOE 1996c.

TABLE E.3.4–30.—*Risk Assessments from Exposure to Hazardous Chemicals from Assembly/Disassembly at Nevada Test Site*

	Regulated Exposure Limits/ Risk Factors			Emissions Inventory		Hazard Quotient		Cancer Risk	
Chemical	RfC (mg/m^3)	PEL[a] (mg/m^3)	Slope Factor (mg/kg/day)	Boundary Annual MEI[b] (mg/m^3)	Worker 100 m 8 hours (mg/m^3)	Boundary Annual MEI[b,c]	Worker 100 m 8 hours[d]	Boundary Annual MEI[b,e]	Worker 100 m 8 hours[f]
Acetonitrile	0.021	70	None	3.82×10^{-11}	4.41×10^{-7}	1.82×10^{-9}	6.30×10^{-9}	0	0
Benzene	0.0796	3.25	0.029	1.15×10^{-10}	1.32×10^{-6}	1.44×10^{-9}	4.07×10^{-7}	7.50×10^{-13}	1.48×10^{-9}
Carbon monoxide	1.35	55	None	5.73×10^{-8}	6.61×10^{-4}	4.24×10^{-8}	1.20×10^{-5}	0	0
Cresylic acid	0.539	22	None	3.82×10^{-11}	4.41×10^{-7}	7.09×10^{-11}	2.00×10^{-8}	0	0
1,2-Dichloroethane (ethylene dichloride)	10.069	411	0.091	3.82×10^{-11}	4.41×10^{-7}	3.79×10^{-12}	1.07×10^{-9}	9.94×10^{-13}	1.55×10^{-9}
Dimethylformamide (DMF)	0.03	30	None	1.15×10^{-10}	1.32×10^{-6}	3.82×10^{-9}	4.41×10^{-8}	0	0
Hydrogen chloride	0.007	7	None	3.82×10^{-10}	4.41×10^{-6}	5.46×10^{-8}	6.30×10^{-7}	0	0
Hydrogen sulfide	0.0009	28.4	None	3.82×10^{-10}	4.41×10^{-6}	4.24×10^{-7}	1.55×10^{-7}	0	0
Mercury (vapor)	0.0003	0.1	None	3.82×10^{-11}	4.41×10^{-7}	1.27×10^{-7}	4.41×10^{-6}	0	0
Methyl alcohol	1.75	260	None	1.91×10^{-10}	2.20×10^{-6}	1.09×10^{-13}	8.48×10^{-9}	0	0
Methyl ethyl ketone (MEK)	1	590	None	6.49×10^{-9}	7.50×10^{-5}	6.49×10^{-9}	1.27×10^{-7}	0	0
Propylglycol methyl ether			None	1.15×10^{-10}	1.32×10^{-6}	5.73×10^{-11}	3.67×10^{-9}	0	0
Ozone	0.0049	0.2	None	3.06×10^{-7}	3.53×10^{-3}	6.24×10^{-5}	1.76×10^{-2}		
Toluene	0.4	766	None	3.06×10^{-9}	3.53×10^{-5}	7.64×10^{-9}	4.61×10^{-8}	0	0
1,1,1-Trichloroethane (TCA)	0.1225	1,900	None	7.64×10^{-10}	8.82×10^{-6}	6.24×10^{-9}	4.64×10^{-9}	0	0
Trichloroethylene (TCE)	13.377	546	0.006	1.15×10^{-10}	1.32×10^{-6}	8.57×10^{-12}	2.42×10^{-9}	1.97×10^{-13}	3.07×10^{-10}
Xylene	7	434	None	3.06×10^{-9}	3.53×10^{-5}	4.37×10^{-10}	8.13×10^{-8}	0	0
Hazard Index[g]						6.03×10^{-5}	1.77×10^{-2}	2.14×10^{-12}	3.35×10^{-9}
Total Cancer Risk[h]								1.70×10^{-12}	5.03×10^{-9}

[a] See the Chemical Health Effects Technical Reference (TTI 1996b) for the ACGIH-TLV, NIOSH-REL, and other exposure limit values.
[b] MEI - maximally exposed individual of the public.
[c] Hazard Quotients for MEI - boundary annual emissions/reference concentration (RfC).
[d] Hazard Quotients for workers - 100-meter, 8-hr emissions/permissible exposure limit (PEL).
[e] Cancer risk for MEI - (emissions concentrations) x (0.286 [converts concentration to dose]) x (slope factor [SF]).
[f] Cancer risk for workers - (emissions for 8-hr) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (0.286 [converts concentration to dose]) x (slope factor).
[g] Hazard Index - sum of individual Hazard Quotients.
[h] Total cancer risk - sum of individual cancer risks.
Source: NT DOE 1995b.

E.4 HEALTH EFFECTS STUDIES: EPIDEMIOLOGY

Various epidemiologic studies have been conducted at some of the sites evaluated in this PEIS because of the concern for potential adverse health effects associated with the manufacture and testing of nuclear weapons. These studies focus on the DOE workforce and residents of communities surrounding DOE sites.

E.4.1 Background

The health effects associated with ionizing radiation exposure were first published about 60 years ago. Studies published in the 1930s first documented cancer among painters who used radium to paint watch dials back in 1910 to 1920. Radiation therapy for disease has been used since the 1930s and studies have shown that the risk of cancer was related to the amounts of radiation received. Nuclear weapons research and manufacture, and consequent exposure to radiation occurred beginning in the late 1930s. Exposure to radionuclides has changed over time with higher levels occurring in the early days of research and production. Numerous epidemiologic studies have been conducted among workers who manufactured and tested nuclear weapons due to the concern with potential adverse health effects. More recently, concerns about radiologic contaminants offsite have resulted in health studies among communities that surround DOE facilities. The following section briefly gives an overview of epidemiology followed by a review of epidemiologic studies of sites evaluated in this PEIS.

Epidemiology is the study of the distribution and determinants of disease in human populations. The distribution of disease is considered in relation to time, place, and person. Relevant population characteristics should include the age, race, and sex distribution of a population, as well as other characteristics related to health, such as social characteristics (e.g., income and education), occupation, susceptibility to disease, and exposure to specific agents. Determinants of disease include the causes of disease, as well as factors that influence the risk of disease.

E.4.1.1 *Study Designs*

Ecologic Studies. Ecologic studies compare the frequency of a disease in groups of people in conjunction with simple descriptive studies of geographical information in an attempt to determine how health events among populations vary with levels of exposure. These groups may be identified as the residents of a neighborhood, a city, or a county where demographic information and disease or mortality data are available. Exposure to specific agents may be defined in terms of residential location or proximity to a particular area, such as distance from a waste disposal site. An example of an ecologic study is a comparison of the rate of heart disease among community residents by drinking water quality.

The major disadvantage of ecologic studies is that the measure of exposure is based on the average level of exposure in the community, when what is really of interest is each individual's exposure. Ecologic studies do not take into account other factors such as age and race that may also be related to disease. These types of studies may lead to incorrect conclusions, an "ecologic fallacy." For the above example, it would be incorrect to assume that the level of water hardness influences the risk of getting heart disease. Despite the obvious problems with ecologic studies, they can be a useful first step in identifying possible associations between the risk of disease and environmental exposures. However, because of their potential for bias they should never be considered more than an initial step in investigation of disease causation.

Cohort Studies. The cohort study design is a type of epidemiologic study frequently used to examine occupational exposures within a defined workforce. A cohort study requires a defined population that can be classified as being exposed or not exposed to an agent of interest, such as radiation or chemicals that influence the probability of occurrence of a given disease. Characterization of the exposure may be qualitative (e.g., high, low, or no exposure) or very quantitative (e.g., radiation measured in Sieverts (Sv), chemicals in parts per million [ppm]). Surrogates for exposure, such as job titles, are frequently used in the absence of quantitative exposure data.

Individuals enumerated in the study population are tracked for a period of time and fatalities recorded. In general, overall rates of death and cause-specific rates of death have been assessed for workers at the PEIS sites. Death rates for the exposed worker population are compared with death rates of workers who did not have the exposure (internal comparison), or compared with expected death rates based on the U.S. population or state death rates (external comparison). If the rates of death differ from what is expected, an association is said to exist between the disease and exposure. In cohorts where the exposure has not been characterized, excess mortality can be identified, but these deaths cannot be attributed to a specific exposure, and additional studies may be warranted. More recent studies have looked at other disease endpoints, such as overall and cause-specific cancer incidence (newly diagnosed) rates.

Most cohort studies at PEIS sites have been historical cohort studies, that is, the exposure occurred some time in the distant past. These studies rely on past records to document exposure. This type of study can be problematic if exposure records are incomplete or were destroyed. Cohort studies require extremely large populations that have been followed for many (20 to 30) years. They are generally difficult to conduct and are very expensive. These studies are not well suited to studying diseases that are rare. Cohort studies do, however, provide a direct estimate of the risk of death from a specific disease, and allow an investigator to look at many disease end points.

Case-Control Studies. The case-control study design starts with the identification of persons with the disease of interest (case) and a suitable comparison (control) population of persons without the disease. Controls must be persons who are at risk for the disease and are representative of the population that generated the cases. The selection of an appropriate control group is often quite problematic. Cases and controls are then compared with respect to the proportion of individuals exposed to the agent of interest. Case-control studies require fewer persons than cohort studies, and therefore, are usually less costly and less time consuming, but are limited to the study of one disease (or cause of death). These types of studies are well suited for the study of rare diseases and are generally used to examine the relationship between a specific disease and exposure.

E.4.1.2 *Definitions*

Unfamiliar terms frequently used in epidemiologic studies, including those used in this document, are defined below.

Age, gender, and cigarette smoking are the principal determinants of mortality. Standardization is a statistical method used as a control for the effects of age, gender, or other characteristics so that death rates may be compared among different population groups. There are two ways to standardize rates, the indirect or direct methods. In general, the indirect method of standardization is most frequently used.

Indirect Standardization: The disease rates in the reference (comparison) population are multiplied by the number of individuals in the same age and gender groups in the study population to obtain the expected rate of disease for the study population.

Direct Standardization: The disease rates in the study population are multiplied by the number of individuals in the same age and gender group in the reference (comparison) population. This gives the expected rates of disease for the reference population if these rates had prevailed in that group.

Standardized Mortality Ratio: The standardized mortality rate (SMR) is the ratio of the number of deaths observed in the study population to the number of expected deaths. The expected number of deaths is based on a reference (or comparison population). Death rates for the U.S. (or state) population are most frequently used as the comparison to obtain expected rates. An SMR of 1 indicates a similar risk of disease in the study population compared with the reference population. An SMR greater than 1 indicates excess risk of disease in the study population compared with the reference group, and an SMR less than 1 indicates a deficit of disease.

Relative Risk: The ratio of the risk of disease among the exposed population to the risk of disease in the nonexposed population. Relative risks are estimated from cohort studies.

Odds Ratio: The ratio of the odds of disease if exposed, to the odds of disease if not exposed. Under certain conditions the odds ratio approximates the relative risk. Odds ratios are estimated from case-control studies.

E.4.2 Oak Ridge Reservation

Surrounding Communities. The population-based National Cancer Institute's mortality survey for selected nuclear facilities *Cancer in Populations Living Near Nuclear Facilities* (NIH Publication No. 90-874, July 1990) examined the cancer mortality within an 80 km (50 mi) radius around several nuclear facilities, including Anderson and Roane counties (JAMA 1991a:1403-1408). No excess cancer mortality was observed in the population living in the exposed counties when compared to the U.S. white male population, nor when compared to the population of the control counties (Blount, Bradley, Coffee, Jefferson, and Hamblen, TN, and Henderson, NC), nor when time trends were assessed.

Tennessee Medical Management, Inc. used data from the Tennessee Cancer Reporting System to compare mortality and incidence data for counties near Oak Ridge, Tennessee, for the 3-year period, 1988 to 1990, to the U.S. population (TMM 1993a). For Oak Ridge, total deaths from all causes was significantly lower than expected. For Anderson County, the observed number of deaths from uterine cancer and from cancer of respiratory and intrathoracic organs was statistically greater than expected and the number of deaths from brain cancer, breast cancer, and the "all other sites" category were lower than expected for Anderson County. For Roane County, the number of deaths from cancer of the respiratory and intrathoracic organs was statistically greater than expected. The number of deaths from cancer of the digestive organs and the peritoneum; from uterine cancer; and from lip, oral cavity, and pharynx cancer was lower than expected.

Tennessee Medical Management, Inc. examined new (incident) cancer cases and identified the following as statistically significant: For Anderson County, the observed numbers of cases of cancer of the prostate and of cancer of the lung and bronchus were greater than expected. Leukemia, stomach and small intestine cancers, and cancers of the colon and intestinal tract were lower than expected. For Roane County, the number of cases of cancer of the lung and bronchus was greater than expected. Non-Hodgkin's lymphoma, female breast cancer, esophageal cancer, cancer of the pancreas, and cancer in all sites were lower than expected. The only consistent excess reported for both cancer mortality and cancer incidence was for cancer of respiratory and intrathoracic organs.

Because of a concern for possible contamination of the population by mercury, the Tennessee Department of Health and Environment conducted a pilot study in 1984 (TN DHE 1984a). The study showed no difference in urine or hair mercury exposures (residence or activity in contaminated areas based on soil measurements or consumption of fish caught in the contaminated areas), compared to those with little potential exposure. Mercury levels in some soils measured as high as 2,000 ppm. Analysis of a few soil samples showed that most of the mercury in the soil, however, was inorganic, thereby lowering the probability of bioaccumulation and health effects. Examination of the long-term effects of exposure to mercury and other chemicals continues.

State Health Agreement Program. Under the State Health Agreement Program managed by DOE's Office of Epidemiologic Studies, a grant was awarded to the Tennessee Department of Health and Environment. The purpose of the grant was to determine the extent of exposure to contaminants among workers and residents of the surrounding community as a result of ORR operations, and to assess the current status of health outcomes and determine their potential association with these exposures.

A dose reconstruction feasibility study began in 1992, with the contract awarded by the State of Tennessee to ChemRisk. The contractor performed extensive review of Oak Ridge documents and issued a report, which concluded that sufficient information exists to reconstruct past releases and offsite doses caused by radioactive and hazardous materials. The report also concluded that doses from mercury, polychlorinated biphenyl, radioactive iodine, and radioactive cesium may have been great enough to cause harmful health effects in the offsite population. Based on this information, a full dose reconstruction study was initiated in August 1994.

Other activities supported under the grant include: development of a birth defects registry, a quality improvement program for the Tennessee cancer registry, a review and evaluation of the DOE occupational medical program, and the implementation of a community participation/public information program.

Technical support to the State health department is provided by a 12-member Oak Ridge Health Agreement Steering Panel. The Health Advisory Panel provides direction and oversight to those working on health studies, ensures public input, and informs the public of activities related to the health studies. A representative of the Centers for Disease Control and Prevention's National Center for Environmental Health is a member of the advisory panel. A representative from DOE serves as an ex-officio member.

Workers. Between 1943 and 1985, there were 118,588 male and female individuals of all races who were employed in any of the Oak Ridge facilities. These included Oak Ridge National Laboratory (ORNL) for nuclear research (also called the X-10 Facility); the Y-12 Plant (Y-12) under management of the Tennessee-Eastman Corporation (1943 to 1947), which produced enriched uranium by the electromagnetic separation process; Y-12 under management of Union Carbide (1948 to 1984), which fabricated and certified nuclear weapons parts; and the K-25 Site (K-25) (Oak Ridge Gaseous Diffusion Plant), which produced enriched uranium through the gaseous process. Analyses at the Oak Ridge facilities have been carried out mostly for white males, and for specific cohorts taking into consideration time-related exposure risks.

Oak Ridge National Laboratory. The mortality experience of 8,375 white males employed at least a month between 1943 and 1972 at ORNL was compared with the U.S. white male population using SMR analyses in a 1985 paper by Checkoway et al. (BJIM 1985a:525-533). Increases in deaths from leukemia (SMR - 1.49, 16 observed), cancer of the prostate (SMR - 1.16, 14 observed), and Hodgkin's disease (SMR - 1.10, 5 observed) were observed, although none were statistically significant. Dose response analyses were performed for all causes of death combined, all cancers combined, leukemia, and prostate cancer comparing exposed worker death rates with nonexposed worker death rates. Dosimetry data were available for the entire period of the study with the total population external radiation dose measuring 13,500 mrem. No dose response gradients were observed. Death rates were calculated for 11 different job categories by length of time in each job in an attempt to determine whether specific work environments were related to cancer and leukemia. Leukemia mortality was observed to be related to length of employment in engineering and maintenance jobs.

Followup to this cohort study was expanded through 1984 in an updated study by Wing et al. (JAMA 1991a:1397-1402). Again, death rates in the worker population were compared with those in the U.S. population. Nonstatistically significant increases were noted for cancers of the pancreas (SMR - 1.09, 25 observed), prostate (SMR - 1.05, 26 observed), brain (SMR - 1.04, 15 observed), and lymphosarcoma and/or reticulasarcoma (SMR - 1.05, 9 observed). There was a significant increase in deaths from leukemia (SMR - 1.63, 28 observed, 95 percent confidence interval [CI] 1.08-2.35). The total population external radiation dose was 144 Sv. Dose response analyses performed for all causes except cancer, lung cancer, and leukemia did not demonstrate a relationship between level of external radiation and increased risk of death from these outcomes. There was a significant dose response relationship (4.94 percent per 1,000 mrem) between cancer deaths and level of external radiation dose using models with a 20-year lag. A subgroup of workers who were monitored for internal contamination had nonstatistically elevated SMRs for cancer of the prostate (SMR - 1.12, 10 observed) and lymphosarcoma and/or reticulasarcoma (SMR - 1.65, 6 observed). The workers monitored for internal contamination had a statistically significant elevated SMR for leukemia (SMR - 2.23 16 observed, 95 percent CI 1.27-3.62).

A second publication on the above data set examined the effect of controlling for a number of possible selection and confounding factors on the risk coefficient for all cancer dose responses (AJIM 1993a:265-279). Models were adjusted for the following variables with little change in the previously reported risk coefficient: employment during the World War II era, short-term employment, job category, and exposure to beryllium, lead, and mercury. The authors concluded that the previously calculated dose response estimate was fairly stable when adjustments were made for a wide range of potential confounders that were not explored in the earlier study.

Y-12 Plant. Y–12 is a nuclear weapons materials fabrication plant where the radiologic exposure of greatest concern is internal exposure from the inhalation of uranium compounds. The Tennessee Eastman Corporation managed the plant from 1943 to 1947. Polednak and Frome reported a followup through 1974 of all 18,869 white male workers employed at Y-12 from 1943 to 1947 (JOM 1981a:169-178). The workers included those exposed to internal (alpha) and external (beta) radiation through the inhalation of uranium dusts, electrical workers who performed maintenance in the exposed areas, and other nonexposed workers. Individual measures of exposure were not available for any members of this cohort, so exposure levels were inferred from plant areas of work and jobs. High average air levels of uranium dust were documented in departments employing chemical workers. Elevated SMRs were observed for mental, psychoneurotic, personality disorders (SMR - 1.36, 36 observed), emphysema (SMR - 1.16, 100 observed), diseases of the bones and organs of movement (SMR - 1.22, 11 observed), lung cancer (SMR - 1.09, 324 observed), and external causes of death (SMR - 1.09, 623 observed). The lung cancer SMR was greater among workers employed for 1 year or more compared with workers employed less than 1 year and was more pronounced in workers hired at the age of 45 or older (SMR - 1.51; 95 percent CI 1.01-2.31). Of the workers employed after the age of 44, the SMR for lung cancer was greatest for electrical workers (SMR - 1.55, 7 observed), alpha chemistry workers (SMR - 3.02, 7 observed), and beta process workers (SMR - 1.51, 11 observed).

During the early operation of Y-12 from 1942 to 1947, a group of male workers was exposed to phosgene gas on a chronic basis (N - 694) and a smaller group of males received acute exposures (N - 106) along with a small group of females (N - 91) (ER 1980a:357-367; TIH 1985a:137-147). A control group of 9,280 workers who also worked at Y-12 during the same era, but who did not have phosgene exposure, was also described. All groups were followed through the end of 1978. The SMRs for the chronically exposed group and the control group were similar for all causes examined. There was no evidence for increased mortality from respiratory diseases in this group and the SMR for lung cancer, while elevated, was similar to the lung cancer SMR for workers in the rest of the plant. Among those with acute exposures, the SMR for respiratory diseases was elevated (SMR - 2.66, 5 observed) and this elevation may be related to residual lung damage from the acute phosgene exposure. It was difficult to trace the vital status of the 91 women; therefore, description of these highly exposed workers was limited to listing the frequency of their initial symptoms after exposure. As expected, nausea, vomiting, and coughing were the most frequently reported symptoms. Unexpectedly, the women experienced a lower frequency of pneumonitis than their male counterparts.

The portion of the Y-12 cohort employed between 1947 and 1974 was described in a study by Checkoway et al. (AJE 1988a:255-266). This study included 6,781 white male workers first employed at Y-12 between 1947 and 1974 who were employed for at least 30 days. Mortality data were collected for the cohort through the end of 1979 and were used to perform SMR and cause specific dose-response analyses. Nonstatistically significant increases were observed for all cancers (SMR - 1.01, 196 observed), diseases of the blood-forming organs (SMR - 1.48, 3 observed), kidney cancer (SMR - 1.22, 6 observed), brain cancer (SMR - 1.80, 14 observed), and other lymphatic cancers (SMR - 1.86, 9 observed). A statistically significant increase in deaths from lung cancer (SMR - 1.36, 89 observed; 95 percent CI - 1.09-1.67) was observed compared with the U.S. lung cancer rates, but not with Tennessee lung cancer rates (SMR - 1.18, 95 percent CI - 0.95-1.45). Dose-response analyses for lung cancer and internal alpha radiation dose and external gamma radiation dose did not reveal a positive relationship for a 0- or 10-year lag. Examination of lung cancer rates distributed across both internal and external dose categories suggested a dose-response with external radiation dose among individuals who had 5 or more rems of internal dose. Brain cancer was not related to the level of internal or external radiation dose.

The Y-12 cohort studied by Checkoway was updated through the end of 1990 by Loomis and Wolf and included African-American and white female workers (AJIM 1996a:131-141). The dose-response analyses were not included in the update; therefore, only SMR analyses are reported. For all workers examined as a group, nonstatistically significant elevations were observed for cancer of the pancreas (SMR - 1.36, 34 observed), skin cancer (SMR - 1.07, 11 observed), breast cancer (females only, SMR - 1.21, 11 observed), prostate cancer

(SMR - 1.31, 36 observed), kidney cancer (SMR - 1.30, 16 observed), brain cancer (SMR - 1.29, 20 observed), cancers of other lymphatic tissues (SMR - 1.32, 22 observed), and diseases of the blood-forming organs (SMR - 1.23, 6 observed). The SMR for lung cancer was statistically significant (SMR - 1.17, 202 observed; 95 percent CI 1.01-1.34), particularly in the white male segment of the population (SMR - 1.20, 194 observed; 95 percent CI - 1.04-1.38). Examination of the lung cancer mortality by year of hire, latency, duration of employment, and calendar year at risk indicated the excess was confined to those who were first hired before 1954 (SMR - 1.27, 161 observed), and was greatest in persons employed 5 to 20 years with 10 to 30 years of followup. Elevated lung cancer deaths was first evident between 1955 and 1964 and continued to increase from 1975 to 1979, followed by a decrease in lung cancer death rates.

Between 1953 and 1963 Y-12 used mercury in a process to produce large quantities of enriched lithium. Cragle et al. studied all workers employed at Y-12 at least 5 months between January 1, 1953 and April 30, 1958 (N - 5,663) (JOM 1984a:817-821). This group was categorized into workers exposed to mercury and workers not exposed to mercury based on results of urinalysis data supplied by the plant. Vital status followup was complete through the end of 1978 and SMRs were calculated. Compared with nonexposed workers, there were no differences in the mortality patterns for: 1) mercury-exposed workers as a whole, 2) workers with the highest mercury exposures, and 3) workers employed more than a year in a mercury process. The authors acknowledge that mortality is not the optimal end point to assess health effects related to mercury exposure.

The mercury workers were involved in a clinical study by Albers et al. who examined 502 Y-12 workers, 247 of whom worked in the mercury process 20 to 35 years prior to the examination (AN 1988a:651-659). Correlations between declining neurological function and increasing exposure were identified. An exposure assessment was determined for each mercury worker during the time of employment in the mercury process. Study subjects who had at least one urinalysis equal to or greater than 0.6 mg/liters of mercury showed decreased strength, coordination, and sensation along with increased tremor, and prevalence of Babinski and snout reflexes when compared with the 255 nonexposed workers. Clinical polyneuropathy was associated with the level of the highest exposure, but not with the duration of exposure.

K-25 Site. K-25 enriched uranium beginning in 1945 using a gaseous diffusion process. There was potential exposure to uranium dust, oxidized uranium compounds, uranium hexafluoride, and a number of chemical compounds used in the process. In later years of operation, the gas centrifuge process was used to enrich uranium. No analyses of death rates for this population have been published; however, health effects have been studied.

Powdered nickel was used at K-25 in the production of the barrier material used to separate and enrich uranium. Workers who fabricated the barrier material were exposed to nickel powder through inhalation. Cragle et al. (IARC 1984a:57-63) updated an earlier study by Godbold et al. (JOM 1979a:799-806) of 814 workers who were employed in the manufacture of barrier material between 1948 and 1953. A comparison group of white males employed at K-25 sometime between 1948 and 1953 (N - 7,552) was also selected. The SMRs in the barrier group were similar to those in the nonbarrier worker group for most noncancer outcomes. The nickel workers were noted to have a higher rate of death from cancers of the buccal cavity and pharynx (SMR - 2.92, 3 observed) than the nonnickel workers (SMR - 0.23, 3 observed). When the directly standardized rates were compared, the rate of buccal cavity and pharynx cancer in the nickel workers was approximately 19 times higher than the rate in the nonnickel workers. The authors acknowledge that the number of cases is quite small and recommended additional followup to determine if this trend continued. There were no nasal sinus cancers observed in the worker population exposed to metallic nickel, in contrast to the results of studies of workers in nickel refineries where the rates of sinus cancer related to nickel compounds are quite high.

K-25 workers employed in the gas centrifuge process were the focus of an interview study by Cragle et al. (AOEH 1992a:826-834). The study was conducted in order to determine the incidence rate for cancer and illness symptoms among workers exposed to epoxy resin and solvents prevalent in the process. A total of 263 workers determined to have worked closest and longest to the process were compared with 271 employees employed at the plant during the same time, but did not work in the centrifuge process. The centrifuge workers and the noncentrifuge workers had similar overall cancer incidence rates. However, the centrifuge workers reported five incident bladder cancers versus none reported by the noncentrifuge group. The centrifuge workers also reported significantly more rashes, dizziness, and numb or tingling limbs during employment, which are symptoms associated with high solvent exposure. One of the epoxy resins used in the early years of the process was a potential bladder carcinogen, but none of the workers with bladder cancer had jobs that required routine, hands-on work with that material. A specific causative agent for the increase in bladder cancer was not identified.

Combined Oak Ridge Reservation Facilities. Frome et al. reported on the mortality experience of World War II workers employed at three ORR facilities between 1943 and 1947 (RR 1990a:138-152). Poisson regression analyses were used as a control for potential confounders such as facility of employment, socioeconomic status, period of follow-up, and birth year. The cohort included white males employed at any ORR facility at least 30 days between the start of the operation and 1947 and were never employed at an ORR facility after 1947 (N - 28,008). Elevated mortality was statistically significant for all causes (SMR - 1.11, 11,671 observed); tuberculosis (SMR - 1.37, 108 observed); mental, psychoneurotic, and personality disorders (SMR - 1.60, 81 observed); cerebrovascular disease (SMR - 1.11, 833 observed); diseases of the respiratory system (SMR - 1.25, 792 observed); emphysema (SMR - 1.24, 209 observed); all accidents (SMR - 1.28, 694 observed); and motor vehicle accidents (SMR - 1.44, 339 observed). The only elevated site-specific cancer that was statistically significant was lung cancer (SMR - 1.27, 850 observed). A surrogate for radiation exposure based on a worker's job and department was used to indicate the probability of exposure. This surrogate for actual radiation exposure was not associated with increased rates of cancer.

Carpenter investigated earlier reports of an association between brain cancer and employment at Y-12 by conducting a case-control study of workers employed between 1943 and 1977 at ORNL or Y-12 (JOM 1987a:601-604). Cases consisted of 72 white males and 17 white females with brain cancer. Four controls were selected for each case matched on age, sex, cohort, year of birth, and year of hire. Analyses with respect to internal and external radiation exposures indicated no association with brain cancer. Two companion papers were also published from this case-control study, one examined relationships between brain cancer and chemical exposures (AJIM 1988a:351-362) and the other examined non-occupational risk factors (AJPH 1987a:1180-1182). No statistically significant association between the use of 26 chemicals evaluated and the risk of brain cancer was observed. The chemicals evaluated included those encountered in welding fumes, beryllium, mercury, 4,4-methylene bis 2-chloroaniline or MOCA, cutting oils, thorium, methylene chloride, and other solvents. Excess brain cancer was observed, however, among individuals employed for more than 20 years (odds ratio - 7.0, 9 cases; 95 percent CI 1.2-41.1). Analysis of 82 cases with complete medical records revealed an association with a previous diagnosis of epilepsy (odds ratio - 5.7, 4 cases; 95 percent CI 1.0-32.1) recorded for preemployment and health status followup.

Causes of death among white male welders (N - 1,059) employed between 1943 and 1973 at Y-12, K-25, and ORNL were studied by Polednak (AEH 1981a:235-242). Based on deaths reported through 1974, mortality from all causes for welders was slightly lower than that expected based on death rates for U.S. white males (SMR - 0.87, 173 observed). Nonstatistically significant decreases in mortality were also observed for all cancers (SMR - 0.88, 32 observed), especially digestive cancer (SMR - 0.49, 5 observed); diseases of the circulatory system (SMR - 0.74, 72 observed); diseases of the digestive system (SMR - 0.76, 9 observed); and accidents (SMR - 0.89, 16 observed). Nonstatistically significant increases were noted for lung cancer (SMR - 1.50, 17 observed); diseases of the respiratory system (SMR - 1.33, 13 observed), especially emphysema (SMR - 2.21, 6 observed); and suicide (SMR - 1.64, 10 observed). A sub-group of welders (N - 536) exposed to nickel oxides (possible respiratory carcinogens) at K-25 were compared with welders at the other two facilities (N - 523). The risk of lung cancer and other respiratory diseases did not differ between the two groups.

Combined Nuclear Sites. ORR workers have been included in several studies that have examined occupational risks across the nuclear complex, both in the United States and internationally. These combined studies have been undertaken in an attempt to increase the statistical power of the studies to detect the effects of low-level chronic radiation exposure.

Y-12 workers were included in a lung cancer case-control study of workers from the Fernald Feed Materials and Production Center cohort and the Mallinckrodt Chemical Works cohort. Dupree et al. conducted a nested case-control study of lung cancer (N - 787) to investigate the relationship between lung cancer and uranium dust exposure (Epidemiology 1995a:370-375). Eligible cases included workers who were employed at least 183 days in any of the facilities and died before January 1, 1983, with lung cancer listed anywhere on the death certificate. Inclusion of deaths through 1982 allowed over 30 years of observation at each facility. One control was matched to each case on facility, race, gender, and birth and hire dates within 3 years. Data collected on all study members included smoking history, first pay code (a surrogate for socioeconomic status), complete work histories, and occupational radiation monitoring records. Annual radiation lung dose from deposited uranium was estimated for each study member. Annual external whole body doses from gamma radiation were determined for workers who had personal monitoring data available. Potential confounders considered in the analysis were smoking (ever/never used tobacco) and pay code (monthly/nonmonthly). With a 10-year lag, cumulative lung doses ranged from 1 to 137 rads for cases and from 0 to 80 rads for controls. The odds ratios for lung cancer mortality for seven cumulative internal dose groups did not demonstrate increasing risk with increasing dose. An odds ratio of 2.0 was estimated for those exposed to 25 rads or more, but the 95 percent confidence interval of -.20 to 20 showed great uncertainty in the estimate. There was a suggestion of an exposure effect for workers hired at age 45 years or older.

A combined site mortality study included workers from ORNL, the Hanford Site, and the Rocky Flats Plant (RR 1993a:408-421). Earlier analyses of these cohorts indicated that risk estimates calculated through extrapolation from high-dose data to low-dose data did not seriously underestimate risks of exposure to low-dose radiation (AJE 1990a:917-927; RR 1989a:19-35). The updated analyses were performed in order to determine whether the extrapolated risks represented an over-estimation of the true risk at low doses. The study population consisted of white males employed at one of the three facilities for at least 6 months and monitored for external radiation. The Hanford population also included females and nonwhite workers. The total population dose was 123,700 rem. Analyses included trend tests for site-specific cancer deaths and several broad noncancer categories. Statistically significant trends were noted for cancer of the esophagus, cancer of the larynx, and Hodgkin's disease. These cancers were not related to radiation exposure levels in previously published studies. Excess relative risk models were calculated for the combined DOE populations and for each DOE site separately. Without exception, all risk estimates included the possibility of zero risk (i.e., the confidence interval for the risk coefficient went from below zero to above zero). There was evidence of an increase in the excess relative risk for cancer with increasing age in the Hanford and ORNL populations; both populations showed significant correlations of all cancer with radiation dose among those 75 years and older.

An international effort to pool data from populations exposed to external radiation included the ORNL population in addition to other radiation worker populations in the United States, Canada, and Britain (RR 1995a:117-132). The cohort comprised 95,673 workers (85.4 percent men) employed 6 months or longer and the population dose was 384,320 rem. There was no evidence of an association between radiation dose and mortality from all causes or from all cancers. There was a significant dose-response relationship with leukemia, excluding chronic lymphocytic leukemia (excess relative risk - 2.18 per 100 rem; 90 percent CI 0.1-5.7) and multiple myeloma (excess relative risk not computed; 44 observed). The study results do not suggest that current radiation risk estimates for cancer at low levels of exposure are appreciably in error.

Memorandum of Understanding. DOE entered into a Memorandum of Understanding with the Department of Health and Human Services to conduct health studies at DOE sites. The National Institute for Occupational Safety and Health is responsible for the conduct or management of worker studies.

The following studies are managed by the National Institute for Occupational Safety and Health with funding from DOE: a study of multiple myeloma among workers at K-25 at ORR (expected completion date 1996), a multisite study to assess the potential association between paternal exposure to ionizing radiation and the risk of leukemia in offspring of exposed male workers, a study of neurologic health outcomes in workers exposed to high levels of mercury between 1953 and 1963, studies of mortality among ORR workers, a multisite study of mortality among female nuclear workers, a multisite exposure assessment of hazardous waste/cleanup workers, a chronic beryllium disease study, and a multisite study of heat stress and performance among carpenters.

E.4.3 Savannah River Site

SRS, established in 1953 in Aiken, SC, produces plutonium, tritium, and other nuclear materials. There are reports that millions of curies of tritium have been released over the years both in plant exhaust plumes and in surface and groundwater streams (ED 1982a:135-152).

Surrounding Communities. In 1984, Sauer and Associates examined mortality rates in Georgia and South Carolina by distance from the Savannah River Plant (now known as SRS) (SR duPont 1984b). Rates for areas near the plant were compared with U.S. rates and with rates for counties located more than 80-km (50-mi) away. Breast cancer, respiratory cancer, leukemia, thyroid cancer, bone cancer, malignant melanoma of the skin, nonrespiratory cancer, congenital anomalies or birth defects, early infancy death rates, stroke, or cardiovascular disease in the populations living within 80 km (50 mi) of the plant did not show any excess risk compared with the reference populations.

State Health Agreement Program. Under the State Health Agreement Program managed by DOE's Office of Epidemiologic Studies, a grant was awarded to the Medical University of South Carolina in 1991 to develop the Savannah River Region Health Information System. The purpose of the Savannah River Region Health Information System database was to assess the health of populations surrounding SRS by tracking cancer rates and birth defects rates in the area. Information from the registry is available to public and private health care providers for use in evaluating cancer control efforts. A steering committee provides advice to the Savannah River Region Health Information System and communicates public concerns to the System. It consists of 12 community members and persons with technical expertise representing South Carolina and Georgia. The meetings are open to the public.

Workers. A descriptive mortality study was conducted that included 9,860 white male workers who had been employed at lease 90 days at the Savannah River Plant between 1952 and the end of 1974 (AJIM 1988b:379-401). Vital status was followed through the end of 1980 and mortality was compared with the U.S. population. SMRs were computed separately for hourly and salaried employees. For hourly employees, nonstatistically significant increases were seen for cancer of the rectum (SMR - 1.09, 5 observed), cancer of the pancreas (SMR - 1.08, 10 observed), leukemia and aleukemia (SMR - 1.63, 13 observed), other lymphatic tissue (SMR - 1.06, 5 observed), benign neoplasms (SMR - 1.33, 4 observed), and motor vehicle accidents (SMR - 1.10, 63 observed). Salaried employees exhibited nonstatistically significant increases in cancer of the liver (SMR - 1.84, 3 observed), cancer of the prostate (SMR - 1.35, 5 observed), cancer of the bladder (SMR - 1.87, 4 observed), brain cancer (SMR - 1.06, 4 observed), leukemia and aleukemia (SMR - 1.05, 4 observed), and other lymphatic tissue (SMR - 1.23, 3 observed). No trends between increasing duration of employment and SMRs were observed. A statistically significant excess of leukemia deaths was observed for hourly workers employed at least 5, but less than 15 years (SMR - 2.75, 6 observed). Review of the plant records and job duties of the workers who died from leukemia indicated that two of the cases had potential routine exposure to solvents, four had potential occasional exposure to solvents, and one had potential for minimal exposure. Benzene, a known carcinogen, was reportedly not used at the plant.

Epidemiologic Studies. DOE's Office of Epidemiologic Studies has implemented an Epidemiologic Surveillance Program at SRS to monitor the health of current workers. This program will evaluate the occurrence of illness and injury in the workforce on a continuing basis, and the results will be issued in annual reports. The implementation of this program will facilitate an ongoing assessment of the health and safety of the SRS workforce and will help identify emerging health issues.

Epidemiologic surveillance, which is currently operational at a number of DOE sites, including production sites and research and development (R&D) facilities, uses routinely collected health data, including descriptions of illness resulting in absences lasting 5 or more consecutive workdays, disabilities, and OSHA-recordable injuries and illnesses abstracted from the OSHA 200 log. These health event data, coupled with demographic data about the active workforce at the participating sites, are analyzed to evaluate whether particular occupational groups are at increased risk of disease or injury when compared with other workers at a site. As the program continues and data for an extended period of time become available, time trend analysis will become an increasingly important part of the evaluation of worker health. Monitoring the health of the workforce provides a baseline determination of the illness and injury experience of workers and a tool for monitoring the effects of changes made to improve the safety and health of workers. Noteworthy changes in the health of the workforce may indicate the need for more detailed study or increased health and safety measures to ensure adequate protection for workers.

Memorandum of Understanding. DOE entered into a Memorandum of Understanding with the Department of Health and Human Services to conduct health studies at DOE sites. The Centers for Disease Control and Prevention's National Center for Environmental Health is responsible for dose reconstruction studies and the National Institute for Occupational Safety and Health is responsible for worker studies. These activities are funded by DOE.

A study of mortality among SRS workers employed from 1952 to 1974 to examine whether risks of death due to selected causes may be related to occupational exposures at SRS is being conducted by the National Institute for Occupational Safety and Health. SRS is also included in several multisite studies managed by the institute. The first study is to assess the potential association between paternal work-related exposure to ionizing radiation and the risk of leukemia in offspring of exposed male workers. The second study is to examine causes of death among female workers at nuclear weapons facilities to develop risk estimates based on exposures to external and internal ionizing radiation and to hazardous chemicals. A third multisite project is a case-control study of multiple myeloma, a type of blood cell cancer.

A dose reconstruction project around SRS is being conducted by the National Center for Environmental Health to determine the type and amount of contaminants to which people living around the site may have been exposed, to identify exposure pathways of concern, and to quantify the doses people may have received as a result of SRS operations. The estimated completion date is 1999 or 2000.

E.4.4 Kansas City Plant

Surrounding Communities. No known epidemiologic studies have been conducted in the surrounding communities to date.

Epidemiologic Surveillance. DOE's Office of Epidemiologic Studies has implemented an Epidemiologic Surveillance Program at the Kansas City Plant to monitor the health of current workers. This program will evaluate the occurrence of illness and injury in the workforce on a continuing basis and annual reports will be issued reporting the results of the ongoing surveillance. The implementation of this program currently supports the automation of occupational medical data management at the site to facilitate electronic access to key information used in surveillance. The program will facilitate an ongoing assessment of the health and safety of the site's workforce and help to identify any emerging health issues in a timely manner.

Currently operational at a number of DOE sites, including production sites and R&D laboratories, epidemiologic surveillance makes use of routinely collected health data, including reasons for illness, absence lasting 5 or more consecutive workdays, disabilities, and OSHA-recordable injuries and illnesses abstracted from the OSHA 200 log. These health event data, coupled with demographic data about the active workforce at the participating sites, are analyzed to evaluate whether particular occupational groups are at increased risk of disease or injury when compared with other workers at a site. As the program continues and data become available for an extended period of time, trend analysis will become an increasingly important part of the evaluation of worker health. Monitoring for changes in the health of the workforce provides both a baseline determination of the illness and injury experience of workers and a tool for monitoring the effects of changes made to improve the safety and health of workers. Epidemiologic surveillance also provides an early warning of noteworthy changes in health and safety that may indicate areas in need of additional, more-detailed study or increased health and safety measures to ensure adequate protection for workers.

E.4.5 Pantex Plant

Surrounding Communities. A June 1994 study by the Texas Cancer Registry, Texas Department of Health, showed significant increases in prostate cancer mortality among Potter County and Randall County males, and leukemia mortality among Carson County males during the period between 1981 and 1992 (TX DOH 1994a). There were no statistically significant increases observed in site-specific cancer mortality among females during this period. For cancer incidence during the period between 1986 and 1992, no statistically significant excesses in males were seen; however, cancer of the prostate was slightly elevated in Potter/Randall County males. Analysis of the four major cell-specific types of leukemia, showed a significant excess in the incidence of chronic lymphocytic leukemia among Potter/Randall County females. This study was conducted in Carson, Potter, and Randall Counties, which are located near Pantex. This study focused only on cancers of the breast, prostate, brain, thyroid, and leukemia, which were of specific concern to citizens in the area. Other radiation-associated cancers, such as bone and lung, were not included in this study. Although prostate cancer and chronic lymphocytic leukemia have not been linked to radiation exposure, further followup to this study was recommended.

Workers. An epidemiologic study of Pantex workers was published by Acquavella (HP 1985b:735-746). This study compared total and cause-specific mortality for Pantex workers employed between 1951 and December 31, 1978, with expected cause-specific mortalities based on U.S. death rates. Significantly fewer deaths were observed in the workforce than would be expected based on U.S. death rates for the following causes of death: all cancers, arteriosclerotic heart disease, and digestive diseases. No specific causes of death occurred significantly more frequently than expected. Slightly elevated mortality ratios were observed for brain cancer and leukemia; neither excess was statistically significant. The four deaths from brain cancer all occurred among those who had worked at the plant less than 5 years. The four deaths from leukemia occurred with equal frequency among those who had worked at the plant a short time and those who had worked more than 15 years.

Memorandum of Understanding. A followup of the 1985 mortality study of the Pantex workforce is planned. The update will be conducted by the National Institute for Occupational Safety and Health as part of a research program funded by DOE under a Memorandum of Understanding with the Department of Health and Human Services. The followup study is scheduled to commence either in late 1996 or early 1997. In addition, female workers at Pantex will be included in a National Institute for Occupational Safety and Health funded multisite study of mortality among female nuclear weapons workers.

Epidemiologic Surveillance. DOE's Office of Epidemiologic Studies Epidemiologic Surveillance Program was implemented at Pantex in 1993 in order to monitor the health of current workers. This program evaluates the occurrence of illness and injury in the workforce on a continuing basis and issues the results of the ongoing surveillance in annual reports. The program facilitates an ongoing assessment of the health and safety of the site's workforce and helps to identify any emerging health issues in a timely manner. Monthly data collection began on January 1, 1994, and the results of the first complete year of epidemiologic surveillance will be presented to workers and other site stakeholder groups in spring 1996.

Currently operational at a number of DOE sites, including production sites and R&D laboratories, epidemiologic surveillance makes use of routinely collected health data including descriptions of illness resulting in absences lasting 5 or more consecutive workdays, disabilities, and OSHA-recordable injuries and illnesses abstracted from the OSHA 200 log. These health event data, coupled with demographic data about the active workforce at the participating sites, are analyzed to evaluate whether particular occupational groups are at increased risk of disease or injury when compared with other workers at a site. As the program continues and data become available for an extended period of time, trend analysis will become an increasingly important part of the evaluation of worker health. Monitoring for changes in the health of the workforce provides both a baseline determination of the illness and injury experience of workers and a tool for monitoring the effects of changes made to improve the safety and health of workers. Noteworthy changes in the health of the workforce may indicate areas in need of more detailed study or increased health and safety measures to ensure adequate protection for workers.

E.4.6 Los Alamos National Laboratory

Los Alamos and adjacent counties comprise a unique setting and history. LANL, for much of its existence, was a closed community where most of the residents had direct economic ties to the laboratory. Nearly all male residents and some of the female residents are employed at LANL. Medical care in Los Alamos County had been centralized at the laboratory and a single community hospital. This is a unique, highly educated community situated adjacent to lands populated by Native Americans.

Surrounding Communities. Selected cancer mortality and incidence (newly diagnosed cancer) rates between 1950 and 1969, for 11 selected cancers among white males in Los Alamos County were compared with rates for the State of New Mexico, U.S. rates, and with rates of five socioeconomic and occupational control counties and five high-education western counties, based on U.S. Bureau of the Census information (ER 1981a:86-105). The comparisons were made to identify cancer types that were greater than expected while taking into account important factors, such as income and education, associated with cancer patterns. Six cancer types were identified that had rates greater than cancer rates for one or more of the four comparison groups; they are: cancer of the bile ducts and liver, bladder, prostate, brain and nervous system, lympho- and reticulo-sarcoma, and leukemia. Cancer rates of the prostate, bladder, and leukemia were also greater than expected.

Compared with New Mexico white males, Los Alamos County Anglo-white males show nonstatistically significant excesses in cancer incidence from 1969 to 1974 for the stomach, colon, rectum, pancreas, lung, and bladder (ER 1981a:86-105). All cancers combined show a 35-percent statistically significant excess. Los Alamos County white females show nonstatistically significant excesses for cancer of the stomach, large intestine, lymphosarcoma and reticulasarcoma, and leukemia. All cancers combined show a statistically significant 40-percent excess.

In 1991, the New Mexico Department of Health initiated epidemiologic studies in response to citizen concerns about an apparent excess of brain tumors among residents of the western area neighborhood of Los Alamos County as a result of historical LANL nuclear operations. The New Mexico Department of Health conducted a descriptive study of brain cancer incidence in Los Alamos County and for 22 other sites (NM DOH 1993a). The study showed that during the mid- to late-1980s an excess of approximately 80 percent of brain cancer had occurred in Los Alamos County compared with a New Mexico reference population and national statistics. The excess incidence had disproportionately occurred among persons who were residents of the western area at the time of diagnosis or death; however, there were only three cases, and they were confined to the 2-year time period, 1986 to 1987. Additional descriptive studies showed that the brain cancer rates for Los Alamos County were within the range of rates observed across New Mexico counties from 1983 to 1987 and 1988 to 1991. A review of mortality statistics for benign or unspecified neoplasms of the brain and nervous system showed no deaths from these causes in Western Area residents during 1984 to 1990.

Los Alamos County breast cancer incidence rates remained level, but higher than New Mexico rates from 1970 to 1990. Reproductive and demographic factors associated with the risk of breast cancer were thought to account for the higher rates. A special study was conducted to examine the recent increase in breast cancer since 1988 (NM DOH 1994a). The New Mexico Tumor Registry concluded that the increase seen between 1988 and 1992 was primarily due to increased detection of early stage disease.

The incidence of ovarian cancer in Los Alamos County women was elevated from the mid-1970s to 1990. From 1986 through 1990, ovarian cancer incidence in Los Alamos County was roughly two-fold higher compared with New Mexico reference population rates. The excess ovarian cancer rate was confined to a census tract corresponding to two neighborhoods and was four- to six-fold higher than that observed in the remaining Los Alamos County census tracts.

The incidence rates for melanoma (cancer of the skin) in Los Alamos County were elevated from 1970 through 1990, with peak elevations occurring from the mid- to late-1980s. There was approximately a twofold excess risk compared with a New Mexico State reference population. The excess melanoma incidence observed in Los Alamos County was thought to be related to the high ambient solar ultraviolet radiation intensity due to its high altitude.

A fourfold increase in thyroid cancer incidence during the late 1980s was noted in a study by Athas (NM DOH 1996a). A case-series records review was initiated to examine data relating to the detection, diagnosis, and known risk factors for thyroid cancer. All cases of thyroid cancer diagnosed among Los Alamos County residents between 1970 and 1995 were identified through the New Mexico Tumor Registry. The incidence rate for thyroid cancer in Los Alamos County was slightly higher than New Mexico rates between 1970 and the mid-1980s. There was a statistically significant fourfold increase during the late 1980s and early 1990s compared with the State, but the rate began to decline in 1994 and 1995.

The higher than expected number of thyroid cancer cases could not be explained by changes in diagnosis of thyroid cancer among Los Alamos County residents. Additional analyses suggested that increased medical surveillance and greater access to medical care were responsible for the recent excess in Los Alamos County.

Potential risk factors for thyroid cancer including therapeutic irradiation, genetic susceptibility, occupational radiation exposure, and weight were also examined. However, the investigation did not identify a specific cause for the elevated rate of thyroid cancer in Los Alamos County.

Male Workers. A mortality study of 224 white males with the highest internal depositions of plutonium 239 (10 nanocuries or more) at LANL were examined by Voelz et al. (LANL 1985a). Followup was through April 1980. SMRs were low for all cause of death (SMR - 0.56, 95 percent CI - 0.40-0.75), all malignant neoplasms (SMR - 0.54, 95 percent CI - 0.23-1.06), compared with U.S. white males and lung cancer (SMR - 20, 95 percent CI - 0-110).

A cohort mortality study by Wiggs et al. examined the causes of death among 15,727 white males hired at LANL between 1943 and 1977 (HP 1994a:577-588). The purpose of the study was to determine if plutonium deposition and external ionizing radiation were related to worker mortality. After nearly 30 years of followup, the LANL workforce experienced 37 percent fewer deaths from all causes, and 36 percent fewer deaths due to cancer than expected when compared with death rates for the U.S. population.

The researchers identified a subset of 3,775 workers who had been monitored for plutonium exposure; of these, 303 workers were categorized as "exposed" based on a urine bioassay for plutonium; the remainder were nonexposed. One case of rare bone cancer, osteogenic sarcoma, a type of cancer related to plutonium exposure in animal studies, was noted among the plutonium exposed group. The overall mortality and site-specific rates of cancer did not differ significantly between the two groups of workers. A nonstatistically significant increase in lung cancer among the exposed group was noted, but there was no information on cigarette use among the workers.

When researchers examined data for the 10,182 workers who were monitored for exposure to external ionizing radiation (including 245 workers exposed to plutonium) they observed a dose-response relationship for cancers of the brain/central nervous system, cancer of the esophagus, and Hodgkin's disease. When the 225 plutonium-exposed workers were excluded from the analysis, there was a statistically significant dose response between external ionizing radiation and kidney cancer and lymphocytic leukemia.

A special lifetime medical study was conducted on 26 of the workers who have the largest internal depositions of plutonium at LANL. Voelz and Lawrence reported on the 42-year followup of the 26 white males who designed and built the first atomic bomb and were determined to have had a significant deposition of plutonium-239 sometime in 1944 or 1945 based on job assignment, working conditions, and urine levels of plutonium (HP 1991a:181-190). Their mortality experience was compared to U.S. white males adjusted for age and calendar time. The mortality rates were also compared with rates for a cohort of LANL workers hired at the same time and born between the same years; no significant differences were for all cause mortality and all cancer mortality. One of the seven reported deaths was due to bone sarcoma, the most frequent radiation-induced cancer observed in persons with radium depositions.

Wiggs reported on 6,970 women employed at LANL for at least 6 months from 1943 through 1979, with deaths determined through 1981 (LA Wiggs 1987a). The mortality rates for all causes of death combined and all cancers combined were 24 and 22 percent below the rate for the U.S. population, respectively. Although the overall rates are low, women occupationally exposed to ionizing radiation have elevated rates for cancer of the ovary and of the pancreas relative to those not exposed. An unusual finding was that female radiation workers experienced a statistically significant excess of death from suicide. In a special in-depth study, the suicides were compared to two control groups, deaths from other injuries and deaths from noninjuries. History of employment as a radiation worker was significantly associated with death from suicide for both comparison groups. No significant associations for duration of employment, plutonium exposure, or martial status were seen (APHA 1988a).

As result of a reported threefold excess of malignant melanoma among laboratory workers at LLNL in California and similarities between occupational exposures and prevailing sunshine conditions at LANL and LLNL, an investigation was undertaken to assess the risk of melanoma at LANL (Lancet 1981a:712-716). Incidence data were obtained from the New Mexico Tumor Registry. No excess risk for melanoma was detected at LANL among 11,308 laboratory workers between 1969 and 1978. Six cases were identified where about 5.7 were expected (Lancet 1982a:883-884). The rate for the total cohort, Hispanic males and females, non-Hispanic males and females were not significantly different from the corresponding New Mexico rates.

A special in-depth study of 15 cases diagnosed through 1982 did not detect an association between melanoma and exposure to any type of external radiation as measured by film badges, neutron exposures, plutonium body burden based on urine samples, or employment as a chemist or physicist (HP 1983c:587-592). However, the workers with melanoma were more educated than the comparison group using the college and graduate degree as a measure of education, a finding consistent with other reports of malignant melanoma according to the authors. The numbers in this study are too small to detect any but large excesses.

Memorandum of Understanding. DOE entered into a Memorandum of Understanding with the Department of Health and Human Services to conduct health studies at DOE sites. The National Institute for Occupational Safety and Health is responsible for managing or conducting the worker studies. The following multisite studies that include LANL are currently underway: a study of mortality among female nuclear weapons workers, a case-control study of multiple myeloma, a leukemia study, and an exposure assessment of hazardous waste/cleanup workers.

E.4.7 Lawrence Livermore National Laboratory

Surrounding Communities. The California Department of Health Services released a study of cancer occurrence among children and young adults living or born in Livermore, California (CA DHS 1995a). The study specifically aimed to determine the risk of leukemia and non-Hodgkin's lymphoma among young people living near LLNL. An increased risk of these two cancers among children living near the Sellafield nuclear facility in England had been suggested by a British study (JRSS 1989a:307-325).

Investigators studied two groups of children and young adults under the age of 25: those who were born in Livermore between 1960 and 1990 and those who actually lived in Livermore between 1960 and 1991. No increased risk of leukemia or non-

Hodgkins lymphoma was detected among Livermore children living near a nuclear facility, as suggested by the British study. However, a 2.4-fold increase in the risk of malignant melanoma, a form of skin cancer which can be fatal, was found for children and young adults who lived in Livermore between 1960 and 1991 compared with youngsters who lived other places within Alameda County. An even more significant 6.4-fold increased risk of malignant melanoma was found in children born in Livermore between 1960 and 1991. The rate of melanoma was highest in those under 20 years of age. No increased risk of any other type of cancer was found. The report states that "it is not possible, within the scope of the current study, to assess whether or not melanoma cases had any affiliation with LLNL."

Workers. In 1981, a joint study undertaken by the California Department of Health Services and LLNL reported that 19 cases of malignant melanoma were observed between 1972 and 1977 among approximately 5,100 LLNL employees (Lancet 1981a:712-716). This incidence rate was significantly higher than that expected in the comparable population of the San Francisco Bay Area. Preliminary findings, however, suggested that this apparent increase in the malignant melanoma was not associated with length of employment at LLNL, nor with type of monitored radiation exposure. No other cancers were increased among LLNL employees from 1969 to 1980 (WJM 1985a:214-218).

The reasons for the malignant melanoma increase were not clear, and a series of studies was prompted to investigate the problem. A case-control study reported five occupational factors having causal relationships with the observed excess in malignant melanoma: exposure to radioactive materials, exposure to volatile photographic chemicals, Site 300 at LLNL, chemist duties based on job titles, and Pacific Test Site (LLNL 1984b). The association between melanoma and occupational factors reported in the study was criticized by Shy et al. (LLNL 1985a). A question concerning surveillance bias was also raised, because the number of cases was too small and because of the excessive number of exposure factors analyzed. The authors noted that evidence for a dose-response gradient was not provided and the biological plausibility of causal hypothesis was not established.

Various studies investigated the role of surveillance bias in relation to the elevated incidence of melanoma. Hiatt and Fireman reported that the increase among melanoma incidence is associated with increased biopsy rates for pigmented nevi in LLNL employees compared with matched controls who belonged to the same prepaid health plan but who did not work at LLNL (PM 1986a:652-660). The occupational physicians caring for LLNL employees may be more aware of the potential malignancy of pigmented lesions than those caring for non-LLNL employees. Subsequently, the increasing percentage of thin cutaneous malignant melanoma over time (1969 to 1976, 1977 to 1984, and 1984 to 1986) reported at LLNL suggests increased efforts to diagnosis cutaneous malignant melanoma early on (Lancet 1987a: 1435). The mean thickness of cutaneous malignant melanoma among LLNL employees has decreased more rapidly between 1976 and 1984 than those from the comparison laboratory (AD 1990a:967-969). On the other hand, others reported that the thinner lesions were only confirmed prior to 1976, and after 1976 there was no difference in lesion thickness (Epidemiology 1993a:43-47).

The most recent case-control study of malignant melanoma concluded that there was no association between occupational factors and the increased melanoma diagnosis among LLNL employees (LLNL 1994e). No clear explanation for the increased melanoma among LLNL workers has been provided. Increased awareness and enhanced surveillance are currently suspected, and monitoring of mortality from melanoma continues at LLNL.

Memorandum of Understanding. DOE entered into a Memorandum of Understanding with the Department of Health and Human Services to conduct health studies at DOE sites. The National Institute for Occupational Safety and Health is responsible for managing or conducting the worker studies. The Institute funded a grant to examine the industrial hygiene system at LLNL that will allow the study of complex exposure scenarios.

E.4.8 Sandia National Laboratories

Community Studies. There are no known epidemiologic studies that have been conducted which examine the impact of SNL on the health of the surrounding communities.

Epidemiologic Surveillance. The Office of Epidemiologic Studies Epidemiologic Surveillance Program has been implemented at SNL to monitor the health of current workers at the Albuquerque site. This program monitors and evaluates the occurrence of illness and injury in the workforce on a continuing basis and annual reports are issued reporting the results of the ongoing surveillance. The program facilitates a continuing assessment of the health and safety of the site's workforce and helps to identify any emerging health issues. Refinements to epidemiologic surveillance at SNL include the anticipated addition of selected dosimetry data, enhancing the program's ability to monitor potential health effects associated with radiation exposure.

Epidemiologic surveillance makes use of routinely collected health data including reasons for illness absence lasting five or more consecutive workdays, disabilities, and OSHA-recordable injuries and illnesses abstracted from the OSHA 200 log. These health event data, coupled with demographic data about the active workforce are analyzed to evaluate whether particular occupational groups are at increased risk of disease or injury when compared with other workers at SNL. As the program continues and data become available for an extended period of time, trend analysis will become an increasingly important part of the evaluation of worker health. Monitoring for changes in the health of the workforce provides a baseline rate of illness and injury among the workers and a tool to evaluate changes in industrial hygiene and health physics practices. Epidemiologic surveillance also provides an early warning of changes in health and safety that may indicate areas in need of more detailed study or increased safety measures to ensure adequate protection for workers.

Workers. Broadwell et al. report that 25 workers, 5 currently, and 20 formerly involved in the manufacture of hybrid microcircuits, underwent clinical evaluations at the request of a management union committee concerned about chronic solvent exposures in an R&D laboratory (AJIM 1995a:677-698). A battery of neurobehavioral tests was administered to compare the solvent-exposed group with age-, ethnicity-, and education-matched controls. The tests included MMPI-I, handgrip strength, tactile sensitivity, dexterity, color discrimination, visual acuity and contrast sensitivity, and tests selected from the computerized Neurobehavioral Evaluation System. Clinical narratives and retrospective exposure assessments in the study group suggested chronic low-level exposure to solvents, with intermittent acute excursions. The most frequently reported symptoms from the clinical questionnaires were upper respiratory irritation (68 percent), poor concentration and memory loss (48 percent), depressed mood (40 percent), lower respiratory irritation (28 percent), eye irritation (28 percent), distal upper extremity paresthesia (24 percent), and skin rash (12 percent). Work-related diagnosis included upper respiratory mucosal irritation and sinusitis (44 percent), lower respiratory reactive disease (12 percent), and dermatitis (5 percent). Ten of the 25 exposed workers (40 percent) had a history of a clinical syndrome with headache, dizziness, disequilibrium, fatiguability, memory impairment, difficulty in concentration, and loss of initiative following acute solvent exposures. Solvent exposures linked to this syndrome were intermittent, and symptoms were reversible after cessation of what were reported as high-level exposures. Several exposed workers showed clinical evidence of an acquired toxic encephalopathy supporting an association between long-term solvent exposure and depressed mood, with increased somatic symptoms. Significant differences (after Bonferroni correction) were found between the two groups on the following Neurobehavioral Evaluation System subtests: finger tapping, simple reaction time, symbol digit substitution, mood scale, and symptom questionnaire. Differences also reached significance for contrast sensitivity, vibrotactile threshold, and handgrip strength. Attention to engineering controls, chemical fume hood ventilation, work practices, safety training, and personal protective gear was markedly improved when the lab was moved in the fall of 1990.

E.4.9 Nevada Test Site

Surrounding Communities. Above ground testing of nuclear weapons at NTS Test Range Complex in southern Nevada between 1951 and 1958 resulted in the dissemination of radioactive fallout over southeastern Nevada and southwestern Utah through wind dispersion. Several epidemiologic studies have been conducted to investigate possible adverse health effects of low-level radiative fallout on residents of these states. These studies focused on leukemia and thyroid disease in children downwind of NTS.

A series of ecologic studies showed equivocal results in potentially exposed children. A cross sectional review of thyroid nodularity among teenage children reported by Weiss et al. found no significant difference in the frequency of nodules among potentially exposed and nonexposed children (AJPH 1971a:241-249). Exposure was defined in terms county of residence. Rallison et al. reported no significant difference in any type of thyroid disease between Utah children exposed to fallout radiation in the 1950s and control groups drawn from Utah and Arizona (AJM 1974a:457-463; JAMA 1975a:1069-1072).

To investigate the possible relationship between childhood leukemia and radioactive fallout, Lyon et al. conducted a mortality study of Utah children under 15 years old who died in Utah between 1944 and 1975 (NEJM 1979a:397-402). Lyon et al. selected this age group because of the reported increased susceptibility of children to the neoplastic effects of radiation and the lack of a comparison group over 14 years of age with suitable low exposures. Lyon et al. obtained death certificates from the Utah vital statistics registrar and based on year of death, categorized decedents into either high (fallout years of 1951 to 1958) or low exposure periods (combined pre-fallout years of 1944 to 1950 and post-fallout years of 1959 to 1975). From estimated fallout patterns contained in maps of 26 tests, Lyon et al. categorized 17 southern rural counties as high fallout area and the remaining northern urban counties as low fallout area. Age-specific mortality rates derived for deaths which occurred in the combined low exposure periods were compared with those in the high exposure period. For reasons unknown, leukemia mortality during the low exposure periods in high fallout counties was half that of the United States and Utah. A significant excess of leukemia occurred among children statewide who died during the high fallout period compared to those who died during the low fallout periods (SMR - 1.40, 95 percent CI - 1.08-1.82, <0.01). This excess was more pronounced among those who resided in the high fallout area (SMR - 2.44, 95 percent CI - 1.18-5.03). No pattern was found for other childhood cancers in relation to fallout exposure. Actual radiation dosage was not available, and the effects of migration were not determined for this study.

Beck and Krey (Science 1983a:18-24) reconstructed exposure of Utah residents studied by Lyon et al. (NEJM 1979a:397-402) to external gamma-radiation from NTS fallout through measurements of residual cesium-137 and plutonium in soil. Beck and Krey found that residents in southwest Utah closest to NTS received the highest exposures, but noted that residents of urban northern areas received a higher mean dose and a significantly greater population dose than did residents of most counties closer to the test site. Northern Utah residents received higher average bone doses than southern Utah residents; therefore, distance from NTS should not be the sole criteria for dividing the state into geographic subgroups for the purpose of conducting epidemiologic studies. Beck and Krey concluded that bone doses to southern Utah residents were too low to account for the excess leukemia deaths identified by Lyon et al. They also determined that bone and whole body doses from NTS fallout were small relative to lifetime doses most Utah residents receive from background radiation, and that it was unlikely that these exposures would have resulted in any observed health effects.

Land et al. (Science 1984a:139-144) attempted to confirm the association between leukemia and fallout reported by Lyon et al. (NEJM 1979a:397-402) using cancer mortality data from the National Center for Health Statistics for the period 1950 through 1978. No statistically significant differences in mortality from leukemia or other childhood malignancies between northern and southern Utah were observed. The small observed difference in leukemia mortality between the border and interior counties was opposite in direction to that reported by Lyon et al. Results indicated a downward trend in childhood leukemia mortality over time. Eastern Oregon and the State of Iowa also were selected for comparison with Utah. The leukemia mortality rate for eastern Oregon was higher, and Iowa lower than the rate for Utah. Although both were not statistically significant, Land et al. concluded that these results suggest that the association reported by Lyon et al. merely reflects an unexplained low leukemia rate in southern Utah for the period 1944 to 1949.

Another study that assessed the development of cancer among individuals potentially exposed to radioactive fallout has been reported by Rallison et al. (HP 1990c:739-746). This study examined the thyroid neoplasia risk in a cohort of children born between 1947 to 1954 in two counties near nuclear test sites, one in Utah and one in Nevada. A comparison group of Arizona children presumed to have no fallout exposures was also evaluated. The children (11 to 18 years of age) were examined between 1965 to 1968 for thyroid abnormalities and were reexamined in 1985 and 1986. Children living in the nuclear testing (Utah/Nevada) area had a higher rate of thyroid neoplasia than the comparison children (in Arizona), but the differences were not statistically significant. The authors concluded that living near NTS in the 1950s has not resulted in a statistically significant increase in thyroid neoplasms.

A study by Johnson examined cancer incidence in a cohort of Mormon families in southwest Utah near the NTS (JAMA 1984b:230-236). The study compared cancer incidence among all Utah Mormons during the period 1967 to 1975 with cancer incidence among two exposed populations: persons residing in a high fallout area and an exposure effects group residing in a broader area that received less intense exposure from radioactive fallout. Limitations of the study include: the inability to locate 40 percent of the defined population, the lack of verifying the reported diagnosis of cancer, and the inability to interview a comparable control group.

Cancer incidence for both exposed groups was compared with that of all Utah Mormons for two time periods, 1958 to 1966 and 1972 to 1980. Johnson found an apparent increased incidence of leukemia and cancers of the thyroid and bone for residents of the high fallout area for both time periods (p - 0.01). Additional analyses suggested that a higher proportion of the cancers among exposed groups were in radiosensitive tissues and the proportional excess increased with time compared with all Utah Mormons. The ratio of radiosensitive cancers to all other cancers from 1958 to 1966 was 24 percent higher among the high fallout area group and 29.6 percent higher among those in the fallout effects group. For 1972-80, the ratio was 53.3 percent higher in the high fallout area group and 300 percent higher in the fallout effects group.

Machado examined cancer mortality rates of a three-county region in southwestern Utah in comparison to the remainder of Utah (AJE 1987c:44-61). There was no excess risk of cancer mortality in southwest Utah, with the exception of leukemia, which showed a statistically significant excess for all ages combined, and for children age 0 to 14. In fact, mortality from all cancer sites combined was lower in southwest Utah than the remainder of the state. The authors noted that their findings, including those for leukemia, were inconsistent with the cancer incidence study conducted by Johnson (JAMA 1984b:230-236).

Archer measured soil, milk, and bone strontium-90 levels to identify states with high-, intermediate-, and low-fallout contamination (AEH 1987a:263-271). He then correlated the deaths from radiogenic and nonradiogenic leukemias with the time periods of aboveground nuclear testing both in the United States and Asia. The results show that leukemia deaths in children were higher in states with high exposure and lower in states with less exposure. He showed that leukemia deaths in children peaked approximately 5.5 years following nuclear testing peaks. The last leukemia peak in the United Sates occurred from 1968 to 1969, 5.5 years after the last year of a 3-year period of intensive testing in Asia. The increases were seen in the radiogenic leukemias (myeloid and acute leukemias), and not with all other leukemias.

Kerber et al. updated a previously identified cohort of children living in portions of Utah, Nevada, and Arizona, to estimate individual radiation doses and determine thyroid disease status through 1985 to 1986 (JAMA 1993a:2076-2082). Of the 4,818 children originally examined between 1965-70, 2,473 were included in the followup exam. Outcomes of interest included thyroid cancers, neoplasms, and nodules based on physical examinations of the thyroid. Exposure of the thyroid to radioiodines was based on radionuclide deposition rates provided by DOE and surveys of milk producers. Children with questionable findings were referred to a panel of endocrinologists for further examination. The authors reported an excess number of thyroid neoplasms (combined benign and malignant) and a positive dose-response trend for neoplasms, both of which were statistically significant. The authors also reported a positive dose-response trend for thyroid nodules, not statistically significant, and a positive dose-response trend for thyroid carcinomas with marginal statistical significance. The authors estimated that an excess of between 1 and 12 neoplasms (between 0 to 6 excess malignancies) was probably caused by exposure to radioiodines from the nuclear weapons testing. A letter to the editor criticized Kerber et al. for relying on food histories obtained 22 years after the fact to depict radioiodine intake, and for the untested modeling approach for determining dose to the thyroid (JAMA 1994a:825-826). These concerns were addressed by Kerber et al., which acknowledged the uncertainties in the dose estimates, but concluded that their estimates were conservative (JAMA 1994b:826).

Till et al. estimated doses to the thyroid of 3,545 subjects who were exposed to radioiodine fallout from NTS (HP 1995a:472-483). The U.S. Public Health Service first examined this cohort for thyroid disease between 1965 to 1970 and later in 1985 to 1986. Till et al. assigned individual doses based on age, residence histories, dietary histories, and life-style. Individualized dose and uncertainty was combined with the results of clinical examinations to determine the relationship between dose from NTS fallout and thyroid disease incidence.

Workers. Military personnel and civilian employees of the Department of Defense observed and participated in maneuvers at the NTS Test Range Complex during above ground tests. An excess number of leukemia cases was reported (9 cases, 3.5 expected) among the 3,224 men who participated in military maneuvers in August 1957 at the time of the nuclear test explosion "Smoky" (JAMA 1980a:1575-1578). The participants were located and queried on their health status, diseases, or hospitalizations as of December 1981. Various Federal records systems were linked, including clinical files, and next of kin were queried about cause of death for those participants who were deceased. Exposure information was available from film badges records, and the mean gamma dose for the entire cohort was 466.2 mrem. In a later report of the same cohort, the number of incident cases of leukemia had increased to 10 with 4 expected (JAMA 1983a:620-624). No excess in "total cancers" was observed, however. In addition, four cases of polycythemia vera were reported where 0.2 was expected (JAMA 1984a:662-664). The excess in leukemia cancer incidence and mortality appear to be limited to the soldiers who participated in "Smoky."

The leukemia excess was not observed in a National Research Council mortality study of soldiers exposed to five series of tests at two sites: Nevada Test Site (PLUMBBOB) and the Pacific Proving Ground (DOE 1985b; NAS 1985a). The National Research Council reported that the number of leukemia cases in "Smoky" was greater, but the increase was considered nonsignificant when analyzed with the data from the other four tests. In 1989, however, it was discovered that the roster of the atomic veterans cohort on which the National Research Council based its 1985 study contained misclassification errors. As a result, this study is being reanalyzed, and the National Research Council anticipates publishing the new results by 1997.

APPENDIX F

Appendix F

APPENDIX F: FACILITY ACCIDENTS

F.1 EVALUATION METHODOLOGIES AND ASSUMPTIONS

F.1.1 Introduction

The potential for facility accidents and the magnitudes of their consequences are important factors in evaluating the stockpile stewardship and management alternatives addressed in this programmatic environmental impact statement (PEIS). The health risk issues are twofold:

- Whether accidents at any of the individual stockpile stewardship and management facilities (or reasonable combinations thereof) pose unacceptable health risks to workers or the general public.
- Whether alternative locations for stockpile stewardship and management facilities (or reasonable combinations thereof) can provide lesser public or worker health risks. These lesser risks may arise either from a greater isolation of the site from the public or from a reduced frequency of such external accident initiators as seismic events, and aircraft crashes.

Guidance for implementing Council on Environmental Quality regulation, 40 Code of Federal Regulations 1502.22, as amended (51 FR 15618), requires the evaluation of impacts which have low probability of occurrence but high consequences if they do occur; thus, facility accidents must be addressed to the extent feasible in this PEIS. Further, public comments received during the scoping process clearly indicated the public's concern with facility safety and consequent health risks and the need to address these concerns in the decision-making process.

For the No Action case, potential accidents are defined in existing facility documentation, such as safety analysis reports, hazards assessment documents, *National Environmental Policy Act* (NEPA) of 1969 documents, and probabilistic risk assessments. The accidents include radiological and chemical accidents that produce high consequences but have a low likelihood of occurrence, and a spectrum of other accidents that have a higher likelihood of occurrence and lesser consequences than the high consequence accidents. The data in these documents includes accident scenarios, probabilities, materials at risk, source terms (quantities of hazardous materials released to the environment), and consequences.

For new, modified, or upgraded stockpile stewardship and management facilities, the identification of accident scenarios and associated data would normally be a product of safety analysis reports performed on completed facility designs. However, facility designs have not been completed for the alternatives analyzed in the programmatic portion of this PEIS. Accordingly, the accident information developed for this PEIS has been developed based upon existing information for similar facilities. The likelihood and consequences of accidents (which are site dependent) are recomputed for each of the stockpile stewardship and management proposed sites where a facility may be located. This calculation reflects the effects of such site parameters as population size and distribution, meteorology, and distance to the site boundary.

This analysis also acknowledges, semi-quantitatively, the differences in likelihood of accident initiators at specific sites (e.g., aircraft impacts, beyond design basis seismic events, and so forth), as well as qualitatively discussing the opportunities for risk reduction afforded by the potential incorporation of new technologies, processes, or protective features in the stockpile stewardship and management facilities that will enhance public health and safety over the existing facilities.

Subsequent to this PEIS, evaluation of the specific benefits achieved by such measures would be presented in the tiered project-specific NEPA document for each facility. Also, for each new facility, a Hazards Analysis Document that identifies and estimates the effects of all major hazards that have the potential to impact the environment, workers, and the public would be issued in conjunction with the Conceptual Design Package. Additional accident analyses for identified major hazards would be provided in a Preliminary Safety Analysis Report (SAR) to be issued during the period of Definitive Design (Title II) Review. A Final SAR would be prepared during the construction period and issued before testing begins as final documented evidence that the new facility can be operated in a manner that does not present any undue risk to the health and safety of workers and the public.

The accident scenarios chosen to represent the impacts for each alternative were arrived at through a screening process based on a larger set of accidents presented in existing safety documentation for similar facilities. Documents such as those shown in table F.1.1–1 were reviewed for applicable accident scenarios and data. The process sought to identify a bounding accident in each of several classes of events (e.g., fire, explosion, spill, mechanical, criticality, natural phenomena initiators, and external initiators) applicable to the alternative. The process also sought to identify bounding accidents over the spectrum of high to low probability of occurrence in order to include high-consequence/low-probability and low-consequence/high-probability accidents. These accidents are generally referred to as beyond evaluation basis accidents and evaluation basis accidents, respectively. In accordance with Department of Energy (DOE) NEPA Guidelines, beyond evaluation basis accidents are generally in the probability of occurrence range of 10^{-7} to 10^{-6} per year (yr), and evaluation basis accidents generally have a probability of occurrence greater than 10^{-6}/yr. These two designations are used only if formal SARs have not been prepared. In cases where SARs have been prepared, they are the source documents for two equivalent designations "beyond design basis accidents" and "design basis accidents." Based on discussions and meetings with experts, including a workshop, the accident scenarios were modified to reflect expected stockpile management facility conditions. For example, the material at risk identified in a safety report for a similar facility was adjusted to reflect the material at risk applicable to the Stockpile Stewardship and Management Program. A complete description of the development of accident scenarios for the alternatives is provided in a topical report (HNUS 1996a).

For each alternative, a number of evaluation and beyond evaluation basis accidents have been identified and are generally referred to as the "composite set of accidents." Two subsets of the composite set are also referred to as the "composite set of evaluation basis accidents" and the "composite set of beyond evaluation basis accidents." Impacts are presented for the composite set of accidents to reflect the combined impacts of evaluation basis and beyond evaluation basis accidents. The impacts for the composite set of evaluation basis accidents are also provided to reflect the impacts of high-frequency/low-consequence accidents and impacts for the composite set of beyond evaluation basis accidents are provided to show the impacts of low-frequency/high-consequence accidents. Evaluation basis accidents are generally in a frequency range greater than 10^{-6}/yr, while beyond evaluation basis accidents are generally in a frequency range of 10^{-7} to 10^{-6}/yr. In some cases, accidents less than 10^{-7} are included in the composite set of beyond evaluation basis accidents to provide information that is relevant to decisionmaking and that otherwise would not be considered.

For each alternative, each accident is analyzed to estimate its risk (i.e., mathematical product of an accident's probability of occurrence and the accident's consequences) and consequences (e.g., cancer fatalities) to a noninvolved worker, a member of the public at the site boundary and the population out to 80 kilometers (km) (50 miles [mi]) from the accident. The estimated risks for the composite set of accidents analyzed for the alternative are mathematically combined to obtain an average risk (cancer fatalities per year) and consequences (cancer fatalities), given that the accidents occurred. The data on individual accidents used to calculate the composite values are provided in section F.2.

F.1.2 Safety Design Process

One of the major design goals for stockpile stewardship and management facilities is to achieve a reduced risk to workers and the public relative to that associated with similar facilities in the existing Nuclear Weapons Complex. Significant changes exist between stockpile stewardship and manage-

TABLE F.1.1–1.—*Source Documents Reviewed for Applicable Accident Scenarios* [Page 1 of 3]

Item Number	Title	Site	Report Number	Date Published
01	"The Continued Operation of the Pantex Plant & Associated Storage of Nuclear Weapon Components EIS" Safety Information Document	Pantex	Draft Rev. 2	January 1995
02	Stockpile Stewardship and Management/PEIS Expanded Data Call Addendum to the Alternative Report for "Pit Manufacturing at Los Alamos National Laboratory"	LANL	none	June 1995
03	Stockpile Stewardship and Management/PEIS Expanded Data Call Addendum to Alternative Report for "Pit Manufacturing at Los Alamos National Laboratory"	LANL	LA-UR-95-2670	Sept. 1995
04	Appendix D "Accident Analysis"	LLNL	Volume II	Feb. 1992
05	Stockpile Stewardship and Management PEIS "Canned Secondary Assembly and Case Manufacturing Facility" Data Report Chapter 8 - Design Process for Accident Mitigation	LLNL	SST 95-07-006 Revision 1	July 17, 1995
06	Draft EIS and EIR for "The Continued Operation of Lawrence Livermore National Laboratory & Sandia National Laboratories, Livermore" **Unclassified Controlled Nuclear Information**	Sandia/LLNL	Volume 1 DOE/EIS - 0157 SCH90030847	Feb. 1992
07	Preliminary Draft EIS "The Continued Operation of the Pantex Plant & Associated Storage of Weapons Components" **Unclassified Controlled Nuclear Information**	Pantex	DOE/EIS 0225 DEIS Vol.1 & 2	Sept. 1995
08	EA for the "Proposed Interim Storage of Enriched Uranium Above the Maximum Historical Storage Level at the Y-12 Plant, Oak Ridge, Tennessee"	Y-12	DOE/EA-0929	Sept. 1994
09	"Basis for Interim Operation for the Pantex Plant, Amarillo, Texas"	Pantex	none	June 1995
10	"Revision 2 of the Basis for Interim Operation for TA-55-4"	LANL	ESH-3:94-105	June 1994
11	"Submittal of Revised JCO for CMR Facility" **Unclassified Controlled Nuclear Information**	LANL	none	Feb. 1995
12	"Accident/Event Analysis" (Safety Information Document)	Pantex	Draft-Rev. 2	Jan. 1995
13	"CMR Facility (SM-29) Final Safety Analysis Report" **Unclassified Controlled Nuclear Information**	LANL	CMR-FAC-94-001	Feb. 1994
14	Executive Summary - "Hazards Analysis of the Los Alamos National Laboratory Plutonium Facility (TA-55)" **Unclassified Controlled Nuclear Information**	LANL	TA-55 FSAR	July 13, 1995

TABLE F.1.1–1.—*Source Documents Reviewed for Applicable Accident Scenarios* [Page 2 of 3]

Item Number	Title	Site	Report Number	Date Published
15	Stockpile Stewardship and Management/PEIS "Alternative Report for Pit Manufacturing at SRS" **Unclassified Controlled Nuclear Information**	SRS	NMP-PLS-950176	Sept. 1, 1995
16	Draft Safety Analysis Report for "The Device Assembly Facility at the Nevada Test Site" **Unclassified Controlled Nuclear Information**	NTS	DAF SAR-001-193-5394C	March 1995
17	"U.S. Department of Energy Defense Programs Safety Survey Report" Volume III: Appendix B - Uranium Facilities **Unclassified Controlled Nuclear Information**	DOE	DOE/DP/70056-HI	Nov. 1993
18	"U.S. Department of Energy Defense Programs Safety Survey Report" Volume I: Main Report **Unclassified Controlled Nuclear Information**	DOE	DOE/DP/70056-HI	Nov. 1993
19	"U.S. Department of Energy Defense Programs Safety Survey Report" Volume II: Appendix A - Plutonium Facilities **Unclassified Controlled Nuclear Information**	DOE	DOE/DP/70056-HI	Nov. 1993
20	"U.S. Department Of Energy Defense Programs Safety Survey Report" Volume VI: Appendix E - Spent-fuel Handling Facilities **Unclassified Controlled Nuclear Information**	DOE	DOE/DP/70056-HI	Nov. 1993
21	"TA-55 Final Safety Analysis Report" Volume I **Unclassified Controlled Nuclear Information**	LANL	TA-55-PRD-108-01.0	July 13, 1995
22	"TA-55 Final Safety Analysis Report" Volume II **Unclassified Controlled Nuclear Information**	LANL	LA-CP-95-169	July 13, 1995
23	"TA-55 Hazard Analysis" **Unclassified Controlled Nuclear Information**	LANL	LA-CP-94-0076	July 13, 1995
24	"Nuclear Explosive Facilities Final Safety Analysis Report Nuclear Explosive Cells Module" (Buildings 12-44 Cells 1-6, 12-85, 12-96, and 12-98) **Unclassified Controlled Nuclear Information**	Pantex	Volume 1 - Draft B	July 1995
25	"Nuclear Explosive Facilities Final Safety Analysis Report Nuclear Explosive Cells Module" (Buildings 12-44 Cells 1-6, 12-85, 12-96, and 12-98) **Unclassified Controlled Nuclear Information**	Pantex	Volume 2 - Draft B	July 1995
26	"Chemical High Explosives Hazards Assessment for the Pantex Plant, Amarillo, Texas"	Pantex	none	Oct. 1993
27	(Data Call) Tab D: "Facility Operations" **Unclassified Controlled Nuclear Information**	Y-12	OR-9183	no date

TABLE F.1.1–1.—*Source Documents Reviewed for Applicable Accident Scenarios* [Page 3 of 3]

Item Number	Title	Site	Report Number	Date Published
28	"Nuclear Explosive Facilities Final Safety Analysis Report Nuclear Explosive Bays Module" (Buildings 12-64, 12-84, 12-99, and 12-104) **Unclassified Controlled Nuclear Information**	Pantex	Rev. 1 Draft 2 Volume 1	Dec. 1994
29	"Nuclear Explosive Facilities Final Safety Analysis Report Nuclear Explosive Bays Module" (Buildings 12-64, 12-84, 12-99, and 12-104) **Unclassified Controlled Nuclear Information**		Rev. 1 Draft 2 Volume 2	Dec. 1994
30	"Preliminary Safety Analysis Report Special Nuclear Materials Component Staging Facility" **Unclassified Controlled Nuclear Information**	Pantex	none	April 1989
31	"Safety Analysis Report - On-Site Transportation" **Unclassified Controlled Nuclear Information**	Pantex	Draft B	Sept. 1995
32	Stockpile Stewardship and Management/PEIS "Assembly/disassembly Nevada Test Site Alternative"	NTS	Volume 1	Aug. 4, 1995
33	Appendix 11-K - Release Fraction Data, Appendix 11-J - Consequence Equations Used in the Accident Analysis, Appendix 11-F - Seismic Accident Analysis, Appendix 11-E - Derivation of Data Values Used in the Accident Analysis **Unclassified Controlled Nuclear Information**	LANL	CMR-FAC-94-001	Feb., 1994
34	Draft "Design Process for Accident Mitigation" **Pit Disassembly and Conversion Facility Unclassified Controlled Nuclear Information**	LANL	Section 8	Aug. 21, 1995
35	"U.S. Department of Energy Defense Programs Safety Survey Report" Volume V: Appendix D - Laboratory Facilities **Unclassified Controlled Nuclear Information**	DOE	DOE/DP/70056-HI	Nov. 1993

ment facilities and the current facilities design criteria and safety standards, which will reduce total risk to the public. These changes include design to current DOE structural and safety criteria; smaller throughput, batch size and inventories of certain hazardous materials; and elimination of some hazardous materials. This will reduce potential offsite health effects if an accidental release were to occur.

Stockpile stewardship and management facilities will be designed to comply with current Federal, state, and local laws; DOE orders; and industrial codes and standards. As a result, a facility will be provided that is highly resistant to the effects of natural phenomena, including earthquake, flood, tornado, high wind, as well as credible events appropriate to the site, such as fire and explosions, and manmade threats to its continuing structural integrity for containing hazardous materials. The facilities will be designed to maintain their continuing structural integrity in the event of any credible accident or event, including an aircraft crash, if credible at these sites.

The design process for new and modified stockpile stewardship and management facilities will comply with the requirements for safety analysis and evaluation in DOE O 430.1, *Life-Cycle Asset Management* and DOE Order 5480.23, *Nuclear Safety Analysis Reports*. Safety assessment is required to be an integral part of the design process to ensure compliance with all DOE safety criteria by the time that the facilities are constructed and in operation.

For new facilities, the safety analysis process begins early in conceptual design by identifying hazards with the potential to produce unacceptable safety consequences to workers or the public. As the design develops, failure mode and effects analyses are performed to identify events that have the potential to release hazardous material. The kinds of events considered include equipment failure, spills, human error, fire and explosions, criticality, earthquake, electrical storms, tornado, flood, and aircraft crash. These postulated events become focal points for design changes or improvements to prevent unacceptable accidents. These analyses continue as the design progresses to assess the need for safety equipment and to assess the performance of this equipment in accident mitigation. Eventually, the safety analyses are formally documented in an SAR and/or in a probabilistic risk assessment. The probabilistic risk assessment documents the estimated frequency and consequence for an entire spectrum of accidents and helps to identify design improvements that could make meaningful safety improvements.

The first SAR is completed at the conclusion of conceptual design and includes identification of hazards and some limited assessment of a few enveloping design basis accidents. This analysis includes deterministic safety analysis and failure modes and effects analysis of major systems. A detailed, comprehensive Preliminary SAR is completed by the completion of preliminary design and provides a broad assessment of the range of design basis accident scenarios and the performance of equipment provided in the facility specifically for accident consequence mitigation. A limited probability risk assessment may be included in that analysis.

The SAR continues to be developed during detailed design. The safety review of this report and any supporting probabilistic risk assessment is completed and safety issues resolved before the facility construction is initiated. There is also a Final SAR produced that documents safety-related design changes during construction and the impact of those changes on the safety assessment. It also includes the results of any safety-related research and development that has been performed to support the safety assessment of the facility. Final approval of the Final SAR is required before the facility is allowed to commence operation.

F.1.3 Analysis Methodology

F.1.3.1 *Introduction*

The MELCOR Accident Consequence Code System (MACCS) was used to estimate the radiological consequences of all stockpile stewardship and management facilities for all accidents. The CHEMS-PLUS (*CHEMS-PLUS, Enhanced Chemical Hazard Evaluation Methodologies,* Arthur D. Little, Inc., July 1988) computer code was used to estimate the consequences of nonradiological accidents. A discussion of the MACCS code is provided in section F.1.3.2. A detailed description of the MACCS model is available in a three volume report: *MELCOR Accident Consequence Code System* (MACCS), NUREG/CR-4691, SAND 86-1562, February 1990.

F.1.3.2 *MELCOR Accident Consequence Code System*

MACCS models the offsite consequences of an accident that releases a plume of radioactive materials to the atmosphere. Should such an accidental release occur, the radioactive gases and aerosols in the plume would be transported by the prevailing wind while dispersing in the atmosphere. The environment would be contaminated by radioactive materials deposited from the plume, and the population would be exposed to radiation. The objectives of a MACCS calculation are to estimate the range and probability of the health effects induced by the radiation exposures not avoided by protective actions.

In order to understand MACCS, one must understand its two essential elements: the time scale after an accident is divided into various "phases" and the region surrounding the facility is divided into a polar-coordinate grid.

The time scale after the accident is divided into three phases: emergency phase, intermediate phase, and long-term phase. The emergency phase begins immediately after the accident and could last up to seven days following the accident. In this period, the exposure of population to both radioactive clouds and contaminated ground is modeled. Various protective measures can be specified for this phase, including evacuation, sheltering, and dose-dependent relocation.

The intermediate phase can be used to represent a period in which evaluations are performed and decisions are made regarding the type of protective measure actions that need to be taken. In this period, the radioactive clouds are assumed to be gone, and the only exposure pathways are those from the contaminated ground. The only protective measure that can be taken during this period is temporary relocation.

The long-term phase represents all time subsequent to the intermediate phase. The only exposure pathways considered here are those resulting from the contaminated ground. A variety of protective measures can be taken in the long-term phase in order to reduce doses to acceptable levels: decontamination, interdiction, and condemnation of property.

The spatial grid used to represent the region is centered on the facility itself. The user specifies the number of radial divisions as well as their endpoint distances. Up to 35 of these divisions may be defined, extending out to a maximum distance of 9,999 km (6,213 mi). The angular divisions used to define the spatial grid correspond to the sixteen directions of the compass.

Since the emergency phase calculations use highly nonlinear dose-response models for early fatality and early injury, it is necessary for those calculations to be performed on a finer grid than the calculations of the intermediate and long-term phases. For this reason, the 16 compass sectors are divided into 3, 5, or 7 user-specified subdivisions in the calculations of the emergency phase.

The increased likelihood (probability) of cancer fatality to a member of the public is taken as 5.0×10^{-4} times the dose in person-rem for values of dose less than 20 rem. For larger doses, when the rate of exposure is greater than 10 rads per hour, the increased likelihood of cancer fatality is doubled. The MACCS code was applied in a probabilistic manner using a weather bin sampling technique. Centerline doses as a function of distance were calculated for each of 150 meteorological sequence samples; the mean value of these doses and increased likelihoods of cancer fatality for the distance corresponding to the location of the maximum offsite individual at each site were reported for that individual. Doses to noninvolved workers were calculated similarly, except that these workers will experience an increased likelihood of cancer fatality of 4.0×10^{-4} times the dose in person-rem for doses less than 20 rem or exposure rates less than 10 rads per hour. For larger doses, when the rate of exposure is greater than 10 rads per hour, the increased likelihood of cancer fatality is doubled.

The hypothetical worker was placed at 1,000 meters (m) (3,281 feet [ft]) or at the site boundary, whichever is less. It should be noted that since the doses and cancer fatalities for the maximum offsite individual and the workers reported in the high-consequence/low-probability accident tables are mean values based on approximately 100 meteorological sequence samples, there is no direct correlation between the mean value of dose and the mean value of cancer fatalities.

Offsite population doses and latent cancer fatalities are calculated by MACCS using a methodology similar to that described for the maximum offsite individual. In the case of the population, each of the sampled meteorological sequences was applied to each of the 16 sectors (accounting for the frequency of occurrence of the wind blowing in that direction). Population doses are the sum of the individual doses in each sector. Once again, the mean value of the calculated population doses and latent cancer fatalities for each of the trials are reported.

F.2 STOCKPILE MANAGEMENT

F.2.1 Weapons Assembly/Disassembly

Studies of evaluation basis accidents (EBA) and beyond evaluation basis accidents (BEBA) have been performed for the downsized weapons assembly/disassembly (A/D) operations. The studies postulated a set of accident scenarios that were representative of the risks and consequences for workers and the public from operations. Although not all potential accidents were addressed, those that were postulated have consequences and risks that are expected to envelop the consequences and risks of an operating facility.

The accident analyses in this PEIS have been closely coordinated with the Pantex Site-Wide EIS to ensure consistency. The Pantex Site-Wide EIS is a more detailed evaluation of the Pantex Plant (Pantex) operations than this PEIS. Consequently, if there are any differences between the two documents, this PEIS defers to the Pantex Site-Wide EIS as the more accurate analysis of potential impacts from accidents.

F.2.1.1 *Accident Scenarios and Source Terms*

A range of hazardous conditions and potential accidents were reviewed as candidates for estimating the risks to workers and the public from operating this facility. Through a screening process, several evaluation basis and beyond evaluation basis accidents were selected for further definition and analysis. A brief description of each of the six accident scenarios and source terms is presented below. Table F.2.1.1-1 presents a summary of each accident scenario and source term. Further detail can be found in a topical report (HNUS 1996a).

Scenario 1: Aircraft impact and release

Pantex Plant. Pantex is located approximately 13.6 km (8.5 mi) from the northeast-southwest runway at Amarillo International Airport. The scenario involving aircraft impact considers an impact into a cell or bay, possibly causing a fire and subsequent detonation of high explosive (HE) with burning plutonium, or pit damage from debris. An assessment of the probability of aircraft impact into Pantex structures has been prepared for the *Draft Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapons Components* (DOE/EIS-0225D, March 1996). Based on existing information, aircraft impact into an assembly cell or bay buildings and the release of hazardous material is considered a credible but extremely unlikely event with an estimated probability in the range of $1x10^{-7}$ to $5x10^{-6}$/yr. For calculation purposes a value of $8x10^{-7}$/yr is assumed. A high-speed military aircraft or a large commercial aircraft crashing into a single facility could cause suf-

TABLE F.2.1.1-1.—*Accident Scenarios for Downsized Weapons Assembly/Disassembly Operations*

Accident Scenario	Site	Accident Frequency (Per Year)	Total Material Released to Environment
1. Aircraft impact and release	Pantex	$8x10^{-7}$	[a]
	NTS	$<1x10^{-7}$	Not applicable
2. Explosive dispersal of plutonium from high explosives detonation in cell or bay	Pantex	$5.7x10^{-6}$	62 g to 5,000 g plutonium[b] metal
	NTS	$5.7x10^{-6}$	96 g to 5,000 g plutonium[b] metal
3. Mechanical release due to pit drop or impact of forklift breaching pit cladding	Pantex	$7.8x10^{-3}$	$6x10^{-5}$ g plutonium metal
	NTS	$7.8x10^{-3}$	$6x10^{-5}$ g plutonium metal
4. Inadvertent activation of explosive squib on tritium reservoir	Pantex	0.02	1.8 g of tritium oxide and 18.2 g of elemental tritium
	NTS	0.02	1.8 g of tritium oxide and 18.2 g of elemental tritium
5. Operational fire-induced plutonium release	Pantex	$1x10^{-5}$	20 g plutonium oxide
	NTS	$1x10^{-5}$	20 g plutonium oxide
6. Fire-induced release from tritium reservoirs in staging vault	Pantex	$4x10^{-7}$	600 g tritium oxide[b]
	NTS	$4x10^{-7}$	600 g tritium oxide[b]

[a] For the aircraft crash accident, the Stockpile Stewardship and Management PEIS impacts are based on a percentage of the risks described in the Pantex Site-Wide Draft EIS. See the discussion under Scenario 1 in this section for additional details.

[b] The maximum amount of material is a hypothetical amount chosen for the purposes of this analysis.

Source: HNUS 1996a.

ficient damage to release plutonium. The degree of damage incurred and any subsequent release of radioactive materials depends on the size and speed of the aircraft involved, among other factors. The impacts of an aircraft crash into a stockpile stewardship and management weapons A/D Facility are based on an analysis performed for the Pantex Site-Wide EIS of an aircraft crash into Zone 4 and Zone 12 facilities. Since stockpile stewardship and management facilities are only in Zone 12, the Pantex Site-Wide EIS impacts were scaled to 28 percent of the public risk, and 61 percent of the maximum offsite individual risk. For the noninvolved worker, the Pantex Site-Wide EIS estimates that a worker at 100 m (328 ft) will not survive the aircraft crash effects. For the Stockpile Stewardship and Management PEIS, the noninvolved worker is assumed to be at 1,000 m (3,281 ft) and survives the crash. The accident consequences and risks to the noninvolved worker and the maximally exposed individual are discussed in section F.2.1.2.

Nevada Test Site. The probability of an aircraft impact into the downsized weapons A/D facilities is estimated at less than 10^{-7}/yr and, in accordance with NEPA guidelines, does not have to be considered further.

Scenario 2: Explosive dispersal of plutonium from HE detonation in cell or bay. The combined probability of an explosive dispersal of plutonium in a bay ($7x10^{-7}$/yr) or cell ($5x10^{-6}$/yr) is $5.7x10^{-6}$/yr. This value is conservatively based on 2,000 weapons operations per year. The anticipated number of weapons operations per year is 300 for the downsize A/D mission at Pantex.

Scenario 2.1: Explosive dispersal of plutonium from high explosives detonation in an assembly bay. Explosive dispersal of a plutonium pit would be the greatest when HE is in direct contact with the pit during an explosion or fire. The explosion would blow off the roof and doors of the bay; thus, no material would be retained inside the structure. As a result, it is assumed that all of the respirable plutonium would be released into the environment.

Pantex Plant. For the purposes of this analysis, the release of respirable plutonium from a Pantex assembly bay is assumed to be 5,000 grams (g) (176 ounces [oz]). The probability of this accident is $7x10^{-7}$/yr.

Nevada Test Site. For the purposes of this analysis, the release of respirable plutonium from a Nevada Test Site (NTS) assembly bay is assumed to be 5,000 g (176 oz). The probability of this accident is $7x10^{-7}$/yr.

Scenario 2.2: Explosive dispersal of plutonium from high explosives detonation in an assembly cell assuming no roof collapse. A detonation of 13.6 kilograms (kg) (30 pounds [lb]) (39 lb trinitrotoluene [TNT] equivalent) of HE is estimated to be the maximum amount of HE that would not cause the roof of a gravel gertie cell at Pantex or NTS to at least partially collapse. The explosion, which would cause greater than atmospheric pressures, would exist in the cell for approximately 1 minute. Since the roof does not collapse, a large fraction of the plutonium would be retained by the intact structures. In the case of large detonations causing the cell roof to collapse, the estimated release and consequences are bounded by the case in which the roof does not collapse.

Pantex Plant. The calculated respirable release from a Pantex assembly cell for this scenario is estimated to be 62 g (2.2 oz) of plutonium. The probability of this accident is $5x10^{-6}$/yr.

Nevada Test Site. The total respirable release from the NTS assembly cell for this scenario is estimated to be 96 g (3.4 oz) of plutonium. The probability of this accident is $5x10^{-6}$/yr.

Scenario 3: Mechanical release due to dropping a pit and breaching the cladding. For the purposes of this analysis, a pit is generically defined as a 6.5-kg (14-lb) spherical shell clad in thin metal alloy. Operational scenarios that have the potential to release small quantities of plutonium include dropping a pit onto the floor, cracking the external cladding because of disassembly stress, hitting a pit with other equipment, pulling out a pit tube during A/D, and breaching a container and pit with a forklift. A pit drop accident is used to characterize the category of events leading to violation of pit integrity.

An event of this nature has occurred at Pantex, where a weapon cladding was cracked, resulting in localized contamination around the pit. In this instance, the airborne contamination was insufficient to actuate the radiation alarm, and the worker dose was less than 0.1 rem.

Pantex Plant. The probability of a pit drop or forklift impact accident with a small plutonium release to a cell or bay at Pantex is 7.8×10^{-3}/yr. The total release to the environment is estimated to be 6×10^{-5} g of plutonium.

Nevada Test Site. The probability of a pit drop or forklift impact accident with a small plutonium release to a cell or bay at NTS is 7.8×10^{-3}/yr. The total release to the environment is estimated to be 6×10^{-5} g of plutonium.

Scenario 4: Inadvertent activation of explosive squib on tritium reservoir. During assembly or disassembly of a nuclear explosive, conditions could be encountered in which an electro-explosive device is accidentally fired and releases tritium from a reservoir. There have been two events (one at a weapons complex and one at a military installation) in which a squib was inadvertently actuated, releasing tritium from a reservoir. Since the events occurred, added precautions have been implemented. For this scenario, the squib valve must fire, releasing tritium from the reservoir, and the stem tube must be breached or disconnected from the pit (the latter is a normal step of disassembly).

For the purposes of this analysis, a reservoir is assumed to contain 20 g (0.7 oz) of elemental tritium. The entire amount of this tritium is assumed to be released in gaseous form. (Only hydrogen tritide is considered in assessing of worker dose, because only about 1 percent of hydrogen tritide is converted to tritium oxide after 1 hour.) All elemental tritium is 100 percent respirable. The amount of tritium which becomes airborne in the cell or bay is thus 20 g (0.7 oz). Upon detecting tritium, the exhaust fans will continue to operate and exhaust tritium to the atmosphere. The potential offsite doses from the tritium release would depend on the extent of tritium oxidation, which is estimated to be 9 percent as a bounding limit.

Pantex Plant. The probability of inadvertent squib activation during operations in an assembly cell or bay is 0.02/yr. The total release is estimated to be 1.8 g (0.06 oz) of tritium oxide and 18.2 g (0.6 oz) of elemental tritium.

Nevada Test Site. The probability of inadvertent squib activation during operations in an assembly cell or bay is estimated to be the same as at Pantex with the same total release of 1.8 g (0.06 oz) of tritium oxide and 18.2 g (0.6 oz) of elemental tritium.

Scenario 5: Operational fire-induced plutonium dispersal. The metal-clad plutonium pits are designed to maintain their integrity for certain temperature levels but are not intended to function as barriers against release. The facilities (assembly cells or bays) that can have plutonium pits outside of their containers would likely remain intact in a fire not associated with an explosion. A bounding scenario for fire-induced plutonium dispersal assumes the radioactive material limit in a cell or bay is dispersed by fire with no containment.

Pantex Site. The probability of an operational fire-induced plutonium dispersal is 1×10^{-5}/yr. The total material released is 20 g (0.7 oz) of plutonium oxide.

Nevada Test Site. The operational fire at Pantex is assumed to occur at NTS with the same frequency and release as at Pantex.

Scenario 6: Fire-induced release from tritium reservoirs in staging vault. In this scenario, an earthquake is assumed to cause a fire in the vault where in-process tritium reservoirs are stored. The fire causes 100 percent of the tritium reservoirs in the vault to fail, releasing its entire contents. In addition, it is assumed that the elemental tritium is completely oxidized by the fire.

Pantex Plant. The probability of a release of tritium from the Pantex A/D staging area is 4×10^{-7}/yr. For the purposes of this analysis, the release is assumed to be 600 g (21 oz) of tritium oxide.

Nevada Test Site. It is assumed that this scenario at Pantex would be applicable at NTS. Therefore, the accident probability is 4×10^{-7}/yr. For the purposes of this analysis, the release is assumed to be 600 g (21 oz) of tritium oxide.

F.2.1.2 *Accident Consequences and Risk*

Tables F.2.1.2–1 and F.2.1.2–2 list the set of accidents selected to represent consequences and risks to workers and the public from accidental releases of radioactive materials during operations at Pantex and NTS, respectively. For each accident, the table identifies the frequency of occurrence and the consequences to a hypothetical worker located 1,000 m (3,281 ft) from the accident, a hypothetical individual located at the nearest site boundary, and the public out to a distance of 80 km (50 mi). The risks of cancer fatality for the worker, the individual at the site boundary, and the public for the composite set of accidents are also shown.

F.2.2 Secondary and Case Fabrication

Evaluation basis accidents and beyond evaluation basis accidents have been studied for the secondary and case fabrication operations. The studies postulated a set of accident scenarios that were representative of the risks and consequences for workers and the public that can be expected from operations. Although not all potential accidents were addressed, those that were postulated have consequences and risks that are expected to envelop the consequences and risks of the relocated operations.

F.2.2.1 *Accident Scenarios and Source Terms*

A range of hazardous conditions and potential accidents were reviewed as candidates to represent the risks of the facility's operation to workers and the public. Through a screening process, several evaluation basis accidents and beyond evaluation basis accidents were selected for further definition and analysis. A brief description of each of the 12 accident scenarios and source terms is presented below. Table F.2.2.1–1 presents a summary of each accident scenario and source term. Further detail can be found in a topical report (HNUS 1996a).

Scenario 1: Nuclear criticality. Criticality accidents are postulated at nearly all locations where highly enriched uranium (HEU) is handled. Potential causes include operator error and loss of safe geometry resulting from fire damage to aluminum birdcage containers or structural damage from an earthquake. Both ground-level and elevated fission product releases to the atmosphere are postulated. The postulated criticality is based on the characteristics of a solution as specified by the U.S. Nuclear Regulatory Commission.

For the accidental criticality evaluated, it is assumed that $1x10^{19}$ fissions occur before reaching a stable, subcritical condition. This total is comprised of an initial burst of $1x10^{18}$ fissions followed by repeated bursts of $1x10^{17}$ fissions over an 8-hour period as liquid is assumed to be boiled from a solution system. 100 percent of the xenon and krypton formed is released; 25 percent of the iodine is released.

Oak Ridge Reservation. The criticality accident frequency is assumed to be extremely unlikely ($1x10^{-6}$ to $1x10^{-4}$/yr).

Los Alamos National Laboratory. The criticality accident frequency is assumed to be extremely unlikely ($1x10^{-6}$ to $1x10^{-4}$/yr).

Lawrence Livermore National Laboratory. The criticality accident frequency is assumed to be extremely unlikely ($1x10^{-6}$ to $1x10^{-4}$/yr).

Scenario 2: Fire-induced dispersion of highly enriched uranium from a building collapse and resultant fire. The postulated accident assumes that a beyond evaluation basis earthquake causes the uranium process, component fabrication, and storage facilities to collapse. Ruptured gas lines and/or hydraulic lines cause fires in the process and component fabrication facilities.

Oak Ridge Reservation. The frequency of this accident is beyond evaluation basis ($1x10^{-7}$ to $1x10^{-6}$). The total HEU source term released in oxide form is estimated to be 17 kg (37 lb) and 1.5 kg (3.3 lb) of depleted uranium.

Los Alamos National Laboratory. The accident defined for Oak Ridge Reservation (ORR) is assumed to be valid at Los Alamos National Laboratory (LANL). The frequency is assumed to be in the range of $1x10^{-7}$ to $1x10^{-6}$/yr. The total release is 17 kg (37 lb) of HEU and 1.5 kg (3.3 lb) of depleted uranium. The location of the release is the Chemistry and Metallurgy Research Building.

TABLE F.2.1.2–1.—*Downsized Weapons Assembly/Disassembly Operations at Pantex Plant, Impacts of Accidents*

Accident Scenario	Noninvolved Worker at 1,000 Meters		Maximum Offsite Individual		Population to 80 Kilometers		
	Dose (rem)	Probability of Cancer Fatality[a]	Dose (rem)	Probability of Cancer Fatality[a]	Dose (person-rem)	Cancer Fatalities	Accident Frequency (per year)
1. Aircraft impact and release[b]	23	9.2×10^{-3}	23	0.012	2.8×10^{3}	1.4	8.0×10^{-7}
2. Explosive dispersal of plutonium in cell or bay	16.9	6.8×10^{-3}	12.9	6.5×10^{-3}	3.8×10^{3}	1.9	5.7×10^{-6}
3. Mechanical release from impact breach of pit cladding	3.2×10^{-6}	1.3×10^{-9}	2.4×10^{-6}	1.2×10^{-9}	6.5×10^{-4}	3.2×10^{-7}	7.8×10^{-3}
4. Inadvertent activation of explosive squib on tritium reservoir	9.7×10^{-4}	3.9×10^{-7}	7.4×10^{-4}	3.7×10^{-7}	0.20	9.9×10^{-5}	0.02
5. Operational fire-induced plutonium release	0.52	2.1×10^{-4}	0.40	2.0×10^{-4}	107	0.054	1.0×10^{-5}
6. Fire-induced release from tritium reservoirs in staging vault[b]	0.31	1.2×10^{-4}	0.24	1.2×10^{-4}	66	0.033	4.0×10^{-7}
Impacts for Composite Set of EBAs and BEBAs[c]							
Expected consequences[d]		2.0×10^{-6}		2.0×10^{-6}		5.2×10^{-4}	
Expected risk (per year)		5.6×10^{-8}		5.6×10^{-8}		1.5×10^{-5}	
Impacts for Composite Set of EBAs							
Expected consequences[d]		1.7×10^{-6}		1.7×10^{-6}		4.8×10^{-4}	
Expected risk (per year)		4.8×10^{-8}		4.6×10^{-8}		1.3×10^{-5}	
Impacts for Composite Set of BEBAs							
Expected consequences[d]		6.2×10^{-3}		8.0×10^{-3}		0.94	
Expected risk (per year)		7.4×10^{-9}		9.7×10^{-9}		1.1×10^{-6}	

[a] Probability (increased likelihood) of cancer fatality to a hypothetical member of the public located at the site boundary or a worker located at 1,000 m (3,281 ft) from the accident as a result of exposure to the indicated dose if the accident occurred.

[b] A beyond evaluation basis accident (BEBA). All other listed accidents are evaluation basis accidents (EBA).

[c] For the offsite population of 285,409, the average probability of cancer fatality/risk of cancer fatality (per year) for the composite set of accidents is $1.8 \times 10^{-9}/5.3 \times 10^{-11}$.

[d] Result of exposure to the indicated dose if the accident occurs.

Note: All values are mean values.

Source: Model results.

TABLE F.2.1.2–2.—*Downsized Weapons Assembly/Disassembly Operations at Nevada Test Site, Impacts of Accidents*

Accident Scenario	Noninvolved Worker at 1,000 Meters		Maximum Offsite Individual		Population to 80 Kilometers		
	Dose (rem)	Probability of Cancer Fatality[a]	Dose (rem)	Probability of Cancer Fatality[a]	Dose (person-rem)	Cancer Fatalities	Accident Frequency (per year)
1. Aircraft impact and release	b	b	b	b	b	b	b
2. Explosive dispersal of plutonium in cell or bay	26.1	0.01	2.3	1.1×10^{-3}	361	0.18	5.7×10^{-6}
3. Mechanical release from impact breach of pit cladding	4.7×10^{-6}	1.9×10^{-9}	4.0×10^{-7}	2.0×10^{-10}	5.4×10^{-5}	2.7×10^{-8}	7.8×10^{-3}
4. Inadvertent activation of explosive squib on tritium reservoir	1.4×10^{-3}	5.7×10^{-7}	1.2×10^{-4}	6.2×10^{-8}	0.016	8.1×10^{-6}	0.02
5. Operational fire-induced plutonium release	0.77	3.1×10^{-4}	0.066	3.3×10^{-5}	8.9	4.4×10^{-3}	1.0×10^{-5}
6. Fire-induced release from tritium reservoirs in staging vault[c]	0.42	1.7×10^{-4}	0.038	1.9×10^{-5}	5.6	2.8×10^{-3}	4.0×10^{-7}
Impacts of Composite Set of EBAs and BEBAs[d]							
Expected consequences[e]		2.7×10^{-6}		2.9×10^{-7}		4.4×10^{-5}	
Expected risk (per year)		7.4×10^{-8}		8.1×10^{-9}		1.2×10^{-6}	
Impacts for Composite Set of EBAs							
Expected consequences[e]		2.7×10^{-6}		2.9×10^{-7}		4.4×10^{-5}	
Expected risk (per year)		7.4×10^{-8}		8.1×10^{-9}		1.2×10^{-6}	
Impacts for Composite Set of BEBAs							
Expected consequences[e]		1.7×10^{-4}		1.9×10^{-5}		2.8×10^{-3}	
Expected risk (per year)		6.7×10^{-11}		7.7×10^{-12}		1.1×10^{-9}	

[a] Probability (increased likelihood) of cancer fatality to a hypothetical member of the public located at the site boundary or to a worker located 1,000 m (3,281 ft) from the accident as a result of exposure to the indicated dose if the accident occurred.

[b] Not applicable. The probability of an aircraft crash is estimated to be lower than 10^{-7}/yr.

[c] A beyond evaluation basis accident (BEBA). All other listed accidents are evaluation basis accidents (EBA).

[d] For the offsite population of 18,517, the average probability of cancer fatality/risk of cancer fatality (per year) for the composite set of accidents is $2.4 \times 10^{-9}/6.5 \times 10^{-11}$.

[e] Result of exposure to the indicated dose if the accident occurs.

Note: All values are mean values.

Source: Model results.

TABLE F.2.2.1–1.—*Accident Scenarios for Secondary and Case Fabrication*

Accident Scenario	Site	Accident Frequency (per year)	Total Material Released to Environment
1. Nuclear criticality	ORR	$1x10^{-6}$ to $1x10^{-4}$	$1x10^{19}$ fissions
	LANL	$1x10^{-6}$ to $1x10^{-4}$	$1x10^{19}$ fissions
	LLNL	$1x10^{-6}$ to $1x10^{-4}$	$1x10^{19}$ fissions
2. Fire-induced dispersion of highly enriched uranium from a building collapse and resultant fire	ORR	$1x10^{-7}$ to $1x10^{-6}$	17 kg of HEU and 1.5 kg of depleted uranium
	LANL	$1x10^{-7}$ to $1x10^{-6}$	17 kg of HEU and 1.5 kg of depleted uranium
	LLNL	$1x10^{-7}$ to $1x10^{-6}$	17 kg of HEU and 1.5 kg of depleted uranium
3. Dry criticality resulting from vehicle accident	ORR	$1x10^{-6}$ to $1x10^{-4}$	$1x10^{18}$ fissions
	LANL	$1x10^{-6}$ to $1x10^{-4}$	$1x10^{18}$ fissions
	LLNL	$1x10^{-6}$ to $1x10^{-4}$	$1x10^{18}$ fissions
4. Fire-induced release of highly enriched uranium from solvent fire	ORR	$1x10^{-6}$ to $1x10^{-4}$	4 kg of HEU
	LANL	$1x10^{-6}$ to $1x10^{-4}$	4 kg of HEU
	LLNL	$1x10^{-6}$ to $1x10^{-4}$	4 kg of HEU
5. Fire-induced release of highly enriched uranium from metallurgical operations	ORR	$1x10^{-6}$ to $1x10^{-4}$	3.75 kg of HEU
	LANL	$1x10^{-6}$ to $1x10^{-4}$	3.75 kg of HEU
	LLNL	$1x10^{-6}$ to $1x10^{-4}$	3.75 kg of HEU
6. Fire-induced release of lithium	ORR	$1x10^{-6}$ to $1x10^{-4}$	2,800 kg Li_2O
	LANL	$1x10^{-6}$ to $1x10^{-4}$	2,800 kg Li_2O
	LLNL	$1x10^{-6}$ to $1x10^{-4}$	2,800 kg Li_2O
7. Fire-induced release of highly enriched uranium on loading dock	ORR	$1x10^{-6}$ to $1x10^{-4}$	0.8 kg of HEU
	LANL	$1x10^{-6}$ to $1x10^{-4}$	0.8 kg of HEU
	LLNL	$1x10^{-6}$ to $1x10^{-4}$	0.8 kg of HEU
8. Filter failure-induced release of highly enriched uranium	ORR	$1x10^{-6}$ to $1x10^{-4}$	1.6 kg of HEU
	LANL	$1x10^{-6}$ to $1x10^{-4}$	1.6 kg of HEU
	LLNL	$1x10^{-6}$ to $1x10^{-4}$	1.6 kg of HEU
9. Mechanical release of hydrogen fluoride	ORR	$1x10^{-6}$ to $1x10^{-4}$	386 kg of hydrogen fluoride
	LANL	$1x10^{-6}$ to $1x10^{-4}$	386 kg of hydrogen fluoride
	LLNL	$1x10^{-6}$ to $1x10^{-4}$	386 kg of hydrogen fluoride
10. Fire-induced release of hydrogen cyanide	ORR	$1x10^{-6}$ to $1x10^{-4}$	300 kg of acetonitrile solvent
	LANL	$1x10^{-6}$ to $1x10^{-4}$	300 kg of acetonitrile solvent
	LLNL	$1x10^{-6}$ to $1x10^{-4}$	300 kg of acetonitrile solvent

Source: HNUS 1996a.

Lawrence Livermore National Laboratory. The accident defined for ORR is assumed to be valid at Lawrence Livermore National Laboratory (LLNL). The frequency is assumed to be in the range of $1x10^{-7}$ to $1x10^{-6}$/yr. The total release is 17 kg (37 lb) of HEU and 1.5 kg (3.3 lb) of depleted uranium.

Scenario 3: Dry criticality resulting from vehicle accident. A vehicle accident is postulated in which the contents are dislodged and possibly mixed with moderating materials, creating a criticality. HEU oxide powder is spilled and collected in the vehicle's low point. The accidental criticality could be initiated by an error in strapping or by wheels falling off a bottle dolly. The postulated criticality results in $1x10^{18}$ fissions for the dry criticality.

Oak Ridge Reservation. The accident frequency is assumed to be in the range of extremely unlikely ($1x10^{-6}$ to $1x10^{-4}$/yr).

Los Alamos National Laboratory. The accident is assumed to occur at LANL with a frequency of $1x10^{-6}$ to $1x10^{-4}$/yr.

Lawrence Livermore National Laboratory. The accident is assumed to occur at LLNL with a frequency of $1x10^{-6}$ to $1x10^{-4}$/yr.

Scenario 4: Fire-induced release of highly enriched uranium from a solvent fire. A fire releasing uranium aerosols is postulated to occur. The types of fires include contaminated trash, solvents containing uranium solutions, uranium chips, and larger uranium metal shapes. A solvent fire releasing uranium-laden combustion gases at ground level is assumed. In this scenario, the entire contents of an extraction column would be released via a pipe break or other failure and are ignited by an electrical fault. Complete combustion would occur.

Oak Ridge Reservation. The release at ORR is estimated to be 4 kg (8.8 lb) of HEU with a frequency in the range of $1x10^{-6}$ to $1x10^{-4}$/yr.

Los Alamos National Laboratory. The accident is assumed to occur at LANL with a frequency in the range of $1x10^{-6}$ to $1x10^{-4}$/yr and a release of 4 kg (8.8 lb) of HEU.

Lawrence Livermore National Laboratory. The accident is assumed to occur at LLNL with a frequency in the range of $1x10^{-6}$ to $1x10^{-4}$/yr and a release of 4 kg (8.8 lb) of HEU.

Scenario 5: Fire-induced release of highly enriched uranium. A uranium fire accident is postulated to occur during metallurgical operations when a 4-liter (L) (1-gallon [gal]) container of briquettes ignites while check weighing before being loaded into a crucible. The total material at risk is estimated to be 15 kg (33 lb) of HEU.

Oak Ridge Reservation. The accident is assumed to occur with a frequency in the range of $1x10^{-6}$ to $1x10^{-4}$ /yr and a release of 3.75 kg (8.31 lb) of HEU.

Los Alamos National Laboratory. The accident is assumed to occur with a frequency in the range of $1x10^{-6}$ to $1x10^{-4}$ /yr and a release of 3.75 kg (8.3 lb) of HEU.

Lawrence Livermore National Laboratory. The accident is assumed to occur with a frequency in the range of $1x10^{-6}$ to $1x10^{-4}$/yr and a release of 3.75 kg (8.31 lb) of HEU.

Scenario 6: Fire-induced release of lithium. A lithium fire is postulated to occur when burning lithium produces hazardous lithium oxide.

Oak Ridge Reservation. The probability of the accident is assumed to be in the range of $1x10^{-6}$ to $1x10^{-4}$/yr and to release 2,800 kg (6,170 lb) of lithium oxide.

Los Alamos National Laboratory. The probability of the accident is assumed to be in the range of $1x10^{-6}$ to $1x10^{-4}$/yr and to release 2,800 kg (6,170 lb) of lithium oxide.

Lawrence Livermore National Laboratory. The probability of the accident is assumed to be in the range of $1x10^{-6}$ to $1x10^{-4}$/yr and to the release 2,800 kg (6,170 lb) of lithium oxide.

Scenario 7: Fire-induced release of highly enriched uranium on loading dock. A uranium metal fire at the loading dock is postulated to occur and results in a release of heated uranium aerosols at ground level. The fire is assumed to burn for 30 minutes and, during that time, completely oxidate the uranium metal in the transport vehicle. The effective release height is estimated to be 30 m (98 ft) because of thermal buoyancy.

Oak Ridge Reservation. The amount of HEU released to the atmosphere is 0.8 kg (1.8 lb) with an assumed frequency in the range of $1x10^{-6}$ to $1x10^{-4}$/yr.

Los Alamos National Laboratory. The accident is assumed to occur at LANL with a frequency in the range of $1x10^{-6}$ to $1x10^{-4}$/yr. The release is estimated to be 0.8 kg (1.8 lb) of HEU with a release height of 30 m (98 ft).

Lawrence Livermore National Laboratory. The accident is assumed to occur at LLNL with a frequency in the range of $1x10^{-6}$ to $1x10^{-4}$/yr. The release is estimated to be 0.8 kg (1.8 lb) of HEU with a release height of 30 m (98 ft).

Scenario 8: Filter failure release of highly enriched uranium. Mechanical upsets are events such as spills, forklift punctures, loss of filtration, and piping failures. The mechanical upset would result in small releases to the atmosphere, unless the off-gas filters in the fluid bed system fail. The bounding accident scenario postulates that both the primary and secondary filters rupture internally, allowing the contained charge of uranium oxide and uranium fluoride particles to be released to the atmosphere via the exhaust stack.

Oak Ridge Reservation. The release to the atmosphere is 1.6 kg (3.5 lb) of HEU from the filter. The assumed accident frequency is in the range of $1x10^{-6}$ to $1x10^{-4}$/yr.

Los Alamos National Laboratory. The release to the atmosphere is 1.6 kg (3.5 lb) of HEU from the filter. The assumed accident frequency is in the range of $1x10^{-6}$ to $1x10^{-4}$/yr.

Lawrence Livermore National Laboratory. The release to the atmosphere is 1.6 kg (3.5 lb) of HEU from the filter. The assumed accident frequency is in the range of $1x10^{-6}$ to $1x10^{-4}$/yr.

Scenario 9: Mechanical release of hydrogen fluoride. This accident is postulated as a large spill of hydrogen fluoride that would generate a dense cloud of hydrogen fluoride that can exceed Level of Concern limits. It is assumed that the entire contents of a tank containing 386 kg (850 lb) of hydrogen fluoride would leak from a 2.54-centimeter (cm) (1-inch [in]) hole, emptying the tank in 12 minutes.

Oak Ridge Reservation. The accident frequency is assumed to range from $1x10^{-6}$ to $1x10^{-4}$/yr. The release is the tank's entire contents of 386 kg (850 lb) of hydrogen fluoride.

Los Alamos National Laboratory. The accident frequency is assumed to range from $1x10^{-6}$ to $1x10^{-4}$/yr. The release is the tank's entire contents of 386 kg (850 lb) of hydrogen fluoride.

Lawrence Livermore National Laboratory. The accident frequency is assumed to range from $1x10^{-6}$ to $1x10^{-4}$/yr. The release is the tank's entire contents of 386 kg (850 lb) of hydrogen fluoride.

Scenario 10: Fire-induced release of hydrogen cyanide during a vehicle impact. A vehicular traffic accident is postulated to occur and cause a rupture in one or more drums containing acetonitrile solvent waste. The spill is ignited by a spark, and the resulting fire spreads to other drums in the area. The fire produces hydrogen cyanide.

Oak Ridge Reservation. The accident frequency is assumed to be in the range of $1x10^{-6}$ to $1x10^{-4}$/yr. The release involves 300 kg (660 lb) of solvent waste.

Los Alamos National Laboratory. The accident frequency is assumed to be in the range of $1x10^{-6}$ to $1x10^{-4}$/yr. The release involves 300 kg (660 lb) of solvent waste.

Lawrence Livermore National Laboratory. The accident frequency is assumed to be in the range of $1x10^{-6}$ to $1x10^{-4}$/yr. The release involves 300 kg (660 lb) of solvent waste.

F.2.2.2 *Accident Consequences and Risk*

Tables F.2.2.2–1, F.2.2.2–2, and F.2.2.2–3 list the set of accidents selected to represent consequences and risks to workers and the public from accidental releases of radioactive materials during operations at ORR, LANL, and LLNL, respectively. For each accident, the table identifies the frequency of occurrence and the consequences to a hypothetical worker at a specified distance from the accident, a hypothetical individual located at the nearest site boundary, and the public out to a distance of 80 km (50 mi). The risks of cancer fatality for the worker, the individual at the site boundary, and the public for the composite set of accidents are also shown.

F.2.3 Pit Fabrication and Intrusive Modification Pit Reuse

Studies of evaluation basis accidents and beyond evaluation basis accidents have been performed for the pit fabrication and intrusive modification pit reuse operations. The studies postulated a set of accident scenarios that were representative of the risks and consequences

TABLE F.2.2.2–1.—*Secondary and Case Fabrication at Oak Ridge Reservation, Impacts of Accidents*

Accident Scenario	Noninvolved Worker at 619 Meters		Maximum Offsite Individual		Population to 80 Kilometers		
	Dose (rem)	Probability of Cancer Fatality[a]	Dose (rem)	Probability of Cancer Fatality[a]	Dose (person-rem)	Cancer Fatalities	Accident Frequency (per year)
1. Nuclear criticality	0.051	$2.0x10^{-5}$	0.051	$2.5x10^{-5}$	3.1	$1.5x10^{-3}$	$1.0x10^{-5}$
2. Fire-induced dispersion of highly enriched uranium from a building collapse and resultant fires[b]	2.4	$9.6x10^{-4}$	2.4	$1.2x10^{-3}$	363	0.18	$5.0x10^{-7}$
3. Dry criticality resulting from vehicle accident	$5.1x10^{-3}$	$2.0x10^{-6}$	$5.1x10^{-3}$	$2.5x10^{-6}$	0.31	$1.5x10^{-4}$	$1.0x10^{-5}$
4. Fire-induced release of highly enriched uranium from solvent fire	0.57	$2.3x10^{-4}$	0.57	$2.9x10^{-4}$	86	0.04	$1.0x10^{-5}$
5. Fire-induced release of highly enriched uranium from metallurgical operations	0.54	$2.2x10^{-4}$	0.54	$2.7x10^{-4}$	80.6	0.04	$1.0x10^{-5}$
7. Fire-induced release of highly enriched uranium on loading dock	0.083	$3.3x10^{-5}$	0.083	$4.2x10^{-5}$	17.6	$8.8x10^{-3}$	$1.0x10^{-5}$
8. Filter failure-induced release of highly enriched uranium	0.23	$9.2x10^{-5}$	0.23	$1.1x10^{-4}$	34.3	0.017	$1.0x10^{-5}$
Impacts for Composite Set of EBAs and BEBAs[c]							
Expected consequences[d]		$1.1x10^{-4}$		$1.3x10^{-4}$		0.02	
Expected risk (per year)		$6.4x10^{-9}$		$8.0x10^{-9}$		$1.2x10^{-6}$	
Impacts for Composite Set of EBAs							
Expected consequences[d]		$1.0x10^{-4}$		$1.2x10^{-4}$		0.018	
Expected risk (per year)		$5.9x10^{-9}$		$7.4x10^{-9}$		$1.1x10^{-6}$	
Impacts for Composite Set of BEBAs							
Expected consequences[d]		$9.7x10^{-4}$		$1.2x10^{-3}$		0.18	
Expected risk (per year)		$4.9x10^{-10}$		$6.0x10^{-10}$		$9.1x10^{-8}$	

[a] Probability (increased likelihood) of cancer fatality to a hypothetical member of the public located at the site boundary or a worker located at the indicated distance from the accident as a result of exposure to the indicated dose if the accident were to occur.

[b] A beyond evaluation basis accident (BEBA). All other listed accidents are evaluation basis accidents (EBA).

[c] For the offsite population of 1,096,144, the average probability of cancer fatality/risk of cancer fatality (per year) for the composite set of accidents is $1.8x10^{-8}/1.1x10^{-12}$.

[d] Result of exposure to the indicated dose if the accident occurs.

Note: All values are mean values.

Source: Model results.

TABLE F.2.2.2–2.—*Secondary and Case Fabrication at Los Alamos National Laboratory, Impacts of Accidents*

Accident Scenario	Noninvolved Worker at 862 Meters		Maximum Offsite Individual		Population to 80 Kilometers		
	Dose (rem)	Probability of Cancer Fatality[a]	Dose (rem)	Probability of Cancer Fatality[a]	Dose (person-rem)	Cancer Fatalities	Accident Frequency (per year)
1. Nuclear criticality	0.034	1.4×10^{-5}	0.034	1.7×10^{-5}	4.9	2.4×10^{-3}	1.0×10^{-5}
2. Fire-induced dispersion of highly enriched uranium from a building collapse and resultant fire[b]	1.6	6.2×10^{-4}	1.6	7.7×10^{-4}	360	0.18	5.0×10^{-7}
3. Dry criticality resulting from vehicle accident	3.4×10^{-3}	1.4×10^{-6}	3.4×10^{-3}	1.7×10^{-6}	0.49	2.4×10^{-4}	1.0×10^{-5}
4. Fire-induced release of highly enriched uranium from solvent fire	0.36	1.5×10^{-4}	0.36	1.8×10^{-4}	84.5	0.042	1.0×10^{-5}
5. Fire-induced release of highly enriched uranium from metallurgical operations	0.34	1.4×10^{-4}	0.34	1.7×10^{-4}	79.4	0.04	1.0×10^{-5}
7. Fire-induced release of highly enriched uranium on loading dock	0.053	2.1×10^{-5}	0.053	2.6×10^{-5}	15.0	7.5×10^{-3}	1.0×10^{-5}
8. Filter failure-induced release of highly enriched uranium	0.15	5.8×10^{-5}	0.15	7.3×10^{-5}	33.8	0.017	1.0×10^{-5}
Impacts for Composite Set of EBAs and BEBAs[c]							
Expected consequences[d]		6.8×10^{-5}		8.4×10^{-5}		0.02	
Expected risk (per year)		4.1×10^{-9}		5.1×10^{-9}		1.2×10^{-6}	
Impacts for Composite Set of EBAs							
Expected consequences[d]		6.3×10^{-5}		7.9×10^{-5}		0.018	
Expected risk (per year)		3.8×10^{-9}		4.7×10^{-9}		1.1×10^{-6}	
Impacts for Composite Set of BEBAs							
Expected consequences[d]		6.2×10^{-4}		7.7×10^{-4}		0.18	
Expected risk (per year)		3.1×10^{-10}		3.9×10^{-10}		8.9×10^{-8}	

[a] Probability (increased likelihood) of cancer fatality to a hypothetical member of the public located at the site boundary or a worker located at the indicated distance from the accident as a result of exposure to the indicated dose if the accident occurred.
[b] A beyond evaluation basis accident (BEBA). All other listed accidents are evaluation basis accidents (EBA).
[c] For the offsite population of 281,812, the average probability of cancer fatality/risk of cancer fatality (per year) for the composite set of accidents is $7.1 \times 10^{-8}/4.3 \times 10^{-12}$.
[d] Result of exposure to the indicated dose if the accident occurs.
Note: All values are mean values.
Source: Model results.

TABLE F.2.2.2–3.—*Secondary and Case Fabrication at Lawrence Livermore National Laboratory, Impacts of Accidents*

Accident Scenario	Noninvolved Worker at 247 Meters		Maximum Offsite Individual		Population to 80 Kilometers		
	Dose (rem)	Probability of Cancer Fatality[a]	Dose (rem)	Probability of Cancer Fatality[a]	Dose (person-rem)	Cancer Fatalities	Accident Frequency (per year)
1. Nuclear criticality	0.07	2.8×10^{-5}	0.07	3.5×10^{-5}	9.9	5.0×10^{-3}	1.0×10^{-5}
2. Fire-induced dispersion of highly enriched uranium from a building collapse and resultant fire[b]	3.4	1.4×10^{-3}	3.4	1.7×10^{-3}	1.2×10^{3}	0.58	5.0×10^{-7}
3. Dry criticality resulting from vehicle accident	7.0×10^{-3}	2.8×10^{-6}	7.0×10^{-3}	3.5×10^{-6}	0.99	5.0×10^{-4}	1.0×10^{-5}
4. Fire-induced release of highly enriched uranium from solvent fire	0.8	3.2×10^{-4}	0.80	4.0×10^{-4}	273	0.14	1.0×10^{-5}
5. Fire-induced release of highly enriched uranium from metallurgical operations	0.75	3.0×10^{-4}	0.75	3.8×10^{-4}	257	0.13	1.0×10^{-5}
7. Fire-induced release of highly enriched uranium on loading dock	0.11	4.2×10^{-5}	0.11	5.3×10^{-5}	53.2	0.027	1.0×10^{-5}
8. Filter failure-induced release of highly enriched uranium	0.32	1.3×10^{-4}	0.32	1.6×10^{-4}	109	0.055	1.0×10^{-5}
Impacts for Composite Set of EBAs and BEBAs[c]							
Expected consequences[d]		1.5×10^{-4}		1.8×10^{-4}		0.063	
Expected risk (per year)		8.9×10^{-9}		1.1×10^{-8}		3.8×10^{-6}	
Impacts for Composite Set of EBAs							
Expected consequences[d]		1.4×10^{-4}		1.7×10^{-4}		0.06	
Expected risk (per year)		8.2×10^{-9}		1.0×10^{-8}		3.5×10^{-6}	
Impacts for Composite Set of BEBAs							
Expected consequences[d]		1.4×10^{-3}		1.7×10^{-3}		0.6	
Expected risk (per year)		6.8×10^{-10}		8.5×10^{-10}		2.9×10^{-7}	

[a] Probability (increased likelihood) of cancer fatality to a hypothetical member of the public located at the site boundary or a worker located 247 m (810 ft) from the accident as a result of exposure to the indicated dose if the accident occurred.

[b] A beyond evaluation basis accident (BEBA). All other listed accidents are evaluation basis accidents (EBA).

[c] For the offsite population of 7,843,061, the average probability of cancer fatality/risk of cancer fatality (per year) for the composite set of accidents is $8.0 \times 10^{-9}/4.8 \times 10^{-13}$.

[d] Result of exposure to the indicated dose if the accident occurs.

Note: All values are mean values.

Source: Model results.

TABLE F.2.3.1–1.—*Accident Scenarios for Pit Fabrication and Intrusive Modification Pit Reuse*

Accident Scenario	Site	Accident Frequency (per year)	Total Material Released to Environment
1. Fire-induced release of plutonium from a glove box	LANL	$1x10^{-4}$ to 0.01	0.24 g plutonium oxide
	SRS	$1x10^{-4}$ to 0.01	0.24 g plutonium oxide
2. Operational release of tritium	LANL	$1x10^{-6}$ to $1x10^{-4}$	21,000 Ci of tritium oxide[a]
	SRS	$1x10^{-6}$ to $1x10^{-4}$	21,000 Ci of tritium oxide[a]
3. Mechanical release of nitric acid into confined area	LANL	$1x10^{-6}$ to $1x10^{-4}$	6,100 gal of 80-percent nitric acid in bermed area
	SRS	$1x10^{-6}$ to $1x10^{-4}$	6,100 gal of 80-percent nitric acid in bermed area
4. Earthquake-induced mechanical release of nitric acid	LANL	$1x10^{-7}$ to $1x10^{-6}$	6,100 gal of 80-percent nitric acid in bermed area
	SRS	$1x10^{-7}$ to $1x10^{-6}$	6,100 gal of 80-percent nitric acid in bermed area
5. Earthquake-induced release of plutonium	LANL	$1x10^{-6}$ to $1x10^{-4}$	0.61 g of plutonium metal
	SRS	$1x10^{-6}$ to $1x10^{-4}$	0.61 g of plutonium metal
6. Earthquake-induced release of plutonium	LANL	$1x10^{-7}$ to $1x10^{-6}$	0.63 g of plutonium metal
	SRS	$1x10^{-7}$ to $1x10^{-6}$	0.63 g of plutonium metal
7. Wet criticality	LANL	$1x10^{-7}$ to $1x10^{-6}$	$5x10^{17}$ fissions
	SRS	$1x10^{-7}$ to $1x10^{-6}$	$5x10^{17}$ fissions
8. Mechanical-induced release of plutonium	LANL	0.01 to $1x10^{-1}$	$7.2x10^{-12}$ g of plutonium oxide
	SRS	0.01 to $1x10^{-1}$	$7.2x10^{-12}$ g of plutonium oxide
9. Explosive-induced release of plutonium	LANL	$1x10^{-4}$ to 0.01	0.05 g of plutonium metal
	SRS	$1x10^{-4}$ to 0.01	0.05 g of plutonium metal
10. Fire-induced release of plutonium on loading dock	LANL	$1x10^{-6}$ to $1x10^{-4}$	0.8 g plutonium oxide
	SRS	$1x10^{-6}$ to $1x10^{-4}$	0.8 g plutonium oxide

[a] The maximum amount of material is a hypothetical amount chosen for the purpose of this analysis.
Source: HNUS 1996a.

for workers and the public that can be expected from operations. Although not all potential accidents were addressed, those that were postulated have consequences and risks that are expected to envelop the consequences and risks of the relocated operations.

F.2.3.1 *Accident Scenarios and Source Terms*

A range of hazardous conditions and potential accidents were reviewed as candidates to represent the risks to workers and the public of the replacement pit fabrication and intrusive modification operations at Savannah River Site (SRS) and LANL, respectively. Through a screening process, several evaluation basis accidents and beyond evaluation basis accidents were selected for further definition and analysis. Descriptive information on these accidents is provided in table F.2.3.1–1.

Scenario 1: Fire-induced release of plutonium from a glove box. A fire is postulated within a laboratory which involves cleaning liquid such as acetone or isopropyl alcohol and burns the gloves in a glove box. The fire releases the plutonium contamination from the outer surface of the gloves that are in the glove box. Fire suppression and ventilation systems are assumed to be inoperable.

Los Alamos National Laboratory. The accident frequency is estimated to be in the range of 1×10^{-4} to 0.01/yr. The estimated release is 0.24 g (8.47×10^{-3} oz) of plutonium oxide.

Savannah River Site. The accident frequency is estimated to be in the range of 1×10^{-4} to 0.01/yr. The estimated release is 0.24 g (8.47×10^{-3} oz) of plutonium oxide.

Scenario 2: Operational release of tritium from special recovery line. This postulated accident is initiated by the loss of the inert atmosphere in the disassembly glove box in the special recovery line. As a result of the loss of inert atmosphere, a fire is assumed to start. As the tritium storage container is heated, tritium is released. It is assumed that released tritium bypasses the tritium collection system.

Los Alamos National Laboratory. The accident frequency is estimated to be in the range of 1×10^{-6} to 1×10^{-4}/yr. For the purposes of this analysis, the release is assumed to be 21,000 curies (Ci) of tritium oxide.

Savannah River Site. The accident is assumed to be applicable at SRS with an estimated frequency in the range of 1×10^{-6} to 1×10^{-4}/yr. For the purposes of this analysis, the release is assumed to be 21,000 Ci of tritium oxide.

Scenario 3. Mechanical release of nitric acid into confined bermed area. A mechanical failure in a tank, valve, or piping is postulated that releases the entire contents of an 80-percent nitric acid storage tank. The tank is located outdoors within a bermed area. The inventory is confined to the berm surrounding the tank.

Los Alamos National Laboratory. The nitric acid tank contains 23,090 L (6,100 gal) of 80-percent nitric acid. The bermed area is 27 square meters (m^2) (288 square feet [ft^2]). The accident frequency is estimated to be in the range of 1×10^{-6} to 1×10^{-4}/yr.

Savannah River Site. The same nitric acid tank and bermed area are assumed to located at SRS. The tank contains 23,090 L (6,100 gal) of 80-percent nitric acid. The bermed area is 27 m^2 (288 ft^2). The accident frequency is estimated to be in the range of 1×10^{-6} to 1×10^{-4}/yr.

Scenario 4: Beyond evaluation basis earthquake-induced release of nitric acid. A mechanical failure in a tank, valve, or piping is postulated that releases the entire contents of an 80-percent nitric acid storage tank. The tank is located outdoors within a bermed area; however, a beyond evaluation basis earthquake ruptures the berm. The inventory is not confined to the berm surrounding the tank.

Los Alamos National Laboratory. The nitric acid tank contains 23,090 L (6,100 gal) of 80-percent nitric acid. The accident frequency is estimated to be in the range of 1×10^{-7} to 1×10^{-6}/yr.

Savannah River Site. The same nitric acid tank and bermed area are assumed to be located at SRS. The tank contains 23,090 L (6,100 gal) of 80-percent nitric acid. The accident frequency is estimated to be in the range of 1×10^{-7} to 1×10^{-6}/yr.

Scenario 5: Evaluation basis earthquake-induced release of plutonium. The forces from the seismic event are applied to the facility and confinement systems within the facility. For the source term analysis, both anchorage failures and support stand failures are assumed to cause enclosures to fall over. On impact with the floor, glove box windows may break or fall out, connecting rings and connections to exhaust ductwork may separate, and solution transfer lines may break. The enclosures may also fail structurally. For the source term analysis, if the seismic margins assessment shows that an enclosure will fail, it is assumed that the enclosure will be breached, and material that becomes airborne will be released to the laboratory. The building structure, high-efficiency particulate air (HEPA) filter plenums, and ductwork from the plenums to the structure will remain a functional confinement barrier following an earthquake.

Los Alamos National Laboratory. The accident frequency is estimated to be in the range of 1×10^{-6} to 1×10^{-4}/yr. The release is calculated to be 0.61 g (0.02 oz) of plutonium metal.

Savannah River Site. This accident is also assumed to occur at SRS. The accident frequency is estimated to be in the range of $1x10^{-6}$ to $1x10^{-4}$/yr. The release is calculated to be 0.61 g (0.02 oz) of plutonium metal.

Scenario 6. Beyond evaluation basis earthquake-induced release of plutonium. The forces from the seismic event are applied to the facility and confinement systems within the facility. For the source term analysis, both anchorage failures and support stand failures are assumed to cause enclosures to fall over. On impact with the floor, glove box windows may break or fall out, connecting rings and connections to exhaust ductwork may separate, and solution transfer lines may break. The enclosures may also fail structurally. For the source term analysis, if the seismic margins assessment shows that an enclosure will fail, it is assumed that the enclosure will be breached, and material that becomes airborne will be released to the laboratory. For the beyond evaluation basis earthquake, the building structure, HEPA filter plenums, and ductwork from the plenums to the structure are assumed not to be functional confinement barriers.

Los Alamos National Laboratory. The accident frequency is estimated to be in the range of $1x10^{-7}$ to $1x10^{-6}$/yr. The release is calculated to be 0.63 g (0.02 oz) of plutonium metal.

Savannah River Site. This accident is also assumed to occur at SRS. The accident frequency is estimated to be in the range of $1x10^{-7}$ to $1x10^{-6}$/yr. The release is calculated to be 0.63 g (0.02 oz) of plutonium metal.

Scenario 7: Wet criticality. The wet criticality accident occurs in a glove box where the plutonium in solution exceeds the critical mass.

Los Alamos National Laboratory. The wet criticality accident that is postulated results in $5x10^{17}$ fissions. The frequency of occurrence of a criticality is estimated to be in the range of $1x10^{-7}$ to $1x10^{-6}$/yr.

Savannah River Site. The wet criticality is also assumed to occur at SRS. The accident results in $5x10^{17}$ fissions. The frequency of occurrence of a criticality is estimated to be in the range of $1x10^{-7}$ to $1x10^{-6}$/yr.

Scenario 8: Mechanical-induced release of plutonium from a degraded storage container. This postulated scenario assumes a package is dropped and the oxide contents spill onto the room floor. The material at risk is assumed to be 4.5 kg (9.9 lb) of plutonium oxide. No credit is taken for the inner metal container (assumed to have been ruptured by the plutonium oxidation reaction), the inner plastic bag (assumed to have deteriorated), or the outer package (assumed to be a slip-lid can with a degraded seal).

Los Alamos National Laboratory. The accident frequency is in the range of 0.01 to 0.1/yr. The release is estimated to be $7.2x10^{-12}$ g ($2.5x10^{-13}$ oz) of plutonium oxide.

Savannah River Site. The accident frequency is in the range of 0.01 to 0.1/yr. The release is estimated to be $7.2x10^{-12}$ g ($2.5x10^{-13}$ oz) of plutonium oxide.

Scenario 9: Explosion-induced release of plutonium. This postulated accident is the result of a chemical explosion in an ion-exchange column. The explosion causes a breach of the glove box containing the ion exchange column. It is assumed that the normal ventilation system is inoperable.

Los Alamos National Laboratory. The accident frequency is in the range of $1x10^{-4}$ to 0.01/yr. The release of plutonium metal is estimated to be 0.05 g ($1.76x10^{-3}$ oz).

Savannah River Site. The accident frequency is in the range of $1x10^{-4}$ to 0.01/yr. The release of plutonium metal is estimated to be 0.05 g ($1.76x10^{-3}$ oz).

Scenario 10: Fire-induced release of plutonium on loading dock. This postulated scenario involves a fire on the loading dock involving a combustible plutonium contaminated waste drum. This scenario also assumes that the loading dock is open to the atmosphere at the time of the fire.

Los Alamos National Laboratory. The accident frequency is estimated to be in the range of $1x10^{-6}$ to $1x10^{-4}$/yr. The release is calculated to be 0.8 g (0.03 oz) of plutonium oxide.

Savannah River Site. The accident frequency is estimated to be in the range of $1x10^{-6}$ to $1x10^{-}$ /yr. The release is calculated to be 0.8 g (0.03 oz) of plutonium oxide.

F.2.3.2 *Accident Consequences and Risk*

Tables F.2.3.2–1 and F.2.3.2–2 list the set of accidents selected to represent consequences and risks to workers and the public from accidental releases of radioactive materials during operations. For each accident, the table identifies the frequency of occurrence and the consequences to a hypothetical worker located at 1,000 m (3,281 ft) from the accident, a hypothetical individual located at the nearest site boundary, and the public out to a distance of 80 km (50 mi). The risks of cancer fatality for the worker, the individual at the site boundary, and the public for the composite set of accidents are also shown.

F.2.4 Nonintrusive Modification Pit Reuse

A set of potential accidents can be postulated for the nonintrusive modification pit reuse for which there may be releases of hazardous materials that may impact onsite workers and the public. Any such impacts, however, are expected to be bounded by the impacts associated with weapons A/D or pit fabrication.

F.2.5 High Explosives Fabrication

Evaluation basis accidents and beyond evaluation basis accidents have been studied for the HE fabrication operations. The studies postulated a set of accident scenarios that were representative of the risks and consequences for workers and the public from operations. Although not all potential accidents were addressed, those that were postulated have consequences and risks that are expected to envelop the consequences and risks of the relocated operations.

F.2.5.1 *Accident Scenarios and Consequences*

A range of hazardous conditions and potential accidents were reviewed as candidates to represent the risks to workers and the public of the HE fabrication operations. The physical releases (of chemicals and energy) from postulated accidents at the existing HE fabrication facilities at Pantex were used as an analog for potential releases at LANL and LLNL. A range of accidents was considered, from the release of particulates and dust through processing techniques, to the release of explosives from a fire or explosion, to the effects of blast pressure and fragment and debris scatter from an explosion.

The release of particulates and dust through processing operations would be contained where those operations occur. There is a probability in the range of 0.01 to 0.1/yr that the filtration systems fail during these operations. If there is filter failure, the operations would be halted. The releases from such accidents would have marginal effects (may cause minor occupational illnesses).

A release of chemical HE to the environment during a fire is estimated to occur with a probability in the range of $1x10^{-4}$ to 0.01/yr. Such a release would range up to 79 kg (175 lb) of explosives (released over a 10 minute period). The resulting environmental concentrations from a release, either triaminotrinitrobenzene (TATB) or TNT, of this magnitude were simulated. The TATB (which is representative of other explosives such as cyclotrimethylenetrinitramine [RDX] and cyclotetramethylenetetranitramine [HMX]) concentrations in the path of the plume would exceed the threshold limit value-time weighted average (TLV-TWA) of 1.5 mg/m^3 for distances up to 1,500, 2,200; and 2,400 m (5,000; 7,100; and 8,000 ft) from the release for Pantex, LLNL, and LANL, respectively. If the explosive were TNT, the plume concentrations would exceed the TLV-TWA limit of 0.5 milligrams (mg)/cubic meter (m^3) for distances up to 3,100; 4,500; and 5,000 m (10,200; 14,700; and 16,600 ft) from the release for Pantex, LLNL, and LANL, respectively. Concentrations of HE at each of the site boundaries would be 0.9, 54, and 50 mg/m^3, respectively. Concentrations of HE at 1,000 m (3,281 ft) from the fire (typical for a noninvolved worker) at each of the sites would be 3.0, 5.2, and 6.2 mg/m^3, respectively.

A release of chemical HE from the various processing facilities caused by an accidental explosion has a probability in the range of $1x10^{-4}$ to $1x10^{-6}$/yr. Such a release would range up to 79 kg (175 lb) of

TABLE F.2.3.2–1.—*Pit Fabrication and Intrusive Modification Pit Reuse at Savannah River Site, Impacts of Accidents*

	Noninvolved Worker at 1,000 Meters		Maximum Offsite Individual		Population to 80 Kilometers		
Accident Scenario	Dose (rem)	Probability of Cancer Fatality[a]	Dose (rem)	Probability of Cancer Fatality[a]	Dose (person-rem)	Cancer Fatalities	Accident Frequency (per year)
1. Fire-induced plutonium release from a glove box	0.035	$1.4x10^{-5}$	$5.8x10^{-4}$	$2.9x10^{-7}$	4.3	$2.2x10^{-3}$	$1.0x10^{-3}$
2. Operational release of tritium	$6.5x10^{-3}$	$2.6x10^{-6}$	$1.1x10^{-4}$	$5.5x10^{-8}$	0.79	$4.0x10^{-4}$	$1.0x10^{-5}$
5. Earthquake-induced release of plutonium – evaluation basis earthquake	0.099	$4.0x10^{-5}$	$1.7x10^{-3}$	$8.4x10^{-7}$	12.3	$6.2x10^{-3}$	$1.0x10^{-5}$
6. Earthquake-induced release of plutonium – beyond evaluation basis earthquake[b]	0.10	$4.1x10^{-5}$	$1.7x10^{-3}$	$8.6x10^{-7}$	12.8	$6.4x10^{-3}$	$5.0x10^{-7}$
7. Wet criticality[b]	$8.5x10^{-4}$	$3.4x10^{-7}$	$1.4x10^{-5}$	$7.0x10^{-9}$	0.019	$9.5x10^{-6}$	$5.0x10^{-7}$
8. Mechanical-induced release of plutonium	$1.2x10^{-12}$	$4.7x10^{-16}$	$2.0x10^{-14}$	$9.9x10^{-18}$	$1.5x10^{-10}$	$7.3x10^{-14}$	0.05
9. Explosion-induced release of plutonium	$8.1x10^{-3}$	$3.3x10^{-6}$	$1.4x10^{-4}$	$6.9x10^{-8}$	1.0	$5.1x10^{-4}$	$1.0x10^{-3}$
10. Fire-induced release of plutonium on loading dock	0.11	$4.6x10^{-5}$	$1.9x10^{-3}$	$9.7x10^{-7}$	14.3	$7.2x10^{-3}$	$1.0x10^{-5}$
Impacts for Composite Set of EBAs and BEBAs[c]							
Expected consequences[d]		$3.5x10^{-7}$		$7.3x10^{-9}$		$5.4x10^{-5}$	
Expected risk (per year)		$1.8x10^{-8}$		$3.8x10^{-10}$		$2.8x10^{-6}$	
Impacts for Composite Set of EBAs							
Expected consequences[d]		$3.4x10^{-7}$		$7.3x10^{-9}$		$5.3x10^{-5}$	
Expected risk (per year)		$1.8x10^{-8}$		$3.8x10^{-10}$		$2.8x10^{-6}$	
Impacts for Composite Set of BEBAs							
Expected consequences[d]		$3.3x10^{-5}$		$4.4x10^{-7}$		$3.2x10^{-3}$	
Expected risk (per year)		$3.3x10^{-11}$		$4.4x10^{-13}$		$3.2x10^{-9}$	

[a] Probability (increased likelihood) of cancer fatality to a hypothetical member of the public located at the site boundary or a worker located 1,000 m (3,281 ft) from the accident as a result of exposure to the indicated dose if the accident occurred.

[b] A beyond evaluation basis accident (BEBA). All other listed accidents are evaluation basis accidents (EBA).

[c] For the offsite population of 747,836, the average probability of cancer fatality/risk of cancer fatality (per year) for the composite set of accidents is $7.2x10^{-11}/3.7x10^{-12}$.

[d] Result of exposure to the indicated dose if the accident occurs.

Note: All values are mean values.

Source: Model results.

TABLE F.2.3.2–2.—*Pit Fabrication and Intrusive Modification Pit Reuse at Los Alamos National Laboratory, Impacts of Accidents*

Accident Scenario	Noninvolved Worker at 1,000 Meters		Maximum Offsite Individual		Population to 80 Kilometers		
	Dose (rem)	Probability of Cancer Fatality[a]	Dose (rem)	Probability of Cancer Fatality[a]	Dose (person-rem)	Cancer Fatalities	Accident Frequency (per year)
1. Fire-induced plutonium release from a glove box	0.064	$2.6x10^{-5}$	0.035	$1.7x10^{-5}$	9.5	$4.7x10^{-3}$	$1.0x10^{-3}$
2. Operational release of tritium	0.012	$4.8x10^{-6}$	$6.6x10^{-3}$	$3.3x10^{-6}$	1.8	$8.8x10^{-4}$	$1.0x10^{-5}$
5. Earthquake-induced release of plutonium – evaluation basis earthquake	0.18	$7.4x10^{-5}$	0.099	$5.0x10^{-5}$	27.2	0.014	$1.0x10^{-5}$
6. Earthquake-induced release of plutonium – beyond evaluation basis earthquake[b]	0.19	$7.6x10^{-5}$	0.10	$5.1x10^{-5}$	28.1	0.014	$5.0x10^{-7}$
7. Wet criticality[b]	$1.5x10^{-3}$	$6.1x10^{-7}$	$8.7x10^{-4}$	$4.4x10^{-7}$	0.12	$6.2x10^{-5}$	$5.0x10^{-7}$
8. Mechanical-induced release of plutonium	$2.2x10^{-12}$	$8.7x10^{-16}$	$1.2x10^{-14}$	$5.9x10^{-16}$	$3.2x10^{-10}$	$1.6x10^{-13}$	0.05
9. Explosion-induced release of plutonium	0.015	$6.1x10^{-6}$	$8.2x10^{-3}$	$4.1x10^{-6}$	2.2	$1.1x10^{-3}$	$1.0x10^{-3}$
10. Fire-induced release of plutonium on loading dock	0.21	$8.5x10^{-5}$	0.12	$5.7x10^{-5}$	31.5	0.016	$1.0x10^{-5}$
Impacts for Composite Set of EBAs and BEBAs[c]							
Expected consequences[d]		$6.4x10^{-7}$		$4.3x10^{-7}$		$1.2x10^{-4}$	
Expected risk (per year)		$3.3x10^{-8}$		$2.2x10^{-8}$		$6.2x10^{-6}$	
Impacts for Composite Set of EBAs							
Expected consequences[d]		$6.4x10^{-7}$		$4.3x10^{-7}$		$1.2x10^{-4}$	
Expected risk (per year)		$3.3x10^{-8}$		$2.2x10^{-8}$		$6.2x10^{-6}$	
Impacts for Composite Set of BEBAs							
Expected consequences[d]		$3.8x10^{-5}$		$2.6x10^{-5}$		$7.1x10^{-3}$	
Expected risk (per year)		$3.8x10^{-11}$		$2.6x10^{-11}$		$7.1x10^{-9}$	

[a] Probability (increased likelihood) of cancer fatality to a hypothetical member of the public located at the site boundary or a worker located 1,000 m (3,281 ft) from the accident as a result of exposure to the indicated dose if the accident occurred.

[b] A beyond evaluation basis accident (BEBA). All other listed accidents are evaluation basis accidents (EBA).

[c] For the offsite population of 287,977, the average probability of cancer fatality/risk of cancer fatality (per year) for the composite set of accidents is $4.2x10^{-10}/2.2x10^{-11}$.

[d] Result of exposure to the indicated dose if the accident occurs.

Note: All values are mean values.

Source: Model results.

TATB (or HMX or RDX) or up to 29 kg (64 lb) of TNT. The explosive force from such an accident would result in elevating the HE to a height of 68 m (223 ft) before its downwind transport. The maximum concentration to those who could be exposed would be 6.7 mg/m^3 for TATB or 2.5 mg/m^3 for TNT, at a distance of 800 m (2,600 ft) from the release; this distance is offsite for LANL and LLNL but onsite for Pantex. The maximum offsite concentration at Pantex would be 3.2 mg/m^3 or 1.2 mg/m^3 for TATB or TNT, respectively. The TLV-TWA limits for TATB would be exceeded between 180 and 3,500 m (580 and 11,600 ft) from the release; these limits for TNT would be exceeded in the interval from 170 to 3,700 m (550 to 12,300 ft) from the release. The noninvolved worker (1,000 m [3,281 ft] from the explosion) could be exposed to TATB or TNT concentrations of 6.4 or 2.4 mg/m^3, respectively, essentially the maximum concentration found near the ground.

It should be noted that the TLV-TWA represents a TWA limit to a worker for a 40-hour workweek. The toxic exposures considered here are of a much shorter duration, on the order of minutes.

F.2.6 Storage of Plutonium Strategic Reserves

Evaluation basis accidents and beyond evaluation basis accidents have been studied for the storage of plutonium strategic reserves. The studies postulated a set of accident scenarios that were representative of the risks and consequences for workers and the public that can be expected from operations. Although not all potential accidents were addressed, those that were postulated have consequences and risks that are expected to envelop the consequences and risks of the relocated operations.

F.2.6.1 *Accident Scenarios and Source Terms*

A range of hazardous conditions and potential accidents were reviewed as candidates to represent the risks to workers and the public from operating this facility. Through a screening process, several evaluation basis and beyond evaluation basis accidents were selected for further definition and analysis. A brief description of each of the accident scenarios and source terms is presented below. Table F.2.6.1–1 presents a summary of each accident scenario and source term. Further detail can be found in a topical report (HNUS 1996a).

Scenario 1: Fire-induced release of plutonium from storage vault. The combustible material within the vault mostly consists of tags and paperwork. Further, the design and configuration of the vault preclude the introduction of combustible materials in sufficient quantities to significantly alter the thermal environment. Therefore, the only proposed method to initiate a fire in the vault is by the introducing and initiating large amounts of gasoline, jet fuel, or other high-energy-density fuel. Additionally, because of vault, storage container, and pit designs, not all of the pits stored in the vault would be affected by the fire.

For an internal fire to cause some storage containers to fail through would take a sustained (more than 30-minute) exposure to a fire. Even if the storage container containing the pit fails, it is assumed that the material encapsulating the pit retains enough of its integrity so that no plutonium is released, or so that the contribution from pits is insignificant.

Pantex Plant. The accident frequency is estimated at $5x10^{-8}$/yr. The release is estimated to be 11.4 g (0.4 oz) of plutonium oxide.

TABLE F.2.6.1–1.—*Accident Scenarios for Storage of Plutonium Strategic Reserves*

Accident Scenario	Site	Accident Frequency (per year)	Total Material Release to Environment
1. Fire-induced release of plutonium from storage vaults	Pantex	$5x10^{-8}$	11.4 g plutonium oxide
	NTS	Not applicable	Not applicable
2. Mechanical release of plutonium on loading dock	Pantex	$6x10^{-4}$	0.04 g plutonium oxide
	NTS	$6x10^{-4}$	0.04 g plutonium oxide

Source: HNUS 1996a.

Nevada Test Site. The vault fire accident is not considered to be a credible scenario because there is no conceivable way to get enough flammable material inside the underground vaults to make this accident possible.

Scenario 2: Mechanical release of plutonium on loading dock. In this postulated event, a forklift driver attempting to pick up a pallet containing pit storage containers in the shipping and receiving area punctures two of the storage containers. It is assumed that both storage containers contain pits, that the storage containers fall on the floor, and that any loose material in the form of powder is shaken out of the storage container onto the floor.

Pantex Plant. The accident frequency is $6x10^{-4}$/yr. The release is estimated to be 0.04 g ($1.41x10^{-3}$ oz) of plutonium oxide.

Nevada Test Site. This accident is assumed to occur at NTS at a frequency of $6x10^{-4}$/yr and release 0.04 g ($1.41x10^{-3}$ oz) of plutonium oxide.

F.2.6.2 *Accident Consequences and Risk*

Tables F.2.6.2–1 and F.2.6.2–2 list the set of accidents selected to represent consequences and risks to workers and the public from accidental releases of radioactive materials during operations at Pantex and NTS, respectively. For each accident, the table identifies the frequency of occurrence and the consequences to a hypothetical worker located at 1,000 m (3,281 ft) from the accident, a hypothetical individual located at the nearest site boundary, and the public out to a distance of 80 km (50 mi). The risks of cancer fatality for the worker, the individual at the site boundary, and the public for the composite set of accidents are also shown.

F.2.7 Storage of Uranium Strategic Reserves

Studies of evaluation basis accidents and beyond evaluation basis accidents have been performed for the storage of uranium strategic reserves. The studies postulated a set of accident scenarios that were representative of the risks and consequences for workers and the public that can be expected from operations. lthough not all potential accidents were addressed, those that were postulated have consequences and risks that are expected to envelop the consequences and risks of the relocated operations. In this manner, no other credible accidents with an expected frequency of occurrence larger than 10^{-7}/yr are anticipated that will have consequences and risks larger than those described in this section.

F.2.7.1 *Accident Scenarios and Source Terms*

A range of hazardous conditions and potential accidents were reviewed as candidates to represent the risks to workers and the public from facility operation. Through a screening process, several evaluation basis accidents and beyond evaluation basis accidents were selected for further definition and analysis. A brief description of each of the five accident scenarios and source terms is presented below. Table F.2.7.1–1 presents a summary of each accident scenario and source term. Further detail can be found in a topical report (HNUS 1996a).

Scenario 1: Criticality. Criticality accidents were considered for routine handling in storage areas. Hypothetical scenarios were analyzed in the tube vault involving loading and unloading activities that might result in criticality. A facility worker could accidentally overdraw and drop a loaded tube tray, allowing the cans to fall and tumble into a critical pile. A criticality accident could also result from overloading the tube vault (spacing between slots on tube trays physically prevents overloading). A forklift could accidentally crush or jam a sufficient number of cans together to cause a criticality accident (spacing between the slots also makes it physically impossible for a forklift to accidentally crush or jam a sufficient number of cans together to cause a criticality accident).

Oak Ridge Reservation. The probability of a criticality in the vault area is assumed to be in the range of $1x10^{-6}$ to $1x10^{-4}$/yr. A single pulse of $1x10^{17}$ fissions is produced before the solid matrix disassembles.

Pantex Plant. The probability of a criticality in the vault area is assumed to be in the range of $1x10^{-6}$ to $1x10^{-4}$/yr. A single pulse of $1x10^{17}$ fissions is produced before the solid matrix disassembles.

Nevada Test Site. The probability of a criticality in the vault area is assumed to be in the range of $1x10^{-6}$

TABLE F.2.6.2–1.—*Storage of Plutonium Strategic Reserves at Pantex Plant, Impacts of Accidents*

Accident Scenario	Maximum Worker at 1,000 Meters		Maximum Offsite Individual		Population to 80 Kilometers		
	Dose (rem)	Probability of Cancer Fatality[a]	Dose (rem)	Probability of Cancer Fatality[a]	Dose (person-rem)	Cancer Fatalities	Accident Frequency (per year)
1. Fire-induced release of plutonium from storage vaults[b]	1.6	$6.4x10^{-4}$	0.51	$2.6x10^{-4}$	59	0.03	$5.0x10^{-8}$
2. Mechanical release of plutonium from loading dock	$5.6x10^{-3}$	$2.3x10^{-6}$	$1.8x10^{-3}$	$9.0x10^{-7}$	0.21	$1.0x10^{-4}$	$6.0x10^{-4}$
Impacts for Composite Set of EBAs and BEBAs[c]							
Expected consequences[d]		$2.3x10^{-6}$		$9.2x10^{-7}$		$1.1x10^{-4}$	
Expected risk (per year)		$1.4x10^{-9}$		$5.5x10^{-10}$		$6.4x10^{-8}$	
Impacts for Composite Set of EBAs							
Expected consequences[d]		$2.3x10^{-6}$		$9.0x10^{-7}$		$1.0x10^{-4}$	
Expected risk (per year)		$1.4x10^{-9}$		$5.4x10^{-10}$		$6.2x10^{-8}$	
Impacts for Composite Set of BEBAs							
Expected consequences[d]		$6.4x10^{-4}$		$2.6x10^{-4}$		0.03	
Expected risk (per year)		$3.2x10^{-11}$		$1.3x10^{-11}$		$1.5x10^{-9}$	

[a] Probability (increased likelihood) of cancer fatality to a hypothetical member of the public located at the site boundary or a worker located 1,000 m (3,281 ft) from the accident as a result of exposure to the indicated dose if the accident occurred.

[b] A beyond evaluation basis accident (BEBA). All other listed accidents are evaluation basis accidents (EBA).

[c] For the offsite population of 285,409, the average probability of cancer fatality/risk of cancer fatality (per year) for the composite set of accidents is $3.0x10^{-10}/2.2x10^{-13}$.

[d] Result of exposure to the indicated dose if the accident occurs.

Note: All values are mean values.

Source: Model results.

TABLE F.2.6.2–2.—*Storage of Plutonium Strategic Reserves at Nevada Test Site, Impacts of Accidents*

Accident Scenario	Noninvolved Worker at 1,000 Meters		Maximum Offsite Individual		Population to 80 Kilometers		Accident Frequency (per year)
	Dose (rem)	Probability of Cancer Fatality[a]	Dose (rem)	Probability of Cancer Fatality[a]	Dose (person-rem)	Cancer Fatalities	
1. Fire-induced release of plutonium from storage vaults[b]	c	c	c	c	c	c	c
2. Mechanical release of plutonium from loading dock	9.6×10^{-3}	3.8×10^{-6}	1.8×10^{-4}	8.9×10^{-8}	0.013	6.5×10^{-6}	6.0×10^{-4}
Impacts for Composite Set of EBAs and BEBAs							
Expected consequences[d]		e		e		e	
Expected risk (per year)		e		e		e	
Impacts for Composite Set of EBAs[b]							
Expected consequences[d]		3.8×10^{-6}		8.9×10^{-8}		6.5×10^{-6}	
Expected risk (per year)		2.3×10^{-9}		5.3×10^{-11}		3.9×10^{-9}	
Impacts for Composite Set of BEBAs							
Expected consequences[d]		e		e		e	
Expected risk (per year)		e		e		e	

[a] Probability (increased likelihood) of cancer fatality to a hypothetical member of the public located at the site boundary or a worker located 1,000 m (3,281 ft) from the accident as a result of exposure to the indicated dose if the accident occurred.

[b] For the offsite population of 18,517, the average probability of cancer fatality/risk of cancer fatality (per year) for the composite set of accidents is $3.5 \times 10^{-10}/2.1 \times 10^{-13}$.

[c] The accident is not possible at NTS.

[d] Result of exposure to the indicated dose if the accident occurs.

[e] No beyond evaluation basis accidents were identified for NTS. The impacts for the composite set of EBAs and BEBAs is the same as the impacts for the composite set of EBAs.

Note: All values are mean values.

Source: Model results.

to 1×10^{-4}/yr. A single pulse of 1×10^{17} fissions is produced before the solid matrix disassembles.

Scenario 2: Fire-induced release of highly enriched uranium from aircraft crash. An aircraft crash into the vault area, followed by a large fire, bounds the potential consequences associated with the facility. The concern then rises that the multiple barriers of some of the stored HEU could be breached solely because of the crash itself. It is estimated that an engine block penetrating the facility might impact 15 percent of the available containers. Therefore, it is assumed that the impacted 15 percent would be subject to release in the first ten minutes of the fire. Because of the insulated shipping containers, after one hour it is assumed that 1 percent of the total inventory would be available for release. To assume that any impact results in a complete release of the encased materials is a conservative assumption and is used for the purposes of this bounding study.

Oak Ridge Reservation. This accident is not applicable to ORR because the probability of an aircraft crash into a facility is much less than 10^{-7}/yr.

Pantex Plant. This accident is considered a beyond evaluation basis accident (1×10^{-7}/yr). The release for radiological impacts is 270 g (9.5 oz) of HEU. For chemical toxicity impacts, the release is 1.5 g/seconds (s) for 10 minutes then 1.7 g/s for the second hour of the accident.

Nevada Test Site. This accident is not applicable to NTS because the probability of an aircraft crash into a facility is much less than 10^{-7}/yr.

Scenario 3: Fire-induced release of lithium from an aircraft crash. Of the chemical accident scenarios, no mechanisms were identified that could potentially release a significant amount of lithium hydride or uranium to the environment, other than the potential jet fuel-fed fires following an aircraft crash. A large aircraft crash with significant secondary fuel fire is therefore assumed to be the bounding hazardous chemical accident. The release scenario is similar to scenario 2.

Oak Ridge Reservation. This accident is not applicable to ORR because the probability of an aircraft crash into a facility is much less than 10^{-7}/yr.

Pantex Plant. This accident is considered a beyond evaluation basis accident (1×10^{-7}/yr). For chemical toxicity impacts, the release is 2.5 g/s for 10 minutes then 2.8 g/s for the second hour of the accident.

TABLE F.2.7.1–1.—*Accident Scenarios for Storage of Uranium Strategic Reserves*

Accident Scenario	Site	Accident Frequency (per year)	Total Material Release to Environment
1. Criticality	ORR	1×10^{-6} to 1×10^{-4}	1×10^{17} fissions
	Pantex	1×10^{-6} to 1×10^{-4}	1×10^{17} fissions
	NTS	1×10^{-6} to 1×10^{-4}	1×10^{17} fissions
2. Fire-induced release of HEU from aircraft crash	ORR	not applicable	
	Pantex	1×10^{-7}	270 grams of HEU
	NTS	not applicable	
3. Fire-induced release of lithium hydride from aircraft crash	ORR	not applicable	
	Pantex	1×10^{-7}	2.5 g/s to 2.8 g/s
	NTS	not applicable	
4. Fire-induced release of HEU from vault	ORR	1×10^{-6} to 1×10^{-4}	37.64 kg HEU
	Pantex	1×10^{-6} to 1×10^{-4}	37.64 kg HEU
	NTS	1×10^{-6} to 1×10^{-4}	37.64 kg HEU
5. Explosive release of HEU from vault	ORR	1×10^{-6} to 1×10^{-4}	540 grams of HEU
	Pantex	1×10^{-6} to 1×10^{-4}	540 grams of HEU
	NTS	1×10^{-6} to 1×10^{-4}	540 grams of HEU

Source: HNUS 1996a.

Nevada Test Site. This accident is not applicable to NTS because the probability of an aircraft crash into a facility is much less than 10^{-7}/yr.

Scenario 4: Fire-induced release of highly enriched uranium. It is assumed that 3,785 L (1,000 gal) of fuel are inserted into the vault area and that a pool 0.64-cm (1/4-in) deep develops. The area covered by that pool will be approximately 595 m^2 (6,400 ft^2). It is assumed that only in the innermost 20 percent of the fire will temperatures be sufficient to ignite uranium, and that only the topmost of the three drums will reach those temperatures, the lower ones being cooled through conduction to the vault base and the fuel. Of the drums reaching those temperatures, half are assumed to fail and, of those, half fail at the bottom, releasing some or all of their contents. The drum density in the new vault areas is approximately one set of three per 0.9 to 1.0 m^2 (10 to 11 ft^2). Thus, 1,920 drums will be within the fire, and 128 of them will reach high enough temperatures to ignite the uranium, of which 32 will fail at the bottom and expel their contents.

Oak Ridge Reservation. The frequency of this accident is assumed to be in the range of $1x10^{-6}$ to $1x10^{-4}$/yr. The amount estimated to be released will be 37,640 g (1,328 oz).

Pantex Plant. The frequency of this accident is assumed to be in the range of $1x10^{-6}$ to $1x10^{-4}$/yr. The amount estimated to be released will be 37,640 g (1,328 oz).

Nevada Test Site. The frequency of this accident is assumed to be in the range of $1x10^{-6}$ to $1x10^{-4}$/yr. The amount estimated to be released will be 37,640 g (1,328 oz).

Scenario 5: Explosion-induced release of highly enriched uranium from vault. In an explosion, it is assumed that the drums and cans will provide sufficient protection to prevent the uranium from igniting. Consequently, even though there may be significant damage to the drums and/or cans, since the metal contents have not oxidized or vaporized, there is assumed to be no release. For those cans containing powders, the situation is different, in that the powder may spill from the drum and then be released. It is assumed that the storage arrangement will protect all but the "front row" of cans.

Considering a 5x4 arrangement in the pallet, and using the side with five cans, about 25 percent of the cans will feel the blast. Thus, about 250 cans may be damaged. However, it is assumed that only 100 cans, representing the faces of the four closest stacks of pallets, are sufficiently damaged to spill their contents.

Oak Ridge Reservation. Assuming that half the contents of each of the 100 cans spill, 540 g (19 oz) will be released. The estimated probability is in the range of $1x10^{-6}$ to $1x10^{-4}$/yr.

Pantex Plant. Assuming that half the contents of each of the 100 cans spill, 540 g (19 oz) will be released. The estimated probability is in the range of $1x10^{-6}$ to $1x10^{-4}$/yr.

Nevada Test Site. Assuming that half the contents of each of the 100 cans spill, 540 g (19 oz) will be released. The estimated probability is in the range of $1x10^{-6}$ to $1x10^{-4}$/yr.

F.2.7.2 *Accident Consequences and Risk*

Table F.2.7.2–1 lists the set of accidents selected to represent consequences and risks to workers and the public from accident releases of radioactive materials and other hazardous effects during operations at ORR. For each accident, the table identifies the frequency of occurrence, and the consequences to a hypothetical worker at a specified distance from the accident, a hypothetical individual located at the nearest site boundary, and the public out to a distance of 80 km (50 mi). The risks of cancer fatality for the worker, the individual at the site boundary, and the public for the composite set of accidents are also shown.

F.3 Comparison of the No Action Alternative to Proposed Alternatives at Pantex Plant and Oak Ridge Reservation

F.3.1 Pantex Plant

Existing operations at Pantex that have the potential for risks to workers and the public are weapons A/D and storage of plutonium. Under the No Action alternative storage would continue in Zone 4 and weapons A/D would continue in Zones 4 and 12. The

TABLE F.2.7.2–1.—*Storage of Uranium Strategic Reserves at Oak Ridge Reservation, Impacts of Accidents*

Accident Scenario	Noninvolved Worker at 619 Meters		Maximum Offsite Individual		Population to 80 Kilometers		Accident Frequency (per year)
	Dose (rem)	Probability of Cancer Fatality[a]	Dose (rem)	Probability of Cancer Fatality[a]	Dose (person-rem)	Cancer Fatalities	
1. Criticality	$5.1x10^{-4}$	$2.0x10^{-7}$	$5.1x10^{-4}$	$2.5x10^{-7}$	0.031	$1.5x10^{-5}$	$1.0x10^{-5}$
4. Fire-induced release of highly enriched uranium from vault	5.4	$2.2x10^{-3}$	5.4	$2.7x10^{-3}$	806	0.40	$1.0x10^{-5}$
5. Explosive release of highly enriched uranium from vault	0.077	$3.1x10^{-5}$	0.077	$3.9x10^{-5}$	11.6	$5.8x10^{-3}$	$1.0x10^{-5}$
Impacts for Composite Set of EBAs and BEBAs[b]							
Expected consequences[c]		$7.3x10^{-4}$		$9.1x10^{-4}$		0.14	
Expected risk (per year)		$2.2x10^{-8}$		$2.7x10^{-8}$		$4.1x10^{-6}$	
Impacts for Composite Set of EBAs							
Expected consequences[c]		d		d		d	
Expected risk (per year)		d		d		d	
Impacts for Composite Set of BEBAs							
Expected consequences[c]		e		e		e	
Expected risk (per year)		e		e		e	

[a] Probability (increased likelihood) of cancer fatality to a hypothetical member of the public located at the site boundary or to a worker located 619 m from the accident as a result of exposure to the indicated dose if the accident occurred.
[b] For the offsite population of 1,096,144, the average probability of cancer fatality/risk of cancer fatality (per year) for the composite set of accidents is $1.3x10^{-7}/3.7x10^{-12}$.
[c] Result of exposure to the indicated dose if the accident occurs.
[d] The impacts of evaluation basis accidents (EBA) are identical to the data shown in this table.
[e] All accidents are in the frequency range of 10^{-6} to 10^{-4} per year and are grouped together as EBAs. As a result, there are no impacts shown for beyond evaluation basis accidents (BEBA).

Note: All values are mean values.

Source: Model results.

risks of accidents to workers and the public are addressed in applicable SARs and would not be expected to change if they were continued. Under the proposed actions, weapons A/D operations would be entirely relocated to Zone 12.

Through relocation, the A/D operations would be performed in existing, modern facilities resulting in a decrease in the facility footprint in Zone 12 compared to the footprint in Zone 4. Although the risks of accidents due to internal initiators like fires and explosions are not expected to decrease significantly, risks would be reduced through the engineered safety features of a modern facility. More importantly, all Zone 4 operations have a higher probability of an externally initiated accident caused by an aircraft crash because Zone 4 is closer to the nearby commercial airport and traffic patterns than Zone 12. The probability of an aircraft crash into a Zone 12 facility is also decreased as a result of a reduction in the size of the facility compared to the existing facilities in Zone 4.

F.3.2 Oak Ridge Reservation

Existing operations at ORR that have the potential for risks to workers and the public are secondary and case fabrication and storage of HEU. Under the No Action alternative, these operations would continue to be performed in the facilities where they presently exist. The risks of accidents to workers and the public are addressed in applicable SARs and would not be expected to change if they were to be continued.

Under the proposed actions, secondary and case fabrication and HEU storage would be downsized into fewer existing buildings in the same vicinity as buildings associated with the No Action alternative. The risks of accidents to workers and the public from internal causes such as fires and criticality are not expected to change. However, all of the buildings that would perform the downsized operations would be upgraded to meet natural phenomena requirements. These upgrades are expected to reduce risks, which would not happen under the No Action alternative.

F.4 Secondary Impacts of Accidents

The primary impacts of accidents are measured in terms of public and worker exposures to radiation and toxic chemicals. The secondary impacts of accidents include all elements of the environment. For example, if an accident occurred, a radiological release may contaminate farmland, surface and underground water, recreational areas, industrial parks, historical sites, or the habitat of an endangered species. As a result, farm products may have to be destroyed; the supply of drinking water may be lowered; recreational areas may be closed; industrial parks may suffer economic losses during shutdown for decontamination; historical sites may have to be closed to visitors; and the endangered species may move closer to extinction.

This section addresses the secondary impacts of a high consequence EBA and BEBA in the region of a radiological release. The accidents were selected to illustrate the effects of accidents evaluated for each of the technologies. The levels of radioactivity that have a potential for secondary effects are based on analysis using the MACCS computer code with 50 percent meteorology conditions for each site.

The region of secondary effects extends out from the point of release in a pattern formed by dispersion parameters such as meteorology. The level of exposure is generally decreasing with increasing distance from the release point. Figures F.4.1.–1 through F.4.6–2 show the shapes of patterns for each site at a distance at which the level of radioactivity from the accidental release would be higher than the level of radioactivity from natural background at each site.

These results are useful for comparing the environmental sensitivity of sites with respect to the secondary impacts for an accidental radiological release. In reviewing the results, it is useful to note whether the impacted area extends beyond the site boundary where the economic impacts would be larger than if the area were contained within the site boundary. It is also useful to note the size of the contaminated area in which the level of radioactivity exceeds exposures from natural background.

F.4.1 Oak Ridge Reservation

In the region of ORR, the natural background level of radiation (excluding radon) is 95 millirems (mrem)/yr, plus an additional 200 mrem from radon.

The results shown in figures F.4.1–1 and F.4.1–2 indicate the radiation levels at various distances from the accident. Section 4.2 describes the land, water, biotic, cultural, paleontological, and socioeconomic resources in the ORR environment that may receive secondary impacts from accidents.

F.4.2 Savannah River Site

In the region of SRS, the natural background level of radiation (excluding radon) is 98 mrem/yr, plus an additional 200 mrem from radon. The results shown in figure F.4.2–1 indicate the radiation levels at various distances from the accident. Section 4.3 describes the land, water, biotic, cultural, paleontological, and socioeconomic resources in the SRS environment that may receive secondary impacts from accidents.

F.4.3 Pantex Plant

In the region of Pantex, the natural background level of radiation (excluding radon) is 134 mrem /yr, plus an additional 200 mrem from radon. The results shown in figures F.4.3–1 and F.4.3–2 indicate the radiation levels at various distances from the accident. Section 4.5 describes the land, water, biotic, cultural, paleontological, and socioeconomic resources in the Pantex environment that may receive secondary impacts from accidents.

F.4.4 Los Alamos National Laboratory

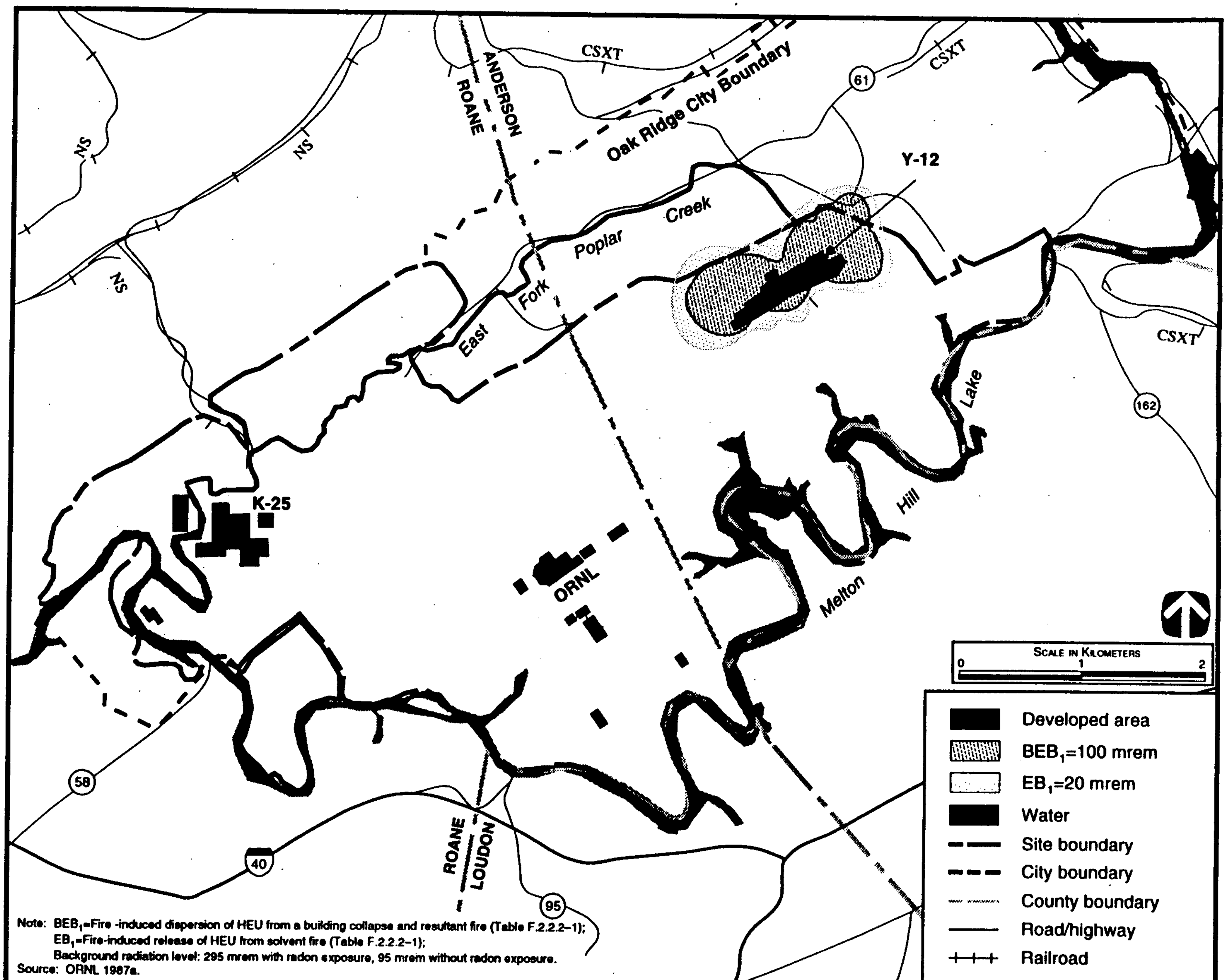
In the region of LANL, the natural background level of radiation (excluding radon) is 140 mrem/yr, plus an additional 200 mrem from radon. The results shown in figures F.4.4–1 and F.4.4–2 indicate the radiation levels at various distances from the accident. Section 4.6 describes the land, water, biotic, cultural, paleontological, and socioeconomic resources in the LANL environment that may receive secondary impacts from accidents.

F.4.5 Lawrence Livermore National Laboratory

In the region of LLNL, the natural background level of radiation (excluding radon) is 100 mrem per/yr, plus an additional 200 mrem from radon. The results shown in figure F.4.5–1 indicate the radiation levels at various distances from the accident. Section 4.7 describes the land, water, biotic, cultural, paleontological, and socioeconomic resources in the LLNL environment that may receive secondary impacts from accidents.

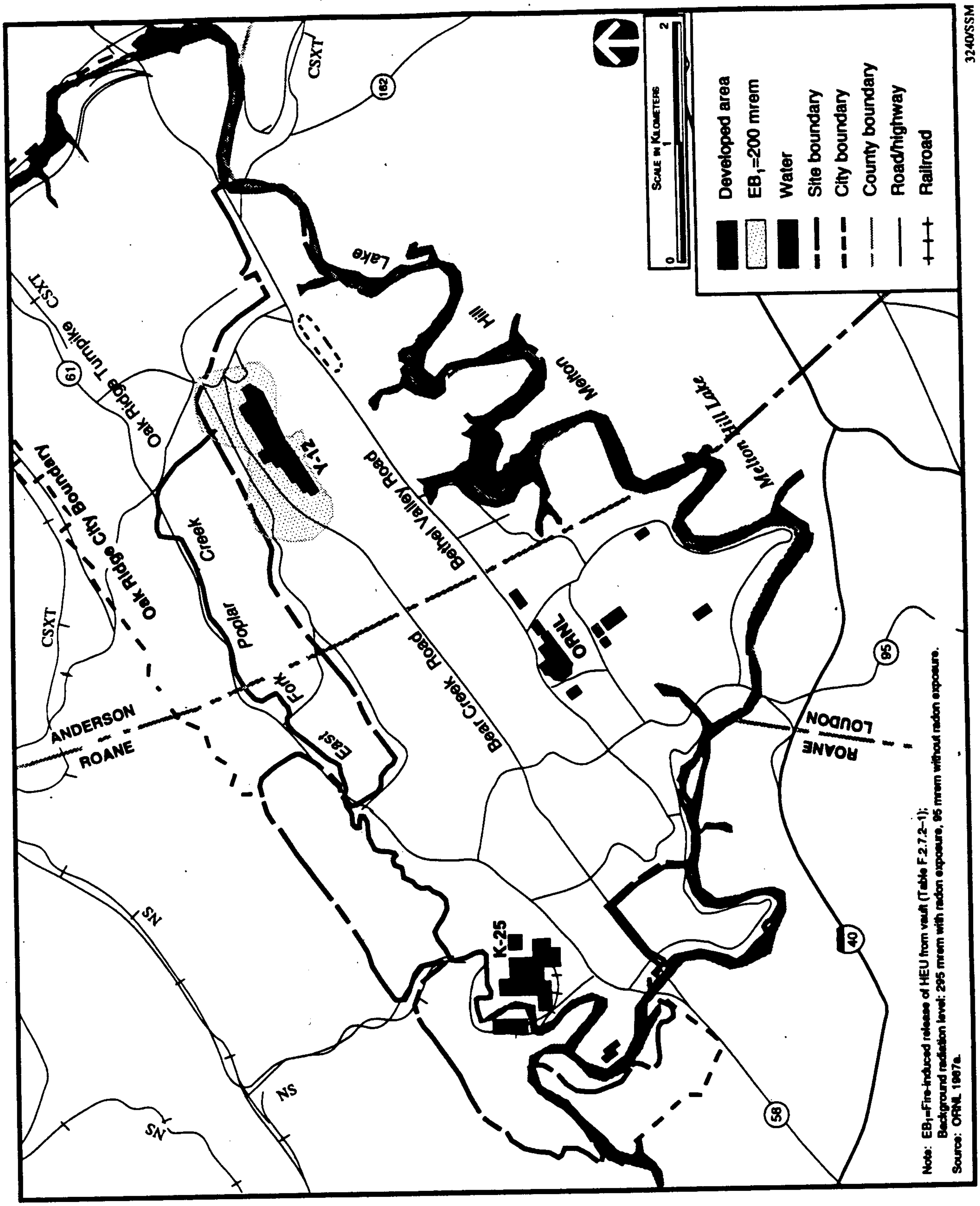
F.4.6 Nevada Test Site

In the region of NTS, the natural background level of radiation (excluding radon) is 113 mrem per/yr, plus an additional 200 mrem from radon. The results shown in figures F.4.6–1 and F.4.6–2 indicate the radiation levels at various distances from the accident. Section 4.9 describes the land, water, biotic, cultural, paleontological, and socioeconomic resources in the NTS environment that may receive secondary impacts from accidents.



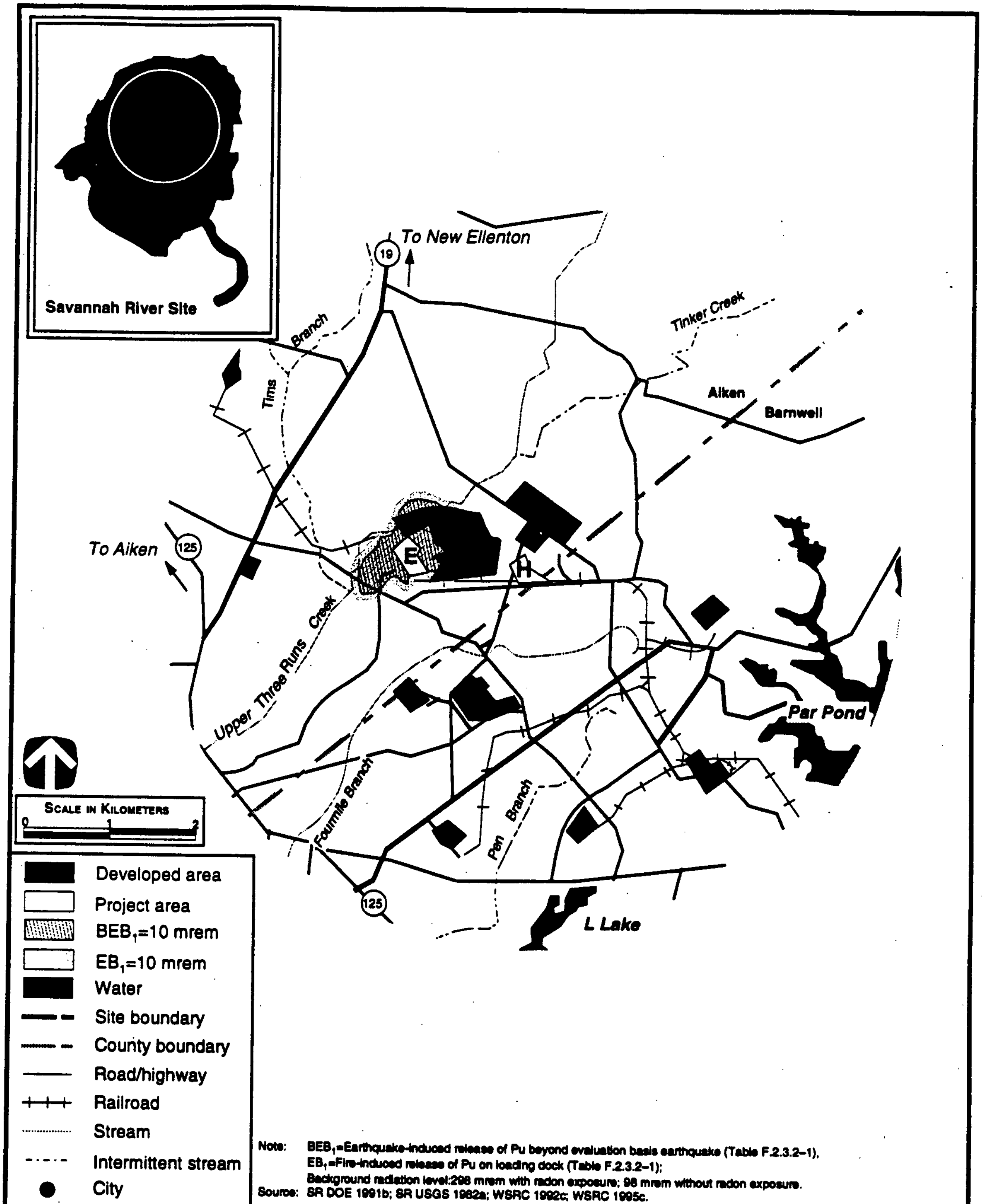
3239/SSM

Figure F.4.1–1.—*Areas of Surface Exposure for Secondary and Case Fabrication Accidents at Oak Ridge Reservation.*



Note: EB_1=Fire-induced release of HEU from vault (Table F.2.7.2–1);
Background radiation level: 295 mrem with radon exposure, 95 mrem without radon exposure.
Source: ORNL 1987a.

FIGURE F.4.1–2.—*Areas of Surface Exposure for S' age of Uranium Strategic Reserve at Oak Ridge Reservatio*



3241/SSM

FIGURE F.4.2–1.—*Areas of Surface Exposure for Pit Fabrication and Intrusive Modification Reuse Accidents at Savannah River Site.*

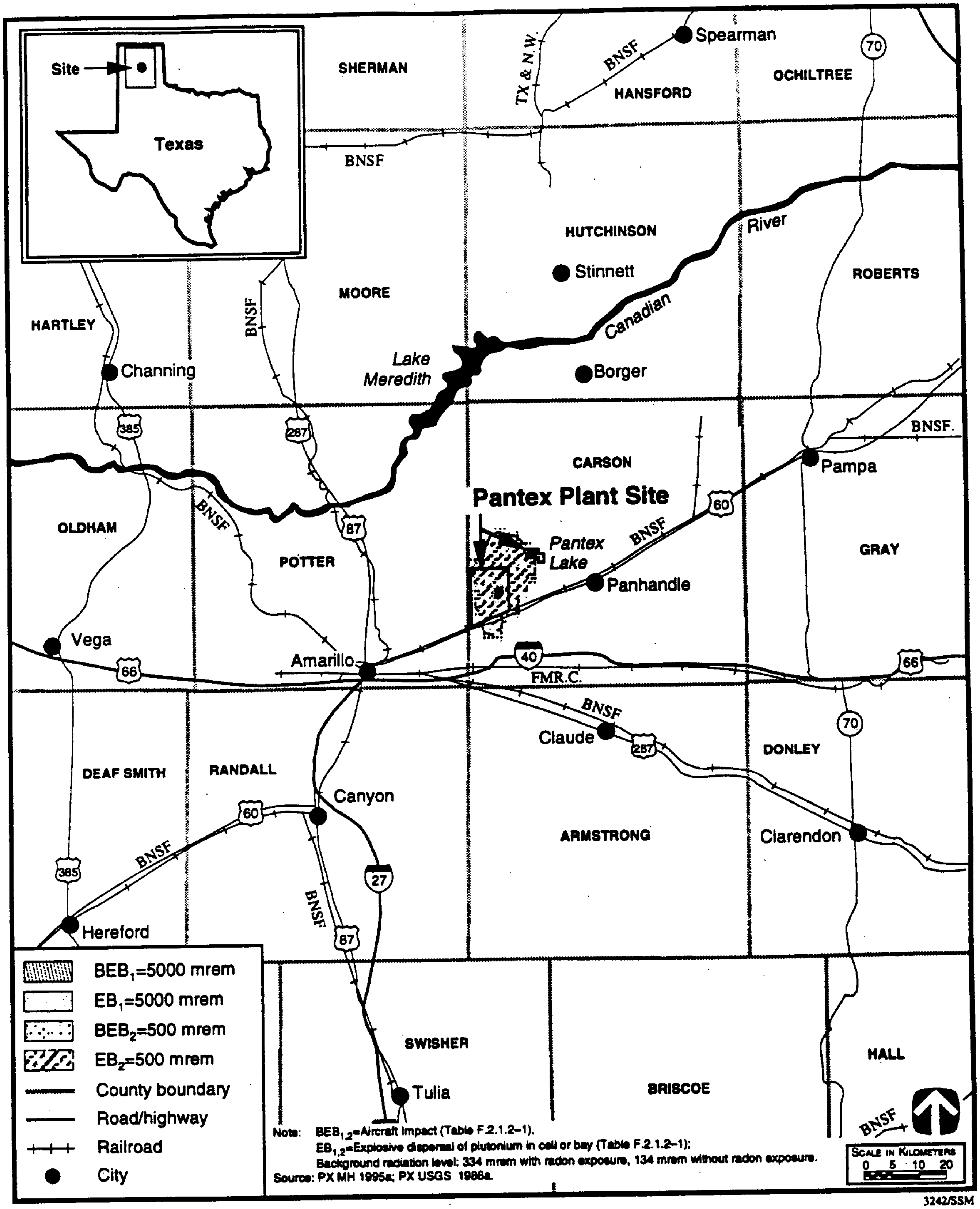


FIGURE F.4.3–1.—*Areas of Surface Exposure for Weapons Assembly/Disassembly Accidents at Pantex Plant.*

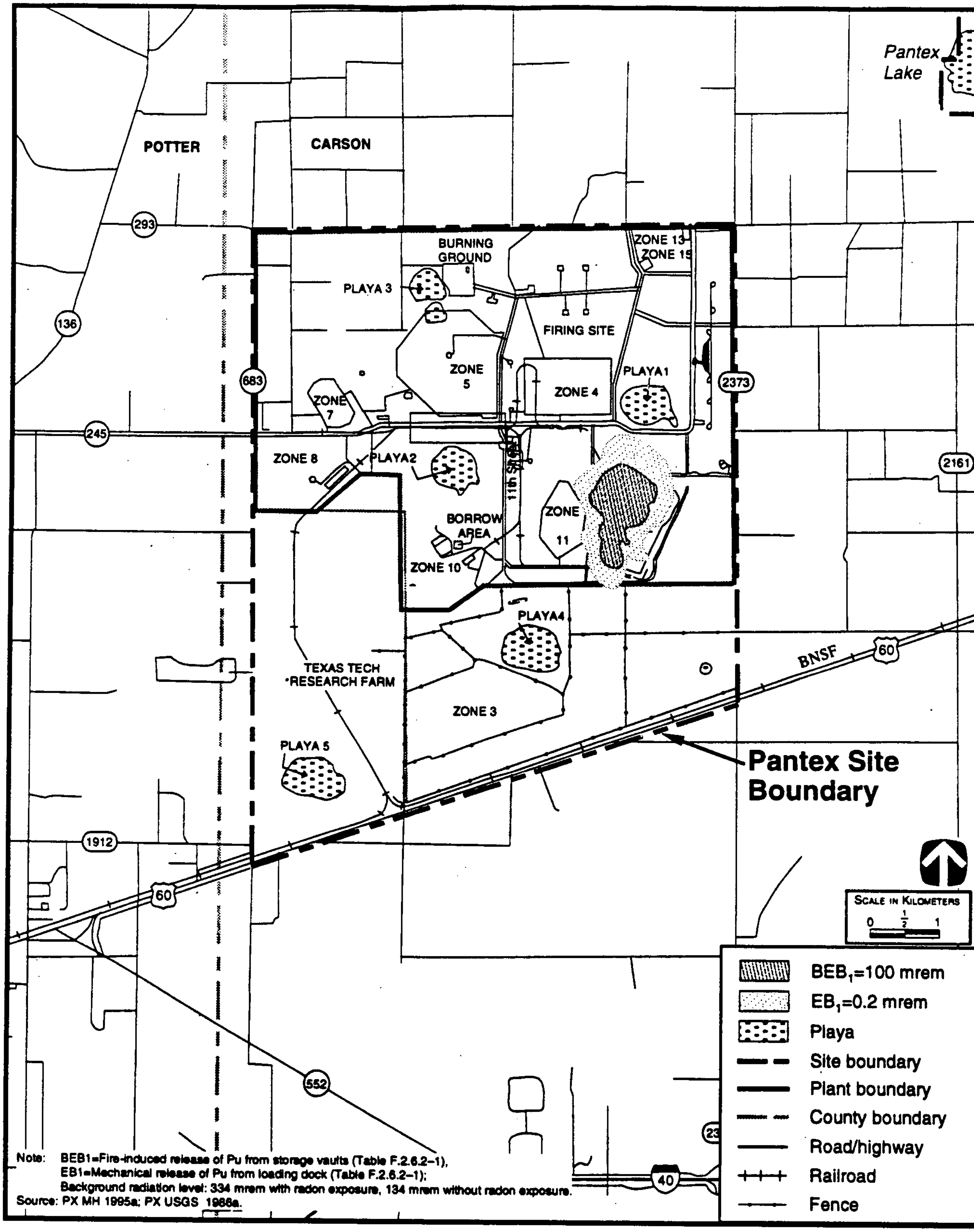


Figure F.4.3–2.—*Areas of Surface Exposure for Storage of Plutonium Strategic Reserve Accidents at Pantex Plant.*

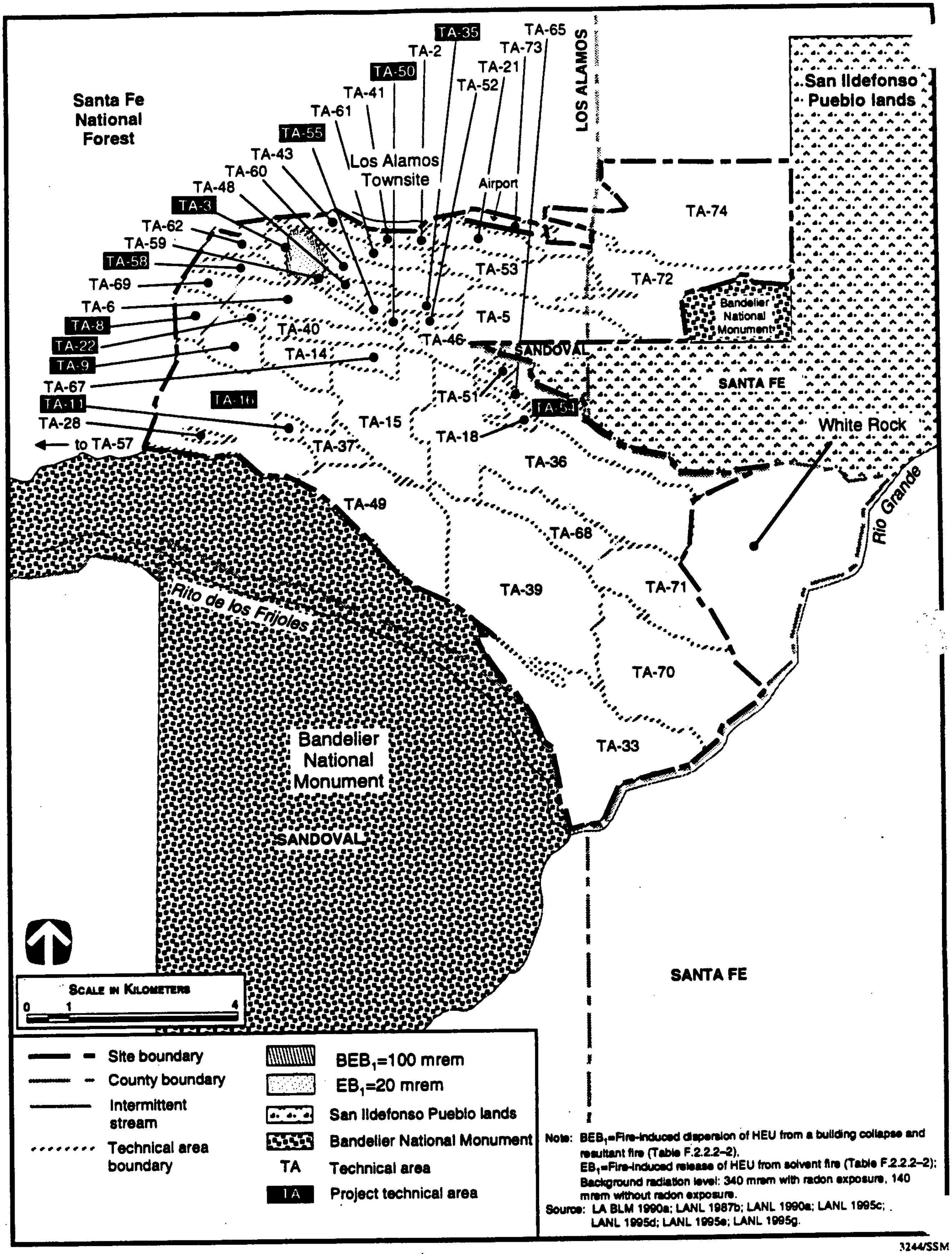


FIGURE F.4.4–1.—*Areas of Surface Exposure for Secondary and Case Fabrication Accidents at Los Alamos National Laboratory.*

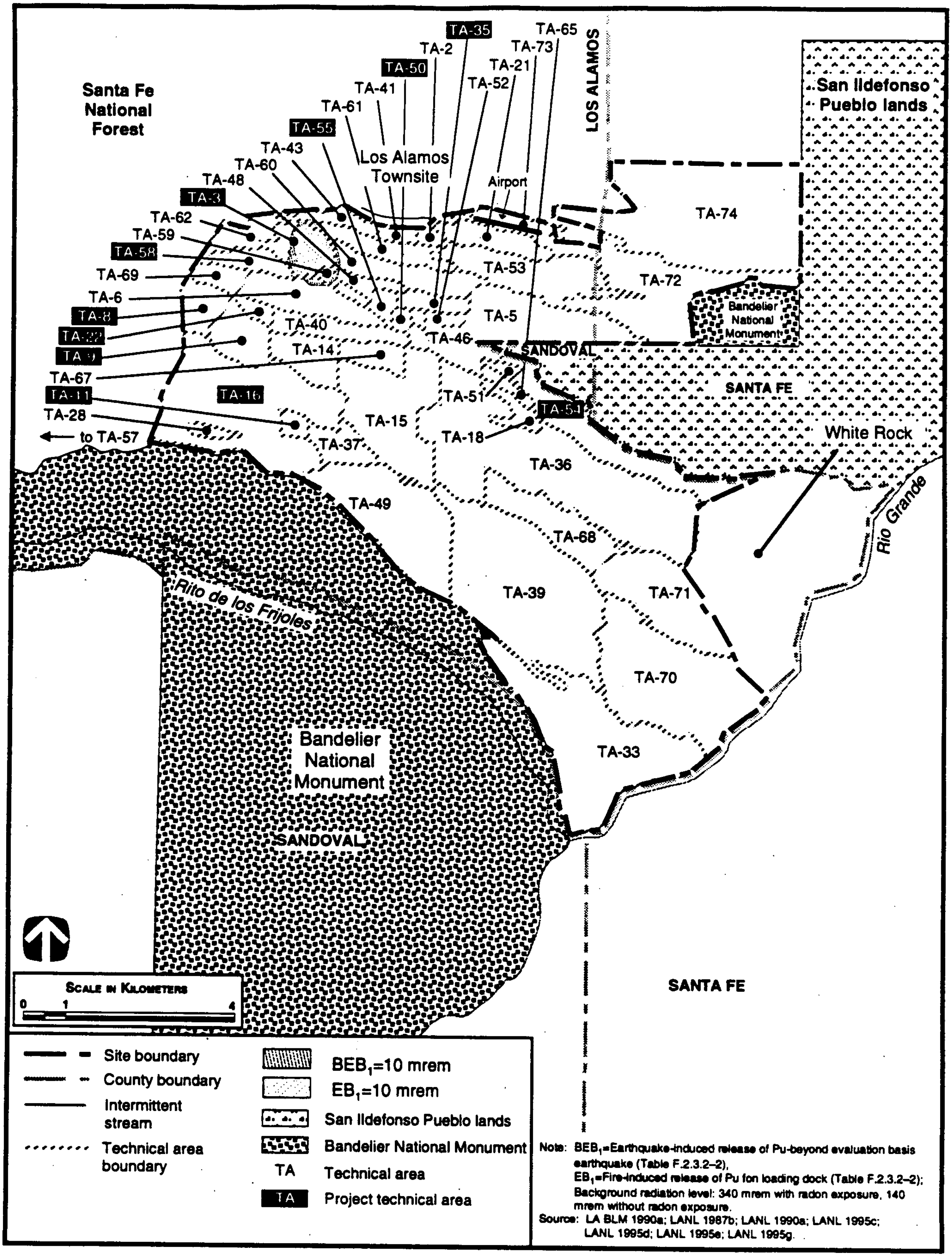


FIGURE F.4.4–2.—*Areas of Surface Exposure for Pit Fabrication and Intrusive Modification Reuse at Los Alamos National Laboratory.*

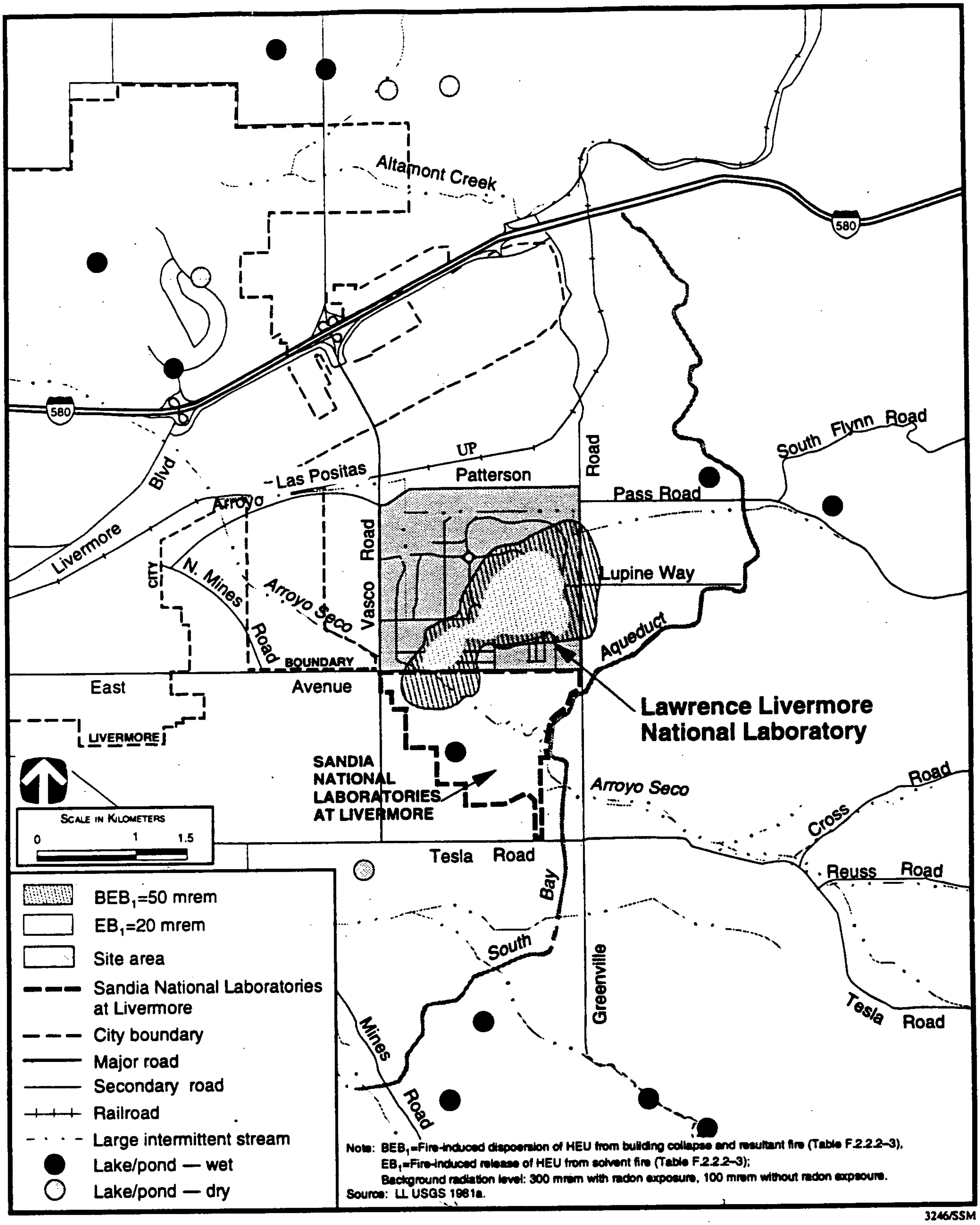


FIGURE F.4.5–1.—*Areas of Surface Exposure for Secondary and Case Fabrication Accidents at Lawrence Livermore National Laboratory.*

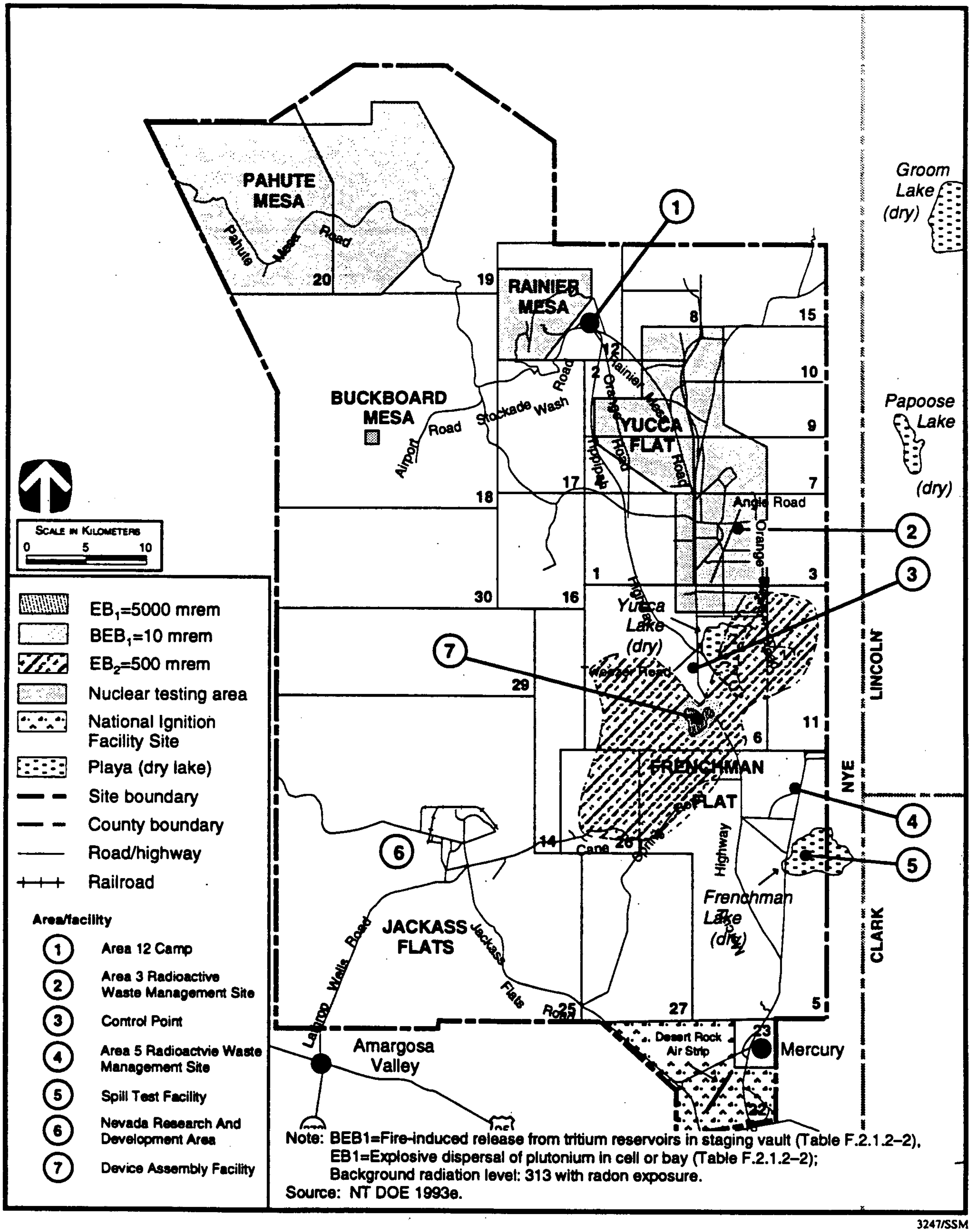


FIGURE F.4.6–1.—*Areas of Surface Exposure for Weapons Assembly/Disassembly Accidents at Nevada Test Site.*

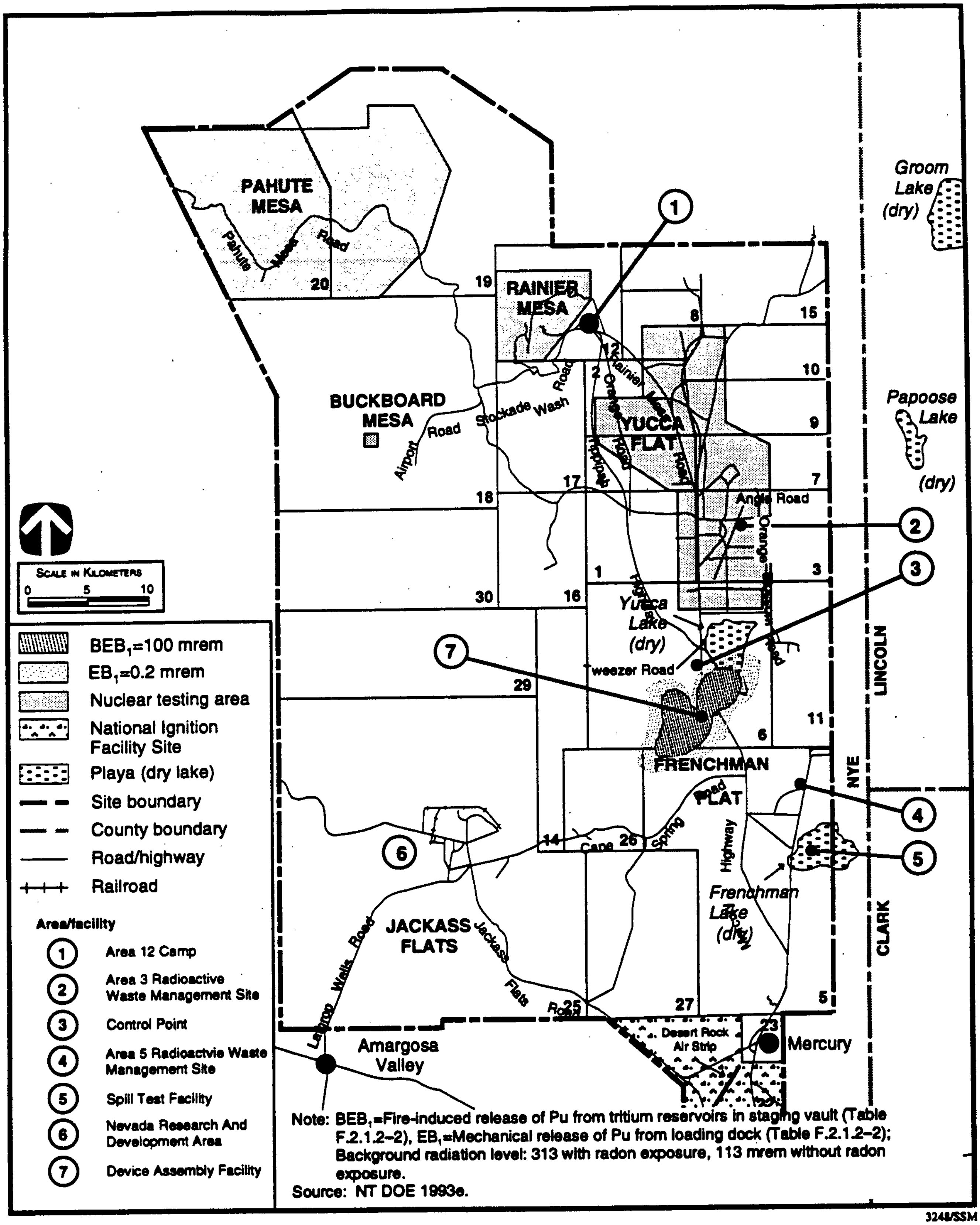


FIGURE F.4.6–2.—*Areas of Surface Exposure for Storage of Plutonium Strategic Reserve Accidents at Nevada Test Site.*

APPENDIX G

Appendix G

Appendix G

APPENDIX G: INTERSITE TRANSPORTATION

G.1 TRANSPORTATION RISK ANALYSIS METHODOLOGY

The transportation risk assessment estimates the health effects, in terms of annual fatalities, from the transportation of plutonium and highly enriched uranium (HEU) for each programmatic environmental impact statement (PEIS) alternative. For this assessment, the PEIS alternatives can be described as combinations of pit fabrication, secondary and case fabrication, and assembly/disassembly (A/D) sites. The potential sites for these functions are:

- A/D—Nevada Test Site (NTS) or Pantex Plant (Pantex)
- Pit Fabrication—Los Alamos National Laboratory (LANL) or Savannah River Site (SRS)
- Secondary and Case Fabrication—LANL, Lawrence Livermore National Laboratory (LLNL), or Oak Ridge Reservation (ORR)

In addition, the sites considered for the storage of the strategic reserve of plutonium and HEU and the tritium recycling site were considered in the analysis for estimating risk. The strategic reserve of plutonium and HEU could be located at six potential sites: Hanford, Idaho National Engineering Laboratory (INEL), NTS, ORR, Pantex, or SRS. Two of these sites, NTS and Pantex, are considered by the Stockpile Stewardship and Management PEIS due to the assumption that storage of the strategic reserve in the form of pits and secondaries would be collocated at the weapons A/D sites. The other four sites are being considered by the *Storage and Disposition of Weapons-Usable Fissile Materials Draft Programmatic Environmental Impact Statement* (DOE/EIS-0229-D, February 1996) for consolidated storage of all plutonium and uranium. Tritium recycling would remain at SRS. All of the alternatives are shown in table G.1–1.

For each of the special nuclear materials and radioactive materials involved, the radiological risk calculations were performed using the RADTRAN Version 4 computer code, developed and maintained by Sandia National Laboratories (SNL) at Albuquerque, NM (*RADTRAN 4: Volume 3 User Guide* [SAND89-2370, January 1992]).

The RADTRAN code combines user-determined demographic, transportation, packaging, and material factors with health physics data to calculate the expected radiological consequences of accident-free and accident risk from transporting radioactive material.

For performing the calculations, plutonium and HEU would be transported via Department of Energy's (DOE) safe secure trailers. Tritium would be transported by DOE's contract air carrier. The packaging types and the number of packages per shipment would be in accordance with regulatory requirements.

For this analysis, the isotopic composition was assumed to be 93 percent uranium-235 for HEU shipments and 100 percent tritium for tritium shipments. Plutonium was assumed to be weapons-grade material.

The transport index is a regulatory characteristic of a package and is equal to the radiation dose rate in millirem per hour at a distance of 1 meter (m) (3.3 feet [ft]) from the outside of the package. The transport index values were estimated to be the maximum allowed by regulatory checks incorporated in RADTRAN. These regulatory checks limit the product of the number of packages and the transport index of each package to a value of about 16. The quantity of material per package, number of packages per truckload, and number of truckloads per year were estimated.

The transportation accident model in RADTRAN assigns accident probabilities to a set of accident categories. For the truck and air analysis, the eight accident-severity categories defined in the Nuclear Regulatory Commission's (NRC) *Final Environmental Statement on the Transportation of Radioactive Material by Air and Other Modes* (NUREG 0170, December 1977) were used. The least severe accident category (Category I) represents low magnitudes of crush force, accident-impact velocity, fire duration, or puncture-impact speed. The most severe category (Category VIII) represents a large crush force, high-impact velocity, high puncture-impact speed, an

TABLE G.1-1.—*Annual Health Impact from Transportation of Materials for Each Alternative* [Page 1 of 3]

Alternative	Pit Fabrication Site	Secondary and Case Fabrication Site	Plutonium Storage Site	HEU Storage Site	Tritium Recycling Site	Health Effects[a] Accident	Accident-Free	Total
No Action	LANL (limited)	ORR	Pantex	ORR	SRS	$2.57x10^{-3}$	$7.64x10^{-4}$	$3.33x10^{-3}$
Assembly/Disassembly at NTS	LANL	ORR	NTS	ORR	SRS	$4.78x10^{-3}$	$1.34x10^{-3}$	$6.12x10^{-3}$
	LANL	ORR	Pantex	Pantex	SRS	$6.47x10^{-3}$	$1.87x10^{-3}$	$8.34x10^{-3}$
	LANL	ORR	ORR	ORR	SRS	$5.30x10^{-3}$	$1.51x10^{-3}$	$6.81x10^{-3}$
	LANL	ORR	NTS	NTS	SRS	$8.44x10^{-3}$	$2.39x10^{-3}$	0.0108
	LANL	ORR	SRS	SRS	SRS	$6.00x10^{-3}$	$1.76x10^{-3}$	$7.76x10^{-3}$
	LANL	ORR	INEL	INEL	SRS	$8.76x10^{-3}$	$2.52x10^{-3}$	0.0113
	LANL	ORR	Hanford	Hanford	SRS	$9.88x10^{-3}$	$2.84x10^{-3}$	0.0127
	SRS	ORR	NTS	ORR	SRS	$7.03x10^{-3}$	$2.03x10^{-3}$	$9.06x10^{-3}$
	SRS	ORR	Pantex	Pantex	SRS	$8.26x10^{-3}$	$2.44x10^{-3}$	0.0107
	SRS	ORR	ORR	ORR	SRS	$5.55x10^{-3}$	$1.61x10^{-3}$	$7.16x10^{-3}$
	SRS	ORR	NTS	NTS	SRS	$1.07x10^{-2}$	$3.07x10^{-3}$	0.0138
	SRS	ORR	SRS	SRS	SRS	$5.87x10^{-3}$	$1.70x10^{-3}$	$7.57x10^{-3}$
	SRS	ORR	INEL	INEL	SRS	$1.08x10^{-2}$	$3.15x10^{-3}$	0.0139
	SRS	ORR	Hanford	Hanford	SRS	$1.19x10^{-2}$	$3.49x10^{-3}$	0.0154
	LANL	LANL	NTS	NTS	SRS	$3.87x10^{-3}$	$1.02x10^{-3}$	$4.89x10^{-3}$
	LANL	LANL	Pantex	Pantex	SRS	$3.06x10^{-3}$	$8.06x10^{-4}$	$3.87x10^{-3}$
	LANL	LANL	ORR	ORR	SRS	$5.67x10^{-3}$	$1.61x10^{-3}$	$7.28x10^{-3}$
	LANL	LANL	SRS	SRS	SRS	$6.39x10^{-3}$	$1.85x10^{-3}$	$8.24x10^{-3}$
	LANL	LANL	INEL	INEL	SRS	$4.80x10^{-3}$	$1.25x10^{-3}$	$6.05x10^{-3}$
	LANL	LANL	Hanford	Hanford	SRS	$5.91x10^{-3}$	$1.59x10^{-3}$	$7.50x10^{-3}$
	SRS	LANL	NTS	NTS	SRS	$6.13x10^{-3}$	$1.70x10^{-3}$	$7.83x10^{-3}$
	SRS	LANL	Pantex	Pantex	SRS	$4.84x10^{-3}$	$1.37x10^{-3}$	$6.21x10^{-3}$
	SRS	LANL	ORR	ORR	SRS	$5.93x10^{-3}$	$1.71x10^{-3}$	$7.64x10^{-3}$
	SRS	LANL	SRS	SRS	SRS	$6.23x10^{-3}$	$1.81x10^{-3}$	$8.04x10^{-3}$
	SRS	LANL	INEL	INEL	SRS	$6.80x10^{-3}$	$1.90x10^{-3}$	$8.70x10^{-3}$
	SRS	LANL	Hanford	Hanford	SRS	$7.92x10^{-3}$	$2.23x10^{-3}$	0.0102
	LANL	LLNL	NTS	NTS	SRS	$3.58x10^{-3}$	$1.08x10^{-3}$	$4.66x10^{-3}$

TABLE G.1–1.—*Annual Health Impact from Transportation of Materials for Each Alternative* [Page 2 of 3]

Alternative	Pit Fabrication Site	Secondary and Case Fabrication Site	Plutonium Storage Site	HEU Storage Site	Tritium Recycling Site	Health Effects[a] Accident	Accident-Free	Total
Assembly/Disassembly at NTS (Continued)	LANL	LLNL	Pantex	Pantex	SRS	$4.76x10^{-3}$	$1.39x10^{-3}$	$6.15x10^{-3}$
	LANL	LLNL	ORR	ORR	SRS	$7.43x10^{-3}$	$2.21x10^{-3}$	$9.64x10^{-3}$
	LANL	LLNL	SRS	SRS	SRS	$8.16x10^{-3}$	$2.44x10^{-3}$	0.0106
	LANL	LLNL	INEL	INEL	SRS	$4.40x10^{-3}$	$1.25x10^{-3}$	$5.65x10^{-3}$
	LANL	LLNL	Hanford	Hanford	SRS	$4.52x10^{-3}$	$1.38x10^{-3}$	$5.90x10^{-3}$
	SRS	LLNL	NTS	NTS	SRS	$5.83x10^{-3}$	$1.77x10^{-3}$	$7.60x10^{-3}$
	SRS	LLNL	Pantex	Pantex	SRS	$6.54x10^{-3}$	$1.96x10^{-3}$	$8.50x10^{-3}$
	SRS	LLNL	ORR	ORR	SRS	$7.68x10^{-3}$	$2.32x10^{-3}$	0.0100
	SRS	LLNL	SRS	SRS	SRS	$8.00x10^{-3}$	$2.39x10^{-3}$	0.0104
	SRS	LLNL	INEL	INEL	SRS	$6.40x10^{-3}$	$1.89x10^{-3}$	$8.29x10^{-3}$
	SRS	LLNL	Hanford	Hanford	SRS	$6.53x10^{-3}$	$2.02x10^{-3}$	$8.55x10^{-3}$
Assembly/Disassembly at Pantex	LANL	ORR	Pantex	ORR	SRS	$2.57x10^{-3}$	$7.64x10^{-4}$	$3.33x10^{-3}$
	LANL	ORR	Pantex	Pantex	SRS	$4.49x10^{-3}$	$1.36x10^{-3}$	$5.85x10^{-3}$
	LANL	ORR	ORR	ORR	SRS	$3.32x10^{-3}$	$9.94x10^{-4}$	$4.31x10^{-3}$
	LANL	ORR	NTS	NTS	SRS	$6.47x10^{-3}$	$1.88x10^{-3}$	$8.34x10^{-3}$
	LANL	ORR	SRS	SRS	SRS	$4.03x10^{-3}$	$1.23x10^{-3}$	$5.26x10^{-3}$
	LANL	ORR	INEL	INEL	SRS	$6.78x10^{-3}$	$2.00x10^{-3}$	$8.78x10^{-3}$
	LANL	ORR	Hanford	Hanford	SRS	$7.90x10^{-3}$	$2.28x10^{-3}$	0.0102
	SRS	ORR	Pantex	ORR	SRS	$3.89x10^{-3}$	$1.20x10^{-3}$	$5.09x10^{-3}$
	SRS	ORR	Pantex	Pantex	SRS	$5.80x10^{-3}$	$1.80x10^{-3}$	$7.60x10^{-3}$
	SRS	ORR	ORR	ORR	SRS	$3.10x10^{-3}$	$9.67x10^{-4}$	$4.07x10^{-3}$
	SRS	ORR	NTS	NTS	SRS	$8.26x10^{-3}$	$2.44x10^{-3}$	0.0107
	SRS	ORR	SRS	SRS	SRS	$3.41x10^{-3}$	$1.07x10^{-3}$	$4.48x10^{-3}$
	SRS	ORR	INEL	INEL	SRS	$8.32x10^{-3}$	$2.52x10^{-3}$	0.0108
	SRS	ORR	Hanford	Hanford	SRS	$9.44x10^{-3}$	$2.85x10^{-3}$	0.0123
	LANL	LANL	Pantex	Pantex	SRS	$2.25x10^{-3}$	$5.96x10^{-4}$	$2.85x10^{-3}$

TABLE G.1–1.—*Annual Health Impact from Transportation of Materials for Each Alternative* [Page 3 of 3]

Alternative	Pit Fabrication Site	Secondary and Case Fabrication Site	Plutonium Storage Site	HEU Storage Site	Tritium Recycling Site	Health Effects[a] Accident	Accident-Free	Total
Assembly/Disassembly at Pantex (Continued)	LANL	LANL	ORR	ORR	SRS	$4.86x10^{-3}$	$1.40x10^{-3}$	$6.26x10^{-3}$
	LANL	LANL	NTS	NTS	SRS	$3.06x10^{-3}$	$8.06x10^{-4}$	$3.87x10^{-3}$
	LANL	LANL	SRS	SRS	SRS	$5.58x10^{-3}$	$1.64x10^{-3}$	$7.22x10^{-3}$
	LANL	LANL	INEL	INEL	SRS	$3.98x10^{-3}$	$1.05x10^{-3}$	$5.03x10^{-3}$
	LANL	LANL	Hanford	Hanford	SRS	$5.10x10^{-3}$	$1.38x10^{-3}$	$6.48x10^{-3}$
	SRS	LANL	Pantex	Pantex	SRS	$3.57x10^{-3}$	$1.03x10^{-3}$	$4.60x10^{-3}$
	SRS	LANL	ORR	ORR	SRS	$4.65x10^{-3}$	$1.38x10^{-3}$	$6.03x10^{-3}$
	SRS	LANL	NTS	NTS	SRS	$4.84x10^{-3}$	$1.37x10^{-3}$	$6.21x10^{-3}$
	SRS	LANL	SRS	SRS	SRS	$4.95x10^{-3}$	$1.48x10^{-3}$	$6.43x10^{-3}$
	SRS	LANL	INEL	INEL	SRS	$5.52x10^{-3}$	$1.57x10^{-3}$	$7.09x10^{-3}$
	SRS	LANL	Hanford	Hanford	SRS	$6.64x10^{-3}$	$1.90x10^{-3}$	$8.54x10^{-3}$
	LANL	LLNL	Pantex	Pantex	SRS	$5.92x10^{-3}$	$1.71x10^{-3}$	$7.63x10^{-3}$
	LANL	LLNL	ORR	ORR	SRS	$8.59x10^{-3}$	$2.54x10^{-3}$	0.0111
	LANL	LLNL	NTS	NTS	SRS	$4.76x10^{-3}$	$1.39x10^{-3}$	$6.15x10^{-3}$
	LANL	LLNL	SRS	SRS	SRS	$9.33x10^{-3}$	$2.74x10^{-3}$	0.0121
	LANL	LLNL	INEL	INEL	SRS	$5.57x10^{-3}$	$1.56x10^{-3}$	$7.13x10^{-3}$
	LANL	LLNL	Hanford	Hanford	SRS	$5.69x10^{-3}$	$1.70x10^{-3}$	$7.39x10^{-3}$
	SRS	LLNL	Pantex	Pantex	SRS	$7.24x10^{-3}$	$2.15x10^{-3}$	$9.39x10^{-3}$
	SRS	LLNL	ORR	ORR	SRS	$8.39x10^{-3}$	$2.51x10^{-3}$	0.0109
	SRS	LLNL	NTS	NTS	SRS	$6.54x10^{-3}$	$1.96x10^{-3}$	$8.50x10^{-3}$
	SRS	LLNL	SRS	SRS	SRS	$8.71x10^{-3}$	$2.59x10^{-3}$	0.0113
	SRS	LLNL	INEL	INEL	SRS	$7.10x10^{-3}$	$2.09x10^{-3}$	$9.19x10^{-3}$
	SRS	LLNL	Hanford	Hanford	SRS	$7.23x10^{-3}$	$2.22x10^{-3}$	$9.45x10^{-3}$

[a] Estimated fatalities per year.
Source: RADTRAN model results.

88-kilometer [km] per hour (54.6-mile [mi] per hour) collision into the side of the vehicle and a 982–degree Celsius (°C) (1,800–degree Fahrenheit [°F]) fire lasting 1.5 hours to produce a release of the material (plutonium, HEU, or tritium). The release fractions for Category VIII accidents were conservatively estimated to be 0.1 for all types of materials analyzed.

To perform the risk calculations, distance and distance fractions for rural, suburban, and urban populations for each intersite route were estimated using the INTERSTAT routing code. INTERSTAT is part of the RADTRAN model. Although the distance fractions in the rural, suburban, and urban populations are slightly different for each route, among the routes considered, the average distance fractions for population distribution for rural, suburban, and urban were 78, 20, and 2 percent, respectively. Also included are nonradiological impacts due to air pollution and highway accidents. Fatalities from potential air pollution were estimated using $1.0x10^{-7}$ cancer fatalities per urban kilometer. Highway accident fatalities were estimated from national statistics using $1.5x10^{-8}$ rural, $3.7x10^{-9}$ suburban, and $2.1x10^{-9}$ urban for occupational risks per kilometer, and $5.3x10^{-8}$ rural, $1.3x10^{-8}$ suburban, and $7.5x10^{-9}$ for nonoccupational risks per kilometer (SNL 1986a:167).

To estimate accident and accident-free impacts, the radiation dose from each shipment was converted to a risk factor by multiplying the occupational accident-free and accident dose by $4.0x10^{-4}$ cancers per person-rem and the public accident-free and accident dose by $5.0x10^{-4}$ cancers per person-rem (ICRP 1991a:22). The resultant annual health risks are presented as potential fatalities. The combined resultant health risks are presented as potential fatalities.

The estimated annual impacts for each alternative were derived by summing the health effects from individual routes. The potential sites for each alternative and the corresponding annual impacts are presented in table G.1–1.

G.2 PACKAGING

Packaging refers to a container and all accompanying components or materials necessary to perform its containment function. Packagings used by DOE for hazardous materials shipments are either certified to meet specific performance requirements or built to specifications described in Department of Transportation (DOT) hazardous materials regulations (49 Code of Federal Regulations [CFR] Subchapter C). For relatively low-level radioactive materials, DOT Specification Type A packagings are used. These packagings are designed to retain their contents under normal transportation conditions. More sensitive radioactive materials shipments require use of highly sophisticated Type B packaging, designed and tested to prevent the release of contents under all credible transportation accident conditions.

Plutonium, HEU, and components containing tritium are DOE-unique hazardous materials that require special protection. In addition to meeting the stringent Type B containment and confinement requirements of NRC's 10 CFR 71 and DOT's 49 CFR, packaging for nuclear weapons and components must be certified separately by DOE. DOE employs a closed, Government-owned and -operated Transportation Safeguards System for the intersite transport of nuclear weapons and components, including plutonium and HEU. Specially designed safe secure trailers are utilized to ensure high levels of safety and physical protection. Limited-life components are transported almost exclusively by DOE's contract air carrier.

As a representation of a typical Type B packaging used to transport weapons components, the testing sequence for the 6M, Type B packaging used for the shipment of HEU is described below. Plutonium and tritium packaging requires a similar, high level of protection. Most other radioactive and hazardous materials, such as low-level waste, would be transported by commercial truck. Historical summaries of the hazardous and nonhazardous materials shipped to and from each of the candidate sites are presented in tables G.3–1, G.3–2, and G.3–3.

In addition to meeting standards demonstrating it can withstand normal conditions of transport without loss or dispersal of its radioactive contents, the model 6M, Type B packaging used for DOE shipments must survive certain severe hypothetical accident conditions that demonstrate resistance to impact, puncture, fire, and water submersion. Test conditions do not duplicate accident environments but, rather, produce damage equivalent to extreme and unlikely accidents. The 6M, Type B packaging is judged as surviving extreme sequential testing if it retains all of its contents except for minuscule allowable releases, and if the dose rate outside the packaging does not exceed 1 rem/hour at a distance of 1 m from the package surface. Drum sizes (outer package) can vary from 38 to 420 liters (10 to 110 gallons).

The complete sequence of tests is listed below:

- **Drop Test.** A 9-m (30-ft) drop onto a flat, essentially unyielding, horizontal surface, striking the surface in a position at which maximum damage is expected
- **Puncture Test:** A 1-m (40-inch [in]) drop onto the upper end of a 15-centimeter (cm) (6-in) diameter solid, vertical, cylindrical, mild steel bar mounted on an essentially unyielding, horizontal surface
- **Thermal Test:** An exposure for not less than 30 minutes to a heat flux not less than that of a radiation environment of 800 °C (1,475 °F) with an emissivity coefficient of at least 0.9
- **Water-Immersion Test:** A subjection to water pressure equivalent to immersion under a head of water of at least 15 m (50 ft) for not less than 8 hours

The regulatory test conditions for the 6M, Type B packaging and other similar packagings are much more demanding than they might appear. For example, an impact on a very hard surface (desert caliche) at over 32 km (200 mi) per hour is not as likely to deform the packaging as would a drop of 9 m (30 ft) onto an unyielding target.

The 6M, Type B packaging is made up of several component parts each playing an integral engineered role in containment and confinement of the radioactive material being shipped. The applicable DOE Safety Analysis Report for Packaging provides additional detail that shows that the package provides a high level of public safety regardless of the accidental conditions it might encounter during transportation. A typical 6M, Type B packaging approved for use by DOE is covered by a Certificate of Compliance. Although 6M, Type B packagings have been involved in severe accidents, the integrity of the packaging has never been compromised. A representative 6M packaging is shown in figure G.2–1.

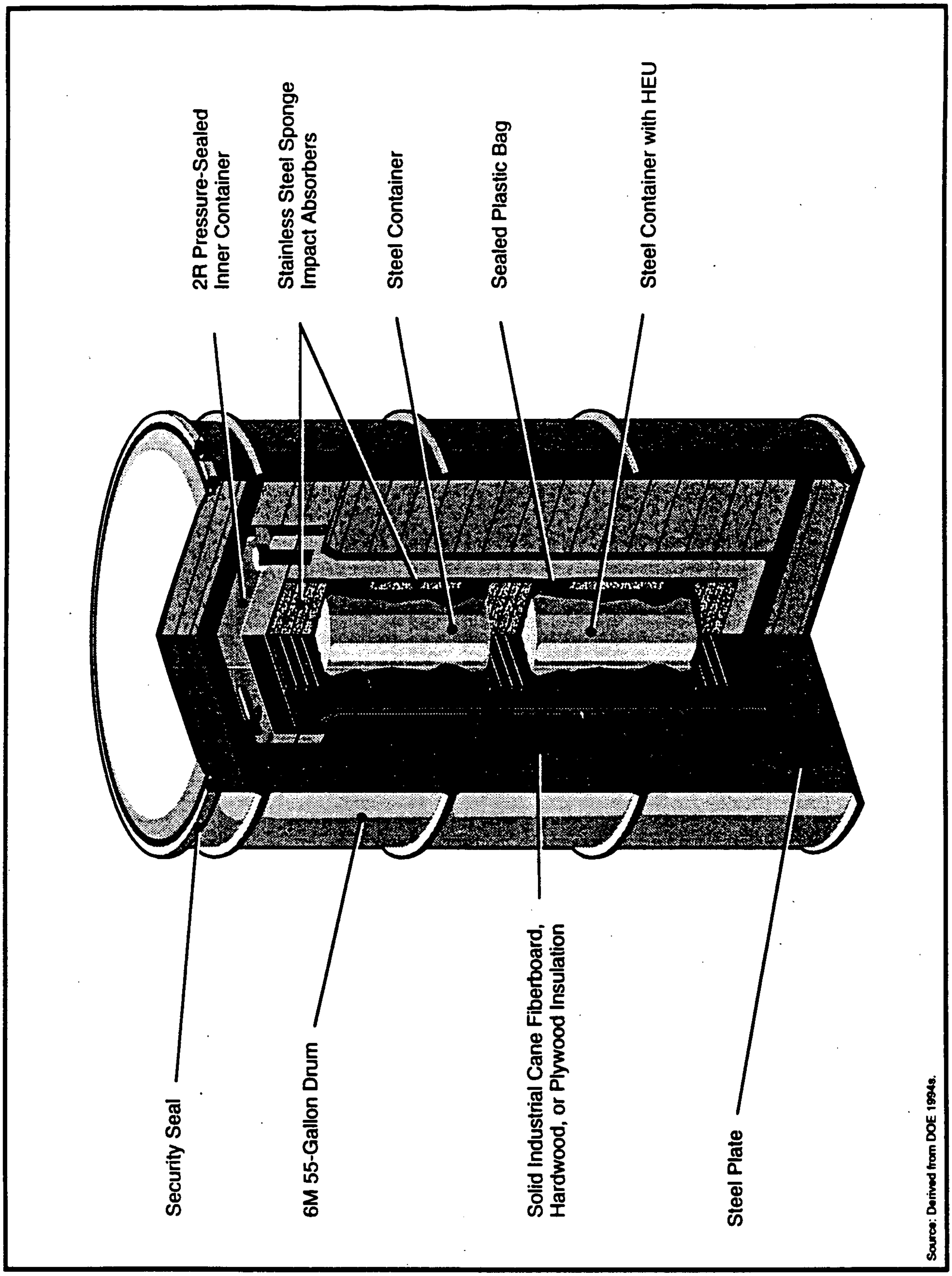
G.3 Intersite Shipment Data

Table G.3–1 presents a 5-year (1990 through 1994) summary of the nonhazardous and hazardous cargo shipped by commercial carriers to and from each of the candidate sites.

Table G.3–2 presents a summary, by chemical name, of hazardous materials shipped to and from Kansas City Plant (KCP), LANL, LLNL, and NTS for 1994. Table G.3–3 presents a summary, by chemical name, of hazardous materials shipped to and from ORR, Pantex, SNL, and SRS in 1994. All references to SNL refer to the Albuquerque location.

G.4 Highway Distance

Table G.4–1 presents highway distances between sites being evaluated.



Source: Derived from DOE 1994s.

FIGURE G.2–1.—*A Representative 6M Packaging Array.*

TABLE G.3–1.—*Five-Year Summary of Cargo Shipments by Commercial Carrier to and from Candidate Sites* [Page 1 of 2]

Site	1990		1991		1992		1993		1994	
	Shipments (number)	Weight (kg)	Shipments (number)	Weight (kg)	Shipments (number)	Weight (kg)	Shipments (number)	Weight (kg)	Shipments (number)	Weight (kg)
Kansas City Plant										
Hazardous	800	363,943	350	142,510	455	142,155	668	170,716	389	120,481
Nonhazardous	18,774	1,933,747	13,680	1,704,409	14,530	1,169,727	13,354	1,040,980	9,998	877,005
All cargo	19,574	2,297,690	14,030	1,846,919	14,985	1,311,882	14,022	1,211,696	10,387	997,486
Los Alamos National Laboratory										
Hazardous	851	544,668	680	316,974	1,089	363,818	1,133	345,403	692	214,510
Nonhazardous	28,266	4,129,802	28,757	3,943,075	36,805	1,855,129	46,663	2,617,906	49,453	3,327,743
All cargo	29,117	4,674,470	29,437	4,260,049	37,894	2,218,947	47,796	2,963,309	50,145	3,542,253
Lawrence Livermore National Laboratory										
Hazardous	987	931,582	453	277,618	2,264	3,329,414	4,510	11,785,251	5,089	15,944,718
Nonhazardous	5,080	729,180	78	455,632	39,818	3,161,580	50,902	4,397,530	56,037	4,243,668
All cargo	6,067	1,660,762	531	733,250	42,082	6,490,994	55,412	16,182,781	61,126	20,188,386
Nevada Test Site										
Hazardous	1,742	20,627,008	1,325	15,777,433	1,432	17,834,469	1,143	15,845,750	1,324	22,384,272
Nonhazardous	23,107	38,455,253	21,898	36,197,342	19,938	31,944,034	16,568	10,622,714	14,839	21,567,339
All cargo	24,849	59,082,261	23,223	51,974,775	21,370	49,778,503	17,711	26,468,464	16,163	43,951,611
Oak Ridge Reservation										
Hazardous	2,141	3,592,513	1,433	2,254,290	3,896	8,546,187	3,130	11,765,312	3,169	6,438,748
Nonhazardous	55,921	8,176,837	57,217	6,905,370	69,771	7,448,941	74,479	5,409,370	75,684	7,409,628
All cargo	58,062	11,769,350	58,650	9,159,660	73,667	15,995,128	77,609	17,174,682	78,853	13,848,376
Pantex Plant										
Hazardous	1,869	407,622	1,339	462,842	1,124	601,087	1,080	597,720	612	328,329
Nonhazardous	8,494	1,262,617	10,085	1,314,989	10,191	1,317,023	11,135	1,733,062	11,760	1,732,379
All cargo	10,363	1,670,239	11,424	1,777,831	11,315	1,918,110	12,215	2,330,782	12,372	2,060,708
Sandia National Laboratories										
Hazardous	454	114,870	482	120,977	554	124,924	456	45,101	695	414,554
Nonhazardous	20,653	2,944,455	20,018	2,254,413	26,986	2,850,913	34,136	3,159,762	39,315	3,624,333
All cargo	21,107	3,059,325	20,500	2,375,390	27,540	2,975,837	34,592	3,204,863	40,010	4,038,887

TABLE G.3–1.—*Five-Year Summary of Cargo Shipments by Commercial Carrier to and from Candidate Sites* [Page 2 of 2]

Site	1990 Shipments (number)	1990 Weight (kg)	1991 Shipments (number)	1991 Weight (kg)	1992 Shipments (number)	1992 Weight (kg)	1993 Shipments (number)	1993 Weight (kg)	1994 Shipments (number)	1994 Weight (kg)
Savannah River Site										
Hazardous	1,151	4,049,534	643	3,192,682	1,462	2,625,821	1,386	2,508,277	1,147	2,754,435
Nonhazardous	36,012	227,513,797	33,870	151,211,460	34,348	136,905,940	34,816	224,005,944	25,915	241,279,894
All cargo	37,163	231,563,331	34,513	154,404,142	35,810	139,531,761	36,202	226,514,221	27,062	244,034,329

Note: Gross weights, which include the weight of the package.

Source: SAIC 1995a:1.

TABLE G.3–2.—*Summary of Hazardous Materials Shipped to and from Kansas City Plant, Los Alamos National Laboratory, Lawrence Livermore National Laboratory, and Nevada Test Site, 1994* [Page 1 of 5]

Commodity	KCP Shipments (number)	KCP Weight (kg)	LANL Shipments (number)	LANL Weight (kg)	LLNL Shipments (number)	LLNL Weight (kg)	NTS Shipments (number)	NTS Weight (kg)
Acetylene gas			1	95	45	15,812		
Aluminum nitrate							2	144
Aluminum sulfate, solid	1	295	1	142				
Ammonia, anhydrous			1	41	17	3,635	1	1,487
Ammonium fluoride					1	5		
Ammonium hydroxide					18	262		
Ammonium sulfate					3	19	1	13
Argon			3	354	431	1,619,450	20	5,975
Asbestos articles			1	1	10	79,565		
Asphalt					3	68	6	3,288,218
Beryllium metal			1	3				
Beryllium metal or powder					11	66		
Cadmium nitrate								
Cadmium sulfate								
Calcium nitrate					1	5		
Chlorine			1	3	12	381	1	5,670
Class A poison			3	18			2	296

TABLE G.3–2.—*Summary of Hazardous Materials Shipped to and from Kansas City Plant, Los Alamos National Laboratory, Lawrence Livermore National Laboratory, and Nevada Test Site, 1994* [Page 2 of 5]

Commodity	KCP Shipments (number)	KCP Weight (kg)	LANL Shipments (number)	LANL Weight (kg)	LLNL Shipments (number)	LLNL Weight (kg)	NTS Shipments (number)	NTS Weight (kg)
Class B poison	5	2,888						
Combustible liquid, n.o.s.	8	1,996	6	1,529	31	7,382	10	55,477
Corrosive material, n.o.s.	108	50,584	28	2,458	208	17,579	29	6,205
Dry ice	9	879	49	427	175	95,059		
Empty haz containers (non-radiological)					2	617	76	292,447
Enriched boric acid								
Environmentally hazardous substance (marine pollutant)							1	5,443
Environmentally hazardous substance	1	17			17	4,458		
Etiologic agent, n.o.s.			1	4				
Explosives, n.o.s. (Class 1.1)	2	349	8	426	63	2,670	3	4,891
Explosives, n.o.s. (Class 1.2)								
Explosives, n.o.s. (Class 1.3)					22	3,805		
Explosives, n.o.s. (Class 1.4)	53	8,119	7	376	89	5,317		
Ferrous sulfamate							1	5
Ferrous sulfate								
Flammable gas, n.o.s.			43	35,757	170	127,807	3	178
Flammable liquid, n.o.s.	64	21,712	23	4,162	198	12,861	21	2,169
Flammable solid, n.o.s.	56	7,414	14	285	21	2,180	2	214
Fluoboric acid					1	5		
Fuel oil (diesel, 1-6)			5	7,146	28	153,493	122	4,093,274
Gasoline			1	2	43	917,622	94	2,741,403
Hazardous waste (nonradiological)	1	408	1	66	269	821,224	2	12
Helium			27	18,439	646	704,382	5	1,278
Hydrocarbon gas, compressed or liquefied					1	454		
Hydrochloric acid			2	2,169	49	869	5	724
Hydrofluoric acid					32	358	3	633

TABLE G.3–2.—*Summary of Hazardous Materials Shipped to and from Kansas City Plant, Los Alamos National Laboratory, Lawrence Livermore National Laboratory, and Nevada Test Site, 1994* [Page 3 of 5]

Commodity	KCP		LANL		LLNL		NTS	
	Shipments (number)	Weight (kg)	Shipments (number)	Weight (kg)	Shipments (number)	Weight (kg)	Shipments (number)	Weight (kg)
Hydrofluoric acid solution, spent			1	1			3	74
Hydrogen gas			1	33	95	152,076		
Hydrogen peroxide					50	23,105	2	343
Irritant, n.o.s.			2	2				
Isobutane, compressed or liquefied			2	1,134	1	64	1	3
Lithium metal	3	249	3	5	18	839		
Lubricating oil			2	182	43	4,746	33	31,307
Magnesium, powder, metal strip			2	11	12	450		
Mercuric nitrate			1	15	1	2	1	1
Methanol, liquid					33	1,163	1	40
Methyl isobutyl ketone					4	309	7	150,547
Misc. hazardous material					10	13,357		
N-dodecane					1	45		
Natural gas, compressed or liquefied							1	1,270
Nitric acid, fuming	4	602	1	1	70	1,586	5	1,098
Nitric acid (over 40 percent)							1	334
Nitric acid, fuming								
Nitrogen			8	277	877	9,990,231	20	14,370
Nonflammable gas, n.o.s.	16	5,909	91	28,603	484	429,841	25	16,682
Organic peroxide, n.o.s.	3	22	1	1,194	4	7		
Orm A, n.o.s.								
Orm B, n.o.s.								
Orm D, consumer commodity					2	516		
Orm E, n.o.s.								
Other regulated material, liquid	5	9,263			8	996	3	3,612
Other regulated material, solid	3	1,525			26	1,158		
Oxidizer, n.o.s.	11	3,158	4	3,023	17	388	5	271
Oxygen			3	166	108	127,200	4	704

TABLE G.3–2.—*Summary of Hazardous Materials Shipped to and from Kansas City Plant, Los Alamos National Laboratory, Lawrence Livermore National Laboratory, and Nevada Test Site, 1994* [Page 4 of 5]

Commodity	KCP		LANL		LLNL		NTS	
	Shipments (number)	Weight (kg)	Shipments (number)	Weight (kg)	Shipments (number)	Weight (kg)	Shipments (number)	Weight (kg)
Poison, liquid, n.o.s.	24	2,780	9	1,026	36	1,761		
Poison, solid, n.o.s.	9	2,483	7	98	21	379	1	19
Propane, compressed or liquefied			1	272			2	158
RAM, empty packages			49	35,462	23	8,294	1	1,016
RAM, fissile, <20 percent uranium-235								
RAM, fissile, >20 percent uranium-235								
RAM, fissile, HRCQ								
RAM, fissile, HRCQ, IR								
RAM, fissile, HRCQ, UNIR								
RAM, fissile, n.o.s.			10	669	1	110		
RAM, fissile, UNIR								
RAM, fissile, waste								
RAM, HRCQ, special								
RAM, instruments and articles			1	154	12	5,856		
RAM, low-specific activity, n.o.s.			5	4,651	141	117,718		
RAM, low-specific activity, uranium hexafluoride			1	277				
RAM, low-specific activity, waste					18	258,967	688	11,291,791
RAM, limited quantity, n.o.s.	2	18	124	3,257	89	9,739	3	3,570
RAM, medical isotopes			6	31				
RAM, n.o.s.			75	21,660	53	33,296	25	2,170
RAM, n.o.s., HRCQ			1	16,329	2	2,386		
RAM, n.o.s., special			5	3,889	2	356	8	5,708
RAM, n.o.s., waste					9	126,634		
RAM, uranium-metal, pyrop			1	1	3	402		
RAM, uranium oxide, n.o.s.					1	204		

TABLE G.3–2.—*Summary of Hazardous Materials Shipped to and from Kansas City Plant, Los Alamos National Laboratory, Lawrence Livermore National Laboratory, and Nevada Test Site, 1994* [Page 5 of 5]

Commodity	KCP		LANL		LLNL		NTS	
	Shipments (number)	Weight (kg)	Shipments (number)	Weight (kg)	Shipments (number)	Weight (kg)	Shipments (number)	Weight (kg)
Small arms ammunition					3	74	1	387
Sodium hydroxide (caustic soda)			7	8,218	47	5,986	7	8,389
Sodium metal (non-RAM)					5	16		
Sodium nitrate			1	5	5	26	1	3
Spontaneously combustible material	1	54	3	47	12	90		
Sulfuric acid			2	403	35	3,386	1	1
Toxic gas, inhalation hazard	1	54	26	7,500	72	7,379		
Trichloroethane 1,1,1					5	396		
Wet cell batteries	1	53	9	2,013	13	15,775	64	344,251
Total	391	120,831	692	214,512	5,089	15,944,719	1,324	22,384,275

Note: Gross weights, which include the weight of the package. RAM - radioactive material; HRCQ - highway route controlled quantity; IR - irradiated; UNIR - unirradiated; n.o.s. - not otherwise specified.

Source: SAIC 1995a:2.

TABLE G.3–3.—*Summary of Hazardous Materials Shipped to and from Oak Ridge Reservation, Pantex Plant, Sandia National Laboratories, and Savannah River Site, 1994* [Page 1 of 5]

Commodity	ORR		Pantex		SNL		SRS	
	Shipments (number)	Weight (kg)	Shipments (number)	Weight (kg)	Shipments (number)	Weight (kg)	Shipments (number)	Weight (kg)
Acetylene gas	13	8,101					17	3,372
Aluminum nitrate	1	5					2	53
Aluminum sulfate, solid	1	378					2	6,277
Ammonia, anhydrous	3	686			1	7	4	587
Ammonium fluoride	1	1						
Ammonium hydroxide			1	34				
Ammonium sulfate								
Argon	199	430,223	8	1,250	1	6	33	82,713
Asbestos articles	33	37,544						

TABLE G.3–3.—*Summary of Hazardous Materials Shipped to and from Oak Ridge Reservation, Pantex Plant, Sandia National Laboratories, and Savannah River Site, 1994* [Page 2 of 5]

Commodity	ORR		Pantex		SNL		SRS	
	Shipments (number)	Weight (kg)	Shipments (number)	Weight (kg)	Shipments (number)	Weight (kg)	Shipments (number)	Weight (kg)
Asphalt			1	540				
Beryllium metal								
Beryllium metal or powder	1	6,638						
Cadmium nitrate	1	489						
Cadmium sulfate								
Calcium nitrate	1	1	1	2				
Chlorine	35	63,200	4	1,780				
Class A poison	2	10			7	1,919		
Class B poison	2	3,680	2	1,343	2	60		
Combustible liquid, n.o.s.	28	2,237	7	1,142	1	4	3	119
Corrosive material, n.o.s.	183	213,634	60	15,996	94	26,185	120	290,507
Dry ice	153	45,406			2	511		
Empty haz containers (non-radiological)	210	576,434			1	752		
Enriched boric acid								
Environmentally hazardous substance (marine pollutant)	3	80					1	20
Environmentally hazardous substance	10	4,934						
Etiologic agent, n.o.s.	1	144						
Explosives, n.o.s. (Class 1.1)			27	25,058	26	41,891		
Explosives, n.o.s. (Class 1.2)			1	40	5	29,821		
Explosives, n.o.s. (Class 1.3)			2	2,650	27	259,008		
Explosives, n.o.s. (Class 1.4)	7	3,870	93	14,008	28	2,064	8	4,859
Ferrous sulfamate	1	2,749	1	21				
Ferrous sulfate	2	2,041						
Flammable gas, n.o.s.	42	24,301	13	1,734	9	372	25	57,028
Flammable liquid, n.o.s.	140	54,056	54	6,947	48	3,352	33	28,406
Flammable solid, n.o.s.	35	360	58	6,068	9	1,222	1	7

TABLE G.3–3.—*Summary of Hazardous Materials Shipped to and from Oak Ridge Reservation, Pantex Plant, Sandia National Laboratories, and Savannah River Site, 1994* [Page 3 of 5]

Commodity	ORR		Pantex		SNL		SRS	
	Shipments (number)	Weight (kg)	Shipments (number)	Weight (kg)	Shipments (number)	Weight (kg)	Shipments (number)	Weight (kg)
Fluoboric acid	1	1						
Fuel oil (diesel, 1-6)	109	366,209					3	2,188
Gasoline	166	624,837					10	4,790
Hazardous waste (nonradiological)	3	12	1	19			8	1,438
Helium	33	42,913	11	640	157	33,864	21	27,444
Hydrocarbon gas, compressed or liquefied								
Hydrochloric acid	16	95	6	20			25	43,606
Hydrofluoric acid	2	59					7	6,885
Hydrofluoric acid solution, spent	1	4					1	27
Hydrogen gas	11	39,032	3	217			13	2,620
Hydrogen peroxide	8	1,911	1	2			9	3,870
Irritant, n.o.s.								
Isobutane, compressed or liquefied	2	1						
Lithium metal	24	3,290	9	845	2	10		
Lubricating oil	13	1,589	14	3,766			22	8,391
Magnesium, powder, metal strip	10	6					1	39
Mercuric nitrate								
Methanol, liquid	1	1					1	123
Methyl isobutylketone								
Misc. hazardous material	19	653	1	13	1	114	1	75
N-dodecane								
Natural gas, compressed or liquefied							1	373
Nitric acid fuming	14	20,827	3	59			22	6,270
Nitric acid (over 40 percent)	1	18					4	306
Nitric acid, fuming	1	2					3	1,143

TABLE G.3–3.—*Summary of Hazardous Materials Shipped to and from Oak Ridge Reservation, Pantex Plant, Sandia National Laboratories, and Savannah River Site, 1994* [Page 4 of 5]

Commodity	ORR		Pantex		SNL		SRS	
	Shipments (number)	Weight (kg)	Shipments (number)	Weight (kg)	Shipments (number)	Weight (kg)	Shipments (number)	Weight (kg)
Nitrogen	58	269,550	2	384	1	8	32	69,318
Nonflammable gas, n.o.s.	141	103,053	29	6,310	18	2,649	205	1,477,767
Organic peroxide, n.o.s.	2	2					2	11
Orm A, n.o.s.	2	7,874						
Orm B, n.o.s.								
Orm D, consumer commodity							10	4,619
Orm E, n.o.s.	5	11,544						
Other regulated material, liquid	3	79					1	626
Other regulated material, solid	1	159						
Oxidizer, n.o.s.	47	1,486	2	35	2	49	4	15,321
Oxygen	24	4,811	2	258			20	26,036
Poison, liquid, n.o.s.	47	5,880	4	124	10	231	1	1
Poison, solid, n.o.s.	50	258			19	47	1	1
Propane, compressed or liquefied	5	227					1	68
RAM, empty packages	68	313,080	88	159,735			17	24,540
RAM, fissile, <20 percent uranium-235	3	6,275						
RAM, fissile, >20 percent uranium-235	15	2,318						
RAM, fissile, HRCQ								
RAM, fissile, HRCQ, IR, PINS							17	212,305
RAM fissile, HRCQ, UNIR, PINS								
RAM, fissile, n.o.s.	10	36,770	1	1,659	1	195	2	220
RAM, fissile, UNIR, PINS								
RAM, fissile, waste			1	7,254				
RAM, HRCQ, special	2	4,364						
RAM, instr. and articles	9	5,875	5	91				

TABLE G.3-3.—***Summary of Hazardous Materials Shipped to and from Oak Ridge Reservation, Pantex Plant, Sandia National Laboratories, and Savannah River Site, 1994* [Page 5 of 5]**

Commodity	ORR		Pantex		SNL		SRS	
	Shipments (number)	Weight (kg)	Shipments (number)	Weight (kg)	Shipments (number)	Weight (kg)	Shipments (number)	Weight (kg)
RAM, LSA, n.o.s.	454	1,120,758	9	465				
RAM, LSA, UF_6	66	1,270,833						
RAM, LSA, waste	6	111,223						
RAM, ltd. quant., n.o.s.	209	197,911	48	57,469	107	8,176	239	64,891
RAM, medical isotopes	107	390						
RAM, n.o.s.	135	124,546	23	3,903	107	302	32	69,099
RAM, n.o.s., HRCQ	1	13,744						
RAM, n.o.s., special	58	38,376	6	89			6	216
RAM, n.o.s., waste	1	109						
RAM, U-metal, pyrop	3	529			1	11		
RAM, UO_x, n.o.s.	1	2						
Small arms ammunition	1	1,013	4	4,913	2	1,237		
Sodium hydroxide (caustic soda)	27	70,840			1	134	52	39.585
Sodium metal, (non-RAM)	3	65			1	136		
Sodium nitrate	3	233	1	2			3	169
Spontaneously combustible material	1	3			1	6		
Sulfuric acid	13	103,875			3	211	13	81,353
Toxic gas, inhalation hazard	16	340	1	653			7	1,675
Trichloroethane 1.1.1	8	247	2	108				
Wet cell batteries	21	27,448	2	684			81	83,084
Total	3,169	6,438,748	612	328,329	695	414,553	1,147	2,754,435

Note: Gross weights, which include the weight of the package. n.o.s. - not otherwise specified; RAM - radioactive material.
Source: SAIC 1995a:2.

TABLE G.4–1.—*Highway Distances Between Selected Sites in Kilometers (Miles)*

Site	SRS	SNL	Pantex	ORR	NTS	LANL	LLNL
KCP	1,599 (993)	1,259 (782)	869 (540)	1,153 (716)	2,330 (1,447)	1,293 (803)	2,919 (1,832)
LLNL	4,249 (2,639)	1,713 (1,064)	2,178 (1,353)	3,911 (2,429)	958 (595)	1,860 (1,155)	
LANL	2,605 (1,618)	166 (103)	535 (332)	2,267 (1,408)	1,220 (758)		
NTS	3,610 (2,242)	1,074 (667)	1,539 (956)	3,272 (2,032)			
ORR	531 (330)	2,145 (1,369)	1,732 (1,076)				
Pantex	2,070 (1,286)	472 (293)					
SNL	2,542 (1,579)						

Source: DOE 1991j; DOE 1992o:3; McNally 1990a.

APPENDIX H

Appendix H

APPENDIX H: ENVIRONMENTAL MANAGEMENT

H.1 Overview

This appendix provides a general overview of the Department of Energy (DOE) Environmental Restoration and Waste Management Program, including the categories of waste streams managed by DOE; the applicable Federal statutes and DOE orders; waste minimization and pollution prevention; waste treatment, storage, and disposal; transportation of wastes; and facility transition management. Site-specific discussions of current waste management activities will follow in section H.2. Stockpile management project-specific waste management activities are addressed in appendix section A.3. Stockpile stewardship project-specific waste management activities are addressed in appendix I (National Ignition Facility [NIF]), appendix J (Contained Firing Facility [CFF]), and appendix K (Atlas Facility).

H.1.1 Waste Categories

Wastes are generated in gaseous, liquid, and solid forms and are categorized by their health hazard and handling requirements. The categories are listed in table H.1.1–1.

H.1.2 Applicable Federal Statutes and Department of Energy Orders

Most of the regulations that impact the storage, treatment, and disposal of wastes were promulgated since the original Nuclear Weapons Complex (Complex) was established. In many cases, the technology available at the time the Complex was constructed does not meet current requirements for full compliance and, as a result, interim agreements have been made with the regulatory agencies. Through continuous upgrade programs, processes have been improved or added to meet the requirements of any new regulations. Operations continue on the basis of using "best available technology" for facilities that were in operation before the regulation came into effect. In the siting and construction of any new facilities, the intent is to meet current regulations and to reach the goal of maximum recycling, minimal waste generation, no liquid discharges to the surface, and treatment and stabilization of unavoidable wastes sufficient for long-term storage or permanent disposal either on or offsite.

In order to operate at most of its facilities, DOE has entered into numerous agreements with states and the Environmental Protection Agency (EPA) to address compliance issues concerning certain aspects of environmental regulatory requirements that have arisen due either to the age of DOE facilities or the uniqueness of DOE operations. For the most part, DOE facilities are in compliance with the major portion of all environmental regulatory requirements, and these compliance agreements address specific situations. At the same time, most of these compliance agreements include a commitment from DOE to achieve compliance with each specific requirement by a specified date, including a schedule and milestones for achieving that compliance. These schedules and milestones are renegotiated on an ongoing basis as a result of changing budgets, additional environmental findings, and other factors. These agreements guide DOE activities at the sites under applicable environmental laws, regulations, and other standards. Compliance with the terms of these negotiated agreements is one of the highest DOE priorities. Site operations would be conducted in accordance with commitments DOE has made and would make in these agreements. DOE would work with the regulators to amend existing agreements and to develop new agreements to ensure continued compliance. Under no circumstances would DOE's performance pursuant to any existing compliance agreement be compromised or diminished as a result of the proposed action.

The following section summarizes the applicable Federal statutes and DOE orders:

Atomic Energy Act. The *Atomic Energy Act* gives DOE the authority to manage and regulate nuclear materials handled and generated at its facilities; however, DOE seeks to make its internal guidelines consistent with standards applied to commercial nuclear facilities regulated by the U.S. Nuclear Regulatory Commission (NRC). Pursuant to the *Atomic Energy Act*, DOE is committed to the practice of as low as reasonably achievable exposure to radiation from its operations, whereby exposures and resultant doses are maintained as low as social, economic, technical, and practical considerations permit.

TABLE H.1.1–1.—*Waste Categories*

Category	Characterization
Spent nuclear fuel	Nuclear reactor fuel that has been irradiated to the extent that it has undergone significant isotopic change to the point that fission-product poisons have reached an uneconomic threshold. DOE is no longer reprocessing spent nuclear fuel solely to recover fissile and fertile material. Although spent nuclear fuel is not categorized as a nuclear waste, the definition is provided here since it is radioactive material that must be stored, managed, and handled.
High-level	Highly radioactive material that results from the reprocessing of spent nuclear fuel including liquid waste produced directly in reprocessing, and any solid waste derived from the liquid that contains fission products in sufficient concentrations and other highly radioactive material that the NRC, consistent with existing law, determines to require permanent isolation.
Transuranic	Radioactive waste contaminated with alpha-emitting elements with an atomic number greater than uranium, half-life greater than 20 years, and in concentrations greater than 100 nanocuries per gram (nCi/g). Such wastes result primarily from fuel reprocessing, and from the fabrication of plutonium weapons components and plutonium-bearing reactor fuel. Generally, little or no shielding is required ("contact-handled" transuranic waste), but energetic gamma and neutron emissions from certain transuranic nuclides and fission-product contaminants may require shielding or remote handling ("remote-handled" transuranic waste).
Low-level	Radioactive waste that is not spent nuclear fuel, high-level waste (HLW), transuranic (TRU) waste, or byproduct material as defined by DOE Order 5820.2A, *Radioactive Waste Management.* Includes research and development (R&D) fissionable test specimens with TRU less than 100 nCi/g. The radiation level from this waste may sometimes be high enough to require shielding for handling and transport. In 10 CFR 61, NRC defines four disposal categories of low-level waste (LLW) that require differing degrees of confinement and/or monitoring: classes A, B, C, and Greater-Than-Class C.
Hazardous	Nonradioactive waste that has characteristics identified by either or both of the following Federal statutes: *The Resource Conservation and Recovery Act* (RCRA) (40 CFR 261) as amended or the *Toxic Substances Control Act* (TSCA). These toxic, corrosive, reactive, or ignitable substances and RCRA-listed wastes have been identified as posing health or environmental risks. Hazardous waste includes chemicals (such as chlorinated and nonchlorinated hydrocarbons), explosives, leaded oil, paint solvents, sludges, acids, organic solvents, heavy metals, and pesticides.
Mixed	Waste containing both hazardous and radioactive constituents.
Nonhazardous (Sanitary)	Solid sanitary waste that includes garbage, is routinely generated by normal housekeeping activities and does not have a defined health risk (neither radioactive nor hazardous). Solid sanitary waste is regulated under RCRA, Subtitle D. Liquid sanitary waste includes sewage and industrial waste, and is treated in a wastewater process before discharge to a publicly owned treatment works or surface waters. The management of liquid sanitary waste is regulated by the *Clean Water Act* (CWA) and the National Pollutant Discharge Elimination System (NPDES).
Nonhazardous (Other)	Other wastes that do not have a defined health risk, such as process wastewater.

Resource Conservation and Recovery Act. The *Resource Conservation and Recovery Act* (RCRA) was passed in 1976 as an amendment to the *Solid Waste Disposal Act* of 1965. RCRA regulates the "cradle to grave" management (generation, accumulation, storage, treatment, recycling, transport, and disposal) of hazardous waste, nonhazardous waste, underground storage tanks containing petroleum products and hazardous substances, and medical waste. Subtitle C of RCRA mandates that hazardous wastes be treated, stored, and disposed of in a manner that will minimize the threat to human health and the environment. To carry out this mandate, RCRA requires that owners and operators of hazardous waste treatment, storage, and disposal facilities obtain operating or post-closure care permits for certain waste management activities. RCRA defines the requirements for treatment, storage, and disposal facilities. Subtitle D of the law addresses the management of nonhazardous solid waste. Title 40 of the *Code of Federal Regulations* (CFR) implements the statutory provisions of RCRA. RCRA is a program which may be delegated to the states and for most states where DOE facilities are located, such delegation has occurred.

Land Disposal Restrictions. The *Hazardous and Solid Waste Amendments* to RCRA enacted in 1984 required the EPA to evaluate all listed and characteristic hazardous wastes according to a strict schedule and to develop requirements by which disposal of these wastes would be protective of human health and the environment. The implementing regulations for accomplishing this statutory requirement are established with the Land Disposal Restrictions Program. The land disposal restrictions regulations (40 CFR 268) impose significant requirements on waste management operations and environmental restoration activities. For hazardous wastes restricted by statute from land disposal, EPA is required to set levels or methods of treatment that substantially reduce the waste's toxicity or the likelihood that the waste's hazardous constituents will migrate. After the land disposal restriction's effective date, restricted wastes that do not meet treatment standards are prohibited from land disposal unless they qualify for certain variances or exemptions. EPA has promulgated standards for each of the five statutorily designated categories (40 CFR 268.31–40 CFR 268.35).

In addition to prohibiting disposal before appropriate treatment, land disposal restrictions prohibit any storage of land-disposal-restricted hazardous wastes (including mixed waste) except "for the purpose of the accumulation of such quantities of hazardous waste as are necessary to facilitate proper recovery, treatment, or disposal" (40 CFR 268.50). EPA has determined that storage of a hazardous waste pending development of treatment capacity does not constitute storage to accumulate sufficient quantities to "facilitate proper recovery, treatment, or disposal."

Underground Storage Tank Provisions. The requirements for the facilities that use tank systems for storing or treating hazardous waste are outlined in 40 CFR 264, Subpart J. These requirements include assessment of the existing tank system's integrity, design, and installation of new tank systems or components, and secondary containment. Hazardous wastes or treatment reagents are not placed in a tank system if they could cause the tank, its ancillary equipment, or the containment system to rupture, leak, corrode, or otherwise fail. Controls and practices to prevent spills and overflows from tank or containment systems are also required. Inspection requirements, procedures for response to leaks or spills, the disposition of leaking or unfit-for-use tanks, and closure and post-closure care requirements are also outlined in 40 CFR 264, Subpart J. Ignitable or reactive and incompatible hazardous wastes have special requirements.

Resource Conservation and Recovery Act Corrective Action Program. Hazardous waste permits require sites to institute corrective action programs for investigating and remediating Solid Waste Management Units. This program applies to all operating, closed, or closing RCRA facilities.

Federal Facility Compliance Act. The *Federal Facility Compliance Act* was passed in 1992. It waived sovereign immunity for Federal facilities and included provisions concerning DOE compliance with RCRA hazardous waste treatment for mixed waste. The *Federal Facility Compliance Act* required DOE to have approved site-specific mixed waste treatment plans and related orders in place 3 years (October 1995) from the date of enactment in order to avoid the imposition of fines and penalties (except for sites already subject to a permit, agreement, or order addressing compliance with the RCRA land disposal restrictions storage prohibition).

In an April 6, 1993, *Federal Register* notice (58 FR 17875), DOE published its schedule for submitting plans for treating mixed wastes for each facility at which DOE generates or stores mixed waste. Two interim versions of the plans were used to facilitate discussions among states and other interested parties. A subsequent consent order signed by the regulatory agency requires implementation of the final site treatment plan. For mixed waste for which identified treatment technologies exist, the plans provide a schedule for submitting permit applications, entering into contracts, initiating construction, conducting systems testing, starting operation, and processing mixed wastes. For mixed waste without an identified treatment technology, the plans include a schedule for identifying and developing technologies, identifying the funding requirements for research and development (R&D), submitting treatability study exemptions, and submitting R&D permit applications. In cases where DOE proposes radionuclide separation, the plans also provide an estimate of the volume of waste that would exist without such separation as well as cost estimates and underlying assumptions. DOE also prepared summary documents of the final plans to provide a national picture of DOE's technology needs and possible options for treatment of its mixed waste. The summaries were provided to all states and made available to other interested parties.

Comprehensive Environmental Response, Compensation, and Liability Act. The *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA), as amended by the *Superfund Amendments and Reauthorization Act* (SARA) of 1986, provides liability, compensation, cleanup, and emergency response for hazardous substances (including radionuclides) released to the environment. The cleanup of inactive waste disposal sites is one of the major requirements of CERCLA. It provides for prioritization of cleanup actions (National Priorities List [NPL] or Superfund List) and directs that a Federal Facility Compliance Agreement be negotiated with EPA and the state to coordinate CERCLA and RCRA compliance activities in one comprehensive strategy for each Federal facility. CERCLA also requires public participation in the selection of remediation alternatives, and this involvement or participation usually addresses the requirements of CERCLA, RCRA, and the *National Environmental Policy Act* (NEPA). Title III of CERCLA further requires that the National Response Center (operated by the U.S. Coast Guard) be notified in the event that a nonpermitted release of a reportable quantity of hazardous substance or radionuclides occurs. In the case of such a release, the National Response Center alerts the appropriate Federal emergency personnel who assess the event, formulate a response, and notify cognizant local emergency agencies. SARA requires industries to report the hazardous substances used at their facilities to include reporting inventories of these substances.

National Contingency Plan. The National Contingency Plan is an implementation regulation that sets forth requirements necessary to comply with CERCLA and SARA. For every site that is targeted for remedial response action under Section 104 of CERCLA, the National Contingency Plan requires that a detailed remedial investigation/feasibility study be conducted. The remedial investigation emphasizes data collection and site characterization. Its purpose is to define the nature, extent, and significance of contamination at a site in order to evaluate, select, and design a cost-effective remedial action. The feasibility study emphasizes analysis of data and decision making; it uses results from the remedial investigation to develop response objectives and alternative remedial responses. These alternatives are then evaluated in terms of their engineering feasibility, public health protection, environmental impacts, and costs. The remedial investigation/feasibility study leads to a decision that sets forth the method selected for remedial action to clean up the NPL site. Under the provisions of CERCLA, Federal facilities have the lead for CERCLA actions.

Toxic Substances Control Act. *The Toxic Substances Control Act* (TSCA) was enacted in 1976 to ensure that the manufacture, sale, storage, and disposal of toxic chemical substances do not present an unreasonable risk of injury to human health or the environment. Its applicability to DOE sites deals principally with the management and disposal of polychlorinated biphenyls (PCBs), asbestos, and dioxin. The problem created by radioactively contaminated PCBs, asbestos, and dioxin is that currently there is a limited capability to treat these materials. Radioactively contaminated PCBs and PCB-contaminated materials generated by DOE are destroyed annually by the K-1435 TSCA Incinerator at K-25 at Oak Ridge Reservation (ORR).

Clean Air Act. The original *Clean Air Act* (CAA) was passed in 1955. It was wholly replaced by the *Air Quality Act* of 1967, but the name *Clean Air Act*, which was reauthorized in 1990, is still used. The CAA establishes air quality requirements and pollutant emission limits. The National Emissions Standards of Hazardous Air Pollutants (NESHAP) is a section of CAA that sets air quality standards for air emissions such as radionuclides, benzene, beryllium, and asbestos. NESHAP regulations require the use of EPA-approved monitoring instrumentation, sampling methodology, calculations, and modeling for each Federal facility.

Clean Water Act. The *Federal Water Pollution Control Act*, as amended by the *Clean Water Act* (CWA) of 1977, establishes a Federal/state scheme for controlling the introduction of pollutants into the Nation's water. The CWA created the National Pollutant Discharge Elimination System (NPDES) program. This program regulates nonradiological effluent discharges to ensure that surface water bodies meet applicable water quality standards. Each discharge point (outfall) is permitted through the NPDES program. New NPDES permit regulations for stormwater discharges require DOE to also characterize surface runoff during rain events.

Safe Drinking Water Act. The *Safe Drinking Water Act* (SDWA) was enacted in 1975 and is designed to protect drinking water resources. Primary drinking water standards set by SDWA apply to drinking water "at the tap" as delivered by public water systems. Of equal significance is that drinking water standards are used to determine groundwater protection regulations under a number of other statutes. The SDWA requires DOE to obtain permits and to complete sample analyses and site inspections of public/industrial water supplies and sources of drinking water. It also imposes requirements on the installation and maintenance of drinking water wells.

Department of Energy Orders. The primary DOE orders governing waste management are as follows:

- DOE Order 5400.1, *General Environmental Protection Program.* Establishes environmental protection program requirements, authorities, and responsibilities for DOE operations for assuring compliance with applicable Federal, state, and local environmental protection laws and regulations, Executive orders, and internal department policies. Requires the preparation of waste minimization plans that describe how waste minimization activities will be promoted and implemented.

- DOE Order 460.1, *(Packaging and Transportation Safety).* Establishes the requirements for the packaging and transportation of hazardous materials, hazardous substances, and hazardous wastes.

- DOE Order 5820.2A, *Radioactive Waste Management.* Establishes policies and guidelines by which DOE manages its radioactive waste, waste byproducts, and radioactively contaminated surplus facilities.

H.1.3 Waste Minimization and Pollution Prevention

Waste minimization is the reduction, to the extent feasible, of radioactive and hazardous waste before treatment, storage, or disposal of the waste. Pollution prevention fully utilizes source reduction techniques in order to reduce risks to public health, safety, welfare, and the environment, as well as utilizing environmentally sound recycling to achieve these same goals. Each DOE site is required to have a Waste Minimization and Pollution Prevention Awareness Plan. To report their progress towards their goals in the plan, each site prepares an Annual Report on Waste Generation and Waste Minimization Progress. When planning for facilities to be constructed by 2005, it will be necessary to consider currently available technology while providing modular, flexible designs that can incorporate process improvements as they become available. In accordance with Executive Orders 12856, 12873, and DOE policy, the facilities that would support the Stockpile Stewardship and Management Program would be designed for waste minimization with an overall operating philosophy of pollution prevention. This waste minimization program would contribute to decreases in waste treatment, storage, and disposal costs and lower health risks to workers and the public. Technical approaches are being sought to optimize the number of production operations required, to increase the use of nonhazardous chemicals and environmentally benign waste-producing chemicals, to increase the use of recyclable chemicals and materials, and implement the new design or redesign of existing processes and products. Some criteria useful in determining successful technologies include improved processing yield, reduced quantities of scrap, reduced waste and processing of byproducts, reduced use of hazardous chemicals, positive return on investment, and continued product quality.

H.1.4 Waste Treatment, Storage, and Disposal

Waste management activities that would support the Stockpile Stewardship and Management Program are assumed to be current per site and are contingent upon decisions to be made through the Waste Management PEIS. Any future waste management facilities that may be required to support the Stockpile Stewardship and Management Program would be coordinated with any decisions resulting from the

Waste Management PEIS and any respective site-specific NEPA documentation.

Treated waste is waste that, following generation, has been altered chemically or physically to reduce its toxicity or prepare it for storage or disposal. Waste treatment can include volume reduction activities, such as incineration or compaction, that may be performed on waste prior to either storage or disposal or both. Stored waste is waste that, following generation (and usually some treatment), is being temporarily retained in a retrievable manner and monitored pending disposal. Disposed waste is waste that has been put in final emplacement to ensure its isolation from the environment, with no intention of retrieval. Deliberate action is required to regain access to the waste. Disposed wastes include materials placed in geologic repositories or buried in landfills.

Waste that is staged for processing would be stored according to its characterization and form. The disposal of waste is managed by the DOE Office of the Assistant Secretary for Environmental Management (EM). A facility near Carlsbad, NM, for disposal of retrievable and newly generated transuranic (TRU) waste, is planned. All surface facilities at the Waste Isolation Pilot Plant (WIPP) have been completed. To date, only underground excavations for the test phase have been done, and the remaining excavation would be completed once the facility is operational. The original planned test phase has been abandoned, and in its place an experimental program at Idaho National Engineering Laboratory is being conducted to develop the technical data to support the permit application under 40 CFR 191 and 40 CFR 268. Once operational, WIPP would become a permanent disposal site. The total projected capacity of WIPP is 175,543 cubic meters (m^3) (229,602 cubic yards [yd^3]), of which 7,080 m^3 (9,260 yd^3) could be remote-handled.

A supplemental environmental impact statement (EIS) is being prepared for the proposed phased development of WIPP for disposal of TRU waste. This supplemental EIS will analyze the impacts of waste storage, characterization, certification, processing or treatment, and loading at the generator sites. It will also discuss the impacts of transportation of TRU waste between generator sites and WIPP. The impacts of waste disposal operations at WIPP will also be analyzed, including the impacts of waste receipt, waste package inspection, monitoring, emplacement, and subsequent activities associated with eventual closure, decommissioning, and institutional control of WIPP once disposal operations have been completed. Options for the interim storage of TRU waste are evaluated in the *Draft Waste Management Programmatic Environmental Impact Statement* (DOE/EIS-0200-D). Yucca Mountain, NV, is a site being studied to determine its suitability for the disposal of commercial spent nuclear fuel and Department of Defense high-level waste (HLW). To date, no decisions to utilize either the Yucca Mountain repository or WIPP have been made. The remainder of this section discusses some of the treatment, storage, and disposal options that may be utilized with the various waste streams from stockpile stewardship and management facilities.

Gaseous Waste. Gaseous wastes can be nonhazardous (e.g., inert gases and air), hazardous (e.g., chlorinated hydrocarbon vapor and polyaromatic hydrocarbon vapor), or radioactive (e.g., tritium and xenon). Most hazardous gaseous wastes that are combustible may be incinerated to destroy the hazardous constituents by converting the combustibles into carbon dioxide and water vapor, while capturing any particulates that may result. When a particulate (ash) is contaminated with heavy metals, the end product must be stabilized into an approved solid form suitable for disposal.

Gaseous radioactive wastes are held for interim storage in tanks; adsorbed on surfaces in filters, molecular sieves, or active beds; refrigerated and liquefied or solidified; or reacted to form an aqueous solution. Gaseous waste may be oxidized, mixed with other liquid wastes, or solidified in a stable form for long-term disposal. Reactive gases such as tritium are captured on reactive beds, in molecular sieves, or in cryogenic traps for recycling back to the process. Inert radioactive gases such as xenon and argon can be separated by cryogenic capture and held in storage tanks until they decay sufficiently to permit release. Gases that decay to metals can be captured on activated charcoal beds and held until they can be stabilized, packaged, and disposed of as solid waste. When sufficiently decayed, gases may be released to the atmosphere.

Liquid Waste. Liquid waste includes both wastewaters and nonwastewaters. Wastewaters are a mixture of water and organic, inorganic, or radioactive contaminants. Liquid radioactive wastes are processed according to their chemical nature and radiological sources and activities. Liquid wastes that meet release criteria in applicable regulations can be released at permitted discharge points. Where conditions permit, liquids can be processed and recycled to replace virgin feedstocks. Waste processing removes the hazardous or radioactive contaminants from the releasable or recyclable liquids. The largest volume of liquid radioactive waste is low-level waste (LLW), typically in aqueous solution from process operations. Some of this waste is contaminated with hazardous compounds such as solvents or resins, and the result is a liquid mixed waste. Liquid HLW would not be generated in stockpile stewardship and management facilities, but is part of the reference conditions at candidate sites where spent fuel or target processing was conducted. The desired final waste form for liquid wastes is a stable solid that is resistant to stresses from heat generation and from internal and external physical loads. The form must remain stable while stored and the radioactive constituents must not be allowed to migrate to the surroundings.

Mixed waste often has combustible constituents. These are most readily decomposed in thermal treatment (incineration) or chemical reaction resulting in the creation of an ash. The resulting material would be granular and suitable for stabilization in a cemented form in which the hazardous constituents (radionuclides and heavy metals) are bound in compounds that have an affinity for heavy metals and radionuclides. These processes have been utilized in various forms, and their retention properties have been credibly demonstrated.

Liquid LLW is normally processed to reclaim or remove the excess water, leaving a saturated salt solution. This can be accomplished by clarification processes normal to water treatment or by evaporation. This usually results in the greatest volume reduction for liquid waste. The subsequent stabilization and solidification of the concentrated solution results in a waste form that does not leach its active constituents for a time sufficient to allow the radioactive constituents to decay.

Liquid radioactive and hazardous wastes are usually stored in tanks, where they are staged for further processing. Processes are employed to concentrate the hazardous constituents. These processes result in significant volume reductions, with the reclaimed water processed to a purity sufficient for permitted discharge or recycle.

Liquid hazardous waste concentrates may contain combustive hydrocarbons and heavy metal contaminants. These can be treated by incineration to produce a dry waste. If this waste is still hazardous after treatment, it can then be processed into a stabilized solid that would not leach its hazardous constituents while in storage or in a disposal facility. Liquid low-level and noncombustible hazardous waste can also be processed into a stabilized solid form for storage and disposal.

Solid Waste. Solid radioactive waste typically consists of contaminated materials (e.g., filters, clothing, storage vessels, cleaning materials, and tools) that have been used in, or contaminated by, nuclear materials processing. The term is also applied to those stabilized forms resulting from gaseous or liquid waste processing. In solid waste handling, forms and materials would be segregated, combustibles could be incinerated, and the resultant materials would be reduced in volume, stabilized if necessary, and packaged in specified containers for storage or disposal.

The only HLW stored at sites considered for the Stockpile Stewardship and Management Program is liquid HLW in tanks at Savannah River Site (SRS). It would be processed to a borosilicate glass, stored in an engineered facility onsite, and eventually shipped to a Federal repository.

Dry LLW that consists of protective clothing, containers, process materials, and equipment is stored in specified containers designed to retain the waste constituents for a time sufficient to permit decay of the radioactive constituents.

Solid hazardous waste may contain combustible hydrocarbon compounds or mixtures with heavy metal contamination. These wastes are usually shipped offsite to RCRA-permitted commercial facilities where they are treated, if required, and disposed of. Wastes that retain their hazardous constituents after processing must be packaged into forms that would retain the hazardous constituents safely within the waste form. For LLW or hazardous waste that results from liquid waste processing or incineration, the accepted form is solidification with a cement-like bonding agent.

Some mixed waste can be processed to remove its hazardous constituents and can be disposed of as LLW. Otherwise, it can be processed into stabilized forms and packaged for storage in an engineered facility until a licensed facility is available for permanent disposal. Solid nonhazardous wastes from process wastewater evaporation ponds or from sanitary waste treatment plants are usually deposited as sludge in a landfill.

Sites under consideration for stockpile stewardship and management facilities th do not have or have planned an onsite LLW disposal facility would ship their LLW offsite to one of DOE's LLW disposal facilities. As shown in table H.1.4–1, data from the DOE Integrated Database were used to calculate LLW disposal land usage factors from 1990 to 1993 for Los Alamos National Laboratory (LANL), Nevada Test Site (NTS), and SRS. ORR (Oak Ridge National Laboratory [ORNL]) is not listed because it only accepts ORNL-generated LLW. To determine a usage factor for the waste management impact analysis, an average value was calculated and then rounded down to the nearest hundred cubic meters. For the proposed Class II LLW disposal facility at ORR, a 3,300-m^3/hectares (ha) (1,700-yd^3/acre) usage factor was assumed (OR DOE 1995e:1).

H.1.5 Transportation

DOE complies with applicable Department of Transportation (DOT) regulations (10 CFR 71 and 49 CFR) when shipping hazardous materials over public roads. Transportation, especially for radioactive material, is highly regulated by Federal, state, and local laws. The stringent packaging requirements, combined with strict regulations and procedures governing the shipment of hazardous and radioactive materials, ensure that transport is a safe activity. Federal DOT regulations require the use of appropriate warning placards on vehicles and labels on packages to alert workers, officials, and the public to the hazardous nature of the shipped material. The use of placards on vehicles and warning labels on packages is a joint responsibility of the carrier and the shipper. The labels and placards are familiar to emergency response personnel and are valuable in determining content and hazard information.

Shipments of hazardous materials, including radioactive materials, must be accompanied by properly completed shipping papers such as bills of lading and cargo manifests that contain detailed information on the material being transported. These papers must be kept in the vehicle transporting the material and must be available for inspection by responsible officials at any time. The shipper must certify on the shipping papers that the hazardous material offered for transport is properly classified, packaged, marked, labeled, and made ready for transport according to all DOT regulations.

Radioactive material is shipped in secure packages. Type A packages contain small amounts of radioactive material and are designed to withstand normal conditions of transport. Type A packages are subjected to rigorous water spray, free-fall compression, and penetration tests carried out in sequence to ensure that radioactive materials are contained. Type B packaging is designed to contain more hazardous, and larger amounts of, radioactive waste. It can withstand severe accident conditions and contain radioactive materials under any credible circumstance.

If WIPP is determined to be a suitable disposal facility for TRU and mixed TRU wastes pursuant to the requirements of 40 CFR 191 and 40 CFR 268, TRU wastes would be shipped in TRUPACT-II (contact-handled) and RH-72B (remote-handled) containers. No remote-handled waste is expected to be generated in any of the stockpile stewardship and management facilities. To determine the number of TRU waste shipments required, 8.7 m^3 (11.5 yd^3) of waste per truck shipment, 17.5 m^3 (23 yd^3) of waste per regular train shipment, and 52.4 m^3 (69 yd^3) of waste per dedicated train shipment was assumed (DOE 1994v:B-4).

The additional shipments of LLW from stockpile stewardship and management sites without onsite LLW disposal were estimated. All LLW would be transported in a solid form. A typical shipment would consist of 80 208-liter (L) (55-gallon [gal]) drums loaded into an enclosed semi-trailer type truck. Each drum is assumed to be fully loaded, resulting in a total shipment volume of 17 m^3 (21.7 yd^3). The truck is assumed to operate as an "exclusive-use" vehicle.

TABLE H.1.4–1.—*Low-Level Waste Disposal Land Usage Factors for Department of Energy Sites*

Site	Total Cumulative Volume (m^3)	Estimated Area Utilized (ha)	Land Usage Factor (m^3/ha)
1993			
LANL	220,700	17.4	12,684
NTS	458,435	174.2	2,632
SRS	665,239	67.9	9,797
1992			
LANL	218,000	17.2	12,674
NTS	439,700	55.0	7,995
SRS	649,700	78.2	8,308
1991			
LANL	215,700	17.2	12,541
NTS	419,600	55.0	7,629
SRS	636,700	78.2	8,142
1990			
LANL	209,900	17.0	12,347
NTS	408,400	No Data	No Data
SRS	612,800	72.1	8,499
Average			
LANL	NA	NA	12,562
NTS	NA	NA	6,085
SRS	NA	NA	8,687

Note: NA - not applicable.
Source: DOE 1991h; DOE 1992f; DOE 1994c; DOE 1994d.

H.1.6 Facility Transition Management

Any transition activities of facilities from a production mode to a cleanup mode that are part of the baseline for this PEIS are discussed as appropriate in the impacts sections of chapter 4 and in section H.2 of this appendix. Decontamination and decommissioning (D&D) considerations of stockpile stewardship and management facilities would be planned for in the design.

The DOE Office of the Assistant Secretary for Defense Programs (DP) is responsible for the safe operation, shutdown, and ultimate disposition of facilities used to support the nuclear weapons program. EM is responsible for final facility disposition, which may include D&D of inactive facilities or refurbishment of them for further economic development. Transition activities would require appropriate NEPA evaluation and would proceed consistent with programs within EM, DP, and Materials Disposition. Depending on the site, facility transition activities are in different stages of planning. The dominant time-intensive activities are building characterizations of the environmental hazards related to the building and the deactivation of the facility.

At the end of their useful lives, all potential facilities would require decommissioning. The transition process begins when DOE management decides to stop operating the production facility and ends when responsibility for the facility is formally turned over to EM. Transition plans would be required for all facility transfers to EM. These plans define the actions necessary to bring the identified facilities into a condition acceptable for transfer to EM. Some facility transition issues that would be considered in the facilities design process are:

- Land-use criteria defined for the period after cleanup
- Interim storage of mixed waste
- Disposal facilities for hazardous and LLW

The cleanup of proposed stockpile stewardship and management facilities would be significantly less difficult because consideration for waste minimization and ease of decontamination would be included in the facility design. The surfaces that come in contact with potential contaminants would be easier to decontaminate. In-process decontamination (to reduce operational exposures) would significantly reduce the cleanup required at the end of the facilities' life.

In spite of the best design and process practices, many of the proposed stockpile stewardship and management facilities would require decontamination efforts at the end of their life. Because of the necessity of working inside contaminated areas during the cleanup phase, the potential for exposure for cleanup workers is higher than during the operation phase. All D&D workers would wear protective clothing and would be supplied breathing air, as appropriate, to minimize their exposure.

Technologies for cleanup are established and are improving as experience in working with nuclear facilities increases. The use of robotics, improved task planning, and new materials to prevent the spread of contamination have already improved current cleanup activities. By the time the proposed stockpile stewardship and management facilities are decommissioned, DOE will have gained considerable cleanup experience; thus, further improvements should be expected.

H.2 Waste Management Activities

H.2.1 Oak Ridge Reservation

ORR consists of three operating industrial complexes in and around the city of Oak Ridge. The Energy Systems Waste Management Organization provides the waste management oversight for ORR. It also provides guidance to each of the operating facility waste management divisions that are responsible for operating and managing their respective waste management facilities and activities. Because there is no spent nuclear fuel, HLW, or TRU waste associated with the fabrication of secondaries and cases, there will be no further discussion of these wastes at ORR in this appendix.

Y-12 Plant. Laboratory, maintenance, construction, demolition, and cleanup activities; machining operations; and waste produced in the purification of uranium for recycle are the primary waste generation activities at the Y-12 Plant (Y-12). In addition, metal-plating operations generate plating waste solutions while various laboratory activities generate reactive wastes and waste laboratory chemicals. Liquid process waste and the sludge resulting from the treatment of these process wastes are generated throughout the plant. Waste oils and solvents are generated from machining and cleaning operations. Daily operations such as janitorial services and floor sweepings generate both noncontaminated and uranium-contaminated industrial trash.

Pollution Prevention. The Y-12 Pollution Prevention Awareness Program Plan describes the overall program in detail. The program is designed to maintain the flow of information pertaining to waste minimization and pollution prevention and to facilitate activities to implement real reductions in waste generation. A summary description of the four key elements of the Waste Minimization and Pollution Prevention Program includes a promotional campaign, information exchange, a waste tracking system, and waste assessment performance.

One goal of the program is to sustain an effective pollution prevention effort by improving the awareness of the employees of waste minimization opportunities and activities. Improved awareness is accomplished in many ways including training, posters, publications, seminars, promotional campaigns, and recognition of individuals and teams for activities that reduce waste generation. Waste minimization activities at other ORR sites and other weapons sites provide useful input to the program. Using ideas developed by others is an important aspect that can save time and resources.

Tracking waste generation in a manner that lends itself to waste minimization reporting is a prerequisite to documenting successes or failures in waste minimization efforts. Y-12 is improving its ability to record and track waste shipments. Process waste assessments are being conducted as part of the ongoing program to identify, screen, and analyze options to reduce the generation of waste. This determines the amount of material in a workplace that is disposed of as waste during work operations. The assessment provides a summary of hazardous materials usage and waste production and identifies those processes and operations that need to be improved or replaced to promote waste minimization.

Low-Level Waste. Machining operations that use stock materials including steel, stainless steel, aluminum, depleted uranium, and other materials produce machine turnings and fines as waste products. Waste treatment provides controlled conversion of waste streams generated from operations to an environmentally acceptable, or to a more efficiently handled or stored, form. This activity includes continuing operation and maintenance of facilities that treat wastewaters and solid waste generated from production and production support activities. Waste minimization and planned treatment facilities are expected to reduce the magnitude of these wastes. In 1993, Y-12 treated approximately 1,030,000 L (272,000 gal) of liquid LLW and 4,730 m^3 (6,200 yd^3) of solid LLW (OR MMES 1995c:5-13). Table H.2.1–1 summarizes the LLW treatment facilities at Y-12 of which the major facilities are described below.

The Uranium Chip Oxidation Facility thermally oxidizes depleted and natural uranium (less than 1 percent enrichment) machine chips under controlled conditions to a stable uranium oxide. Upon arrival, chips are weighed, placed into an oxidation chamber, and ignited. The oxide is transferred into drums and transported to the uranium oxide storage vaults. The Uranium Chip Oxidation Facility is not designed to treat uranium sawfines. Hence, sawfines are currently blended with uranium oxide and placed in the oxide vaults as a short-term treatment method.

The Waste Feed Preparation Facility processes and prepares solid LLW for volume reduction by an outside contractor or storage at Y-12. The facility utilizes a 200-ton capacity baler to reduce the waste volume to one-eighth of its original size. Waste comes to the facility from areas known to generate contaminated material, or from dumpsters that were analyzed at the trash monitoring station and deemed to be above the radioactive acceptability limits for the sanitary landfill. The compacted bales are placed in DOT-approved metal boxes and staged in an adjacent warehouse prior to offsite shipment for incineration or storage at Y-12.

The Uranium Treatment Unit is located near Building 9206 and was used to treat uranium-contaminated nitrate waste solutions that are generated in enriched uranium recovery operations in Buildings 9212 and 9206. The RCRA closure plan for this unit was issued in March 1995 and is awaiting approval from the state.

The Waste Coolant Processing Facility is a biodegradation and storage facility for waste coolants that may be LLW and utilizes the following equipment for coolant treatment:

- Three storage tanks
- Feed tank
- Waste processing reactor/clarifier
- Sludge holding tank
- Two sludge blenders/dryers
- Effluent holding tank
- Transfer pumps

Microorganisms biodegrade approximately 114,000 L (30,000 gal) of waste coolant per month into harmless products. Each batch of coolant takes approximately 30 days to treat. After treatment, the clarifier separates the wastes into three process streams: floating oily solids, liquid effluent, and settled biological solids. Floating solids are dewatered in the dryer/ribbon blender and are transferred to drums. Liquid effluent is sent to the Central Pollution Control Facility or West End Treatment Facility/West Tank Farm for final treatment prior to NPDES discharge. Biological solids are further treated in the aeration tank and are then recycled or sent through the blender for dewatering. Nonrecycled solids are currently pumped into tankers for storage. This practice will continue until adequate treatment and disposal methods are established.

Long-term storage options include storage in warehouses, tanks, and vaults, as well as storage of Y-12 wastes in buildings at K-25. The major Y-12 LLW storage facilities, described below, are summarized in table H.2.1–2. As of June 1994, approximately 7,930 m^3 (10,400 yd^3) of LLW and 4,740 m^3 (6,210 yd^3) of uranium-contaminated scrap metal were stored at Y-12 (OR MMES 1995c:5-25).

The Classified Waste Storage Facility (located in Building 9720-25) will provide for the permitted storage of solid LLW and mixed LLW, which is classified for national security purposes under provisions of the *Atomic Energy Act*. These wastes are currently being stored by the waste generators. The facility will meet plant security requirements for classified waste management and guidelines for the management of LLW and mixed LLW.

Containerized waste storage units in Buildings 9206 and 9212 provide for the storage of cans of ash resulting from the combustion of uranium-contaminated solid wastes. Combustible solid wastes contaminated with enriched uranium are turned into ash by oxidation during the uranium recovery process. The resulting cans of ash are stored in containerized storage units in Buildings 9206 and 9212 until uranium accountability results have been obtained and the material can be returned to the uranium recovery process for further processing to recover the enriched uranium.

The Depleted Uranium Oxide Storage Vaults I and II are located on Chestnut Ridge northeast of Building 9213. The vaults are constructed of reinforced concrete and provide a retrievable storage repository for uranium oxide, uranium metal, and a blended mixture of uranium sawfines and oxide. The vaults contain a negative pressure exhaust system that operates during material entry. The exhaust is filtered and monitored prior to its release to the atmosphere. The facility utilizes forklift trucks, electric hoists, and a motorized drum dumper during operation. Depleted uranium oxide and blended sawfines are delivered in sealed [illegible] 208-L (30- and 55-gal) drums. The containers have a weight limit of 386 kilograms (kg) (850 pounds [lb]).

The Old Salvage Yard contains both low-level uranium-contaminated and nonradioactive scrap metal. Most scrap currently sent to this facility is contaminated. The Contaminated Scrap Metal Storage is an area within the Old Salvage Yard that is used to store uranium-contaminated scrap metal. Contaminated scrap is being placed in approved containers and eventually will be transferred to the aboveground storage pads. Noncontaminated scrap is sold when offsite shipments are allowed. This facility is located at the west end of Y-12.

Y-12 has no current onsite LLW disposal capability. All disposal activities at the Bear Creek Burial Ground were terminated on June 30, 1991. This landfill was used to dispose of radiologically contaminated solid waste. These wastes are currently containerized and stored at Y-12 in aboveground storage pads or are shipped offsite for incineration. In 1993, approximately 187 m^3 (245 yd^3) of solid nonmetallic LLW were sent offsite to be compacted or incinerated with the ash returned to Y-12 for storage (OR MMES 1995c:5-15). Also, 745 m^3 (976 yd^3) of contaminated scrap were sent to be smelted offsite. The proposed LLW disposal facilities project would provide new disposal facilities at a new centralized location of ORR. The proposed LLW disposal facilities would utilize state-of-the-art disposal technologies, including lined trenches with leachate collection treatment capabilities and tumulus confinement disposal units. The Class-II Facility, for wastes contaminated with very low concentrations of short (less than 30 years) half-life radionuclides, is expected to be operational in 2002. DOE has indefinitely postponed construction of the Class-I Facility, for wastes contaminated with very low concentrations of predominantly long (greater than 30 years) half-life radionuclides.

Mixed Low-Level Waste. Mixed LLW is generated from the development, metal preparation, fabrication, and assembly/industrial engineering functions at Y-12. Mixed LLW is hazardous waste such as solvents, degreasers, biodegradable coolants, organic and inorganic acids, biodenitrification sludge, and wastewater that is contaminated with enriched and/or depleted uranium. There is no disposal of mixed waste at Y-12; however, future plans include disposal of mixed wastes at a permitted offsite commercial facility. Mixed wastes are put in storage awaiting treatment or disposal, treated at Y-12, or sent to another ORR facility for treatment and disposal. Table H.2.1–3 presents the inventory of mixed LLW at Y-12 as of December 31, 1994, along with a 5-year projection. In 1993, approximately 2,410,000 L (636,000 gal) of liquid mixed LLW was treated at Y-12 (OR MMES 1995c:7-9). The Y-12 Waste Management Division operates several mixed LLW treatment facilities which are described below and summarized in table H.2.1–1.

The Groundwater Treatment Facility treats wastewater from the Liquid Storage Facility at Y-12 and seepwater collected at K-25 to remove volatile and nonvolatile organic compounds and iron. It is part of the Disposal Area Remedial Action program to collect and treat contaminated groundwater from the Bear Creek Burial Grounds. The Groundwater Treatment Facility is located at the far west end of Y-12, adjacent to the West End Treatment Facility. This facility utilizes an air stripping operation to remove volatile organics. In addition, carbon adsorption eliminates nonvolatile organics and PCBs. Iron removal equipment is also operational. After treatment, wastewater is sampled and recycled if additional processing is required. Wastewater that meets discharge specifications is pumped into East Fork Poplar Creek through an NPDES monitoring station. The Groundwater Treatment Facility treated and discharged approximately 2,780,000 L (735,000 gal) during 1992 (DOE 1994n).

The West End Treatment Facility/West Tank Farm treats the following nitrate-bearing wastes generated by Y-12 production operations: nitric acid wastes, nitrate-bearing rinsewaters, mixed acid wastes, waste coolants, mop water, caustic wastes, and biodenitrification sludges. Treatment operations consist of biological denitrification, biological oxidation, metals precipitation, coagulation, flocculation, clarification, filtration, hydrogen-ion concentration adjustment, degassification, and carbon adsorption. Wastes are received at the West End Treatment Facility/West Tank Farm in 18,900-L (5,000-gal) tankers, 2,270-L (600-gal) polytanks, and in smaller, approved waste transportation containers such as drums, bottles, and carboys. Detailed waste analysis documentation is used to determine the treatment scheme and temporary storage location of each shipment. The West End Treatment Facility effluent polishing system facilitates the removal of uranium, trace metals, and suspended solids. The treated wastewater is then discharged to East Fork Poplar Creek through an NPDES monitoring station. Sludges, spent carbon, and spent filter material generated during the treatment processes are currently stored in 1,890,000-L (500,000-gal) tanks. A major modification to the West End Treatment Facility/West Tank Farm is currently in the design phase. This modification will remove all heavy metals up front, thus separating the hazardous sludge from the nonhazardous sludge. Approximately two-thirds of the current sludge volume generated can then be disposed of as nonhazardous wastes.

The Y-12 Cyanide Treatment Unit provides storage and treatment of waste solutions containing metallic cyanide compounds from spent plating baths and precious metal recovery operations or other areas. The cyanide reduction process performed within the unit is currently performed in 208-L (55-gal) containers. After waste is treated at the Cyanide Treatment Unit, it is transferred to the West End Treatment Facility for further treatment then discharged to the East Fork Poplar Creek.

As of June 1994, approximately 16,600 m^3 (21,700 yd^3) of mixed LLW were stored at Y-12 (OR MMES 1995c:7-32). Table H.2.1–2 summarizes the mixed LLW storage facilities at Y-12 that are described below.

The Containerized Waste Storage Area consists of three concrete pads covering approximately 2,320 square meters (m^2) (24,800 square feet [ft^2]). These pads provide storage for LLW, RCRA hazardous, and mixed LLW. An impermeable dike surrounds each pad to provide spill containment. Fire protection at this facility will be upgraded, contingent on funding.

The Building 9811-1 RCRA Storage Facility (OD7 and OD8) contains a diked storage area for tanks (OD7) and an enclosed storage area for containers (OD8) with a capacity of 1,000 drums. The OD7 contains four 114,000-L (30,000-gal) tanks, two 37,900-L (10,000-gal) tanks, and associated piping and pumps. RCRA waste oil/solvent mixtures containing various concentrations of chlorinated and nonchlorinated hydrocarbon solvents, uranium, trace PCBs, and water for specific chemical constituents are stored at OD8 in 208-L (55-gal) drums and 1,140-L (300-gal) Tuff-tanks to await sampling and analytical results. Wastes deemed compatible with OD7 materials are pumped into those tanks. Noncompatible wastes are transported to different facilities.

The Waste Oil/Solvent Storage Facility (OD9) is a permitted RCRA TSCA hazardous waste storage facility. It consists of a diked area supporting five 151,000-L (40,000-gal) tanks, a tanker transfer station with five centrifugal transfer pumps, and a drum storage area. Three tanks house PCB wastes contaminated with uranium, one tank contains nonradioactive PCB wastes, and one tank holds RCRA hazardous wastes. Likewise, a diked and covered pad furnishes space for 33 m^3 (43 yd^3) of containerized waste. Wastes assigned to this facility are first stored at OD8 (Building 9811-1 RCRA storage facility) to await laboratory results. The diked area contains additional space for a sixth 151,000-L (40,000-gal) tank. This facility is projected to be used until 2010, due to the anticipated lack of disposal outlets for uranium-contaminated organic liquids.

The Liquid Organic Waste Solvent Storage Facility (OD10) contains four 24,600-L (6,500-gal) and two 11,400-L (3,000-gal) stainless steel tanks for storage of ignitable nonreactive liquids, including those contaminated with PCBs and uranium. In addition, a diked and covered storage area provides space for 40,000-L (10,600 gal) of containerized waste. The facility is capable of segregating various spent solvents for collection and storage. Major solvent waste streams are transferred to tanks until final disposition.

Building 9720-9 storage area supplies a drum storage area for mixed and PCB wastes, including an area designed to contain flammable wastes. The western half, which contains space for approximately 1,500 drums, stores both PCB and RCRA hazardous waste. The facility's eastern half is not currently in use. Upgrades are underway to the ventilation, diking, and fire-suppression systems to comply with RCRA, TSCA, and DOE standards and to allow for mixed and PCB waste storage.

The RCRA Staging and Storage Facility (Building 9720-31) prepares solid, liquid, and sludge wastes for offsite shipment. The facility consists of seven storage rooms and seven staging rooms, each with a separate ventilation system. The staging rooms house small containers that are packed with compatible materials and shipped. The storage rooms hold larger containers, such as 208-L (55-gal) drums. Each room, which can hold up to 90 drums, accommodates a different class of hazardous waste.

The RCRA and PCB Container Storage Area (Building 9720-58) is a warehouse facility utilized for staging prior to treatment or disposal of PCB-contaminated equipment (transformers, capacitors, and electrical switchgear) and nonreactive, nonignitable RCRA waste contaminated with uranium. Waste containers received at Building 9720-58 include 114- and 208-L (30- and 55-gal) drums, 1,250- and 2,500-L (330- and 660-gal) portable tanks, B-25 boxes, and self-contained PCB equipment.

The Solid Storage Facility provides 1,630 m^2 (17,500 ft^2) of storage space for PCB- and uranium-contaminated soil. The facility also contains a synthetic liner for leachate collection and a leak detection system. Collected leachate is transferred to the Liquid Storage Facility for pretreatment. The Solid Storage Facility is currently undergoing the RCRA Part B permitting process. No additional wastes are being added to the facility.

Hazardous Waste. Plating rinsewaters, waste oil, and solvents from machining and cleaning operations; contaminated soil, soil solutions, and soil materials from RCRA closure activities; and waste contaminated with hazardous constituents from construction/demolition activities are the major sources of hazardous waste. In 1993, approximately 8,840,000 L (2,340,000 gal) of hazardous liquid were treated (OR MMES 1995c:6-6). The remaining hazardous waste consists of 1,080 m^3 (1,420 yd^3) of solid waste which is stored at the RCRA Storage and Staging Facility. In 1994, approximately 190 m^3 (250 yd^3) of PCB hazardous material was shipped offsite for treatment (DOE 1995h). The Y-12 Waste Management Division operates several hazardous treatment facilities that are described below and are summarized in table H.2.1–4.

The Plating Rinsewater Treatment Facility treats dilute plating rinsewaters contaminated primarily with chromium, copper, nickel, and zinc. In addition, the facility can treat cyanide-bearing wastes and remove chlorinated hydrocarbons. The design capacity for this facility is 30.3 million l/yr (MLY) (8 million gal/yr [MGY]). Under normal conditions, the Plating Rinsewater Treatment Facility treats 852,000 L (225,000 million gal) of plating rinsewater per year (DOE 1995gg). The facility is located across the street from the Building 9401-2 plating shop, which produces most of Y-12's rinsewaters. The facility neutralization, equalization, and cyanide destruction equipment is located outdoors in a diked basin. The remainder of the facility process is located in Building 9623. Rinsewaters are received via a direct pipeline from the plating shop. In addition, rinsewaters may be received in tankers, polytanks, or in any acceptable waste shipping container. The Plating Rinsewater Treatment Facility performs the following treatment operations: pH adjustment, flow equalization, heavy metal removal by electrochemical precipitation, flocculation, clarification, carbon adsorption, and filtration. After the clarification operation, the rinsewater is transferred to the Central Pollution Control Facility. The Central Pollution Control Facility provides the carbon adsorption operation, final filtration, and discharge to East Fork Poplar Creek through an NPDES monitoring station. Treated rinsewater is sometimes recycled for use as make-up water for Central Pollution Control Facility processes. Sludge from the clarification process is transferred to the Central Pollution Control Facility and then taken to the West Tank Farm for interim storage.

The Steam Plant Wastewater Treatment Facility treats approximately 144 MLY (38 MGY) of wastewater from steam plant operations, demineralizers, and coal pile runoff (OR MMES 1995c:8-7). Treatment processes include wastewater collection/sedimentation, neutralization, clarification, pH adjustment, and dewatering. The treatment facility utilizes automated processes for continuous operation. All solids generated during treatment are nonhazardous and are disposed of in the sanitary landfill. The treated effluent is monitored prior to NPDES discharge to the East Fork Poplar Creek. The Y-12 utilities department manages this facility.

Hazardous waste is being stored until the management and operations contractor and DOE approve shipment for offsite disposal under the DOE "No Rad Added" performance objective. As of June 1994, approximately 60 m^3 (79 yd^3) of hazardous waste and 20 m^3 (26 yd^3) of PCB wastes was in storage at Y-12 (OR MMES 1995c:6-11). Table H.2.1–5 summarizes the major existing Y-12 hazardous waste storage facilities described below.

The Oil Landfarm Soil Storage Facility contains approximately 420 m^3 (550 yd^3) of soil contaminated with PCBs and volatile organics (OR DOE 1993a:9-21). The soil was excavated from the Oil Landfarm and Tributary 7 in 1989. The soil is contained in a covered, double-lined concrete dike with a leak-detection system. The leak-detection system will soon be modified to enhance detection capabilities.

The Liquid Storage Facility of the Disposal Area Remedial Actions Liquid Storage Treatment Unit is a hazardous waste storage facility built during the Bear Creek Burial Ground closure activities. It is located in Bear Creek Valley approximately 3.2 kilometers (km) (2 miles [mi]) west of Y-12. It collects and stores groundwater and other wastewaters received from the seep collection lift station, the Solid Storage Facility, tankers, polytanks, and the diked area rainfall accumulation. Feed streams may contain oil contaminated with PCBs, volatile and nonvolatile organic compounds, and heavy metals. Processing and storage equipment include:

- Two 284,000-L (75,000-gal) bulk storage tanks
- 22,700-L (6,000-gal) oil storage tank
- Gravity separator
- Filtering unit
- Composite sampling station
- Tanker transfer station

The wastewater travels through the gravity separator, cartridge filters, and composite sampling station prior to storage in the bulk tanks. A reinforced concrete dike surrounds all equipment to provide spill containment. After sufficient wastewater accumulates in the bulk storage tanks, it is processed at the Groundwater Treatment Facility. A new leachate collection system collects and pumps hazardous waste seepage from the burial ground to the Liquid Storage Facility.

The Y-12 Waste Management Division operates Industrial Landfill V, which provides for the disposal of industrial and institutional solid waste and special wastes such as asbestos materials, empty aerosol cans, materials contaminated with beryllium oxide, glass, fly ash, coal pile runoff sludge, empty pesticide containers, and Steam Plant Wastewater Treatment Facility sludge. The landfill area is located on Chestnut Ridge near the eastern end of the plant and serves Y-12, ORNL, K-25, and other DOE prime contractors at Oak Ridge. The landfill utilizes shallow land burial by the area fill method and is permitted by the State of Tennessee. Requests are filed with the state to provide disposal for additional materials as needed.

The Chestnut Ridge Borrow Area Waste Pile (Industrial Waste Landfill III) consists of mercury-contaminated soil removed from the Oak Ridge Civic Center area and deposited at Y-12 Chestnut Ridge. No further disposal at this site has been made.

Nonhazardous Waste. Major waste-generating activities include construction and demolition activities that produce large volumes of noncontaminated wastes, including lumber, concrete, metal objects, and soil and roofing materials. Industrial trash is generated by daily operations throughout the plant. These operations include janitorial services, floor sweepings in production areas, and production activities. In 1993, Y-12 generated 145 million L (38.3 million gal) of industrial and sanitary liquid waste (OR MMES 1995c:8-5) that included oils and solvents, operational wastewater, Central Pollution Control Facility/Plating Rinsewater Treatment Facility wastewater, steam plant wastewater, environmental restoration waste, and liquid waste received from ORNL and K-25. The Waste Storage Facility in Building 9720-25 has a solid waste baler with an 8:1 compaction ratio (DOE 1994n). Approximately 43,900 m^3 (57,600 yd^3) of solid nonhazardous waste were compacted and/or stored during 1993 (OR MMES 1995c:8-5).

The Sludge Handling Facility (T-118) was designed and constructed to provide water filtration and sludge dewatering in support of a storm sewer cleaning and relining project. Filtered water was reused by the sewer-cleaning contractor, and the dewatered sludge was stored in specially constructed containers for future disposal. The facility is currently being used to store containers of LLW.

The Steam Plant Ash Disposal Facility is used to collect, dewater, and dispose of sluiced bottom ash generated during operation of the coal-fired steam plant. An additional trench was constructed for the disposal of sanitary and industrial wastes generated by ORNL, K-25, and Y-12. In order to comply with environmental regulations for landfill operations, the Steam Plant Ash Disposal Facility includes a leachate collection system, a transfer system to discharge the collected leachate into the Oak Ridge public sewage system, groundwater monitoring wells, and a gas migration/ventilation system.

In 1992, approximately 677 m^3 (887 yd^3) of clean scrap metal was stored at Y-12 (OR DOE 1993b:9-6). The new salvage yard is used for the staging and public sale of nonradioactive, nonhazardous scrap metal. Sales have been suspended, however, until procedures to meet the DOE "No Rad Added" performance objective have been approved. The New Salvage Yard provides accumulation and sorting activities for nonradiologically contaminated scrap metal. Plans are in place to provide an automotive lead cell battery repository for used batteries until recycling options are initiated. This facility is located near the Bear Creek Burial Ground.

The new Industrial Landfill V and Construction Demolition Landfill VI permits disposal of approximately 93,500 m^3/yr (122,000 yd^3/yr) of industrial and sanitary waste (OR MMES 1995c:8-18). The facilities were designed and operated in accordance with Tennessee solid waste disposal regulations. A baler, located in Building 9720-25, is used for compaction of sanitary/industrial solid waste destined for the Industrial Landfill V.

Oak Ridge National Laboratory. Because ORNL is a research facility, it has many diverse waste-generating activities, each of which may produce only a small quantity of waste. Isotope production, utilities, and support functions such as photography are additional sources of waste. The radioactive wastes produced by each activity at ORNL reflect the nature of its operation. A large number of radioisotopes are handled, in isotope production and packaging, in reactor and accelerator operations, in reprocessing studies on nuclear fuel, and in investigations into the interactions of radioactivity with living systems. The radioactive wastes generated by these activities can be classified as follows:

- Concentrates generated by the treatment of intermediate-level wastes, which are disposed of by hydrofracture.
- LLW contaminated with beta/gamma emitting radioactivity. These wastes, which have a low surface dose rate, are compacted, if possible, and disposed of in earthen trenches; those wastes that exhibit a high surface dose rate are disposed of in augered holes.
- Low-level alpha-emitting wastes, which are evaluated for criticality hazards before disposal in augered holes.

Pollution Prevention. Waste segregation is used to minimize the generation of solid LLW. By providing collection barrels for both radioactive and nonradioactive wastes, the volume of wastes that requires handling as radioactive waste has been reduced. Before these procedures were implemented, radioactive and nonradioactive wastes were discarded in the same barrel. This contaminated the nonradioactive portion and required special disposal of an inflated amount of waste.

Low-Level Waste. Isotope production and research activities generate a variety of low-level radioactive wastes to include low-level wastewater. Sources of solid LLW include contaminated equipment, filters, paper, rags, plastic, and glass and sludge from the Process Waste Treatment Plant. Table H.2.1–6 shows the LLW treatment facilities that are operating at ORNL. In 1993, 434 m^3 (569 yd^3) of solid LLW were compacted and 180,000 L (47,700 gal) of liquid LLW were solidified at ORNL. Approximately 25 m^3 (33 yd^3) were sent offsite to be compacted and/or incinerated (OR MMES 1995c:5-14, 5-15).

Solid LLW to include radioactive scrap metal is placed in storage prior to disposal. Table H.2.1–7 lists the LLW and mixed LLW storage facilities currently operating at ORNL. As of June 1994, approximately 1,050 m^3 (1,370 yd^3) of solid LLW and 2,960 m^3 (3,870 yd^3) of radioactive scrap metal were in storage awaiting disposal at ORNL (OR MMES 1995c:5-27).

The area designated as SWSA-6 at ORNL is the only active onsite disposal unit on ORR. It receives solid LLW, including radioactively contaminated asbestos. Table H.2.1–8 lists the LLW disposal units at SWSA-6. As of the end of 1993, approximately 606 m^3 (794 yd^3) of solid LLW were buried at SWSA-6 (OR MMES 1995c:5-29).

Mixed Low-Level Waste. Mixed wastes are generated by research projects and some facility operations. Isotope production and research activities generate a variety of mixed low-level and mixed TRU wastes. Table H.2.1–9 presents the inventory of mixed LLW at ORNL as of December 31, 1994, along with a 5-year projection.

As shown in table H.2.1–6, three facilities are currently treating or are capable of treating mixed waste at ORNL: the Process Waste Treatment Plant, the Liquid Low-Level Waste Evaporation Facility, and the Melton Valley Low-Level Waste Immobilization Facility (DOE 1995gg). One other treatment facility at ORNL, the Nonradiological Wastewater Treatment Plant, is operating and could be used to treat mixed waste.

The Process Waste Treatment Plant is designed to treat process wastewaters, groundwater, and evaporator condensate wastewaters that contain low levels of radioactivity. Small concentrations of radioactive materials have occasionally been processed. Process wastewaters may contain small quantities of radionuclides, metals, anions, and organic chemicals. Under normal operating conditions, the Process Waste Treatment Plant can process wastewater at a rate of 492 L/minute (min) (130 gal/min). The design capacity is 757 L/min (200 gal/min) (DOE 1994n). Wastewaters can contain organic materials and low levels of radioactivity. The facility can treat waste streams with some heavy metals but not streams containing PCBs.

The Liquid Low-Level Waste Evaporation Facility treats liquid LLW using evaporation. It operates in a semicontinuous mode; waste is accumulated in collection tanks and transferred through underground piping to an evaporator system. The design capacity is 106,000 L/day (28,000 gal/day). The facility processes an average of 1,140 L (300 gal) of liquid wastes per day under normal operating conditions (OR DOE 1993a:9-22). The facility can treat waste streams containing organic contaminants.

A summary of the mixed LLW storage facilities at ORNL is shown in table H.2.1–7. An estimate of the capacity of these facilities is also given. As of June 30, 1994, approximately 3,190 m^3 (4,180 yd^3) of mixed waste were in storage at ORNL (OR MMES 1995c:7-32).

The only disposal of mixed waste done at ORNL is the burial of radioactive asbestos at SWSA-6. Asbestos contaminated with low levels of radioactivity is placed in silos. In 1992, approximately 23 m^3 (30 yd^3) of contaminated asbestos was buried (OR DOE 1993b:9-4). Low-level contaminated biological waste has also been buried at SWSA-6.

Hazardous Waste. Hazardous wastes are generated in laboratory research, electroplating operations, painting and maintenance operations, descaling, demineralizer regeneration, and photographic processes. Few hazardous wastes are treated in onsite facilities. Onsite treatment at ORNL includes elementary neutralization and detonation facilities. A summary of the hazardous waste treatment facilities at ORNL is shown in table H.2.1–10.

The Chemical Detonation Facility treats small amounts of wastes that would be dangerous to transport offsite. Explosives such as aged picric acid are detonated in the detonation facility. Certain other wastes (e.g., spent photographic processing solutions) are processed onsite into a nonhazardous state. Those wastes that are safe to transport are shipped to offsite RCRA-permitted commercial treatment/disposal facilities.

The Nonradiological Wastewater Treatment Plant is designed to reduce pollutant concentrations in nonradiological wastewaters including hazardous wastes to levels acceptable for effluent discharge. The plant operates in a continuous mode and involves physical and chemical processing steps. The facility contains a heavy-metal removal system, where the pH of the wastewater is raised to 10.5 in a clarifier. Polymers are added to induce flocculation and settling of the metal precipitates. The wastewater is passed through a filtration system to remove particulates. An air stripper then removes volatile organics and activated carbon columns remove mercury. In 1993, approximately 23,800,000 L (6,300,000 gal) of liquid hazardous wastes were treated at the Nonradiological Wastewater Treatment Plant (OR MMES 1995c:6-6).

As of June 1994, approximately 60 m^3 (79 yd^3) of hazardous waste and 20 m^3 (26 yd^3) of PCB waste were stored at ORNL (OR MMES 1995c:6-11). PCB wastes are managed in storage facilities until they can be shipped offsite for treatment and/or disposal. PCB-contaminated and hazardous wastes are temporarily stored at Building 7507, and PCB-contaminated wastes are stored on the 7507W storage pad. Due to the "No Rad Added" policy, hazardous wastes are being stored as mixed waste. A listing of the hazardous waste storage facilities at ORNL is shown in table H.2.1–11. Approximately 10 m^3 (13 yd^3) of asbestos wastes were sent offsite in 1992 to Y-12 Sanitary and Industrial Landfill II. About 12 m^3 (16 yd^3) of hazardous and PCB wastes were sent to K-25 for storage and incineration in the TSCA incinerator (OR DOE 1993b:9-5).

Nonhazardous Waste. Nonhazardous wastes result from ORNL maintenance and utilities. The steam plant and the sanitary waste treatment plant produce a sludge which is sampled to demonstrate that it is nonhazardous and meets the Y-12 Industrial and Sanitary Landfill II waste acceptance criteria. The sewage treatment facility treats sanitary and laundry wastewater. It is an extended aeration-activated sludge unit followed by mixed media tertiary filtration of secondary effluent dewatering. The sludge is dried onsite in open-air drying beds. In 1993, approximately 331 million L (88 million gal) of industrial and sanitary liquid waste were treated at the sewage treatment plant (OR MMES 1995c:8-7).

The Melton Valley Low-Level Waste Immobilization Facility is currently treating nonhazardous liquid waste (OR DOE 1994a:A-20). The facility can be used to solidify liquid mixed LLW that has a pH greater than 12.5 and that contains some heavy metals. This liquid mixed LLW is transferred from tanks by interconnecting pipelines. Batches of waste are pumped from a liquid decantation system to a solidification system as required to provide adequate storage-tank capacity. The facility operates only on a campaign basis to provide adequate storage capacity. Solidification is currently performed using cementation. Design capacity is 62,500 L (16,500 gal) of liquid waste per month. Under normal operating conditions, the facility can process 7,570 L/month (mo) (2,000 gal/mo) as required to provide adequate storage-tank capacity. The facility cannot treat HLW, alpha-contaminated waste with TRU activity levels greater than 100 nanocuries per gram (nCi/g), organic wastes, or PCBs.

Scrap metals are discarded from maintenance and renovation activities and are recycled when appropriate. Construction and demolition projects also produce nonhazardous industrial wastes. All solid nonhazardous and medical wastes (after they are autoclaved to render them noninfectious) except scrap metal are sent to the Y-12 Industrial and Sanitary Landfill II. Approximately 16 m^3 (21 yd^3) of scrap metal were placed in storage at ORNL in 1992. This waste will remain at ORNL until it is characterized as nonradioactive per the "No Rad Added" policy (OR DOE 1993b:9-7).

Rainfall runoff from the ORNL steam plant coal yard storage area plus additional wastewater from the sulfuric acid tank diked area runoff, steam plant boiler blowdown, and water softener regenerate are collected in a basin. This waste is treated at the Coal Yard Runoff Treatment Facility.

K-25 Site. Enrichment, maintenance, decontamination, and R&D activities have generated a wide variety of waste at K-25. Because of its past uranium enrichment mission, uranium is the predominant radionuclide found in K-25 waste streams. Waste management activities are increasing. Low-level radioactive wastes from other DOE sites are placed in building vaults until a final disposition strategy is identified. Also, PCB wastes and RCRA wastes contaminated with uranium began arriving from other DOE sites in 1987 for incineration in the K-1435 TSCA incinerator. Tables H.2.1–12 and H.2.1–13 summarize the treatment and storage facilities, respectively, at K-25 that are capable of treating and storing multiple categories of waste.

Pollution Prevention. K-25 policy mandates minimization of waste generated while achieving compliance with applicable environmental regulations. Five waste reduction options are used at K-25: segregation, material substitution, process innovation, mechanical volume reduction, and recycling/reuse. In recent years, some aluminum cans, worker clothing, and office furniture have been recycled for use at K-25. Such recycling has saved approximately 1,150,000 kg (2,520,00 lb) of materials as of 1991. K-25 management supports the waste reduction program. An example of this program is the conversion to gas-fired boilers to reduce capacity excursions and, in effect, reduce or eliminate fly ash production.

Low-Level Waste. Solid LLW is generated by discarding radioactively contaminated construction debris, wood. paper, asbestos and trapping media. Solid LLW is also generated by process equipment and by removing radionuclides from liquid and airborne discharges. Currently, solid LLW is being stored for future disposal. Table H.2.1–14 shows the storage facilities that deal only with LLW. Specifics on some of the storage facilities are described below. Treatment of the current inventory of contaminated scrap metal at K-25 (as well as at Portsmouth, Paducah, and Fernald facilities) is expected to occur over the next 3 to 5 years as part of a comprehensive DOE Scrap Metal Program to be managed through K-25. All contaminated scrap metal is stored aboveground at the K-770 scrap metal facility until further disposal methods are evaluated.

The Uranium Hexafluoride Cylinder Program is directed toward improving the safety and reliability of long-term storage for 7,000 cylinders currently at K-25. These cylinders remain from the now-terminated gaseous diffusion mission. In storage at the site are approximately 5,000 9-metric tons (t) (10-tons) and 13-t (14 tons) cylinders of depleted uranium hexafluoride; 1,000 cylinders of normal-assay feed uranium hexafluoride; 400 cylinders containing more than 23 kg (50 lbs) of "enriched" material; and 600 miscellaneous empty cylinders. The Uranium Hexafluoride Cylinder Program is being designed to develop a clear understanding of the current conditions of the cylinders and define any near-term and long-term actions for safe storage of the cylinders, pending decisions on ultimate disposition of the uranium hexafluoride material. Some of the initial actions in the program are a baseline inspection, a corrosion coupon program, and an ultrasonic thickness measurement program. The baseline inspection identified a variety of cylinder defects that will require special attention and also identified four breached cylinders. Immediate corrective actions have been taken to handle the breached cylinders and a schedule of activities has been developed for moving and repairing the cylinders.

The cylinders containing normal-assay feed uranium hexafluoride are currently being shipped to the Paducah Gaseous Diffusion Plant. The current DOE direction for the 5,000 cylinders with depleted uranium hexafluoride is to store them until at least 2020, at which time conversion to oxide will be performed if no other uses have been determined. A plan for cleaning the cylinders containing more than 110 kg (50 lb) of enriched material and empties has not yet been approved (this may be performed at K-25 or at one of the operating gaseous diffusion plants).

Currently, there are no onsite disposal facilities being operated at K-25. An ORR Centralized Waste Management Organization has been established and assigned the responsibility to design, construct, and operate all new LLW disposal facilities for ORR. This organization is physically located at K-25.

Mixed Low-Level Waste. Mixed LLW primarily consists of contaminated waste oils, solvents, sludges, soils, and acid wastes. Table H.2.1–15 presents the inventory of mixed LLW as of December 31, 1992, along with a 5-year projection. Sludges contaminated with low-level radioactivity were generated by settling and scrubbing operations and were stored in K-1407B and K-1407C ponds. Sludges have been removed from these ponds, and a portion have been fixed in concrete at the K-1419 Sludge Treatment Facility and stored at Building K-33. These materials are considered mixed LLW and will be shipped offsite for disposal at a permitted commercial facility.

Most of the treatment of mixed waste is at the TSCA Incinerator and the Central Neutralization Facility. The majority of waste treated at the TSCA Incinerator cannot be treated by commercial incinerators because of radioactive contamination. All waste sent to this facility must be fully characterized and identified. DOE has an approved chain-of-custody system for all waste received from offsite. The K-1435 TSCA Incinerator is capable of incinerating waste that is mixed or contains PCBs. In 1990, a limited amount of waste was incinerated as a part of the startup testing. The incinerator began full operations in early 1991 and met all regulatory requirements in processing 1,000 m^3 (1,310 yd^3) of mixed waste. Mixed TSCA waste is being generated in the ash residue at the TSCA Incinerator. Compliance issues regarding the management of the mixed PCB and radioactive waste generated in the ash are being pursued with EPA by DOE.

Most of the radioactively contaminated wastewater treated at the Central Neutralization Facility is generated at the TSCA Incinerator from the wet scrubber blowdown. Treated effluents are discharged through a designated release point. The contaminated sludges that precipitate in the sludge-thickener tank are stored in an approved aboveground storage area at K-25.

RCRA-mixed, radioactive land-disposal-restricted waste (including some nonradiological classified land-disposal-restricted waste) has been stored in some areas for longer than 1 year. These wastes are currently subject to the land disposal restriction that permits storage only for accumulation of sufficient quantities to facilitate proper treatment, recycling, or disposal. This waste is being stored because of the nationwide shortage of treatment and disposal facilities for this type of waste. Private-sector technology demonstrations are being conducted that involve uranium extractions from sludge.

Uranium-contaminated PCB wastes (i.e., mixed wastes) are being stored in excess of the 1-year limit imposed by TSCA because of the lack of treatment and disposal capacities. DOE and EPA have signed a Federal Facility Compliance Agreement, effective February 20, 1992, to bring the facility into compliance with TSCA regulations for use, storage, and disposal of PCBs. It also addresses the approximately 10,000 pieces of nonradioactive PCB-containing dielectric equipment associated with the shutdown of diffusion plant operations.

In 1989, during routine inspections of the drums of stabilized K-1407 pond sludge at the K-1417 storage facility, it was discovered that many of the drums had begun to corrode. Free liquid (waste with a pH of 12) on top of the concrete in the drums was found to be causing the corrosion (OR DOE 1993a:9-16). An action plan has been implemented to decant and/or dewater the mixed waste contained in the drums. A total of 45,000 drums of stabilized material and 32,000 drums of raw sludge must be processed and moved to storage facilities that meet regulations governing mixed wastes. All containers will be transferred to and stored in new and existing facilities at the K-1065 site, and the K-31 and K-33 buildings.

Hazardous Waste. Hazardous wastes generated at K-25 include PCB articles and items, waste oils and items, and uncontaminated asbestos waste. All hazardous wastes are managed according to applicable state and Federal regulations and DOE orders. Several waste management facilities are already in place. Changing laws and regulations have made it necessary to upgrade several facilities and to design and construct new facilities that reflect the most recent environmental technology. The Central Neutralization Facility and the TSCA Incinerator are the two major facilities that treat hazardous waste.

The Central Neutralization Facility provides pH adjustment and chemical precipitation for several aqueous streams throughout K-25. The main purpose of the Central Neutralization Facility is to treat wastewater to ensure compliance with the requirements of NPDES discharge limits on pH, heavy metal concentrations, and suspended solids. The treatment system consists of two 94,600-L (25,000-gal) reaction tanks and a 227,000-L (60,000-gal) sludge-thickener tank. Acidic wastes are neutralized with a hydrated-lime slurry, and basic wastes are neutralized with sulfuric or hydrochloric acid. The hydrated lime bin and acid tanks are located at the facility. The treatment facility is physically divided into two distinct sections for treating both hazardous and nonhazardous waste streams.

The TSCA Incinerator consists of storage tanks, dikes, and the incinerator. The incinerator system consists of a liquid, solid, and sludge feed system; a rotary kiln incinerator; and a secondary combustion chamber. The wastes treated at this facility include oils, solvents, chemicals, sludges, and aqueous waste.

In general, most of the waste stored at K-25 is designated as hazardous waste that has been contaminated with PCBs. Recyclable materials such as mercury and silver-bearing photographic wastes are stored before recycling, while other hazardous wastes are stored until sufficient quantity is accumulated for an offsite shipment. All offsite disposals of hazardous wastes were halted in 1991 until procedures addressing a DOE performance objective of "No Rad Added" were developed by the sites and approved by DOE Headquarters. Incineration is the preferred method for offsite treatment or disposal of wastes, particularly PCB wastes; however, landfills and other types of disposal are used as needed. On the K-25 Site all hazardous waste is treated as mixed LLW.

Nonhazardous Waste. Computer paper is being recycled from the K-25 Computer Technology Center. The program for recycling paper is being reviewed for expansion into nonradiological areas. Product substitutions at the paint shop and photography lab have resulted in a decrease of waste generation. No percentage of reduction has been calculated due to the lack of baseline data.

Waste assay monitors have been purchased and are being used to screen solid, potentially radioactive waste to determine the potential to manage it as a nonhazardous waste. The K-770 clean scrap yard provides storage for nonradioactive scrap metal. The scrap metal is stockpiled before being sold to the public. The solid nonhazardous waste from K-25 is sent to Y-12 Industrial Landfill V. Some materials such as furniture, file cabinets, and paper are sold through property sales. The only nonhazardous treatment facility at K-25 is the Sanitary Waste Treatment Plant (Building K-1203). The system consists of an extended aeration treatment plant with a rate capacity of approximately 2,270,000 L/day (600,000 gal/day). The current demand is about 1,140,000 L/day (301,000 gal/day) (OR MMES 1995c:8-9). The sanitary sludge is disposed of in the Y-12 landfill. The Central Neutralization Facility does treat some nonhazardous liquid waste streams along with hazardous and/or mixed waste streams.

TABLE H.2.1–1.—*Low-Level and Mixed Low-Level Waste Treatment Capability at Y-12 Plant* [Page 1 of 2]

Treatment Unit	Treatment Method(s)	Input Capability	Output Capability	Total Capacity[a] (m^3/yr)	Comment
Biodenitrification Unit (Bldg. 9818)	Neutralization, pH adjustment, nitrate removal	Liquid mixed LLW (nitrate solutions from enriched uranium recovery-Buildings 9212 and 9206)	Biosludge to West End Treatment Facility	2,100	RCRA permit-by-rule. Design capacity.
Central Pollution Control Facility	Filtration, carbon adsorption, oil/water separation, and sludge dewatering	Liquid LLW, mixed LLW, and hazardous waste (nonnitrate liquid wastes)	Treated wastewater discharged through NPDES outfall and solids to west tank farm	10,300	NPDES permit April 28, 1995. RCRA permit-by-rule. Design capacity.
Cyanide Treatment Facility (Bldg. 9201-5N)	Chemical oxidation, pH adjustment	Liquid mixed LLW and hazardous waste (cyanide spent plating batches)	Wastewater to West End Treatment Facility	15	RCRA permit issued September 25, 1995. Also has 8 m^3 of mixed waste storage. Assumed operation is 250 days/yr, 8 hr/day.
Groundwater Treatment Facility (Bldg. 9616-7)	Carbon adsorption and air stripping	Liquid LLW and mixed LLW (liquid storage facility groundwater)	Groundwater air stripper effluent, spent carbon, and sludge to depleted uranium oxide storage vaults and liquid effluent through NPDES outfall	9,450	NPDES permit April 28, 1995. Facility may be treating mixed waste, but is intended for hazardous waste only. Maximum capacity is 17,700 m^3/yr.
Interim Reactive Waste Treatment Area	Open burning	Solid LLW (sodium-potassium waste)	Treated residue waste to depleted uranium oxide storage vaults and treated waste to K-25	Campaign 2 times per year, 8 hours per campaign, 57 L/day	RCRA permit application submitted August 1992. Design feedrate is 0.7 m^3/yr.
Liquid Storage Facility (Bldg. 9416-35)	Oil/water separation by filter cartridges	Liquid mixed LLW (leachate from certain capped burial grounds in Bear Creek Valley)	Stored liquids to groundwater treatment facility and PCB-laden oil to TSCA incinerator	9,450	Also a storage unit. Facility may be treating mixed waste, but is intended for hazardous waste only. RCRA permit-by-rule.
Uranium Chip Oxidation Facility	Thermal oxidation	Solid LLW (depleted and normal uranium chips)	Uranium oxide to Depleted Uranium Oxide Storage Vaults	Classified yearly treatment	Exempted from state air permitting requirements.
Uranium Recovery Operations (Bldg. 9206, 9272)	Leaching, filtration, dissolution, oxidation, evaporation, extraction	Metal and organic removal from aqueous stream, aqueous neutralization, purification for recycle	All waste diverted to Bioidentification Unit	2,100	System is exempt from permitting requirements under agreement with the State. Same capacity as Acid Neutralization and Recovery Facility. System removed from consideration for treatment.

TABLE H.2.1–1.—*Low-Level and Mixed Low-Level Waste Treatment Capability at Y-12 Plant* [Page 2 of 2]

Treatment Unit	Treatment Method(s)	Input Capability	Output Capability	Total Capacity[a] (m^3/yr)	Comment
Uranium Treatment Unit (Bldg 9206)	Filtration and precipitation	Liquid mixed LLW (uranium-contaminated organic solvents)	Organic waste to TSCA Incinerator at K-25	2 m^3/day	Closure plan submitted March 1995.
Waste Coolant Processing Facility (Bldg. 9983-78)	Extended activated sludge treatment, sludge drying	Liquid LLW and mixed LLW (contaminated waste coolants)	Oily solids to dewatering and drums, biological solids to dewatering, and liquid to Central Pollution Control Facility or West End Treatment Facility/West Tank Farm	756	Also a storage unit. Maximum capacity is 1,320 m^3/yr. RCRA permit-by-rule. Planned facility not currently funded.
Waste Feed Preparation Facility (Bldg. 9401-4)	Compaction	Compactible solid LLW	Compacted solid LLW to Y-12 Sludge Handling Pad	19,000	An exemption for the state air permit has been granted. Design feedrate is 23 m^3/hr. Intermittent operation at 8 hours/day and 2 days/week.
West End Treatment Facility (Bldg. 9616-7)	Absorption, anaerobic digestion, clarification, coagulation, filtration, flocculation, and precipitation	Liquid mixed LLW and hazardous waste (radioactive-contaminated and nonradioactive nitrate waste)	Liquid effluent through NPDES outfall	2,600	Permitted capacity NPDES permit issued April 28, 1995. RCRA permit-by-rule. Design capacity is 7,600 m^3/yr.

[a] For those facilities already in use, this is a normal operating capacity; whereas, for facilities under design or construction, this is a design capacity. Schedules and capacities for facilities under design or construction are subject to changes such as availability of funds, results of treatability studies, and permit issuance.

Source: DOE 1993h; DOE 1994k; DOE 1994n; DOE 1995gg; OR DOE 1995g; OR MMES 1993f; OR MMES 1995c.

TABLE H.2.1–2.—*Low-Level and Mixed Low-Level Waste Storage Capability at Y-12 Plant* [Page 1 of 2]

Waste Oil/Solvent Bulk Storage Grade Facility	Input Capability	Total Capacity[a] (m^3)	Comment
Above Grade Storage Pads	Solid LLW	7,130	Aboveground storage of LLW until completion of Low-Level Waste Disposal Facility.
Southeast Switchgear Room Bldg. 9201-4 (Alpha-4)	Solid mixed LLW (Old shutdown process waste) and LLW	65	RCRA Part B storage permit issued on September 28, 1995. Permitted storage capacity.
Bldg. 9404-7 (PCB Drum Storage Facility)	Solid PCB and uranium contaminated waste	40	Storage of liquid and/or hazardous waste not permitted except for PCB waste. Capacity for 496 drums.
Building 9206, Container Storage Area	Liquid/solid LLW and mixed LLW	15	RCRA Part B permit issued September 28, 1995.
Building 9212, Container Storage Area	Liquid/solid LLW and mixed LLW	15	RCRA Part B permit issued September 28, 1995.
Building 9720-25S	Liquid/solid LLW and mixed LLW	334	This is a new facility that previously stored classified waste only. RCRA Part B permit issued September 28, 1995.
Classified Waste Storage Area (CWSA), Bldg. 9720-25	Solid LLW and mixed LLW	495	RCRA Part B permit issued September 28, 1995.
Container Storage Facility (Bldg. 9720-12)	Solid mixed LLW	105	RCRA permit issued September 28, 1995. Design capacity is 123 m^3. Also contains hazardous and nonhazardous classified waste.
Containerized Waste Storage Area	Liquid/solid LLW and mixed LLW	632	Three concrete pads. RCRA permit issued September 28, 1995.
Contaminated Scrap Metal Storage Yard	Solid LLW (uranium-contaminated scrap)	4,740	No permit necessary.
Cyanide Treatment Facility	Cyanide spent plating batches, mixed LLW	8	RCRA permit issued September 28, 1995. Also treatment facility for hazardous and mixed wastes.
DARA Solid Storage Facility	Solid mixed LLW	5,060	RCRA interim status. Facility full as of August, 1994. Currently within the Environmental Restoration Program.
Depleted Uranium Storage Vaults I and II (9825-A and B oxide vault)	Solid LLW (depleted uranium oxide and metal)	1,020	Two vaults of reinforced concrete.
East Chestnut Ridge Waste Pile	Solid mixed LLW (contaminated soil and spoil from closure of RCRA units)	901	RCRA permit application submitted June 1993.
Liquid Organic Waste Storage Facility (Bldg. 9720-45, OD-10)	Liquid and solid mixed LLW. Ignitable nonreactive and radioactive waste. Can also include hazardous waste.	147	RCRA permit submitted September 1994. Consists of six storage tanks and a diked and covered storage area of approximately 186 m^3. Additional 40 m^3 of drum storage.
Liquid Storage Facility (Bldg. 9416-35)	Liquid hazardous and mixed LLW	416	RCRA permit-by-rule. Also a treatment unit. Provides temporary storage before treatment.
Oil Land Soils Containment Pad	Soil contaminated with PCBs and volatile organics	612	RCRA permit issued June 30, 1989

TABLE H.2.1–2.—*Low-Level and Mixed Low-Level Waste Storage Capability at Y-12 Plant* [Page 2 of 2]

Waste Oil/Solvent Bulk Storage Grade Facility	Input Capability	Total Capacity[a] (m^3)	Comment
PCB and RCRA Hazardous Drum Storage Facility, Bldg. 9720-9 (western half)	PCB and RCRA hazardous waste	738	RCRA permit issued September 28, 1995. The practical capacity has decreased to 20 m^3 due to renovation. Much of inventory was moved to 9720–25s.
RCRA and PCB Container Storage Area (Bldg. 9720-58)	Solid mixed LLW	580	RCRA permit issued September 28, 1995. Permitted RCRA waste materials. Hazardous waste section included in hazardous waste storage table.
RCRA Staging Area (Bldg. 9720-31)	Liquid and solid mixed LLW and hazardous waste	170	RCRA permit issued September 28, 1995.
Sludge Basin	Solid LLW	2,720	NA
Solid Storage Facility	Solid mixed LLW and hazardous waste to include PCB-contaminated waste	3,100	RCRA permit application submitted June 1993. Contains waste pile contaminated with radioactivity. Facility is currently within the Environmental Restoration Program.
Waste Oil/Solvent Bulk & Storage Facility (Bldg. 9811-1, OD-7)	Liquid hazardous waste and mixed LLW (oils and solvents contaminated with uranium and PCBs)	568	RCRA permit issued September 28, 1995. Four 30,000-gal and three 10,000-gal tanks.
Waste Oil/Solvent Drum Storage Facility (Bldg. 9811-1, OD-8)	Liquid and solid hazardous waste, LLW and mixed LLW	402	RCRA permit issued September 28, 1995. Waste is eventually taken to OD-9 or OD-10.
Waste Oil/Solvent Storage Facility (Bldg. 9811-8, OD-9)	Liquid mixed LLW (including PCBs) and hazardous waste	757	RCRA permit issued September 28, 1995. Site includes five storage tanks. Also includes 33 m^3 of storage for drums.
West End Tank Farm	Mixed LLW (sludge)	9480	Permit by rule.

[a] Schedules and capacities for facilities under design or construction are subject to changes such as availability of funds and permit issuance.

Note: NA - not applicable.

Source: DOE 1994n; OR DOE 1993a; OR DOE 1995g; OR MMES 1993f; OR MMES 1995c.

TABLE H.2.1–3.—*Mixed Low-Level Waste at Y-12 Plant*

Waste Matrix	Number of Waste Streams	Inventory as of December 31, 1992 (m^3)	Number of Waste Streams Five-Year Projection	Total Generation Five-Year Projection (m^3)
Contact-Handled				
Aqueous liquids/slurries	3	40	3	123
Organic liquids	4	314	4	383
Homogeneous solids	7	6,520	6	1,300
Soils/gravel	6	6,420	3	7
Debris waste	11	147	11	120
Labpacks	2	<1	None	None
Special waste	7	11	4	5
Other	3	9	1	<1
Total	43	13,461	32	1,938

Source: DOE 1995gg.

TABLE H.2.1–4.—*Hazardous Waste Treatment Capability at Y-12 Plant*

Treatment Unit	Treatment Method(s)	Input Capability	Output Capability	Total Capacity (m^3/yr)	Comment
Plating Rinsewater Treatment Facility (Bldg. 9623)	Chemical treatment followed by filtration.	Liquid industrial and hazardous wastes	Treated wastewater discharged through NPDES outfall	144,000	RCRA permit-to-rule. NPDES permit. Capacity based on maximum treatment in 1993.
Steam Plant Wastewater Facility	Cyanide destruction, pH adjustment, electrochemical chrome reduction, carbon adsorption and filtration.	Liquid hazardous (plating rinsewater) and mixed LLW	Treated wastewater discharged through Central Pollution Control Facility NPDES outfall and solids to West Tank Farm	144,000	RCRA permit-by-rule. NPDES permit. Capacity based on maximum treatment in 1993.

Source: DOE 1994n; DOE 1995gg; OR MMES 1995c.

TABLE H.2.1–5.—*Hazardous Waste Storage Capability at Y-12 Plant*

Storage Unit	Input Capability	Total Capacity (m^3)	Comment
Building 9418-9	PCB-contaminated mineral oil	53	Below-grade, diked tank.
Oil Drum Storage Area (OD3)	PCB-contaminated oils	45	Site is closed except for tanker.
Oil Landfarm Soils Storage Facility	Solid hazardous waste contaminated with PCBs and volatile organics (excavated soil from the closure of the Oil Landfarm)	612	RCRA permit application submitted June 1993. No new wastes are being stored.
PCB and RCRA Hazardous Drum Storage Facility, Bldg. 9720-9 (eastern half)	Liquid and solid PCB waste	751	RCRA permit issued September 28, 1995 and TSCA permit approved September 24, 1991. Part of building included in mixed waste storage table.
PCB and RCRA Container Storage Area (Bldg. 9720-58)	Solid hazardous waste and mixed LLW	223	Permitted PCB waste materials. Mixed waste included in mixed LLW table. RCRA permit issued September 28, 1995.
RCRA Storage and Staging Area (Bldg. 9720-31)	Liquid and solid hazardous waste to include PCB-contaminated waste	170	RCRA permit issued September 28, 1995.

Source: DOE 1994n; OR DOE 1993a; OR DOE 1995g; OR MMES 1995c.

TABLE H.2.1–6.—*Low-Level Waste Treatment Capability at Oak Ridge National Laboratory*

Treatment Unit	Treatment Method(s)	Input Capability	Output Capability	Total Capacity (m^3/yr)	Comment
Waste Compactor Facility (Bldg. 7831)	Compaction	Compactible solid LLW	Compacted solid LLW in B-25 3x3x4.6 m (4x4x6 ft) boxes to K-25	11,300	Design capacity.
Liquid Low-Level Waste Evaporation Facility (Bldg. 2531)	Evaporation/drying	Liquid LLW and mixed LLW	Evaporator condensates to process waste treatment plant. Some evaporator bottoms are stored at Melton Valley Facility.	18	Normal operating capacity. Maximum capacity is 4,540 L/hr for 20 days per month.
Melton Valley LLW Immobilization Facility	Liquid decantation, ion exchange, and solidification	Liquid mixed LLW and nonhazardous waste	Concrete block	189	System is limited to 189,000 L (50,000 gal) per campaign.
Process Waste Treatment Plant (Bldg. 3544)	Ion exchange, neutralization, clarification, and filter presses	Liquid LLW and mixed LLW	Solid LLW (filter cake) to storage at K-25. Wastewater is sent to nonradiological wastewater treatment plant.	265,000	Normal operating capacity. Design capacity is 390,000 m^3/yr.

Source: DOE 1994k; DOE 1994n; DOE 1995gg.

TABLE H.2.1–7.—*Low-Level and Mixed Low-Level Waste Storage Capability at Oak Ridge National Laboratory*

Storage Unit	Input Capability	Total Capacity (m^3)	Comment
Buildings 7823B, 7823E, 7827, 7829, 7831C, 7878A, B7823C, B7823D	Solid LLW	903	No permit necessary.
Buildings 7842A and 7856	Solid remote-handled LLW	949	No permit necessary.
Bulk Contaminated Soil Facility (Bldg. 7576)	Low-level contaminated soil	938	Planned and funded.
Class L-III/IV Retrievable Storage Facilities	Class III and IV solid LLW	566	Planned and funded. RCRA Part B permit submitted March 30, 1992.
Facility 7841	LLW (contaminated scrap metal)	1,020	No permit necessary.
Liquid Low-Level Waste System	Liquid LLW and mixed LLW	3,230	Active portion has 1,970 m^3 of storage. Includes Melton Valley Storage Tanks, which have capacity of 1,510 m^3.
Long-Term Hazardous Waste Storage Facility (Bldg. 7654)	Solid and liquid mixed LLW	62	Interim Part A (included in Part B application) submitted January 14, 1993.
Mixed Waste Drum Storage Pad (Bldg. 7507W)	Liquid/solid mixed LLW	74	Interim Part B RCRA submitted May 21, 1992.
Scrap Metal Accumulations Area	Contaminated scrap metal	4,350	No permit necessary.
Storage Facility–semi-underground (Bldg. 7823)	Liquid/solid mixed waste oils, solvents, and other process	110	Interim Part A (included on Part B application).
Tank 7830A	Bulk mixed waste oils	19	Interim RCRA Part A (included in RCRA Part B application).

Source: DOE 1994n; OR DOE 1995g; OR MMES 1995c.

TABLE H.2.1–8.—*Low-Level Waste Disposal Units at Oak Ridge National Laboratory*

Disposal Unit	Input Capability	Capacity (m^3)	Comment
Asbestos silos (SWSA-6)	Low-level contaminated asbestos	22	Unit accepts only Y-12 asbestos, if contaminated with other than uranium contamination, other than that no offsite waste accepted. Closed at end of 1993. Capacity is amount stored.
Biological trenches (SWSA-6)	Low-level contaminated biological waste	106	Landfill operation. Closed at end of 1993. Capacity is amount stored.
High range silos (SWSA-6)	Solid LLW (200 mrem/hr to 1 rem/hr)	23	Concrete silos inside diameter (15 ft x 8 ft). Closed at end of 1993. Capacity is amount stored.
Interim Waste Management Facility	Solid LLW B-25 boxes encased in concrete	3,590	Four Tumulus pads (18.2 x 27.4 m). Fifth under construction. Each pad provides 897 m^3 for disposal.
Low range silos (SWSA-6)	Solid LLW (<200 mrem/hr)	204	Concrete silos inside diameter (15 ft x 8 ft). Closed at end of 1993. Capacity is amount stored.

Source: DOE 1994n; OR MMES 1993d; OR MMES 1995c.

TABLE H.2.1–9.—*Mixed Low-Level Waste at Oak Ridge National Laboratory*

Waste Matrix	Number of Waste Streams	Inventory as of December 31, 1994 (m^3)	Number of Waste Streams Five-Year Projection	Total Generation Five-Year Projection (m^3)
Contact-Handled				
Aqueous liquid/slurries	3	22	3	34
Organic liquids	4	61	3	62
Homogeneous solids	6	4	5	4
Solids/gravel	3	5	3	8
Debris waste	9	7	9	22
Labpacks	4	36	4	3
Special wastes	7	2	5	2
Other	3	39	3	33
Remote-Handled				
Aqueous liquid, alpha	1	2,780	None	532
Homogeneous solids	1	42	None	None
Total	42	2,998	36	700

Source: DOE 1995gg.

TABLE H.2.1–10.—*Hazardous Waste Treatment Capability at Oak Ridge National Laboratory*

Treatment Unit	Treatment Method(s)	Input Capability	Output Capability	Total Capacity[a]	Comment
Acid Neutralization Facility	Neutralization	Liquid blowdown and demineralizer regeneration from Steam Plant	Effluent to Nonradiological Wastewater Treatment Plant	44,900	Volume treated in 1992. Design feedrate is $23 m^3$/hr.
Chemical Detonation Facility (Bldg. 7667)	Open burning	Solid and liquid explosive wastes (lab pack flammables)	Residue (ash) to Sludge Fixation Facility for treatment	Campaign	RCRA interim permit submitted January 14, 1993.
Leaking Gas Cylinder Area	Venting of damaged and excess gas cylinders	Hazardous gas cylinders	Returned to vendors or disposed of at Y-12 Plant Sanitary Landfill II	Campaign	Remote site consisting of clear area.
Non-Radiological Wastewater Treatment Plant (Bldg. 3608)	Clarification, filtering, air stripper, absorption, neutralization, dewatering, and ion exchange	Liquid corrosive waste in storage	Dewatered waste, carbon, liquid discharge	745,000	Normal operating capacity. Design capacity is 1,510,000 m^3/yr.

[a] For those facilities already in use, this is a normal operating capacity; for facilities under design or construction, this is a design capacity. Schedules and capacities for facilities under design or construction are subject to changes such as availability of funds, results of treatability studies, and permit issuance.

Source: DOE 1994n; DOE 1995gg; OR DOE 1994a; OR MMES 1995c.

TABLE H.2.1–11.—*Hazardous Waste Storage Capability at Oak Ridge National Laboratory*

Storage Unit	Input Capability	Total Capacity (m^3)	Comment
Chemical Waste Storage Facility (Bldg. 7653)	Solid explosives, lab pack chemicals, and waste reactive metals	26	RCRA interim permit. Part A included on Part B application. Can be used for mixed waste. Permitted storage is 12 m^3.
Clean Oil Storage Pad (Bldg. 7651)	Clean oil	27	RCRA interim permit. Part A included on Part B application. Can be used for mixed waste. Permitted storage.
Hazardous Waste Storage Facility (Bldg. 7507)	Liquid PCB	31	RCRA interim permit. Part A included on Part B application. Can be used for mixed waste.
Hazardous Waste Storage Facility (Bldg. 7652)	Hazardous bulk liquids and solids	57	Final RCRA Part B September 1, 1986. Can be used for mixed wastes.

Source: DOE 1994n; OR MMES 1995c.

TABLE H.2.1-12.—*Low-Level, Mixed Low-Level, and Hazardous Waste Treatment Capability at K-25 Site*

Treatment Unit	Treatment Method(s)	Input Capability	Output Capability	Total Capacity (m^3/yr)	Comment
Central Neutralization Facility (K-1407H)	Clarification, thickening, and neutralization	Liquid LLW, mixed LLW, and hazardous waste	Liquid effluent through NPDES outfall and sludge to hazardous waste storage unit	221,000	RCRA permit-by-rule, NPDES permit. Permitted capacity. Normal operation capacity is 111,000 m^3/yr.
Liquid Pretreatment Facility	Neutralization, precipitation, liquid separation, and chemical oxidation/reduction	Liquid aqueous and organic mixed wastes.	Effluent to existing wastewater facilities or TSCA incinerator	Planned	Batch process
Sludge Fixation Facility (Bldg. K-1419)	Screening, solidification/stabilization, centrifuging, and neutralization	Mixed waste sludges and solids	Liquid effluent to Central Neutralization Facility. Solidified container stored at Concrete Block Casting and Storage Yard (Bldg. K-1417)	2.5 m^3/hr	Design feedrate RCRA permit submitted May 18, 1989. Facility on stand by.
TSCA Incinerator (K-1435)	Incineration (rotary kiln)	Liquid and solid - mixed LLW, LLW and mixed LLW contaminated with PCBs	Ash (solid mixed LLW and hazardous) to hazardous waste storage unit, WSU-012, ash water and blowdown water (mixed LLW and hazardous) to central neutralization facility, and sludge (solid mixed LLW) to sludge fixation facility	1860 (liquid only)	Final State CAA permit approved; state RCRA permit expires September 27, 1997 and TSCA permit expires March 20, 1992. Site given continued authority to operate an old TSCA permit for air and normal operating capacity. Maximum capacity is 15,700 m3/yr.
Wastewater Treatment Facility (K-1232)	Centrifugation, neutralization, and precipitation	Liquid mixed LLW	Leachate (liquid LLW) to central neutralization facility and sludge (solid mixed LLW) to sludge fixation facility	0.8m^3/hr	RCRA permit submitted May 18, 1989. Design feedrate. Facility not currently being utilized.

Source: DOE 1994n; DOE 1995gg; OR DOE 1994a.

TABLE H.2.1–13.—*Low-Level, Mixed Low-Level, and Hazardous Waste Storage Capability at K-25 Site* [Page 1 of 4]

Storage Unit	Input Capability	Total Capacity[a] (m^3)	Comment
Buildings K-1232, K-305-12, K306-4	Mixed LLW and LLW	688	Permitted.
Buildings K-1417 and K-1419	Mixed waste (sludge)	27,100	Under RCRA closure. Pond Waste Management Project storage facility for pond waste sludge.
Combustible Liquid Storage Tanks (K-1202)	Liquid LLW, mixed LLW, and hazardous waste	108	RCRA permit expires September 1, 2002. Two bulk storage tanks.
Flammable Liquid Storage Unit (K-1420A)	Liquid mixed LLW, PCB waste, and hazardous waste	108	RCRA permit expires September 1, 2002. Two bulk storage tanks.
Hazardous Waste Storage Unit (K-311-1)	Solid mixed LLW and hazardous waste	456	RCRA permit expires September 1, 2002. Vault for radiogenic lead waste.
Hazardous Waste Storage Unit (K-310-1)	Liquid and solid LLW, mixed LLW, hazardous, and non-RCRA waste	445	RCRA permit expires September 1, 2002. RCRA sludges and ash from operation of K-1035 incinerator. No remaining capacity as of August 1994.
Hazardous Waste Storage Unit (Vault 2A)	Liquid and solid LLW, mixed LLW, hazardous, and non-RCRA waste	439	RCRA permit expires September 1, 2002. Practical capacity.
Hazardous Waste Storage Unit (K-309-3)	Liquid and solid LLW, mixed LLW, hazardous, and non-RCRA waste	416	RCRA permit expires September 1, 2002. Has been used for RCRA, PCB, and mixed wastes from all sites at ORR.
Hazardous Waste Storage Unit, (K-301-1, Vault 4)	Liquid and solid LLW, mixed LLW, hazardous, and non-RCRA waste to include PCBs	431	RCRA permit expires September 1, 2002. Storage of laboratory waste acids, bases, and organics.
Hazardous Waste Storage Unit, (K-301-1, Vault 4A)	Liquid and solid LLW, mixed LLW, hazardous, and non-RCRA waste to include PCBs	637	RCRA permit expires September 1, 2002. Waste consists of sludges and incinerator ash.
Hazardous Waste Storage Unit, (K-301-2, Vault 4B)	Liquid and solid LLW, mixed LLW, hazardous, and non-RCRA waste to include PCBs	380	RCRA permit expires September 1, 2002. Waste consists primarily of photographic waste and incinerator ash.
Hazardous Waste Storage Unit, (K-302-4)	Liquid and solid LLW, mixed LLW, hazardous, and non-RCRA waste to include PCBs	503	RCRA permit expires September 1, 2002. Storage of PCB organics and mercury-contaminated organics.
Hazardous Waste Storage Unit, (K-302-5, Vault 8A)	Liquid and solid LLW, mixed LLW, hazardous, and non-RCRA waste to include PCBs	635	RCRA permit expires September 1, 2002. Storage of hazardous wastes from K-25 and Y-12.
Hazardous Waste Storage Unit, (K-302-5)	Liquid and solid LLW, mixed LLW, hazardous and non-RCRA waste to include PCBs	464	RCRA permit expires September 1, 2002. Storage of RCRA and mixed wastes from K-25 and Y-12.

TABLE H.2.1–13.—*Low-Level, Mixed Low-Level, and Hazardous Waste Storage Capability at K-25 Site* [Page 2 of 4]

Storage Unit	Input Capability	Total Capacity[a] (m^3)	Comment
Hazardous Waste Storage Unit (K-303-1)	Liquid and solid mixed LLW, mixed LLW, hazardous and non-RCRA waste to include PCBs	592	RCRA permit expires September 1, 2002.
Hazardous Waste Storage Unit (K-303-2)	Liquid and solid mixed LLW, mixed LLW, hazardous and non-RCRA waste to include PCBs	496	RCRA permit expires September 1, 2002.
Hazardous Waste Storage Unit (Bldg. K-305-6, Vault 19A)	Liquid and solid mixed LLW, LLW, hazardous and non-RCRA waste to include PCBs	592	RCRA permit expires September 1, 2002.
Hazardous Waste Storage Unit (K-305-6)	Liquid and solid LLW, mixed LLW, hazardous and non-RCRA waste to include PCBs	354	RCRA permit expires September 1, 2002.
Hazardous Waste Storage Unit (K-305-12)	Liquid and solid mixed LLW, LLW, hazardous and non-RCRA waste to include PCBs	789	RCRA permit expires September 1, 2002. Includes 3 m^3 of LLW and/or contaminated scrap metal as of June 1994.
Hazardous Waste Storage Unit (K-306-1)	Liquid and solid LLW, mixed LLW, hazardous and non-RCRA waste to include PCBs	224	RCRA permit expires September 1, 2002. Sludges generated during treatment of Y-12 wastewaters.
Hazardous Waste Storage Unit (Vault 23A)	Liquid and solid LLW, mixed LLW, hazardous and non-RCRA waste to include PCBs	429	RCRA permit expires September 1, 2002. Sludge generated during treatment of Y-12 wastewaters at either K-1232 of Y-12 facilities.
Hazardous Waste Storage Unit (K-306-3)	Liquid and solid LLW, mixed LLW, hazardous and non-RCRA waste to include PCBs	369	RCRA permit expires September 1, 2002. Storage of RCRA, PCB, and mixed wastes from K-25, Y-12, and ORNL.
Hazardous Waste Storage Unit (K-306-4, Vault)	Liquid and solid mixed LLW, mixed LLW hazardous and non-RCRA waste to include PCBs	399	RCRA permit expires September 1, 2002. Mixed waste.
Hazardous Waste Storage Unit (Vault 25A)	Liquid and solid mixed LLW, LLW, hazardous and non-RCRA waste to include PCBs	1,030	RCRA permit expires September 1, 2002.
Hazardous Waste Storage Unit (K-1036-A)	Liquid and solid LLW, mixed LLW, hazardous and non-RCRA waste to include PCBs	150	RCRA permit expires September 1, 2002. Used for solvents and waste oil storage. Oil may be contaminated. Maximum capacity 2,000 55-gal drums.
Hazardous Flammable Waste Storage Unit (K-711)	Liquid and solid LLW, mixed LLW, hazardous and non-RCRA waste to include PCBs	312	RCRA permit expires September 1, 2002. Waste oils and solvents generated at other DOE facilities. Maximum capacity of 1,800 55-gal drums.

TABLE H.2.1–13.—*Low-Level, Mixed Low-Level, and Hazardous Waste Storage Capability at K-25 Site* [Page 3 of 4]

Storage Unit	Input Capability	Total Capacity[a] (m^3)	Comment
Hazardous Waste Storage Unit (K-1025C)	Liquid and solid LLW, mixed LLW, hazardous and non-RCRA wastes	9	RCRA permit expires September 1, 2002. No incompatibles. Used for out-of-date or off-specification laboratory chemicals disposed through offsite commercial facilities.
Hazardous Waste Storage Unit (K-1302)	LLW, mixed LLW, hazardous, and non-RCRA compressed gas	3	RCRA permit expires September 1, 2002. Gases are commercial products that are to be discarded or treated.
K-31 WP (stabilized sludge storage)	Hazardous/mixed waste	8,000	RCRA permit expires July 1, 2023. Storage of solidified pond waste sludge from closure of K-1407B and -C ponds. Design capacity is 8,000 m^3.
K-33 WP (stabilized sludge storage)	Mixed LLW	8,510	Permitted. Storage of solidified pond waste sludge from closure of K-1470B and -C ponds. Material continues to be shipped offsite for disposal.
K-301-4, K-25 Building, one unnamed Vault	Solid hazardous/mixed waste	377	Permitted Part B.
K 303-3/Vault 10A, 11A	Solid LLW and mixed LLW	10,400	Permitted. Includes contaminated scrap metal. Awaiting letter of approval from state before use as hazardous waste storage facility.
K-306-IT, Bldg. K-25 (Vault)	Liquid/solid mixed waste	156	Permit not necessary.
K-310-3, Vault in Building K-25	Hazardous/mixed waste	527	RCRA permit expires September 1, 2002. New facility. Awaiting letter of approval from State before use as a hazardous waste storage facility.
K-402-1 Process Vault and Vault 31X, Building K-27	Hazardous/mixed waste	765	RCRA permit expires September 2002. Formerly LLW storage unit. Awaiting letter of approval from State before use as a hazardous waste storage facility.
K-1065-A, -B, -C, -E	Mixed waste/sludge	4,680	RCRA permit expires 2023. Pond Waste Management Project storage units for pond waste sludge.
RCRA Storage Unit, Vault 3A	Liquid and solid LLW and hazardous wastes	326	RCRA final permit expires 2002. Will be used for RCRA and mixed wastes from K-25, Y-12, and ORNL. Currently, empty PCB-contaminated containers from K-25 and Y-12 being stored in vault.
TSCA Container and Tank Storage (K-1435)	Non-PCB contaminated flammable liquid and mixed low-level that is also PCB-contaminated	527	TSCA incinerator has three storage areas. The Tank Farm has 3 10,000-gal and 12 5,000-gal tanks for liquid only. Area B (TSCA waste) can store 352 55-gal drums and Area C (RCRA waste) can store 496 55-gal drums. Part B permitted.
TSCA Storage Unit (K-33)	Liquid and solid hazardous waste (PCB)	960	No permit required.
TSCA Storage Unit (K-726)	Liquid and solid - LLW and non-RCRA, nonradioactive waste contaminated with PCBs	94	No permit required to store waste when covered under TSCA. Concrete block building - PCB waste.

TABLE H.2.1-13.—*Low-Level, Mixed Low-Level, and Hazardous Waste Storage Capability at K-25 Site* [Page 4 of 4]

Storage Unit	Input Capability	Total Capacity[a] (m^3)	Comment
TSCA Storage Unit (K-303-4)	Liquid and solid - LLW and non-RCRA, nonradioactive waste contaminated with PCBs	583	No permit necessary.
Vault 5A, Bldg. K-25	Solid hazardous/mixed LLW	535	Permitted. Awaiting letter of approval from state before use as a hazardous waste storage facility.
Vault 24A, K-306-4	Solid hazardous/mixed LLW	292	Permitted. New facility. Awaiting letter of approval from state before use as a hazardous waste storage facility.
Waste Oil/Hazardous Wastes Storage I (K-1425 containers)	Liquid and solid LLW and mixed LLW	85	RCRA Part B permit issued September 30, 1992. Wastes stored include oils, solvents, water, and organics. Max. capacity is 480 55-gal drums.
Waste Oil/Hazardous Wastes Storage II (K-1425 tanks)	Liquid LLW and mixed LLW	343	RCRA Part B permit issued September 30, 1992. Wastes stored include oils, solvents, water, and organics. Four 22,500-gal tanks.

[a] Schedules and capacities for facilities under design or construction are subject to changes such as availability of funds, results of treatability studies, and permit issuance. These capacities are the practical capacity rather than the design capacity.

Source: DOE 1994n; OR DOE 1993a; OR DOE 1995g; OR MMES 1993e; OR MMES 1995c; ORR 1993a:11.

TABLE H.2.1–14.—*Low-Level Waste Storage Capability at K-25 Site*

Storage Unit	Input Capability	Total Capacity[a] (m^3)	Comment
Contaminated Scrap Metal Yard (K-770)	Solid LLW (uranium-contaminated scrap metal, ferrous and nonferrous)	202,000	6.9 acres of contaminated scrap metal. Design capacity. As of June 1994, 29,600 m^3 of LLW can be stored. Responsibility for facility transferred to Environmental Restoration in 1994 and is no longer available for LLW storage.
K-33 LLW Drum and Container Facilities	Liquid/solid LLW	3,110	No permit necessary.
K-1313A (Rubb Tents I, II)	Solid LLW	246	Permit not necessary. Used to store Y-12, ORNL, and K-25 LLW.
LLW Storage Unit (K-310-2)	Liquid and solid LLW	654	Used for radioactively contaminated waste generated at ORNL.
LLW Storage Unit (K-309-2)	Liquid and solid LLW, non-RCRA, and nonradioactive (soils and metals)	663	Used for radioactively contaminated waste from K-25.
LLW Storage Unit (K-303-5)	Liquid and solid LLW	470	RCRA permit expires September 1, 2002. Construction upgrades required before storage of mixed waste. Used for radioactively contaminated waste from K-25, Y-12 and ORNL.
LLW Storage Unit (Vault 15A)	Solid LLW	564	RCRA interim status September 1, 1990. Construction upgrades required before storage of mixed waste. Used for radioactively contaminated waste from K-25, Y-12 and ORNL.
LLW Storage Unit (K-306-2)	Solid LLW	396	Used for radioactively contaminated soil from Y-12. As of June 1994, 246 m^3 of LLW can be stored.
LLW Storage Unit (K-306-7)	Liquid and solid LLW	343	Used for radioactively contaminated soil from Y-12. As of June 1994, 314 m^3 of LLW can be stored.
LLW Storage Unit (K 1066-H)	Solid LLW (containerized)	4,730	Outdoor storage area.
Vault 6 (K-25 building)	Solid LLW	269	No permit necessary.

[a] Schedules and capacities for facilities under design or construction are subject to changes such as availability of funds and permit issuance.

Source: DOE 1994n; OR DOE 1993a; OR DOE 1995g; OR MMES 1995c.

TABLE H.2.1–15.—*Mixed Low-Level Waste at K-25 Site*

Waste Matrix	Number of Waste Streams	Inventory as of December 31, 1994 (m^3)	Number of Waste Streams Five-Year Projection	Total Generation Five-Year Projection (m^3)
Contact-Handled				
Aqueous liquids/slurries	5	442	5	169
Organic liquids	6	348	4	118
Homogeneous solids	15	27,800	8	1,380
Soils/gravel	4	272	3	49
Debris waste	12	386	12	317
Labpacks	2	22	2	5
Special waste	7	117	4	10
Other	3	66	1	1
Total	54	29,453	39	2,049

Source: DOE 1995gg.

H.2.2 Savannah River Site

The process of manufacturing useful nuclear materials has produced radioactive, mixed, and hazardous wastes that are treated, stored, or disposed of at SRS. The *Savannah River Site Waste Management Final Environmental Impact Statement* (DOE/EIS-0217, July 1995) addressed the tasks to be completed in the next 10 years to clean up existing waste units and bring current operations into compliance with applicable regulations. The EIS discusses the current conditions and provides DOE's preferred alternatives for processing current and future waste streams. It also addresses the development and funding of processes to minimize waste generation and to safely process and dispose of future waste generation. Because there is no spent nuclear fuel associated with the fabrication of primaries, there will be no further discussion of spent nuclear fuel at SRS.

Pollution Prevention. Pollution prevention, previously driven by best management practices and economics, is now mandated by statutes, regulations, and agency directives. The SRS Waste Minimization and Pollution Prevention Program is designed to achieve a continuous reduction of wastes and pollutant releases to the maximum extent feasible in accordance with regulatory requirements while fulfilling national security missions. The SRS Waste Minimization and Pollution Prevention Awareness Plan addresses wastes and potential pollutants of all types and establishes priorities for accomplishing waste minimization and pollution prevention through source reduction, recycling, treatment, and environmentally safe disposal.

High-Level Waste. Liquid HLW containing actinides and hazardous chemicals was generated from recovery and purification of TRU products and from spent fuel processing, and is retrievably stored in 51 underground tanks. One of these tanks is out of service. The tanks are managed in compliance with Federal laws, State of South Carolina regulations, and DOE orders. The waste is segregated by heat generation rate, neutralized to excess alkalinity, and stored to permit the decay of short-lived radionuclides before its volume is reduced by evaporation. Of the 51 tanks, 29 are located in the H-Area Tank Farm, and 22 are located in the F-Area Tank Farm. The tanks are of four different designs, but all are of carbon steel. Newer tanks which have full height secondary containment and forced water cooling are used for waste processing. Some older tanks contain salt and sludge awaiting waste removal. Old tanks that have had waste removed except for residue are used to store low-activity waste. The older tanks will be taken out of service when space in other tanks becomes available due to transfer to the Defense Waste Processing Facility.

High-heat liquid waste is stored for 1 to 2 years to allow decay of radionuclides before being processed through evaporators. Low-heat waste is sent directly to the evaporator feed tanks. Each tank farm has one evaporator that is used to reduce the volume of the water and concentrate the solids. A replacement higher capacity evaporator is planned that may be used in conjunction with the current evaporators. Liquids can be reduced to 25 to 33 percent of their original volume and stored as salts or sludges. Cesium removal columns can operate in conjunction with the evaporators. The evaporators obtain decontamination factors of 10,000 to 100,000 and the cesium removal columns can obtain another 10 to 200 decontamination factors. Decontaminated liquids (overheads) are sent to the Effluent Treatment Facility for processing before being released to Upper Three Runs Creek. The concentrated salt solution is processed to remove radionuclides, and the decontaminated solution is sent to the Defense Waste Processing Facility Saltstone Facility for solidification and onsite storage in the Saltstone Vaults.

The remaining sludges and salts contain the majority of the radionuclides and are stored separately awaiting vitrification. Prior to vitrification, salt would be precipitated in the in-tank precipitation process. The precipitate and sludge would be fed into the vitrification process in the Defense Waste Processing Facility. The waste would be mixed with borosilicate glass and immobilized by melting and then pouring the mixture into stainless steel cylinders. These cylinders would be stored in a shielded facility at the Defense Waste Processing Facility until a repository is available. Figure H.2.2–1 illustrates HLW management at SRS. Tables H.2.2–1, H.2.2–2, and H.2.2–3 list HLW inventories and treatment and storage facilities at SRS.

Transuranic Waste. All TRU waste currently being generated is stored in containers on aboveground storage pads in compliance with state regulations and DOE orders. Older TRU wastes (prior to 1965) were

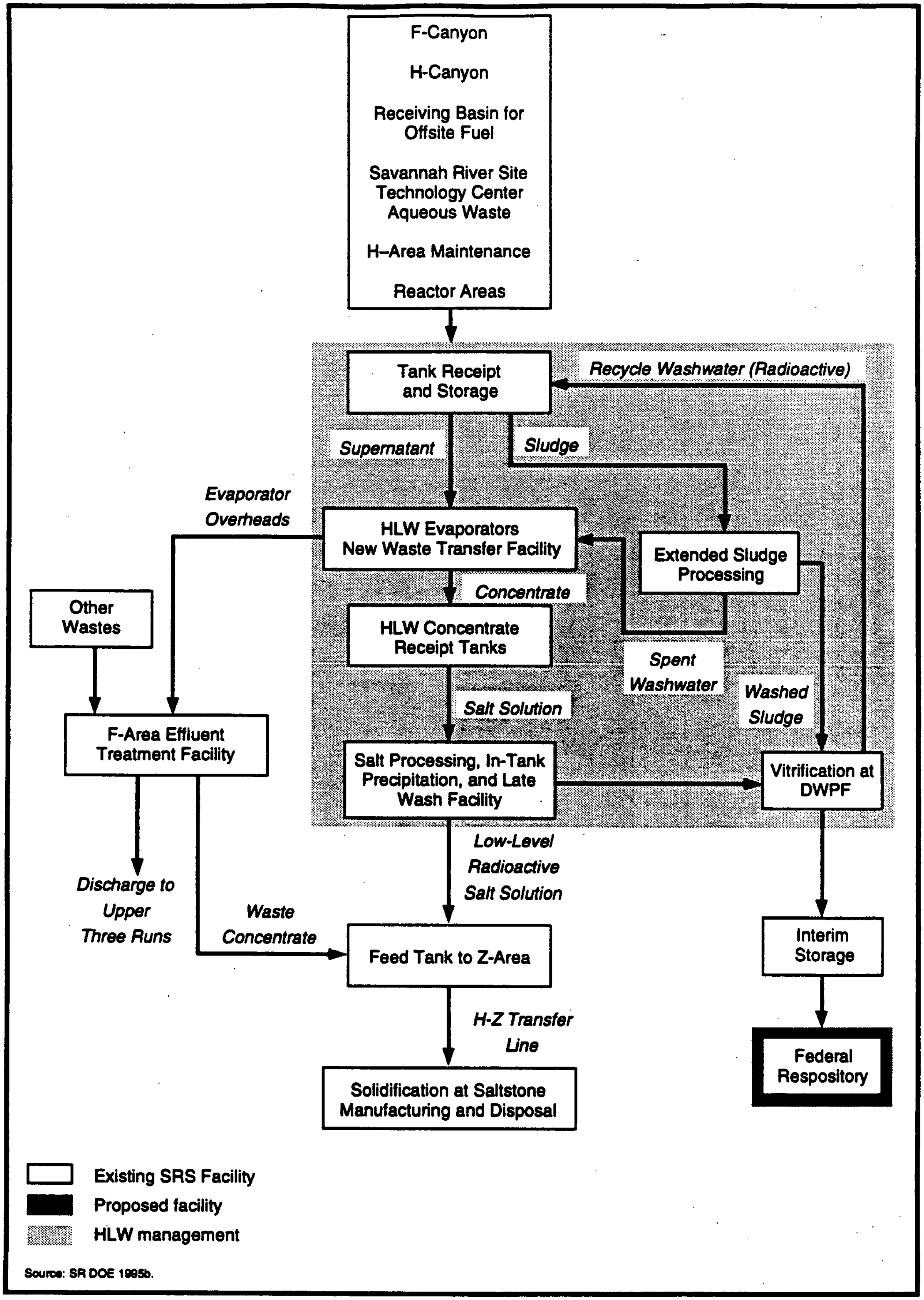


FIGURE H.2.2–1.—*High-Level Waste Management Plan at Savannah River Site.*

TABLE H.2.2–1.—*High-Level Wastes at Savannah River Site*

Waste Matrix	Number of Waste Streams	Inventory as of September 30, 1994 (m^3)	Number of Waste Streams Five-Year Projection	Total Generation Five-Year Projection (m^3)
Remote-Handled				
Aqueous liquids, slurries	2	127,040	2	15,430

Source: SR DOE 1995c; WSRC 1995a.

TABLE H.2.2–2.—*High-Level Waste Treatment Capability at Savannah River Site*

Treatment Unit	Treatment Method	Input Capability	Output Capability	Total Capacity[a] (m^3 per year)	Comment
F- and H-Tank Farms	Neutralization dissolution and chemical reaction	HLW aqueous liquid solutions and slurries	HLW aqueous liquid, sludge, and solutions	[b]	Operational
Savannah River Technology Center high activity treatment probe	Ion exchange	HLW aqueous liquid	Mixed LLW liquid and HLW sludge	1,725	Operational
F- and H-evaporators	Evaporation and ion exchange (cesium removal)	HLW aqueous liquid	HLW sludge, salt, slurry, and organic solid	26,900[c]	Operational
Replacement evaporator	Evaporation and ion exchange (cesium removal)	HLW aqueous liquid	HLW sludge, salt, slurry, and organic solid	13,800	Design and construction phase planned for 1999
Defense Waste Processing Facility	Vitrification	HLW and precipitate slurry	HLW borosilicate	18,800	Operational
Extended sludge processing	Soil washing to remove soluble salts, precipitation	HLW sludge	HLW sludge	834	Operational
In-tank precipitation	Soil washing to remove soluble salts, precipitation	HLW salt solution	LLW salt solution and HLW precipitate slurry	Would produce 22,700 m^3 salt solution and 1,900 m^3 precipitate	Operational
Late wash	Washing to remove sodium nitrate	HLW precipitate slurry	HLW precipitate	24,600	Undergoing design and construction

[a] For those facilities already in use, this is a normal operating capacity; whereas, for facilities under design or construction, this is a design capacity. Schedules and capacities for facilities under design or construction are subject to changes such as availability of funds, results of treatability studies, and permit issuance.

[b] Batch process; depends on available tanks and process used.

[c] Based on net tank space gained. Input volume.

Source: SR DOE 1994b; SR DOE 1995b; SR DOE 1995c; WSRC 1995a; WSRC 1995b.

TABLE H.2.2–3.—*High-Level Waste Storage at Savannah River Site*

Storage Unit	Input Capability	Total Capacity[a]	Comment
F- and H-Area Tank Farms[b]	HLW, corrosive, toxic aqueous liquids, salt, and sludge	145,000 m^3	Operational
Defense Waste Processing Facility vitrification plant, glass waste storage buildings	HLW solid borosilicate glass in stainless steel cylinders	2,286 canisters (3.8 t glass)	First unit available December 31, 1995, one building constructed, one more planned
Defense Waste Processing Facility vitrification plant, failed equipment storage	Failed melters	3,720 m^3	

[a] Schedules and capacities for facilities under design or construction are subject to changes such as availability of funds and permit issuance.
[b] Tanks that do not meet secondary containment criteria as described in the Federal Facility Compliance Agreement are not included.
Source: SR DOE 1994b; SR DOE 1995c.

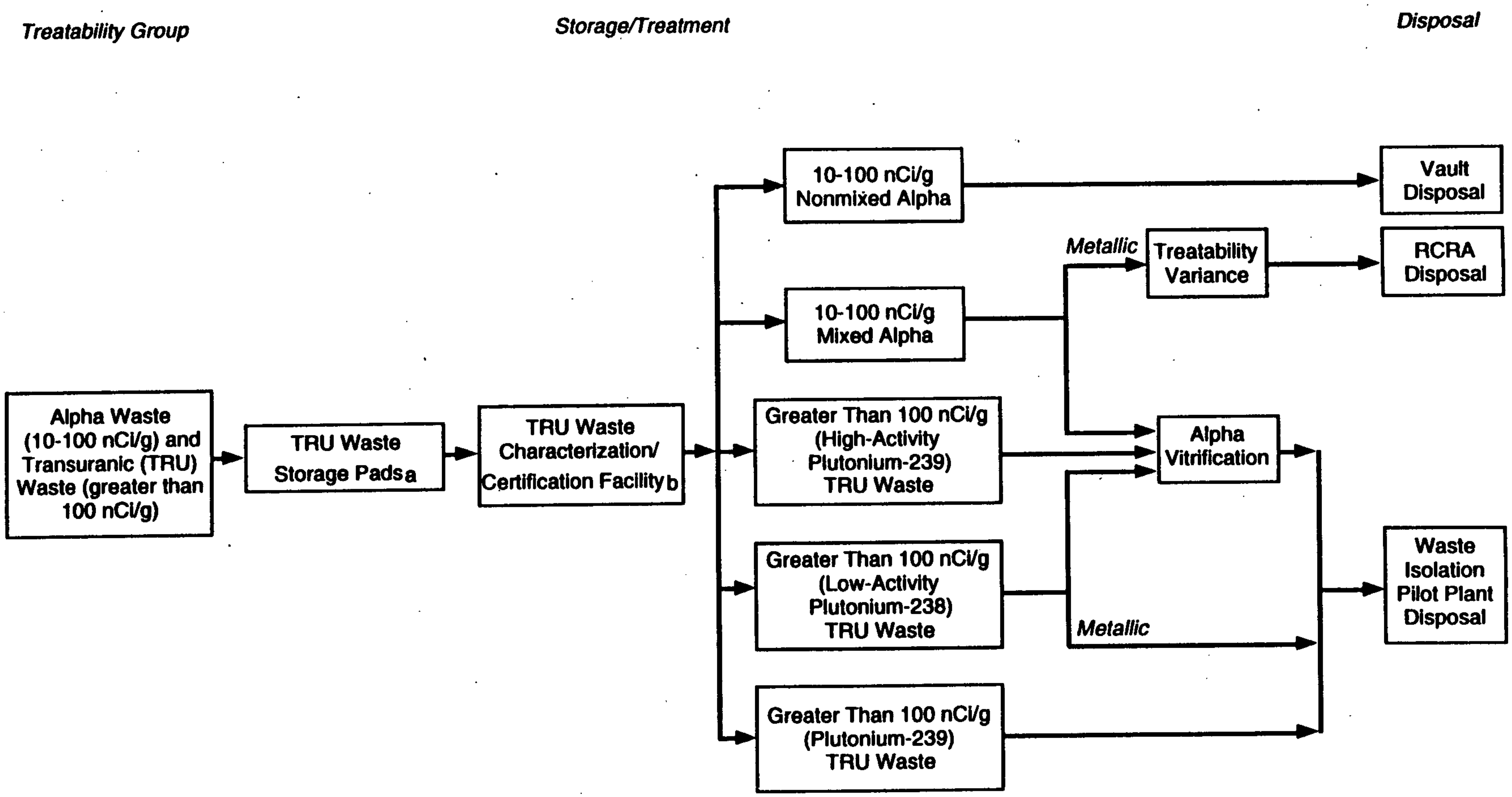
buried in plastic bags and cardboard boxes in earthen trenches. Wastes containing more than 0.1 curies (Ci) per package were placed in concrete containers and buried. Wastes containing less than 0.1 Ci per package were buried unencapsulated in earthen trenches. Since 1974, TRU wastes containing more than 10 nCi/g have been stored in retrievable containers free of external contamination. Polyethylene-lined galvanized drums containing more than 0.5 Ci are additionally protected by closure in concrete culverts.

Currently, approximately 85 percent of the TRU waste in storage is suspected of being contaminated with hazardous constituents. Presently, waste is characterized by onsite generators and is being stored prior to final disposal. TRU waste containing less than 100 nCi/g may be disposed of as LLW at SRS. Waste containing greater than 100 nCi/g and meeting the final WIPP Waste Acceptance Criteria will be sent to WIPP, if it is determined to be a suitable repository pursuant to the requirements of 40 CFR 191 and 40 CFR 268. Waste not meeting the acceptance criteria as currently packaged will be repackaged as necessary to meet the WIPP Waste Acceptance Criteria. If additional treatment is necessary for disposal at WIPP, SRS would develop the appropriate treatment technology, or ship this waste to another facility for treatment. Studies are underway to solve the problem of high-heat TRU waste, which is unique to SRS. Wastes with high plutonium-238 fractions generate too much heat to be shipped in the Transuranic Package Transporter (TRUPACT)-II container. TRU waste is currently stored on 17 pads at the Solid Waste Disposal Facility in E-Area. The TRU waste management plan is illustrated in figure H.2.2–2. Table H.2.2–4 lists the mixed TRU waste inventories. Tables H.2.2–5 and H.2.2–6 present the TRU and mixed TRU waste treatment and storage facilities.

Low-Level Waste. Both liquid and solid LLW are treated at SRS. Liquids are managed and processed to remove and solidify the radioactive constituents and to release the balance of the liquids to permitted discharge points in compliance with state regulations. The bulk of liquid waste is aqueous process waste including effluent cooling water, purge water from storage basins for irradiated reactor fuel or target elements, distillate from the evaporation of process waste streams, and surface water runoff from areas where there is a potential for radioactive contamination. Aqueous LLW streams are sent to the Effluent Treatment Facility where they are treated by filtration, reverse osmosis, and ion exchange to remove the radionuclide contaminants. After treatment, the effluent is discharged to Upper Three Runs Creek. The resultant wastes are concentrated by evaporation and stored in the H-Area Tank Farm prior to treatment in the Defense Waste Processing Facility Saltstone Facility. In that facility, they are processed with grout for onsite disposal. Figure H.2.2–3 illustrates the LLW processing at SRS. Treatment and storage facilities for LLW are listed in tables H.2.2–7 and H.2.2–8.

Disposal of solid LLW at SRS traditionally has been accomplished using engineered trenches in accordance with the guidelines and technology existing at the time of disposal. Currently, packaged LLW is deposited in the E-Area vaults, which are concrete structures that meet the requirements of DOE orders, incorporate technological advances, and address more stringent Federal regulations and heightened environmental awareness. Four basic types of vaults/buildings are utilized for the different waste categories: low-activity waste vault, intermediate-level nontritium vault, intermediate-level tritium vault, and long-lived waste storage building. The vaults are below-grade concrete structures, and the storage building is a metal building on a concrete pad. Long-lived waste is being stored until a final disposition can be determined. Additional information on these facilities is given in table H.2.2–9.

Solid LLW is segregated into several categories to facilitate proper treatment, storage, and disposal. Solid LLW that radiates less than 200 mrem per hour at 5 centimeters (cm) (1.97 inch [in]) from the unshielded container is considered low-activity waste. If it radiates greater than 200 mrem per hour at 5 cm (1.97 in), it is considered intermediate-activity waste. This waste is typically contaminated equipment from separations, reactors, or waste management facilities. Intermediate-activity tritium waste is intermediate-activity waste with greater than 10 Ci of tritium per container. Spent lithium-aluminum targets from tritium operations equipment is included in this waste. Long-lived waste is contaminated with long-lived isotopes that exceed the waste acceptance criteria for disposal. Resin contaminated with carbon 14 from reactor operations is an example. Excavated soil from radiological materials areas that is potentially contaminated and cannot be economically demonstrated to be uncon-



a Alternative storage location are being evaluated.
b Waste certification activities consolidated with characterization facility.
Note: nCi/g - nanocuries per gram; RCRA - *Resource Conservation and Recovery Act*
Source: SR DOE 1995b.

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FIGURE H.2.2–2.—*Transuranic Waste Management Plan at Savannah River Site.*

TABLE H.2.2–4.—*Transuranic and Mixed Transuranic Waste at Savannah River Site*

Waste Matrix	Number of Waste Streams	Inventory as of September 30, 1994 (m^3)	Number of Waste Streams Five-Year Projection	Total Generation Five-Year Projection (m^3)
Contact-Handled				
Organic liquids	1	<1	0	0
Combustible debris	3	7,693	1	240
Debris	2	199	2	2,613
Ash	1	<1	0	0
Total	5	8,162	1	2,853

Source: DOE 1995gg; WSRC 1995a.

TABLE H.2.2–5.—*Transuranic and Mixed Transuranic Waste Treatment Capability at Savannah River Site*

Treatment Unit	Treatment Method	Input Capability	Output Capability	Total Capacity[a]	Comment
TRU Waste Characterization/ Certification Facility	Assaying, sorting, decontamination, size reduction, welding, venting, and encapsulation	Mixed and nonmixed TRU wastes	Certified forms for disposal	1,720 m^3/yr	Begin operations in 2007
Alpha vitrification	Vitrification	TRU and mixed TRU waste	Certified and stabilized forms for disposal	559 m^3/yr liquid or 2,280 m^3/yr solid	Planned

[a] For facilities under design or construction this is a design capacity. Schedules and capacities for facilities under design or construction are subject to changes such as availability of funds, results of treatability studies, and permit issuance.

Source: SR DOE 1995c; WSRC 1995a; WSRC 1995b.

TABLE H.2.2–6.—*Transuranic and Mixed Transuranic Waste Storage at Savannah River Site*

Storage Unit	Input Capability	Total Capacity (m^3)	Comment
TRU storage pads	Miscellaneous solid TRU waste, extraction procedure toxic, listed	34,400	Operational RCRA Part A. No offsite waste planned. Buried waste to be exhumed, processed at TRU Waste Facility, and shipped to WIPP. Nineteen pads in use, 10 additional pads planned.

Source: SR DOE 1995c; WSRC 1995a; WSRC 1995b.

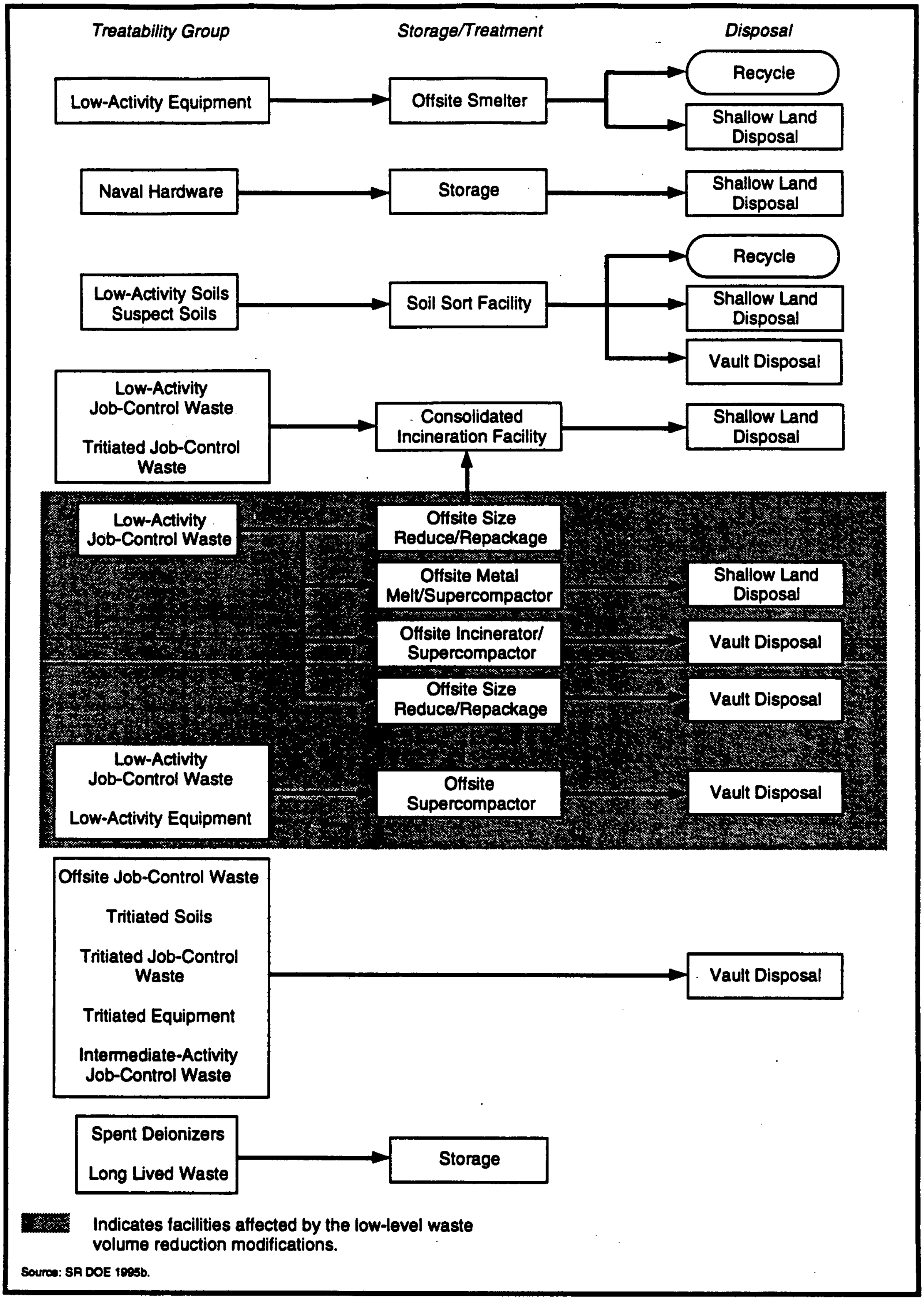


FIGURE H.2.2–3.—*Low-Level Waste Management Plan at Savannah River Site.*

TABLE H.2.2–7.—*Low-Level and Mixed Low-Level Waste Treatment Capability at Savannah River Site* [Page 1 of 2]

Treatment Unit	Treatment Method	Input Capability	Output Capability	Total Capacity[a] (m^3 per year)	Comment
Consolidated Incineration Facility and Ashcrete Stabilization Facility	Incineration/stabilization	LLW, mixed LLW, liquid, solid, ash, and slurry	Stabilized LLW, mixed LLW, and solid waste	4,630 (liquid) 17,830 (solid)	Planned, approved, RCRA final, available 1996
F- and H-Areas Effluent Treatment Facility	Neutralization, chemical precipitation, filtration, carbon adsorption, reverse osmosis, ion exchange, evaporation, and mercury adsorption	Mixed LLW, aqueous liquids (F- and H- area wastewater, evaporator overheads and condensate, and cesium removal column effluent)	Corrosive LLW liquid concentrate, treated water effluent used activated carbon, and used ion exchange resins (solid LLW)	1,930,000	Operational, NPDES operating
M-, L-, and H-Area compactors	Compaction	Solid LLW job waste	Compacted LLW	3,983	Operational
Hazardous/Mixed Waste Containment Building	Physical and chemical decontamination, wet chemical oxidation, encapsulation, and amalgamation	Liquids and solids, mixed LLW, toxic, corrosive, reactive, metal, sludge, and debris	Containment facility	703	Planned, approved, begin operation in 2006
Low-level waste smelter	Offsite decontamination	LLW and equipment	Recovered metal	600	Offsite facility
Non-alpha vitrification facility	Sorting and vitrification	LLW, mixed LLW, and hazardous wastes	Mixed LLW	3,090	Proposed facility
Offsite mixed waste treatments	Amalgamation, PCB destruction, acid bath, and smelting	Mixed LLW	Solid LLW	124	Offsite facilities
M-area Liquid Effluent Treatment Facility	Filtration, flocculation neutralization, and precipitation	Liquid mixed LLW	Wastewater, solid mixed LLW, and sludge	999,000	Operational, NPDES: operating
M-Area Vendor Treatment Facility	Vitrification	Aqueous liquids and slurries, mixed LLW, and sludges	Wastewater, solid mixed LLW, and borosilicate glass	2,470	Planned, approved, contract awarded for construction NPDES
Savannah River Technology Center ion exchange treatment probe low activity	Ion exchange	Mixed LLW and aqueous liquids	Aqueous liquid, solid, and mixed LLW	11,200	Operational, RCRA: interim
Soil Sort Facility	Sorting and separating contaminated soils	LLW soil	Low-level contaminated and uncontaminated soil	2,540	Proposed facility
Offsite supercompactor	Compaction	Solid LLW	Compacted solid LLW	42,400	Commercial facilities
Onsite supercompactor	Compaction	Solid LLW	Compacted solid LLW	5,700	Proposed facility

TABLE H.2.2–7.—*Low-Level and Mixed Low-Level Waste Treatment Capability at Savannah River Site* [Page 2 of 2]

Treatment Unit	Treatment Method	Input Capability	Output Capability	Total Capacity[a] (m^3 per year)	Comment
Z-Area Saltstone Facility	Stabilization (solidification with radionuclide binders)	Liquids, mixed LLW, sludges, toxic, corrosive	Solid LLW, nonhazardous	28,400	Operational, permitted disposal, CWA, RCRA: final

[a] For those facilities already in use, this is a normal operating capacity; whereas, for facilities under design or construction, this is a design capacity. Schedules and capacities for facilities under design or construction are subject to changes such as availability of funds, results of treatability studies, and permit issuance.

Source: SR DOE 1995c; WSRC 1995a.

TABLE H.2.2–8.—*Low-Level and Mixed Low-Level Waste Storage at Savannah River Site*

Storage Unit	Input Capability	Total Capacity[a] (m^3)	Comment
Burial ground solvent tanks (S23-30)	Liquid mixed LLW	727	To be closed, RCRA Part A
Defense Waste Processing Facility organic waste storage tank (430-S)	Liquid mixed LLW, ignitable, toxic	568	Operational, RCRA Part A
Liquid waste solvent tanks (S33-36)	Liquid mixed LLW	454	Planned facility
M-Area Process Waste Interim Treatment/Storage Facility	Liquid mixed LLW, listed, (electroplate sludge)	8,300	Operational, RCRA Part A
Mixed waste storage buildings (643-29E and 643-43E)	Liquid mixed LLW solid, toxic, listed, ignitable, metal, sludge, soil	1,300	Operational, RCRA Part A
Mixed waste storage shed (316-M)	Liquid and solid mixed LLW	120	Operational, RCRA Part A
Savannah River Laboratory high activity storage tanks (772-2A)	Liquid mixed LLW, toxic, toxicity characteristic teaching procedure	198	Operational, RCRA Part A
Hazardous Waste Storage Facility (645-2N)	Mixed LLW	580	Operational, RCRA Part B
Process waste interim treatment	Liquid mixed LLW	8,300	Operational, RCRA Part A
Long-lived waste storage buildings	Process water deionizers containing carbon 14	3,330	Planned facility

[a] Schedules and capacities for facilities under design or construction are subject to changes such as availability of funds and permit issuance.

Source: WSRC 1995a.

TABLE H.2.2–9.—*Waste Disposal at Savannah River Site*

Disposal Unit	Input Capability	Capacity[a,b] (m^3)	Comment
Hazardous/mixed waste disposal vaults	Solid mixed LLW and listed (CIF, Ashcrete, blowdown, and vitrified)	45,600	10 vaults are planned and funded, RCRA submitted 1990, available 2002.
Intermediate-level waste vaults	Solid LLW	27,000	2 vaults operational, additional 5 planned
Low activity waste vaults	Solid LLW, compacted waste, contaminated equipment, filters, sediment, job control waste, process beds, soils, resins, and lithium-aluminum melted forms	61,500	1 vault constructed additional 12 planned.
LLW disposal facility, slit trenches	Solid LLW	407,000	58 trenches planned
Z-area saltstone vaults	Solid LLW	1,110,000	2 vaults operational, additional 12 vaults planned

[a] Schedules and capacities for the facilities under design or construction are subject to changes such as availability of funds and permit issuance.
[b] Includes current capacity and projections through 2024.
Source: SR DOE 1994b; SR DOE 1995c; WSRC 1995a; WSRC 1995b.

taminated is managed as suspect soil. Solid LLW typically consists of protective clothing, contaminated equipment, irradiated hardware, spent lithium-aluminum targets (from tritium extraction), and spent deionizer resins. All LLW is disposed of in the Solid Waste Disposal Facility in E-Area between F- and H-Areas. Wastes are compacted and packaged for burial. Monitoring wells are located near each disposed waste area to verify performance and to monitor groundwater in the vicinity of the vaults. As of December 1994, the total inventory of LLW disposed of at SRS was 676,400 m^3(884,700 yd^3) (DOE 1995gg).

Mixed Low-Level Waste. Management of mixed wastes includes safe storage until treatment is available. Mixed LLW is stored in A-, E-, M-, N-, and S-Areas in various tanks and buildings. These facilities include burial ground solvent tanks, the M-Area process waste interim treatment/storage facility, Savannah River Technology Center mixed waste storage tanks, and the organic waste storage tanks. These South Carolina Department of Health and Environmental Control-permitted facilities will remain in use until appropriate treatment and disposal is performed on the waste.

The Hazardous/Mixed Waste Treatment and Disposal Facility and the Consolidated Incineration Facility will process both mixed and hazardous wastes. The mixed waste management plan for SRS, illustrated in figure H.2.2–4, has been reevaluated through the development of a Site Treatment Plan in accordance with the *Federal Facility Compliance Act* of 1992. Mixed waste inventories are listed in table H.2.2–10. Treatment facilities and processes are listed in table H.2.2–7. The capacities and status of the different storage facilities are listed in table H.2.2–8.

Hazardous Waste. Typical hazardous wastes at SRS include lead, mercury, cadmium, 1,1,1-trichloroethane, leaded oil, trichlorotrifluoroethane, benzene, and paint solvents. Figure H.2.2–5 illustrates the processing of hazardous wastes at SRS. Table H.2.2–11 lists hazardous waste storage facilities at SRS. This waste is stored in RCRA-permitted buildings in B-, M-, and N-Areas, and open storage

TABLE H.2.2–10.—*Mixed Low-Level Waste at Savannah River Site*

Waste Matrix	Number of Waste Streams	Inventory as of September 30, 1994 (m^3)	Number of Waste Streams Five-Year Projection	Total Generation Five-Year Projection (m^3)
Aqueous liquids/slurries	6	158	8	4,692
Debris	12	4,069	13	3,840
Special waste	4	83	4	32
Homogeneous solids	12	2,726	5	155
Lab packs	1	8	1	5
Organic liquids	3	139	4	587
Soil/gravel	2	17	0	0
Total	40	7,200	35	9,311

Source: DOE 1995gg; WSRC 1995a; WSRC 1995b.

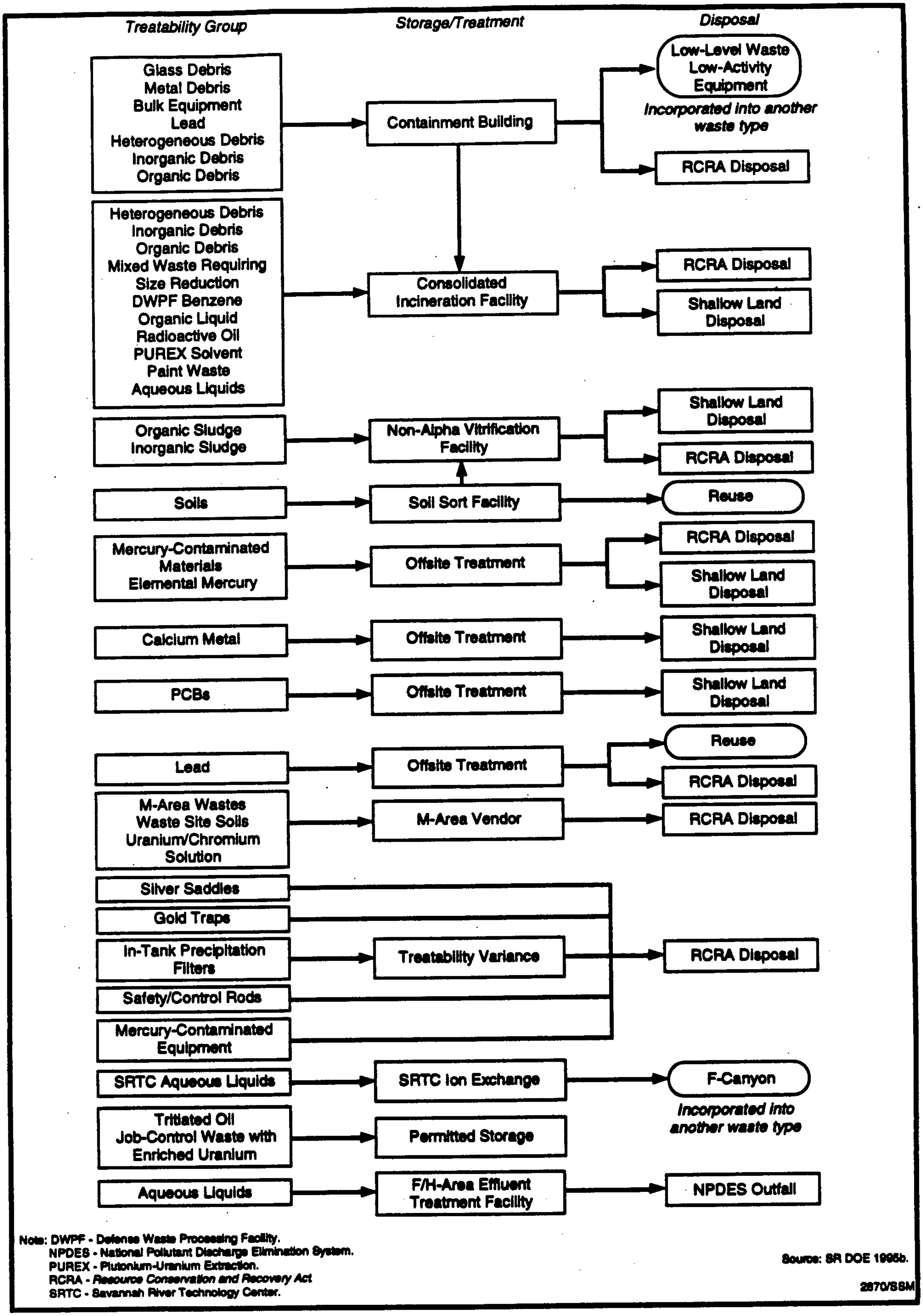
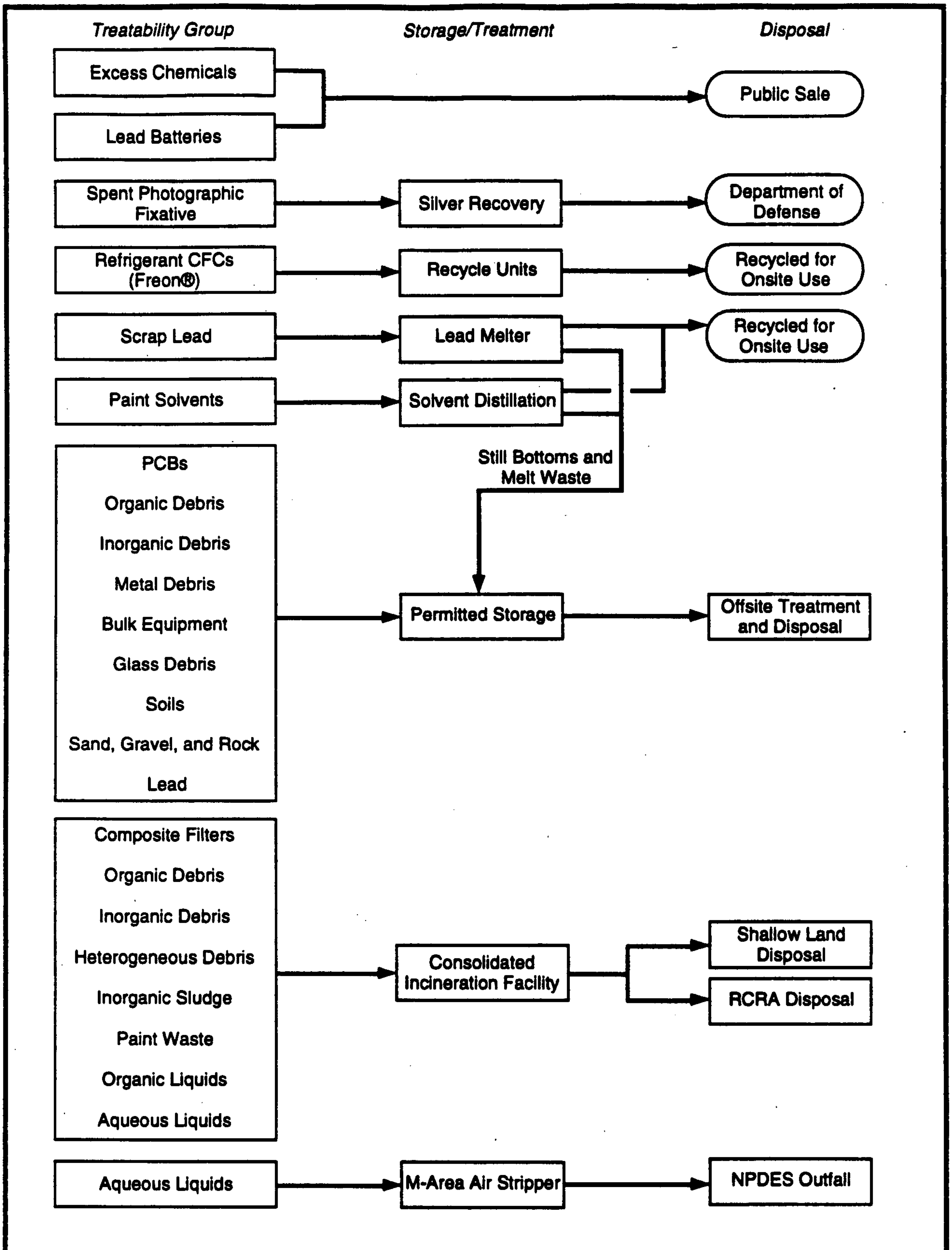


FIGURE H.2.2–4.—*Mixed Waste Management Plan at Savannah River Site.*



Note: RCRA - *Resource Conservation and Recovery Act.*
NPDES - National Pollutant Discharge Elimination System.
Source: SR DOE 1995b.

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FIGURE H.2.2–5.—*Hazardous Waste Management Plan at Savannah River Site.*

TABLE H.2.2–11.—*Hazardous Waste Storage at Savannah River Site*

Storage Unit	Input Capability	Capacity (m^3)	Comment
Solid Waste Storage Pads	Containerized solid hazardous wastes only	1,758	
Building 316-M	Containerized hazardous wastes	117	RCRA-permitted interim status
Building 710-B	Containerized hazardous wastes	146	RCRA-permitted interim status
Building 645-N	Containerized hazardous wastes	171	RCRA-permitted interim status
Building 645-4N	Containerized hazardous wastes	426	RCRA-permitted interim status

Source: SR DOE 1995c.

areas located on the asphalt pads within the fenced area of N-Area. DOE started to send hazardous waste offsite for treatment and disposal, but in 1990 imposed a moratorium on shipments of hazardous materials from radiological areas. Waste that is not subject to the moratorium is shipped to an offsite vendor for processing and disposal. SRS annually publishes the SRS Tier Two Emergency and Hazardous Chemical Inventory Report, which lists hazardous chemicals that are present above their minimum threshold level or that are categorized as extremely hazardous substances by the emergency planning *Community Right-to-Know Act* of 1986. The annual reports filed under the *Superfund Amendments and Reauthorization Act* for the SRS facilities include year-to-year inventories of these chemicals.

Nonhazardous Waste. Municipal solid waste generated at SRS is currently being sent to a permitted offsite disposal facility. DOE is evaluating a proposal to participate in an interagency effort to establish a regional solid waste management center at SRS (DOE/EA-0989, DOE/EA-1079).

SRS disposes of other nonhazardous wastes in addition to the nonhazardous wastes disposed of in the sanitary landfill. These wastes consist of scrap metal, powerhouse ash, domestic sewage, scrap wood, construction debris, and used railroad ties.

Scrap metal is sold to salvage vendors for reclamation. Powerhouse ash and domestic sewage sludge are used for land reclamation. Scrap wood is burned onsite or chipped for mulch. Construction debris is used for erosion control. Railroad ties are shipped offsite for disposal. Nonhazardous waste management is illustrated in figure H.2.2–6.

H.2.3 Kansas City Plant

At Kansas City Plant (KCP), stockpile activities for national security result in the generation and management of hazardous, solid industrial, and sanitary wastes. No LLW or mixed LLW are routinely generated. However, operations resulting in the generation of LLW or mixed LLW may occasionally occur. There is no spent nuclear fuel, high-level, and TRU waste associated with the fabrication of nonnuclear components. The manufacturing operations include machining, plastic fabrication, plating, and electrical and mechanical assembly. Past activities associated with the manufacturing of nonnuclear components for nuclear weapons has resulted in some environmental contamination. The principal sources of contamination at KCP resulted from accidental spills and leaks during manufacturing operations. These spills and leaks have contaminated soils with Volatile Organic Carbons (VOCs), PCBs, and petroleum hydrocarbons. KCP is not on the NPL for sites requiring environmental restoration in accordance with CERCLA and SARA. However, there are some remedial actions required per a consent order between DOE and EPA. Pending future funding levels, these remedial actions are scheduled to be completed by 2001.

KCP does not presently dispose of waste onsite, although onsite disposal and leaks/discharges have occurred in the past. On March 6, 1989, EPA requested DOE to enter into a RCRA Section 3008(h) Administrative Order on Consent. On June 23, 1989, DOE and EPA Region VII signed the order. The provisions of the order require DOE to conduct all assessment and remediation activities regulated

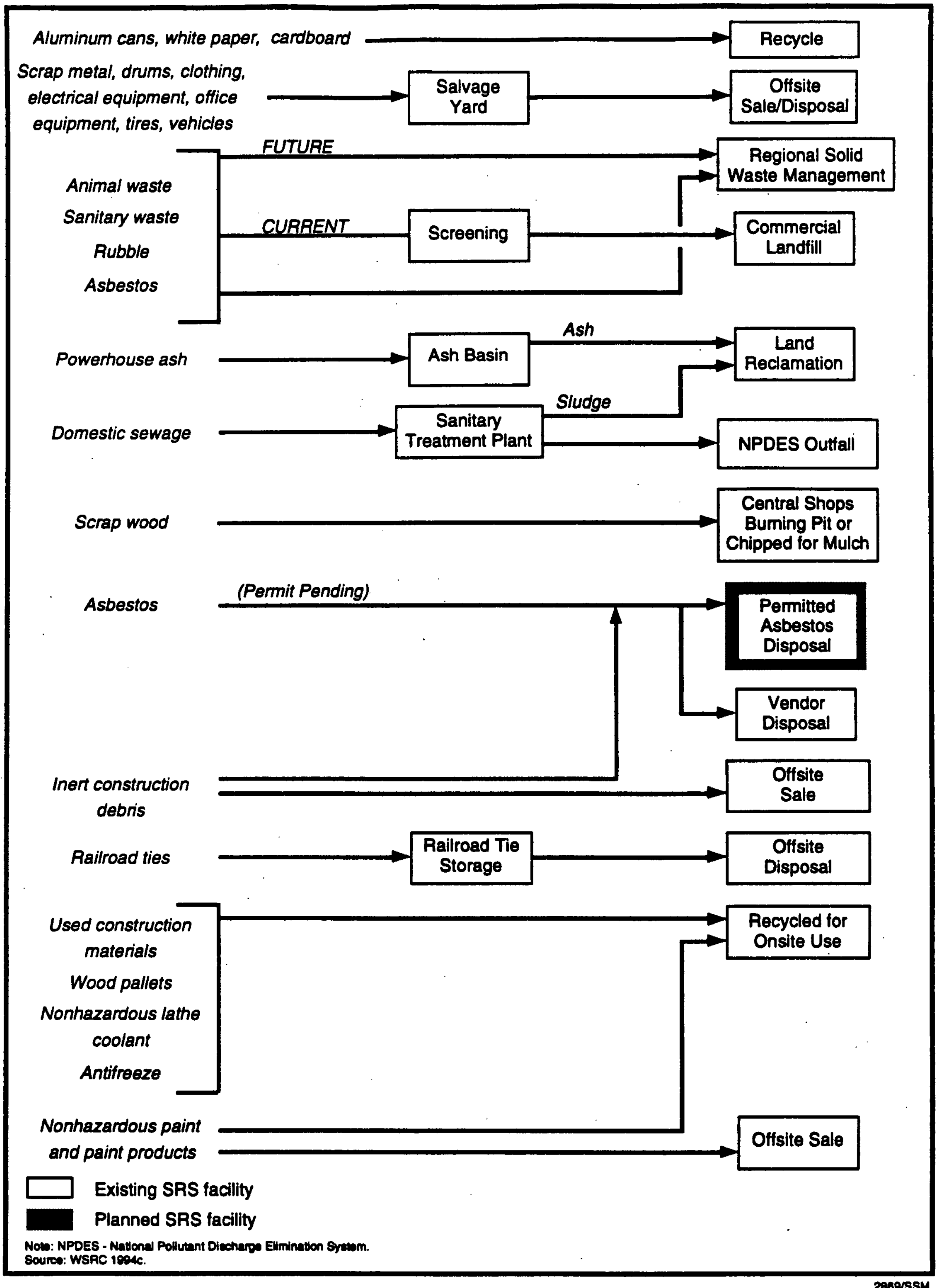

FIGURE H.2.2–6.—*Nonhazardous Waste Management Plan at Savannah River Site.*

under the order in accordance with approved environmental restoration remediation schedules.

Pollution Prevention. A formal Waste Minimization and Pollution Prevention Awareness Program has been initiated and is ongoing at KCP to comply with EPA regulations and DOE orders. This program includes coordinating the development, promotion, implementation, and reporting of site-wide waste reduction activities. Activities include establishing site-wide recycling and source reduction programs for all waste streams. Near-term objectives are to reduce the disposal volume of sanitary, hazardous, and LLW streams. KCP will pursue and adopt appropriate processes and programs to minimize and recycle KCP wastes.

Low-Level Waste. KCP typically generates very small quantities of LLW (<1 m^3/yr). Activities that generate LLW are the disassembly and testing of irradiated components, scheduled replacement of tritium exit signs, removal of used radioactive sources, and general debris (i.e., small amounts of contaminated cleanup towels, disposable gloves, and packing materials) from laboratory and assembly operations. Liquid LLW is solidified and mixed into concrete or plaster of paris for final handling and disposal in accordance with NTS waste acceptance criteria.

LLW is accumulated and stored in two controlled access areas used to store both LLW and mixed waste. LLW is stored onsite until sufficient quantities accumulate to warrant shipment to approved LLW disposal facilities at NTS. The last shipment of solid LLW took place in September 1995. The current inventory of LLW in storage is <1 m^3.

Mixed Low-Level Waste. KCP currently has no mixed waste in storage. Process changes have been made to control the generation of mixed waste. The potential exists for mixed waste to be generated by changes in conditions in current operations or by new processes being brought into KCP through nonnuclear consolidation or new business. KCP mixed waste would be stored with LLW in a controlled access, RCRA-permitted storage area.

Hazardous Waste. Hazardous waste is generated by a number of activities at KCP and consists of wastes such as acidic and alkaline liquids, solvent, and oils and coolants. Processes such as plating, etching, electronic assembly, metals and plastics machining and forming, and wastewater treatment are the principal generating processes. Waste stream residue generated at KCP that is not reclaimed, treated onsite at the Industrial Wastewater Pretreatment Facility, or recycled, is manifested and shipped under contract with waste transporters to permitted offsite facilities. KCP utilizes processes that do not require a permit under RCRA in order to treat hazardous wastes.

Hazardous wastes are managed in compliance with RCRA requirements as delineated in the Operating Permit issued by the Missouri Department of Natural Resources under the provisions of 40 CFR 270-272. KCP currently operates RCRA interim status waste storage areas for containerized nonradioactive hazardous wastes and bulk storage tanks for nonradioactive hazardous wastes.

The KCP Environmental Restoration Program serves to identify the nature and extent of environmental contamination at inactive waste sites. The site investigations conducted to date have indicated that hazardous waste constituents found in soil and groundwater at KCP are associated with past operations and are found at or near units now considered regulated hazardous waste management and solid waste management units. Site reevaluation visits are conducted by KCP personnel for all treatment, storage, or disposal facilities utilized by KCP.

Waste that requires disposal under TSCA continues to decrease. The primary generation source of PCB wastes over the past 15 years has been equipment upgrades and electrical substation replacement (i.e., replacement of transformers). These projects are now complete, and this category of waste is primarily generated from restoration and remediation projects.

Hazardous waste quantities generated at and subsequently shipped offsite from KCP in 1994 are shown in table H.2.3–1. A summary of the hazardous waste storage facilities is shown in table H.2.3–2.

Nonhazardous Waste. Nonhazardous wastes are generated routinely and include general plant refuse such as paper, cardboard, glass, wood, plastics, scrap, metal containers, etc. Nonhazardous wastes are segregated and recycled, whenever possible. The wastes are transported to a sanitary landfill. Sanitary wastewaters are discharged to the sanitary sewer in compliance with Kansas City, MO, sewer-use ordinance provisions and permit discharge limits. Biomedical

TABLE H.2.3-1.—*Hazardous Waste Quantities Shipped Offsite in 1994, Kansas City Plant*

Description	Number of Shipments Containing Description	Quantity (kg)	Estimated Volume (m^3)[a]
Aerosols	1	2,480	2.5
Combustible liquid, n.o.s.	5	32,660	32.7
Corrosive liquid, n.o.s.	1	1,720	1.7
Cyanides, inorganic, n.o.s.	1	51	< 0.1
Environmentally hazardous substances, solid, n.o.s.	21	110,297	73.5
Flammable liquids, n.o.s.	4	20,930	20.9
Flammable liquids, poisonous, n.o.s.	1	1,180	1.2
Hazardous waste, liquid, n.o.s.	3	25,100	25.1
Hazardous waste, solid, n.o.s.	33	261,250	174.2
Isocyanate solutions, n.o.s.	1	3,830	3.8
Mercury	1	154	0.1
Polychlorinated biphenyls	3	10,555	7.0
Polychlorinated biphenyls (less than one pound reportable quantity)	5	41,485	27.7

[a] For those shipments in which only a mass quantity was provided, a volume estimate was made based on density factors of 1,000 kg/m^3 for liquids and 1,500 kg/m^3 for solid.
Note: n.o.s. - not otherwise specified.
Source: DOE 1995h.

TABLE H.2.3–2.—*Hazardous Waste Storage Capability at Kansas City Plant*

Storage Unit	Input Capability	Design Capacity[a] (m^3)	Comment
2x40 yd^3 waste dumpsters	Solid hazardous waste (construction/D&D asbestos debris)	61.2	Operational; interim status
Acid pad	Liquid and solid hazardous waste (also sludge)	180.0	Operational; interim status
Acid plating waste tank	Liquid hazardous waste (also sludge)	22.7	Operational; interim status
Alkaline plating waste tank	Liquid hazardous waste (also sludge)	22.7	Operational; interim status
Bulk solvent waste tanks	Liquid hazardous waste	60.6	Operational; interim status
Demolition lot	Liquid and solid hazardous waste (also sludge, gas)	668.0	Operational; interim status
L-lot	Liquid hazardous waste	758.0	Operational; interim status
Oil/coolant storage tank	Liquid hazardous waste (also sludge)	30.3	Operational; interim status
PCB waste tank	Liquid hazardous waste (also sludge)	30.3	Operational; interim status
Reclamation area	Liquid and solid hazardous waste (also sludge)	16.0	Operational; interim status
Red-X lot	Liquid and solid hazardous waste (also sludge, gas)	250.0	Operational; interim status
Test cell #1	Solid hazardous waste (cyanide wastes)	82.5	Operational; interim status
Test cell #2	Liquid and solid hazardous waste (also gas)	82.5	Operational; interim status
Test cell #3	Solid hazardous waste (classified wastes)	82.5	Operational; interim status
Test cell #4	Liquid hazardous waste (PCB liquids)	82.5	Operational; interim status
Test cell #11	Liquid and solid hazardous waste (also sludge)	22.5	Operational; interim status

[a] Schedules and capacities for facilities under design or construction are subject to changes based on the availability of funds, permit issuance, etc.

Source: DOE 1994n; KCP 1995a:4.

waste is incinerated offsite at an incinerator permitted and approved by the Kansas Department of Health and Environment.

KCP also generates wastes that do not meet the definition of hazardous wastes and are not allowed to be incorporated with normal refuse sent to municipal solid waste landfills. These wastes are managed on a case-by-case basis in accordance with applicable regulations or best management practices.

H.2.4 Pantex Plant

This section describes the baseline conditions and specific waste management operations at Pantex. As part of its normal operation, Pantex generates low-level, mixed low-level, hazardous, and nonhazardous wastes. Tables H.2.4–1 and H.2.4–2 present a detailed description of treatment and storage facilities and their estimated capacities.

Pantex's goals regarding the management of LLW, mixed LLW, and hazardous wastes are as follows:

- Minimize the volumes of low-level radioactive and hazardous wastes generated to the extent technologically and economically practicable
- Recycle those wastes using the best available technology
- Minimize contamination of existing or proposed real property and facilities
- Ensure safe and efficient long-term management of all wastes

Pollution Prevention. The Pantex Waste Minimization Program was formed to define an effective waste minimization system for the site. A committee provides awareness of the program, identifies tasks, and provides a liaison between the site and outside entities. Some of this program's accomplishments are listed below:

- Compact 1,200 drums to approximately 250 drums using a compactor
- Separate radioactive and hazardous waste materials when shearing weapons components
- Reclaim oil, antifreeze, and refrigerant
- Substitute a scintillation solution that is nonhazardous
- Reuse explosives and solvents
- Repackage paint into smaller containers
- Substitute naphtha with nonhazardous biodegradable cleaning solutions

Transuranic Waste. No TRU waste or mixed TRU waste is currently generated at Pantex during normal operation. However, there is potential for an off-normal event to generate small amounts of contact-handled TRU waste or mixed TRU waste during a weapon dismantlement activity. Three drums of TRU waste were generated several years ago from an incident during weapon dismantlement. Ultimately, Pantex plans to ship its TRU waste to a DOE-approved storage site when one is available. In the interim, approximately 1 m^3 of TRU waste is temporarily stored in Building 12-42 (DOE 1995gg).

Low-Level Waste. The waste streams for LLW have the following options available for management consideration:

- Continue to ship to an approved DOE disposal site such as NTS
- Compact solid waste, if possible
- Improve computerized tracking of radioactive waste
- Implement an improved segregation program

Solid LLW consists of contaminated parts from weapons A/D functions and waste materials associated with these functions, such as protective clothing, cleaning materials, filters, and other similar materials. The compactible portions of this waste are processed at the Pantex Solid Waste Compaction Facility and staged along with the noncompactible portions for shipment to a DOE-approved disposal site. Table H.2.4–3 lists Pantex's primary LLW streams, how they are generated, primary radioactive constituents, and method of storage or disposal.

TABLE H.2.4–1.—*Waste Treatment Capability at Pantex Plant*

Treatment Unit	Treatment Method(s)	Input Capability	Output Capability	Total Capacity[a] (m^3/yr)	Comment
Batch Master Hazardous Waste Tank System (Bldg. 12-68)	Filtration, neutralization, and precipitation	Bldg. 12-5C metal cleaning bath, plating process waste, sodium hydroxide radiator cleaner, and spent electrolyte solutions	Metal precipitates to Hazardous Waste Storage Pad and effluent to wastewater treatment plant	Process as needed	Nonoperational due to pending closure
Building 11-15A	Immobilization	Mixed LLW	To be determined	185	Planned
Building 11-9	Immobilization	Mixed LLW	To be determined	185	Planned
Building 11-9S	Stabilization and macroencapsulation	Mixed LLW and hazardous waste	Sent to hazardous waste treatment and processing facility when completed	2 m^3/treatment	Also used as 90-day accumulation area for hazardous and mixed LLW
Building 11-50 (Wastewater Treatment Facility)	Filtration of organics and undissolved HE particles	HE machining operations	Playa 2	684	
Building 12-43 (HE Filtration Facility)	Filtration of HE and carbon	Explosive machining operations in Building 12-24	Playa 1	180	Sock filter and carbon filter
Building 12-73	Settlement and filtration	HE-contaminated water	Sanitary sewage system	Variable	Settling tank and fabric filter system
Burning Ground: one cage, one tray, and one pan	Open burning or detonation	Solid mixed LLW and hazardous waste	Ash to 11-71X storage pad	909	Design capacity. Interim permit until April 2001.
Closed-loop decon system	Reduction	Contaminated lead (solid mixed LLW)	Acid bath (liquid mixed LLW) to offsite commercial vendor	Campaign	One process per year. Standby mode.
Compactor (Bldg. 12-42)	Hydraulic ram compactor-in-drum compaction	Solid LLW (gloves, kim wipes, paper)	Compacted LLW in 17H 55-gallon drums to storage igloo 4-56	Process as needed	No TRU waste, waste greater than Class C, mixed waste, free liquids, or gases
Hazardous Waste Treatment & Processing Facility	Immobilization repackaging, neutralization compaction, shredding, sorting, and solidification	Liquid and solid LLW, mixed LLW and hazardous waste	To be determined. May be stabilized solids	500	Available for treating mixed waste by 1998
Sanitary Sewage Treatment System	Aeration and anaerobic microbial action	Sanitary sewage and industrial waste	Lagoon (chlorine pretreatment)	2,460,000 L/day	Permitted flow. Operational flow about 1,310,000 L/day.

[a] For those facilities already in use this is a normal operating capacity; whereas, for facilities under design or construction this is a design capacity. Schedules and capacities for facilities under design or construction are subject to changes such as availability funds and permit issuance.

Source: DOE 1993h; DOE 1994n; DOE 1995gg; PX DOE 1995i; PX DOE 1996b.

TABLE H.2.4–2.—*Waste Storage Capability at Pantex Plant*

Storage Unit	Input Capability	Total Capacity (m^3)[a]	Comment
Buildings 4-46, 4-72 and 4-74	Liquid and solid mixed LLW	187	Permitted capacity pending permit modification. Operating capacity is 120 m^3.
Buildings 11-7A and 11-7B	Liquid and solid mixed LLW	402	Permitted and operating storage capacity.
Building 11-7N Pad	Various liquid/solid hazardous waste, mixed LLW, and LLW	125	Interim permit dated April 19, 1990. Permitted and operating capacity.
Building 11-9N Pad	Various liquid and solid hazardous wastes	379	Permit dated March 1994. Permitted capacity. Operating capacity is 252 m^3.
Conex containers WM-1 to WM-8	Containerized solid mixed low-level and silver photo wastes	575	Permit dated April 1, 1991. Permitted capacity. Operating capacity is 120 m^3.
Conex containers WM-1A, WM-1B, WM-3A, WM-5A, WM-5B	Containerized liquid and solid LLW	377	No plans to receive offsite waste. Permitted capacity pending permit modification. Operating capacity is 75 m^3.
Conex containers (25)	Solid/liquid LLW	1,800	Each Conex can store 72 55-gal drums (15 m^3) for an operating capacity of 375 m^3.
Magazine 4-50	Liquid/solid mixed LLW, hazardous waste, and LLW	421	Final permit dated April 24, 1992. Permitted capacity. Operating capacity is 40 m^3.
Magazine 4-56	Liquid and solid LLW	421	Temporary storage before shipment to NTS. Operating capacity is 40 m^3.
RCRA Hazardous Staging Facility (Bldg. 16-16)	Containerized liquid/solid LLW and mixed LLW	1,050	Permitted capacity. Operating capacity is 333 m^3. Currently under construction.

[a] Schedules and capacities for facilities under design or construction are subject to changes such as availability of funds and permit issuance.

Source: DOE 1994n; PX DOE 1995i; PX DOE 1996b.

Table H.2.4–4 presents the inventory of LLW at Pantex as of December 2, 1994. A 5-year projection is also given.

Mixed Low-Level Waste. The waste streams for mixed LLW have the following options available for management consideration:

- Treat to satisfy Land Disposal Restriction requirements and store onsite. This is the option now being used at Pantex (PX DOE 1996b:4-193).
- Treat to satisfy Land Disposal Restriction requirements and ship to an approved commercial facility for storage or disposal.
- Ship offsite for treatment and disposal.

Pantex generates solid mixed LLW during weapons component testing. These wastes consist primarily of depleted uranium and beryllium residue and fragments from explosives components tests, contaminated gravel, cleaning materials, and protective clothing associated with these operations. Other mixed LLW streams include cleaning materials from weapons A/D operations. Table H.2.4–5 lists Pantex's primary mixed waste streams, composition, method of process, and treatment alternatives. Pantex will manage mixed waste in accordance with the Pantex Plant *Federal Facility Compliance Act Compliance Plan*. Pantex currently has a contract with a commercial facility for mixed waste treatment and/or disposal. Table H.2.4–6 lists organic liquid mixed LLW waste streams that are being evaluated for commercial treatment and/or disposal. Table H.2.4–7 lists the mixed waste storage inventory as of September 1995. Projections for the following 5 years are also included.

Mixed LLW (HE contaminates only) is currently treated at the Burning Ground which has a permitted capacity of 180 m^3/yr (236 yd^3/yr) (DOE 1995gg). The Hazardous Waste Treatment and Processing Facility is being planned to house mixed waste mobile treatment units.

Hazardous Waste. The waste streams for hazardous waste have the following options available for management consideration:

- Continue to ship to approved hazardous waste disposal facilities
- Encapsulate solid waste and ship to an approved DOE disposal site
- Treat onsite to neutralize corrosive wastes

Table H.2.4–8 presents the inventory and 5-year projection for hazardous waste at Pantex as of December 2, 1994. Two facilities treat hazardous waste: the Burning Ground Facility and the Hazardous Waste Treatment Processing Facility. The Burning Ground is an open-burning area where explosives, explosives-contaminated waste, and explosives-contaminated spent solvents are burned, resulting in a large reduction in volume. The Hazardous Waste Treatment and Processing Facility will house liquid-phase and solid-phase hazardous, low-level, and mixed waste processing facilities. The facility has been planned and approved and should be available in 1998 (DOE 1995gg).

Not all of the hazardous waste is treated at Pantex. Table H.2.4–9 shows the amount of hazardous waste shipped offsite in 1994. There are several separate storage facilities for hazardous wastes. At the Hazardous Waste Drum Storage Area, all drums containing liquid are placed in spill-containment pans. The facility is inspected weekly for leaking drums. Small lab samples of hazardous waste are stored in two chemical storage containers in this area. The materials stored there include asbestos, mercury-contaminated wastes, Burning Ground ash, and electroplating sludge. At Building 16-1, used crank case oil is stored underground until sufficient quantities are generated for offsite processing.

Class 1 non-RCRA hazardous waste includes waters that contain asbestos, PCBs with a concentration greater than 50 parts per million (ppm), and oils with a total petroleum hydrocarbon concentration greater than 1,500 ppm. Table H.2.4–10 presents the Class 1 non-RCRA hazardous waste streams, current inventories as of December 2, 1994, and projected generation volumes. Medical waste is defined as any solid waste that is generated in the diagnosing, treating, or immunizing of human beings or animals, in research, or in producing or testing biologicals. This waste includes cultures and stocks, pathological wastes,

TABLE H.2.4–3.—*Low-Level : Streams at Pantex Plant*

Sources	Waste Description	Radioactive Constituents	Primary Materials	Disposition
Assembly/ dismantlement operations	Debris from demilitarization and sanitization operations	Thorium, U–238, tritium	Generally noncompactible crushed/granulated plastic and metal debris	Disposed of at DOE-approved offsite facility
Assembly/ dismantlement/ stockpile surveillance	Compactible material from normal assembly/dismantlement/stockpile surveillance	U–238, tritium, thorium, and plutonium	Lab wipes and other support materials	Disposed of at DOE-approved offsite facility
Assembly/ dismantlement and stockpile surveillance operations	Radiological materials from normal operations associated with weapons assembly, dismantlement, facility surveillance, container monitoring and routine sample counting operations	U–238, tritium, thorium, and plutonium	Protective clothing, wipes, swipes, tape, plastic and other material in the radiation protection program	Disposed of at DOE-approved offsite facility
Weapon component testing and evaluation	Debris generated during past testing of mock devices associated with any known waste stream	Depleted U–238 residue	Contaminated soil and gravel, additional miscellaneous materials	Stored onsite pending eventual shipment to DOE-approved disposal site
Decontamination products	Materials generated during the decontamination of a concrete assembly work cell (one time generation)	Tritium	Protective clothing, concrete rubble, solidified liquids, tools, equipment, plastic and paper products containing tritium	Stored onsite pending eventual shipment to DOE-approved disposal site

Source: PX DOE 1995i.

TABLE H.2.4–4.—*Low-Level Waste Inventory at Pantex Plant*

Waste Stream Name	Inventory as of December 2, 1994 (m^3)	Total Generation Five-Year Projection (m^3)
Beryllium waste, radioactive	114	0[a]
Tritium contaminated waste (solid/liquid)	55	179
Lab packs, nonregulated radioactive (solid)	1	1
Contaminated soil	8	0
Waste water	7	9
Contaminated metal, radioactive	2	0.02
Desiccant, radioactive	0.2	22
Plant refuse (paper, foam, rags, cardboard)	105	711
Miscellaneous ash, radioactive	9	0
Total	301	922

[a] One-time event, no further generation is expected.
Source: PX DOE 1995i.

TABLE H.2.4-5.—*Mixed Low-Level Waste Streams at Pantex Plant* [Page 1 of 2]

Treatability Group	Waste Stream Name	Composition[a]	Process Description	Treatment Alternatives
Organic liquids	Paint waste - organic liquids	Paint and solvent	Stripping, surface preparation, and repainting	Planning packed bed reactor (Mobile Treatment Unit)
	Spent solvents	Freon, methyl ethyl ketone, High Explosive (HE), and dimethyl sulfoxide	Cleaning dissolution of HE	Planning hydrothermal oxidation (Mobile Treatment Unit or offsite commercial vendor)
	Contaminated liquid	Mercury-contaminated oil	Vacuum pump oil change	Planning packed bed reactor (Mobile Treatment Unit)
Aqueous liquids	Wastewater	Water, HE, chromium, lead	Water-let and thermal shock activities	Planning evaporation oxidation and stabilization (Mobile Treatment Unit)
	Alodine solution	Chromic acid, fluoride salt and iron cyanide	Surface preparation before paint removal	Planning plating waste treatment (Mobile Treatment Unit)
	Metal cleaning waste	Water, alodine, nitric acid, U, Th, cadmium, Cr, Lead, and Hg	Etching and cleaning of metals	Planning plating waste treatment (Mobile Treatment Unit)
Homogeneous solids	Wastewater sludge from explosives	Explosive-contaminated solids, dimethyl sulfoxide	Filtering of wastewater with HE	Open-air burning
	Burning Ground ash	Inorganic ash residue, metals, and some unburned organic material	Burning of HE and HE-contaminated materials	Planning stabilization/barium sulfate (Mobile Treatment Unit)
	Process residues	Residues resulting from treatment of mixed waste	Waste not generated until onsite mixed waste treatment commences in 2000.	Planning stabilization (Mobile Treatment Unit)
Soils/gravels	ER potential mixed waste (soils)	Contaminated soils from solid waste management units, spill cleanup, drill cuttings, sample wastes, etc.	ER program site contaminated soils	Planning thermal desorption and stabilization
Debris waste	Solvent-contaminated solid material	Alcohol, kimwipes, filters, rags, leads, solvents	Weapon dismantlement and maintenance	Planning macroencapsulation
	Contaminated scrap metal	Contaminated scrap metal from demilitarized and sanitized weapons parts	Demilitarized and sanitation activities	Planning macroencapsulation
	Lead-contaminated waste, solid	Seals and tape intermixed with gloves and paper	Demilitarization and sanitization activities	Planning macroencapsulation

TABLE H.2.4-5.—*Mixed Low-Level Waste Streams at Pantex Plant* [Page 2 of 2]

Treatability Group	Waste Stream Name	Composition[a]	Process Description	Treatment Alternatives
Debris waste (Continued)				
	Mercury-contaminated solids	Glass bulbs, mercury-contaminated solids	Maintenance of lighting	Planning macroencapsulation
	Heterogeneous debris-metal contaminated waste	Metals, alodine, light ballasts, beryllium	Maintenance and special activities	Planning macroencapsulation
	Heterogeneous debris	Solid wipes, gloves, and anti-C suits	Painting, paint removal, maintenance testing, and disarmament activities	Planning macroencapsulation
	Plutonium-contaminated solids	Personnel protective equipment, epoxy, floor sweepings, paint, and paint thinner	Dismantlement operations in Building 12-98	Planning macroencapsulation
	Contaminated explosives and contaminated support materials	Support materials with explosive residue, mercury, and solvents	Assembly/disassembly process	Planning macroencapsulation
Lab packs	Lab packs	Epoxy, uranium, acid, lead, thorium nitrate crystals	Disposal of chemicals from testing labs	Proposed radiation surveying followed by separation and onsite treatment if unable to reclassify as hazardous
	Miscellaneous organic liquids	Halogenated and nonhalogenated solvents	Paints, solvents, and special product materials storage	Planning hydrothermal oxidation (Mobile Treatment Unit)
	Scintillation fluids	Scintillation fluids packaged with vermiculite	Radioactivity testing	Commercial treatment. Fluids need to be bulked first.
Special wastes	Used batteries	Nickel, cadmium, lead, silver, mercury, and asbestos	Dismantlement activities	Decontaminate and recategorize as hazardous waste
	Lead waste	Portion of lead drum liners	Removal of lead liners	Planning treatment utilizing decontamination. If not successful, then macroencapsulation (Mobile Treatment Unit)
	Aerosol containers	Discarded spray paint cans	General maintenance	Decontamination

[a] Typical radionuclides that may be present in the mixed waste include uranium, thorium, and tritium.
Note: ER - environmental restoration.
Source: DOE 1994k; DOE 1995gg.

TABLE H.2.4–6.—*Organic Liquid Waste Stream Candidates for Commercial Treatment and/or Disposal*

Waste Stream	Quantities of Waste (L)	Treatable Volume (L)	Composition[a]	Process Description
Lab packs[b]	4,030	988	Scintillation vials packed in cardboard boxes in vermiculite	Laboratory waste packages
Organic debris; solvent-contaminated	163	163	Joint test assembly cleanup water, oil, water	Support material
Spent solvent	3,920	1,740	Scintillation vials packed in cardboard boxes in vermiculite; joint test assembly cleanup water; freon with HE	Spent solvents
Mercury-contaminated liquids	492	492	Oil contaminated with mercury	Discarded oil from vacuum pumps in laboratory equipment; source of mercury contamination from samples analyzed in lab equipment
Total	8,605	3,383		

[a] Mixed LLW stream may include uranium, thorium, tritium, and plutonium.
[b] Cardboard boxes and vermiculite used to pack scintillation vials will be recontainerized and treated as separate sampling lots.
Source: PX DOE 1995i.

TABLE H.2.4–7.—*Mixed Low-Level Waste Inventory at Pantex Plant*

Treatability Group	Number of Waste Streams	Inventory as of March 1995 (m^3)	Total Generation Five-Year Projection (m^3)
Aqueous liquids/slurries	3	2	22
Organic liquids	3	3	2
Homogeneous solids	3	19	29
Soils	1	None	190
Debris waste	8	97	714
Lab packs	3	7	4
Special wastes	3	<1	1
Total	24	128	963

Source: DOE 1995gg.

human blood and blood products, sharps, animal waste, and isolation wastes. Pantex currently generates approximately two boxes of medical waste per week, each with a capacity of 0.142 m^3 (0.186 yd^3). The annual generation rate of medical waste at Pantex is approximately 15 m^3 (19 yd^3) (PX DOE 1995i:14-15). Medical waste is dispositioned through a commercial vendor who picks up and transports the medical facility's biomedical and infectious waste.

Nonhazardous Waste. The Sewage Treatment Quality Upgrade is a project for 1996 at Pantex. This project would upgrade Pantex's sanitary system to ensure that wastewater standards are met through secondary/tertiary treatment. This project includes upgrading the existing treatment lagoon to treat sewage, repairing and replacing existing deteriorated sewer lines, constructing a closed system to eliminate the use of open ditches for conveyance of industrial wastewater discharges, and implementing a plant stormwater management system.

TABLE H.2.4–8.—*Hazardous Waste Inventory at Pantex Plant*

Waste Stream Name	Inventory as of December 2, 1994 (m^3)	Total Generation Five-Year Projection (m^3)
Explosive-contaminated solid waste	4	23
Burning Ground waste from thermal treatment	1	7
Lab packs (solid)	0.4	6
Photographic film	0	0.7
Lead waste	0.7	0.08
Spent halogenated and nonhalogenated solvents and mixtures	2	34
Heavy metal contaminated parts	0	0.8
Contaminated soil[a]	0	14,800
Sodium hydroxide waste (solid)	0	8
Paint sludge	2	3
Wastewater from operations and monitoring[a]	0.4	34
Metal cleaner and photographic waste	0.05	13
Recyclable and nonrecyclable used batteries	0.4	197
Solvent-contaminated solids	3	29
Mercury (solid/liquid)	0	0.01
Sandblasting waste	0.6	1
Lead-contaminated waste	0	0.7
Miscellaneous organics (solid/liquid)	0.4	15
Contaminated engine oil	0.1	2
Oil filter waste	0.02	0.5
Miscellaneous discards contaminated with heavy metals	23	356
Empty organic compressed gas cylinders	0.3	24
Recyclable scrap metal with precious metals	0.2	1
Total	39	15,556[b]

[a] These waste streams are primarily associated with environmental restoration activities.
[b] Of this total, about 550 m^3 is directly from weapons activities.
Source: PX DOE 1995i.

TABLE H.2.4–9.—*Hazardous Waste Quantities Shipped Offsite in 1994, Pantex Plant*

Description	Number of Shipments Containing Description	Quantity (kg)	Estimated Volume[a] (m^3)
Hazardous waste, solid, n.o.s.	9	14,200	9
Corrosive liquids, n.o.s.	2	538	0.5
Flammable liquids, n.o.s.	1	202	0.2
Hazardous waste, liquid, n.o.s.	2	149	0.2
Oxidizing substances, solid, corrosive, n.o.s.	1	166	0.1
Oxidizing substances, solid, poisonous, n.o.s.	1	6	<0.1
Poisonous liquids, n.o.s.	1	28	<0.1

[a] For those shipments in which only a mass quantity was provided, a volume estimate was made based on density factors of 1,000 kg/m^3 for liquids and 1,500 kg/m^3 for solids.

Note: n.o.s. - not otherwise specified.

Source: DOE 1995h.

TABLE H.2.4–10.—*Class 1 Non-Resource Conservation and Recovery Act Hazardous Waste Inventory at Pantex Plant*

Waste Stream	Inventory as of December, 1994 (m^3)	Total Generation Five-Year Projection (m^3)
Beryllium waste	0	740
Empty containers	142	985
PCB-contaminated solids	0.05	0.05
Crank case oil	1	260
Asbestos solids	13	24
PCB-contaminated oil	0	0.06
Paint residue	3	53
Contaminated soil[a]	5	2,350
Metal cleaning waste (solid)	0	0.3
Wastewater[a]	24	1,600
Recyclable and nonrecyclable photographic waste	0.02	0.3
Contaminated metal	0.1	0.7
Antifreeze and engine coolants	0.3	337
Desiccant	0	4
Plant refuse, such as paper, foam, rags, and cardboard	51	543
Used oil filters generated during maintenance	3	23
Miscellaneous ash	4	5
Resins, tar, or tarry sludge (excess material from laboratories)	3	36
Total	249	6,961

[a] These waste streams are primarily associated with environmental restoration activities.

Source: PX DOE 1995i.

TABLE H.2.4–11.—*Class 2 Nonhazardous Waste Disposal in Amarillo Landfill from Pantex Plant*

Year	Total Disposal (kg)	Total Volume of Disposal (m^3)
1989[a]	79,600	53
1990	335,000	223
1991	307,000	205
1992	371,000	247
1993[b]	428,000	285
1994	589,000	393
1995-1999 (estimate)[c]	2,610,000	1,740

[a] Contract for disposal began in 1989 and included approximately 3 months.
[b] In midyear, recycling was stopped because of low cost effectiveness.
[c] Waste minimization efforts are expected to provide an average reduction of 4 percent each year.
Source: PX DOE 1995i.

Class 2 nonhazardous waste (general refuse) is collected at each building from trash cans and placed in dumpsters. This includes cardboard, computer paper, white paper, colored paper, mixed steel, steel and aluminum cans, mixed metal, mixed plastic, foam rubber, and glass. Currently, telephone directories, paper, certain plastics, and some steel and aluminum cans are being recycled. The weights of Class 2 nonhazardous waste disposed of from 1989 to 1994 and the estimated volumes for 1995 through 1999 are given in table H.2.4–11.

H.2.5 Los Alamos National Laboratory

Laboratory research activities at LANL result in the generation of TRU, mixed TRU, mixed low-level, low-level, hazardous, and nonhazardous wastes. Wastes are treated, stored, and disposed of both on and offsite. LANL is not listed on the NPL. As a function of obtaining a RCRA permit, however, the *Hazardous and Solid Waste Amendments* of 1984 mandate that permits for treatment, storage, and disposal facilities include provisions for corrective action to mitigate releases from facilities in operation and to clean up contamination in areas designated as solid waste management units at LANL. LANL does not generate or manage HLW. The site does manage a small amount of spent nuclear fuel originating from the Omega West Reactor. This spent nuclear fuel is in temporary storage at the Chemistry and Metallurgy Research Complex awaiting shipment to SRS for long-term storage.

Pollution Prevention. Radioactive, hazardous, and mixed wastes are treated, stored, or disposed of at LANL. The total amount of waste generated and disposed of at LANL has been, and is being, reduced through the efforts of the pollution prevention and waste minimization programs at the site. The LANL Waste Minimization and Pollution Prevention Program is an ambitious program aimed at source reduction, product substitution, recycling, surplus chemical exchange, and waste treatment. The program is tailored to meet Executive Order 12780, DOE orders, and RCRA and EPA guidelines. All wastes at LANL, including radioactive, mixed, hazardous, and nonhazardous regulated waste, are included in the LANL Pollution Prevention Program. Reductions in the volumes of radioactive wastes generated have been achieved through methods such as intensive surveying, waste segregation, recycling, and use of administrative and engineering controls.

Transuranic Waste. The primary source of LANL liquid TRU waste is the processing of caustic and acidic wastes by the Plutonium Facility (Technical Area [TA]-55). Treatment of liquid TRU wastes yields a solid TRU waste and a liquid LLW that is further treated at TA-50. The pretreatment facility consists of storage and neutralization tanks, a clariflocculator and filter tanks, two precipitate storage tanks, and an in-drum cement mixing area. Lime and/or iron sulfate are added to the liquid TRU stream, resulting in a precipitate containing over 99.9 percent of the plutonium and americium. The precipitate is mixed with cement in drums to form the solid TRU waste. Variations in waste volumes and radioactive content result primarily from program changes, facility D&D activities, and general cleanup programs for laboratory areas.

The TRU waste size reduction facility at LANL is designed to repackage and reduce the volume of various types of metallic waste items such as glove boxes, process equipment, and ductwork. The items are processed in the disassembly/cutting area where attached combustible items are removed and where a plasma torch cuts it into smaller pieces for packaging. The pieces are placed into accepted WIPP containers, then sealed for storage at TA-54, Area G.

LANL has managed solid TRU waste at TA-54, Area G, since approximately 1957. Solid TRU and mixed TRU wastes are stored above ground on asphalt pads at TA-54, Area G. Membrane-covered fabric dome enclosures provide weather protection and prevention of run-on. Drums stored on pallets and fiberglass-reinforced, polyester-coated crates are fitted with skids to maintain them above the floor. Additional TRU container storage units are located within permanent structures at TA-3 and TA-55. These units support R&D activities and are not intended for long-term storage of mixed TRU waste. High-activity or remote-handled TRU wastes are placed in shafts at TA-54, Area G.

In January 1993, the New Mexico Environment Department issued Compliance Order 93-03, which required LANL to retrieve TRU wastes from above-ground earth-covered Pads 1, 2, and 4 and manage them in accordance with requirements of 40 CFR 264, Subpart I. Pursuant to the December 1993 Consent Agreement, LANL has initiated the TRU Waste Inspectable Storage Project to provide for retrieval and inspection of the wastes and replacement in new aboveground storage domes at TA-54, Area G.

In addition, LANL completed the Preconceptual Study for EPA in September 1994 to identify short- and long-term storage needs for mixed TRU waste. This study recommended constructing eight new storage domes for TRU waste at Area G by the year 2000. The domes will have the same structural design and operational capabilities as existing structures. However, based on estimates of anticipated TRU and mixed TRU waste generation, this design may not provide sufficient capacity for all wastes by the year 2000. New requirements for fire protection are being evaluated to determine whether they will further reduce available storage capacity by reducing aisle space.

Most of LANL's TRU waste is currently stored on four asphalt pads, all designated as RCRA interim status storage units. TRU wastes are currently being stored, pending the outcome of WIPP to serve as a repository for these wastes. Assuming WIPP is determined to be a suitable repository for these wastes, pursuant to the requirements of 40 CFR 191 and 40 CFR 268, these wastes will be treated to meet WIPP Waste Acceptance Criteria and packaged in accordance with DOE, NRC, and DOT requirements for transport to WIPP for disposal. The TRU Retrieval Tension Support Dome project will retrieve approximately 16,900 containers of TRU waste from three storage pads. Drums will be cleaned and inspected for corrosion and leakage. Extensively damaged drums and drums containing liquids will be overpacked. Drums which are not overpacked may have HEPA filters installed to prevent the potential for accumulation of hydrogen gas in the drum headspace during storage. All of the drums and crates will be reconfigured in six temporary storage domes erected exclusively for the storage of this waste.

Mixed TRU waste represents the majority of the mixed waste stored at LANL, accounting for approximately 80 percent of the total volume of TRU waste. All mixed TRU waste has been characterized by process knowledge. Some of the waste requires remote-handling during waste management. The regulatory status of stored mixed TRU waste can be broken down into three categories: (1) facilities that meet RCRA storage requirements; (2) facilities designed prior to and subject to RCRA but not in compliance with current storage requirements; and (3) facilities designed and operated prior to RCRA and subject to RCRA.

LANL has identified approximately 7,690 m^3 (10,000 yd^3) of mixed TRU waste in storage (DOE 1995gg). Mixed TRU waste has been stored since 1971. The hazardous components of TRU waste are not well defined. Activities to improve characterization of mixed TRU waste are the subject of a revised waste analysis plan that was submitted to the New Mexico Environment Department in March 1995. Activities to improve storage of these wastes are the subject of a separate compliance order. The preferred option to meet *Federal Facility Compliance Act* requirements follows the DOE national policy on mixed TRU waste, which is shipment to WIPP. Table H.2.5–1 provides information about the mixed TRU waste streams at LANL that are expected to go to WIPP.

The LANL TRU Waste Certification Plan specifies all required information for certification. This information on certifiable/certified TRU waste that is required for transportation, for completion of the WIPP data package, and for certification is supplied by the waste generator. Uncertified waste packages, primarily stored in drums and crates, will be repackaged and treated when possible to meet the WIPP Waste Acceptance Criteria. Table H.2.5–2 describes the current and planned TRU and mixed TRU waste treatment capability at LANL. Table H.2.5–3 shows TRU and mixed TRU waste storage at LANL.

Special modes have been created for storing high beta-gamma active hot-cell wastes (remote-handled TRU wastes), for wastes containing more than 1 gram of plutonium-238, and for the TRU cement paste previously generated at the TA-21 Liquid Waste Treatment Plant. The hot-cell waste is handled remotely and stored in modified shafts. Because the waste is actually below ground during storage, little additional shielding is needed. The storage array currently employed is compatible with the remote-handled canister now approved for WIPP disposal.

The following LANL facilities treat TRU wastes:

- **Radioactive Liquid Waste Treatment Technical Area 50 (TA-50, Room WM-66).** This facility consists of holding/accumulation, neutralization, precipitation, settling, immobilization, and certification for aqueous wastes. The sludge produced is dewatered to 30- to 40-percent solids, placed in lined 208-L (55-gal) drums, and forwarded to TA-54, Area G for storage.

- **Plutonium Facility Solidification (TA-55).** This facility immobilizes liquid and particulate process residues in cement. The solidified product from the process is WIPP-certifiable TRU waste. It is sent to TA-54, Area G for storage.

- **Size Reduction Facility (WM-69).** This facility is designed to repackage and reduce the volume of various types of metallic waste items such as glove boxes, process equipment, and duct work.

- **Drum Preparation Facility.** This facility would be used to clean retrieved drums of TRU waste. Modifications are currently in final design. Drums coated with a "grease" to enhance long-term storage capability would be steam-cleaned and integrity checked before transfer to the waste preparation or transportation facilities. A RCRA Part B Permit application has been submitted to operate the facility. At the present time, there are no drums being cleaned in the drum preparation facility.

- **Transuranic Waste Treatment Facility.** This is a planned but not funded facility. The multiprocess facility would be used for processing LANL legacy TRU waste to meet WIPP certification requirements. Hot-cell capability would exist to process remote-handled waste. The facility would handle currently generated wastes from present and future environmental restoration/corrective actions; and legacy waste from storage and previously treated wastes.

The following LANL facilities store TRU wastes:

- **TA-54-153, TA-54-48 Transuranic Storage Pad (Building 153).** This unit is a steel frame tension support structure on a curbed asphalt pad. It would be used for damaged fiberglass reinforced plastic coated boxes once retrieved from the current storage configurations. Initial repairs would be made to the containers prior to shipment to onsite processing facilities. This unit is 95 percent full.

- **Corrugated Metal Pipe Storage (Pit 29).** This waste stream is no longer generated at LANL. During 1986, the 158 TRU corrugated metal pipes stored at TA-21, Area T, were retrieved, decontaminated, and moved to TA-54, Area G, for storage. They were placed horizontally in the upper layer of Pit 29. Accepted waste streams are corrugated metal pipes and cemented sludge.

- **Storage Holding Shed (MD-8).** This unit is used for TRU waste. This unit is RCRA-permitted, but currently does not have any waste stored in it.

- **TRU Shafts (Various).** High beta-gamma active TRU hot-cell wastes are handled remotely and stored in modified shafts. Because the waste is below ground during storage, little additional shielding is needed.

- **TRU Storage Pads (Pads 1, 2, 4, Pit 9).** Drums are stacked with other TRU wastes on asphalt pads and covered with 1 to 2 m (3 to 7 ft) of earth backfill.

- **TRU Storage Trenches (Trenches A, B, C).** Through 1985, the high activity plutonium-238 wastes were routinely packaged in 114-L (30-gal) drums and placed in concrete casks for storage. Drums of combustible and noncombustible waste were placed in separate casks. The casks were sealed with asphalt and then covered with earth.

- **New Domes, TA-54-224, 283.** Operational soon.

Low-Level Waste. Both liquid and solid LLW are generated and managed at LANL. In 1993, approximately 2,694 m^3 (3,524 yd^3) of solid LLW were generated (as packaged for treatment, storage, and disposal, not including process wastewater). LLW process wastewater generation in 1993 was 21,400 m^3. Liquid LLW is generated from many areas throughout LANL. Major generators are the Chemistry-Metallurgy Building (TA-3), TA-21 Site, Radiochemistry (TA-48), and Plutonium Processing (TA-55). LANL has two onsite liquid LLW treatment facilities. The liquid LLW treatment facilities include a chemical treatment and ion-exchange plant and a 132,659 m^3/yr chemical treatment plant. Significant waste-generating processes for solid LLW are concentrated in nine TAs: TA-2, Omega Site; TA-3, South Mesa (mainly the Chemistry and Metallurgy Research Building and the Sigma Complex); TA-21, DP-Site; TA-35, Ten-Site; TA-46, WA-Site; TA-48, Radiochemistry Laboratory; TA-50, Waste Management Site; TA-53, Meson Physics Facility; and TA-55, Plutonium Facility.

Solid LLW, such as paper, plastic, glassware, and rags, are separated into compactible and noncompactible materials by the waste generators. Compactible waste is solid waste that consists of trash-type materials such as paper, plastic, rubber, and small items of glassware and small items such as short lengths of pipe conduit and small pieces of wood or sheet metal. Excluded are larger noncompactible items, waste chemicals, free or absorbed liquids, biological waste, pressurized containers, powders, and other particularly hazardous materials.

LLW noncompactible items such as large equipment and much of the D&D wastes generally are not packaged but delivered to the burial site in covered or enclosed vehicles. Short-term storage may occur at treatment or disposal facilities to accumulate a required quantity of waste for an operation to be conducted effectively. Area G, situated in Mesita del Buey in TA-54, is the active burial and storage site for solid LLW at LANL. The area has been used since 1957. Burial facilities within the area include pits and shafts of varying dimensions. Most solid LLW waste generated at LANL is buried in large pits ranging in size from 122 to 183 m (400 to 600 ft) long, 8 to 30 m (26 to 98 ft) wide, and 8 to 20 m (26 to 66 ft) deep. The current disposal facility has a remaining capacity of 22,000 m^3 (28,770 yd^3). At current operational generation rates and implementation of waste minimization, Area G has an operational life of 10 years. However, if environmental restoration activity cleanups are accelerated as presently planned, Area G will reach its useful design life by the end of 1997. Continued construction at Area G is dependent on decisions made in conjunction with the LANL Site-Wide EIS and DOE Waste Management PEIS. As an alternative to the continued construction at Area G, LANL is exploring other options for the disposal of LLW in the future (e.g., NTS) (DOE 1995q:NM 23).

Mixed Low-Level Waste. Under the *Federal Facility Compliance Act*, DOE is required to develop a site treatment plan for mixed wastes at LANL. The site treatment plan is intended to bring LANL into compliance with land disposal restrictions storage prohibitions under the *New Mexico Hazardous Waste Act* and RCRA. On March 31, 1995, DOE submitted its proposed site treatment plan to the New Mexico Environment Department for review, public comment, and approval. On October 4, 1995, a Compliance Order was issued by the State of New Mexico requiring LANL to comply with the site treatment plan for the treatment of mixed wastes at LANL. The Compliance Plan Volume of the site treatment plan provides overall schedules for achieving compliance with the RCRA storage and treatment requirements, a schedule for the submittal of applications for permits, construction of treatment facilities, technology development, offsite transportation for treatment, and the treatment of mixed wastes in full compliance with the *New Mexico Hazardous Waste Act* and RCRA. An annual update to the site treatment plan is required.

LANL has approximately 600 m^3 (785 yd^3) of mixed LLW in storage. The waste is made up of just over 5,000 separate items that have been combined into 30 treatability groups, each with a preferred treatment option as shown in table H.2.5–4. LANL just completed recharacterizing the mixed LLW as required by the Federal Facility Compliance Agreement; the recharacterization resulted in a significant decrease in the volume reported in past documentation. Over 1,200 mixed LLW items (approximately 14 m^3 [18.3 yd^3]) are suspect for radioactive contamination. A field sort, survey, and decontamination operation will determine whether or not these wastes are contaminated with radioactivity. If not, they will be treated at commercial offsite facilities. If contaminated, they will be handled with the preferred option identified for that treatability group.

Five-year projections estimate that approximately 108 m^3 (141 yd^3) of mixed LLW would be generated at LANL. Almost all of this waste would result from small-scale R&D projects. Each project would be reviewed for waste minimization and waste treatment, storage, and disposal requirements.

The large variety and relatively small volumes of waste require a substantial array of treatment options. Table H.2.5–5 summarizes LLW and mixed LLW treatment capability at LANL. The treatment of mixed LLW is built around two major components: using offsite commercial treatment or treatment available at other DOE sites, and mixed waste treatment skids that are being designed to treat onsite hazardous and mixed waste streams that are not amenable to offsite treatment. LANL has one existing facility designed to treat mixed waste, the lead decontamination trailer.

A commercial lead decontamination unit has been purchased and located at TA-50. The treatment process is applicable to lead shapes with surface contamination. The unit would be used to decontaminate lead bricks to allow recycling by using an abrasive slurry of water, blasting media, and air. A lead sulfide sludge would be produced which would be solidified for disposal.

The scintillation vial crusher is a standard crusher with a vibrating screen to separate the broken vial glass from the liquid waste. This unit crushes the vials allowing separation of the vial from the liquid. The glass is disposed of as LLW, and the liquid is collected for further treatment. The unit does not rinse vial solid residues.

The following LANL facility would treat mixed LLW:

- **Reactive Waste Treatment.** A wet chemical process would be used to handle reactive mixed wastes, including pyrophoric uranium, sodium metal, and lithium hydride. The process would create a nonhazardous metal salt that would be solidified. Feed materials are limited to chips and powders. Pieces must be smaller than 0.3 m (1 ft) in diameter.

Table H.2.5–6 describes mixed LLW storage at LANL. Table H.2.5–7 summarizes waste disposal at LANL. LANL currently has 1,700 drum equivalents of mixed LLW in storage at TA-54, Areas G and L. Additional container storage facilities exist to support research activities at other areas at the laboratory including TAs -3, -16, -21, -50, and -55. Wastes are stored in compliance with 40 CFR 265 (and, in some cases, Part 264) requirements. To comply with the Federal Facility Compliance Agreement, schedules to complete facility upgrades that address 40 CFR 264 permitted standards and/or identified best management practices were submitted to EPA in September 1994. Several upgrades have been completed. For TA-55, a Part B Permit application addressing storage requirements under 40 CFR 264 is currently in development.

The storage of mixed wastes at Areas L and G complies with requirements of 40 CFR 265, Subpart I, the interim management standards that currently apply to these units. LANL believes that the Area G storage facility also generally complies with the requirements of 40 CFR 264. Both facilities are being upgraded, as necessary, to comply with 40 CFR Part 264 requirements before the permit is issued for these units, which is not anticipated to occur before 1998.

The following LANL facilities are used for storage of mixed LLW:

- **Low-Level Waste Shaft (Shaft 145).** Tritiated waste (>20 mCi/m^3 [740 MBq/m^3]) has been placed in asphalt lined or encapsulated drums and then placed in shafts lined with corrugated metal pipe at Area G. This shaft has been removed from the RCRA Permit and is no longer considered a mixed waste shaft. Shaft 145 is now an LLW shaft.

- **Lead Stringer Shafts (Shaft 35).** The shafts are 9.14 m (30 ft) deep by 1.83 m (6 ft) in diameter and lined with corrugated pipe located at Area L. The stringers are approximately 7.62 m (25 ft) by 0.15 m (0.5 ft) by 0.2 m (0.7 ft) hollow steel columns filled with a concrete/lead mixture. The wastes were generated at Los Alamos Meson Physics Facility.

- **TA-21-61.** Used during the 1980s for storage of PCB wastes, this building has a large diked area for waste storage. The floor is sealed with an epoxy paint. In 1990, two drums of liquid mixed LLW were stored in this facility. In 1991, the RCRA Part A application was modified identifying this facility as an interim status storage facility for mixed LLW. No mixed LLW are presently stored in this facility. LANL anticipates closing this unit in 1996.

- **Mixed Waste Dome.** Solid mixed LLW is stored primarily at Area G in Building 49. This facility contains a bermed (curbed) asphalt pad with a tension support dome structure (18.29 m by 134.11 m) (60 ft by 440 ft).

- **Area L Gas Cylinder Storage.** The RCRA Part B application for this facility was approved November 9, 1989. Accepted waste streams are legacy waste compressed gas cylinders.

- **Mixed Waste Berm.** Liquid mixed LLW is stored at TA-54, Area L. This storage area has an approximate 378,540-L (100,000-gal) capacity.

Hazardous Waste. LANL produces a wide variety of hazardous wastes. Small volumes of all chemicals listed under 40 CFR 261.33 could be generated as a result of ongoing research. Primary laboratory sites for basic and applied chemistry R&D generate typical chemical wastes consisting primarily of laboratory reagent chemicals, pump oil, solvents, test samples, and miscellaneous laboratory wastes. Significant volumes of beryllium, lithium hydride, and magnesium turnings are generated from the main shop department. Plating solutions containing chromates and cyanides, acid or base wastes heavily contaminated with copper, and nitric and sulfuric acid wastes are also generated. All developer, ferric chloride, and sodium hydroxide hazardous wastes are sent out of state for incineration. Fixer photo-wastes undergo metals recycling for silver and other precious metals. Nearly all of LANL's chemical waste is treated at commercial offsite facilities, but LANL does perform volume reduction for some waste (e.g., crushing scintillation vials) and treatment of barium sands. In the future, these hazardous wastes, which cannot be handled by commercial facilities, will be treated at yet to be determined offsite locations. Table H.2.5–8 shows hazardous waste quantities shipped offsite from LANL in 1994. Table H.2.5–9 lists LANL hazardous waste treatment capability. Table H.2.5–10 describes LANL hazardous waste storage capability.

HE waste is generated during processing and testing of various HE materials. Processing, which includes pressing, machining, and casting HE, produces pieces of HE, chips, machine cuttings, and powder. The chips, cuttings, and powder usually are in the form of waterborne suspensions, collected in specially designed accumulating and settling sump tanks. Wastes also consist of materials contaminated with HE: paper, oils, solvents, wood, machine tools, fixtures, and so forth. Chemically the wastes consist of cyclotetramethylenetetranitramine, cyclotrimethylenetrinitramine, trinitrotoluene, pentaerythritoltetranitrate, triaminotrinitrobenzene, ammonium nitrate, barium nitrate, boric acid, nitrocellulose, tetryl, nitroguanidine, and various plastic binders.

All HE hazardous wastes and potentially contaminated HE waste are picked up and delivered to the TA-16 (S-Site) incinerator or flash pad where it is burned. Treated ash residue that is nonhazardous is disposed of in the industrial non-RCRA landfill, TA-54, Area J. Any residue with hazardous constituents remaining is shipped offsite to a commercial RCRA-permitted disposal facility.

HE wastewater is treated by gravity settlement in a sump and then discharged from NPDES-permitted outfalls. Initially, there were 21 such outfall discharges from widespread TAs that process HE. Waste minimization efforts have reduced the number of outfalls from 21 to 2. Dissolved constituents are not removed by this treatment. As a result, there are often compliance issues associated with the NPDES permit. LANL is under Administrative Order from EPA to treat all HE wastewater by 1997, and LANL has agreed to this requirement. To meet this obligation, LANL is developing a HE wastewater treatment facility that will collect and treat these wastewaters with stepped filtration. The ultimate goal for this facility is zero discharge with complete recycling of the system water. Construction is scheduled for completion in 1997 (DOE 1995q:NM 22).

All hazardous waste treatment, storage, and disposal facilities at LANL are either fully permitted, have interim status, or are operating pursuant to enforceable agreements with the regulators while other waste management facilities are being developed. LANL does not landfill RCRA hazardous waste onsite, but contracts with certified transporters to deliver hazardous waste to commercial RCRA-permitted disposal facilities. Before waste is sent offsite, the potential disposal facility is inspected by LANL personnel. Operating records and permits are also reviewed. LANL has an EPA Letter of Authorization allowing disposal of PCB-contaminated articles at the TA-54, Area G Landfill.

TA-54, Area L, is the waste transfer, packaging, and storage unit for accumulating, packaging, and greater-than-90-day storage of RCRA hazardous waste. Concrete containment structures and modular storage buildings are located at Area L. These facilities are used for accumulating, packaging, and storing waste containers generated throughout LANL. Hazardous waste containers generated at the various laboratories are routinely delivered to the waste transfer, packaging, and storage facilities.

Thermal Treatment Facilities at Technical Area-16. Four types of open burn units are at the TA-16 burning ground: a flash pad, where any HE contamination is removed from excess equipment or scrap generated within the TA; two burn pads for destruction of solid HE material; a pad with trays in which HE-contaminated waste oil is burned; and two pressure vessels for reacting HE-contaminated sludge.

The flash pad area is covered with sand. Material to be flashed is placed on the pad with any necessary additional fuel to maintain the burn until all HE has been reacted. The scrap material is then handled as solid nonhazardous waste. Because the burn pad sand may contain toxic characteristic barium, it is put in drums, stored, and managed as a hazardous waste until sampling and analysis are complete. Burn pad sand that is toxic characteristic for barium is treated at TA-54, Area L, to render it nonhazardous.

The two burn pads are used to destroy solid chunks of excess or off-specification HE and machine turnings. The material is placed on a sand-filled steel table lined with refractory brick and then ignited. Used oil and/or solvent that may be contaminated with HE is poured into metal trays lined with fire brick. The trays are in a sand-filled metal tray. The oil is ignited using a remotely operated "electric match." Approximately 374 L (99 gal) of oil are burned each month.

HE-contaminated washwater is collected in sumps at HE fabrication facilities in several TAs. HE settles out of the washwater, is collected in a vacuum truck, and is taken to TA-16 for treatment. Up to 1,650 kg (3,638 lbs) of sludge can be burned in the pressure vessels at one time. Processing liquid effluent is sent to a nearby carbon-filter wastewater treatment unit (TA-16). Treated effluent is regulated by an NPDES permit.

Thermal Treatment Facilities at Technical Areas -14, -15, -36, and -39. Open detonation sites for destruction of excess or waste HE are at TAs -14, -15, -36, and -39. These sites are used routinely to detonate scrap HE, failed experimental detonations, unneeded classified explosives shapes, and small quantities of reactive chemicals. These sites consist of detonation points on the open ground, often in a small canyon. Material to be detonated is placed on sand or on a wooden table at the firing point and detonated with a remote firing mechanism.

Industrial Incinerator at Technical Area 16. A baffled single-chamber industrial incinerator, equipped for combustion of potentially HE-contaminated trash and machine oil, is located outdoors in the northeastern part of TA-16. The incinerator burns potentially HE-contaminated paper, cardboard, wooden boxes, and occasionally a limited volume of potentially HE-contaminated machine oil. The industrial incinerator does not burn wastes other than those permitted by 40 CFR 264.340(b)(i), (ii), (iii), or (iv) [NMHWMR 206.D.8a(2)(a)(i), (ii), (iii), or (iv)]. Emissions from the incinerator conform to Federal and state standards.

Nonhazardous Waste. Nonhazardous wastes are generated routinely and include general facility refuse such as paper, cardboard, glass, wood, plastics, scrap, metal containers, and dirt and rubble. In 1993, 5,453 m^3 (7,132 yd^3) of solid nonhazardous wastes were generated by LANL (LANL 1994b:6). Nonhazardous wastes are segregated and recycled whenever possible. Trash is accumulated onsite in dumpsters, which are emptied on a regular basis by a commercial waste disposal firm and taken to the county sanitary landfill.

Solid sanitary waste generated by LANL is currently disposed of at the Sandia Canyon Site (TA-61) on East Jemez Road. Owned by DOE, this site serves the landfill needs of both LANL and Los Alamos County. Approximately one-third of the domestic solid waste disposed of at the county landfill originates from LANL. The county has operated this landfill under a Special Use Permit from DOE since 1971. The existing sanitary landfill is expected to reach the end of its useful life by 2008. At that time, either a new landfill will have to be constructed or provisions made for offsite disposal.

Administratively controlled waste is not regulated by RCRA and TSCA but is deemed by LANL to be inappropriate for disposal at the Los Alamos County sanitary landfill. Examples are classified computer equipment, magnetic tapes, or any wastes controlled for national security purposes. These wastes are disposed of in the Area J solid waste landfill at TA-54, which is regulated by the New Mexico Solid Waste Bureau, as is the sanitary landfill. Future plans for disposal will depend on the future strategy for sanitary waste disposal. If not, an alternative site will be identified when Area J reaches capacity (DOE 1995q:NM 24).

A new LANL Sanitary Wastewater Treatment Plant and Collection System have been completed to replace 7 existing wastewater treatment facilities and 30 existing septic tanks. The new treatment plant enables reuse of the treated wastewater for nondrinking water uses such as cooling and irrigation. The plant and collection system is designed to meet the requirements of LANL's existing Federal Facility Compliance Agreement.

TABLE H.2.5–1.—*Mixed Transuranic Wastes for Disposal at the Waste Isolation Pilot Plant at Los Alamos National Laboratory*

Waste Category	Storage Locations	Storage Method	RCRA Code	Inventory as of December 31, 1994 (m^3)	Projected Generation (1995-1999) (m^3)
Mixed scrap metal	TA-54 Area G Pit 9, TA-54 Area G 54-153, TA-54 Area G 54-48, TA-54 Area G Pad 1,2, and 4	Container (covered), Container (retrievably buried)	D008	2,206.38	25
Cemented process sludge	TA-54 Area G Pit 9, TA-54 Area G 54-153, TA-54 Area G 54-48, TA-54 Area G Pad 1,2, and 4	Container (covered), Container (pad), Container (retrievably buried)	D007 D008, D009, F001, F002, F005	3,052.97	100
Solidified aqueous waste	TA-54 Area G Pit 9, TA-54 Area G 54-153, TA-54 Area G 54-48, TA-54 Area G Pad 1,2, and 4	Container (covered), Container (pad), Container (retrievably buried)	F001	1,277.42	100
Combustible debris	TA-54 Area G Pit 9, TA-54 Area G 54-153, TA-54 Area G 54-48, TA-54 Area G Pad 1,2, and 4	Container (covered), Container (retrievably buried)	D007,D008, D019, D040, F001, F002, U080	252.43	125
Noncombustible debris	TA-54 Area G Pit 9, TA-54 Area G 54-153, TA-54 Area G 54-48, TA-54 Area G Pad 1,2, and 4	Container (covered), Container (pad), Container (retrievably buried)	D008, D019, D040	213.06	125
Solidified inorganic and organic process solids	TA-54 Area G Pit 9, TA-54 Area G 54-153, TA-54 Area G 54-48, TA-54 Area G Pad 1,2, and 4	Container (covered), Container (pad), Container (retrievably buried)	D006, D007, D008, D019, D021, D039, F001, F002, F003	527.65	150
Glove box and ducting metallic waste	TA-54 Area G Pit 9, TA-54 Area G 54-153, TA-54 Area G 54-48, TA-54 Area G Pad 1,2, and 4	Container (covered), Container (pad), Container (retrievably buried)	D007, D008	142.46	100
Mixed scrap metal	TA-54 Area G Remote shafts	Remote shafts	D008	2.12	8
Noncombustible debris	TA-54 Area G Remote shafts	Remote shafts	D008	15.84	8
Metallic waste	TA-54 Area G Pad 1,2, and 4	Container (covered)	D008	0.567	No future generation
Total				7,690.897	741

Source: DOE 1995gg.

TABLE H.2.5–2.—*Transuranic and Mixed Transuranic Treatment Capability at Los Alamos National Laboratory* **[Page 1 of 2]**

Treatment Unit	Treatment Method	Input Capability	Output Capability	Design Feedrate	Comment
Plutonium Facility solidification (TA-55)	Encapsulation	Liquid, solid and sludge mixed TRU waste, TRU waste, hazardous waste. Solid type: filters, glass, metal, paper, plastic, rags, rubber, corrosive, listed, reactive, TCLP	Solid mixed TRU and TRU cement; corrosive, listed, reactive, TCLP. Contact-handled shielded containers to TA-54, Area G storage	0.08 m^3/hr	Operational; the solidified product from the process is WIPP certifiable TRU
Pretreatment Plant (Rm. WM-66, TA-50-1)	Liquid/solid separation, sedimentation, neutralization, precipitation	Liquid mixed TRU waste. Specific waste: listed, corrosive, TCLP. Contact-handled	Liquid TRU to Radioactive Liquid Waste Treatment (TA-50-1), TRU sludge-solidified (cement) to Certified Waste Pad storage. Specific Waste: listed, corrosive, TCLP. Contact-handled	5.70 m^3/hr	Operational
Size Reduction Facility (WM-69)	Size reduction	Solid mixed TRU waste, TRU waste, LLW. Solid type: equipment, filters, glass, metal, other, paper, plastic, rags, rubber	Size reduced TRU metal to storage LANL TA-54, Area G; TRU certified mixed waste and certified TRU waste to storage Certified Waste Pad	1.36 m^3/hr	Operational
TRU Waste Treatment Facility	Decontamination, solidification, repackaging, shredding, size reduction	Solid and sludge mixed TRU waste, TRU waste. Solid type: filters, glass, labpack, metal, paper, plastic, rags, rubber. Specific waste: corrosive, reactive, TCLP. Contact-handled and remote-handled	Solid and sludge mixed TRU waste, TRU waste. Solid type: filters, glass, labpack, metal, paper, plastic, rags, rubber. Specific waste: TCLP. Contact-handled and remote-handled TRU certified mixed waste and TRU certified waste disposal to WIPP	Planned	Planned but not funded Date available: January 1, 2000
Radioactive liquid waste treatment (TA-50-1)	Adsorption, liquid/solid separation, coagulation, filtration, neutralization, precipitation	Liquid mixed TRU waste, LLW, corrosive	Liquid sludge, mixed LLW, LLW. Specific waste: listed liquid effluent to storage; vacuum filter sludge to storage	30 m^3/hr	Operational; NPDES Permit

TABLE H.2.5–2.—*Transuranic and Mixed Transuranic Treatment Capability at Los Alamos National Laboratory* [Page 2 of 2]

Treatment Unit	Treatment Method	Input Capability	Output Capability	Design Feedrate	Comment
Radioactive Liquid Waste Treatment Plant	Neutralization, precipitation	Liquid mixed TRU waste, mixed LLW, LLW, hazardous waste, corrosive	Gas, liquid, sludge, solid mixed TRU waste, TRU waste, mixed LLW, LLW, hazardous waste, sanitary waste Solid LLW to disposal TA-54; Solid TRU to storage TA-54; Solid TRU to disposal WIPP	600 m^3/hr	Planned but not funded. Date available: January 1, 2004. Will replace the existing treatment plant, TA-50-1, including the pretreatment plant which cannot realistically be modified or upgraded to meet expected ES&H requirements
Drum Preparation Facility	Decontamination	Solid mixed TRU waste, TRU waste, hazardous waste. Solid type: Construction/D&D debris, equipment, filters, glass, metal, paper, plastic, rags, rubber, soil. Specific waste: reactive, listed, ignitable, TCLP, corrosive	Liquid, solid and sludge mixed TRU waste, TRU waste, LLW	0.50 m^3/hr	Operational

Note: TCLP - Toxicity Characteristic Leaching Procedure.
Source: DOE 1994k.

TABLE H.2.5–3.—*Transuranic and Mixed Transuranic Waste Storage at Los Alamos National Laboratory*

Storage Unit	Input Capability	Design Capacity[a] (m^3)	Comment
Certified waste pad	Solid mixed TRU waste, TRU waste, hazardous waste. Solid type: glass, metal, paper, plastic, rags, rubber, soil. Specific waste: corrosive, ignitable, listed, reactive, TCLP. Contact-handled	570	Operational
TRU storage pad 1	Solid and sludge mixed TRU waste, TRU waste; metal, other; listed, TCLP.	Under evaluation per LANL site treatment plan	Operational
TRU storage pad 2	Solid and sludge mixed TRU waste, TRU waste; hazardous waste; other; ignitable, listed, TCLP	Under evaluation per LANL site treatment plan	Operational
TRU storage pad 4	Solid and sludge mixed TRU waste, TRU waste; hazardous waste; other; listed, TCLP	3,000	Operational
Storage holding shed, MD-8	Solid mixed TRU waste, TRU waste, hazardous waste. Specific waste: corrosive, ignitable, listed, reactive, TCLP. Contact-handled	6.25	Operational
TRU storage trench A	Solid mixed TRU waste, TRU waste, hazardous waste. Specific waste: corrosive, ignitable, listed, reactive, TCLP	Under evaluation per LANL site treatment plan	Operational
TRU storage trench B	Solid mixed TRU waste, TRU waste, hazardous waste. Specific waste: corrosive, ignitable, listed, reactive, TCLP	Under evaluation per LANL site treatment plan	Operational
TRU storage trench C	Solid mixed TRU waste, TRU waste, hazardous waste. Specific waste: corrosive, ignitable, listed, reactive, TCLP	Under evaluation per LANL site treatment plan	Operational
TRU shafts	Solid mixed TRU waste, TRU waste. Solid type: equipment, glass, metal, paper, plastic, rags, rubber, soil. Specific waste: listed. Contact-handled, remote-handled	357	Operational
TRU storage pad, pit 9	Solid and sludge mixed TRU waste, TRU waste, hazardous waste. Specific waste: listed, TCLP	Under evaluation per LANL site treatment plan	Operational
Short-term enhanced storage	Solid mixed TRU waste, TRU waste. Specific waste: listed, TCLP. Remote-handled	Under evaluation per LANL site treatment plan	Planned and funded
Corrugated metal pipes storage, pit 29	Solid and sludge mixed TRU waste, TRU waste, hazardous waste. Specific waste: listed. Contact-handled	418.81	Operational
New TRU storage pad, Bldg. 153	Solid mixed TRU waste, TRU waste, hazardous waste. Solid type: equipment, filters, glass, metal, paper, plastic, rags, rubber, soil. Specific waste: listed. Contact-handled	570	Operational

[a] Schedules and capacities for facilities under design or construction are subject to changes based on the availability of funds, permit issuance, and so forth. New shafts and domes can be built as needed. Only one half of the 64-acre site is used for aboveground storage.

Source: DOE 1994k.

TABLE H.2.5–4.—*Mixed Low-Level Waste Streams at Los Alamos National Laboratory* [Page 1 of 2]

Treatability Group	Number of Items	Net Volume (m^3)	Projected Net Volume (1995-2000) (m^3)	Preferred Option	Alternate Option	Treatment Site
IPA wastes	104	15.89	0.01	Commercial thermal treatment	Hydrothermal	offsite
Scintillation fluids	18	2.47	4.0	Commercial thermal treatment	Hydrothermal	offsite
Lead blankets	4	0.74	0.2	Commercial treatment	Macroencapsulation	offsite
Soil with heavy metals	59	10.53	2.0	Commercial treatment	Chelator extraction	offsite
Environmental restoration soils	36	39.32	unknown	Commercial treatment	Macroencapsulation	offsite
Aqueous organic liquids	45	1.65	0.5	Evaporative oxidation	Hydrothermal	onsite
Halogenated organic liquids	385	16.58	5.5	Hydrothermal	DETOX process	onsite
Nonhalogenated organic liquids	275	14.34	10.0	Hydrothermal	DETOX process	onsite
Bulk oils	28	3.75	3.0	Hydrothermal	DETOX process	onsite
Polychlorinated biphenyls wastes with *Resource Conservation and Recovery Act* components	4	0.74	0.2	Hydrothermal	DETOX process	onsite
Organic-contaminated combustible solids	307	28.32	7.0	Thermal desorption	Under evaluation per LANL site treatment plan	onsite
Combustible debris	83	13.82	1.5	Macroencapsulation	Under evaluation per LANL site treatment plan	onsite
Aqueous wastes with heavy metals	203	1.85	1.0	Chemical plating waste skid	Evaporative oxidation	onsite
Corrosive solutions	162	1.36	0.5	Chemical plating waste skid	Evaporative oxidation	onsite
Aqueous cyanides, nitrates, chromates, and arsenates	15	0.13	0.01	Chemical plating waste skid	Evaporative oxidation	onsite
Water-reactive wastes	78	6.03	0.2	Water-reactive metals skid	Under evaluation per LANL site treatment plan	onsite
Compressed gases requiring scrubbing	13	0.35	0.1	Gas scrubbing skid	Under evaluation per LANL site treatment plan	onsite
Compressed gases requiring oxidation	6	0.08	0.1	Gas oxidation skid	Under evaluation per LANL site treatment plan	onsite

TABLE H.2.5–4.—*Mixed Low-Level Waste Streams at Los Alamos National Laboratory* [Page 2 of 2]

Treatability Group	Number of Items	Net Volume (m^3)	Projected Net Volume (1995-2000) (m^3)	Preferred Option	Alternate Option	Treatment Site
Organic-contaminated noncombustible solids	80	7.82	8.0	Thermal desorption	Under evaluation per LANL site treatment plan	onsite
Elemental mercury	45	0.5	0.05	Amalgamation	Under evaluation per LANL site treatment plan	onsite
Activated or inseparable lead	74	15.6	1.0	Macroencapsulation	Under evaluation per LANL site treatment plan	onsite
Noncombustible debris	41	5.62	3.0	Macroencapsulation	Under evaluation per LANL site treatment plan	onsite
Inorganic solid oxidizers	55	0.2	0.05	Hydrothermal	Under evaluation per LANL site treatment plan	onsite
Lead wastes	186	51.44	10.0	Under evaluation per LANL site treatment plan	Under evaluation per LANL site treatment plan	Under evaluation per LANL site treatment plan
Mercury wastes	63	18.3	25.5	Under evaluation per LANL site treatment plan	Under evaluation per LANL site treatment plan	Under evaluation per LANL site treatment plan
Compressed gases	10	1.25	2.0	Under evaluation per LANL site treatment plan	Under evaluation per LANL site treatment plan	Under evaluation per LANL site treatment plan
Biochemical laboratory wastes	9	1.34	unknown	Under evaluation per LANL site treatment plan	Under evaluation per LANL site treatment plan	Under evaluation per LANL site treatment plan
Dewatered treatment sludge	1,288	268.17	unknown	Under evaluation per LANL site treatment plan	Under evaluation per LANL site treatment plan	Under evaluation per LANL site treatment plan
Nonradioactive or suspect waste items	1,250	14.24	9.5	Sort, survey, and decontaminate	Appropriate treatment	onsite
Surface-contaminated lead	125	56.2	12.5	Lead decontamination trailer	Under evaluation per LANL site treatment plan	onsite
Lead requiring sorting	48	9.97	0.0	Sort based on treatment	Under evaluation per LANL site treatment plan	onsite
Total	5,099	608.61	107.9			

Source: LANL 1995a.

TABLE H.2.5-5.—*Low-Level Waste and Mixed Low-Level Waste Treatment Capability at Los Alamos National Laboratory*

Treatment Unit	Treatment Method	Input Capability	Output Capability	Design Feedrate[a]	Comment
Lead decontamination trailer, TA-50	Washing	Solid LLW, TCLP	Solidified lead sulfide to disposal TA 54, Area G	10 kg/hr	Operational
Low-Level Waste Compactor, TA-54, Bldg. 2	Compaction	Solid LLW	Compacted solid LLW	182 t	Replaces existing 45-t compactor
Chemical Plating Waste Treatment Pilot Unit, Chemical TA-50, Bldg. 37	Neutralization, oxidation, precipitation	Liquid mixed LLW; listed; contact-handled	Solidified metal sludge and solidified plating liquid; to disposal Mixed Waste Storage and Disposal Facility, TA-67	31 m^3/yr	Planned–150 55-gal drums per year
Radioactive liquid waste treatment, TA-21-257	Compaction, coagulation, sedimentation, neutralization, precipitation	Liquid mixed LLW, LLW; corrosive; contact-handled	Cemented sludge; to storage mixed waste dome, TA 54-49; liquid purified supernate; to treatment Radioactive Liquid Waste Treatment, TA-50-1	28.50 m^3/hr	Operational
Reactive waste treatment	Oxidation	Solid mixed LLW, LLW, hazardous waste; reactive metal	Solidified LLW metal salts to disposal TA-54, Area G	2.00 kg/hr	Planned but not funded
Scintillation vial crusher, Area L	Crushing and grinding	Liquid and solid mixed LLW; listed, ignitable, contact handled	Solid mixed LLW empty drums to disposal TA-54, Area G, Pit # 37; solvent contaminated process debris to storage mixed waste dome, TA-54-49	0.33 m^3/hr	Operational
TA-15 Open Detonation Facility	Detonation	Liquid and solid mixed LLW, hazardous waste, reactive, TCLP	Solid mixed LLW TCLP; ash with sand to storage TA-54, Area G storage area	Under evaluation per LANL site treatment plan	Standby mode RCRA interim status unit
TA-36 Open Detonation Facility	Detonation	Liquid and solid mixed LLW, hazardous waste, reactive, TCLP	Solid mixed LLW TCLP; ash with sand to storage TA-54, Area G storage area	Under evaluation per LANL site treatment plan	Operational

[a] For those facilities in use, this is a normal operating feedrate; for facilities under design or construction, this is a design feedrate. Schedules and feedrates for facilities under design or construction are subject to changes based on the availability of funds, results of treatability studies, and permit issuance.

Source: DOE 1994k.

TABLE H.2.5–6.—*Low-Level Waste and Mixed Low-Level Waste Storage at Los Alamos National Laboratory*

Storage Unit	Input Capability	Design Capacity[a] (m^3)	Comment
Lead stringer shaft 35	Solid LLW, metal TCLP	24	Operational
Lead stringer shaft 36	Solid LLW, metal TCLP	24	Operational
LLW waste shaft 145	Solid LLW	6.25	Operational
LLW waste shaft 146	Solid LLW	6.25	Operational
Mixed waste berm, TA-54, Area L	Liquid and solid mixed LLW, LLW, hazardous waste; metal; reactive, listed, ignitable, TCLP	Under evaluation per LANL site treatment plan	Operational
Mixed waste dome, TA-54-49	Solid sludge mixed LLW, LLW, hazardous waste; metal; corrosive, reactive, listed, TCLP	650	Operational
Mixed Waste Receiving and Storage Facility	Liquid and solid mixed LLW; listed, ignitable, TCLP	1,135	Planned and funded; Date available: June 1, 1998
Sample Management Facility, TA-3, Bldg. 371	Geologic rock and soil core samples from ER program that are potentially contaminated with radionuclides and nonradioactive contaminants including volatiles	153	Planned
TA-21-61	Liquid mixed LLW, listed, ignitable	120	Operational
TA-54, Area L gas cylinder storage	Gas mixed LLW, LLW, hazardous waste; corrosive, ignitable, listed, reactive	Under evaluation per LANL site treatment plan	Operational

[a] Schedules and capacities for facilities under design or construction are subject to changes based on the availability of funds, permit issuance, and so forth.
Note: ER - environmental restoration; TCLP - Toxicity Characteristic Leaching Procedure.
Source: DOE 1994k.

TABLE H.2.5–7.—*Waste Disposal at Los Alamos National Laboratory*

Disposal Unit	Input Capability	Capacity[a] (m^3)	Comment
Burial site - shafts, TA-54, Area G	Solid TRU waste, LLW. Solid type: construction/D&D debris, equipment, filters, glass, medical, paper, plastic, rags, rubber, soil. Contact-handled, remote-handled	51.5	Operational; Termination date: August 1, 2005
Burial site - pit 37, TA-54, Area G	Solid LLW. Solid type: construction/D&D debris, equipment, filters, glass, labpack, medical, metal, paper, plastic, rags, rubber, soil. Contact-handled Specific waste: PCBs	6,411	Operational; Termination date: December 31, 1996
Mixed Waste Disposal Facility, TA-67	Solid mixed LLW, listed	457,000	Planned and funded; Date available: December 25, 1997

[a] Schedules and capacities for facilities under design or construction are subject to changes based on the availability of funds, permit issuance, and so forth.
Source: DOE 1994k.

TABLE H.2.5–8.—*Hazardous Waste Quantities Shipped Offsite in 1994, Los Alamos National Laboratory*

Description	Number of Shipments Containing Description	Quantity (kg)	Estimated Volume (m^3) [a]
Arsenic compounds, liquid, n.o.s.	1	< 1	< 0.1
Caustic alkali liquids, n.o.s.	1	541	0.5
Combustible liquid, n.o.s.	1	299	0.3
Compressed gases, flammable, n.o.s.	8	999	2.0
Compressed gases, flammable, toxic, n.o.s.	6	542	1.0
Compressed gases, n.o.s.	6	488	1.0
Compressed gases, toxic, n.o.s.	7	1,182	2.4
Corrosive liquids, n.o.s.	52	5,808	5.8
Corrosive liquids, oxidizing, n.o.s.	2	320	0.3
Corrosive liquids, poisonous, n.o.s.	11	770	0.8
Corrosive solids, n.o.s.	2	5	< 0.1
Environmentally hazardous substances, liquid, n.o.s.	1	109	0.1
Flammable liquids, corrosive, n.o.s.	2	8	< 0.1
Flammable liquids, n.o.s.	61	3,799	3.8
Flammable liquids, poisonous, n.o.s.	15	1,383	1.4
Flammable solids, n.o.s.	25	1,872	1.2
Flammable solids, poisonous, n.o.s.	6	285	0.2
Hazardous waste, liquid, n.o.s.	65	11,003	11.0
Hazardous waste, solid, n.o.s.	96	146,344	97.6
Mercury	7	63	< 0.1
Nitrates, inorganic, n.o.s.	2	1	< 0.1
Organochlorine pesticides, solid toxic n.o.s.	1	4	< 0.1
Organophosphorus pesticides, solid, toxic, n.o.s.	1	68	< 0.1
Oxidizing substances, liquid, corrosive, n.o.s.	4	475	0.5
Oxidizing substances, liquid, n.o.s.	3	48	< 0.1
Oxidizing substances, solid, n.o.s.	1	2	< 0.1
Paint-related material	3	585	0.4
Poisonous liquids, corrosive, n.o.s.	1	5	< 0.1
Poisonous liquids, flammable, n.o.s.	5	74	< 0.1
Poisonous liquids, n.o.s.	22	882	0.9
Poisonous solids, n.o.s.	19	1,041	0.7
Refrigerant gases, n.o.s.	3	170	85.0

[a] For those shipments in which only a mass quantity was provided, a volume estimate was made based on density factors of 500 kg/m^3 for compressed gases, 1,000 kg/m^3 for liquids, and 1,500 kg/m^3 for solids.

Note: n.o.s. - not otherwise specified.

Source: DOE 1995h.

TABLE H.2.5–9.—*Hazardous Waste Treatment Capability at Los Alamos National Laboratory* [Page 1 of 2]

Treatment Unit	Treatment Method	Input Capability	Output Capability	Design Feedrate[a] (m^3/yr)	Comment
Wastewater Treatment Plant, TA-16-228	Centrifugation	Liquid hazardous waste, reactive	Liquid effluent to storage, mixed waste dome, TA-54-49 Solid spent carbon granules to treatment, TA-16 flash pad	5.70 m^3/hr	Operational; Final NPDES permit
TA-54, Area L treatment tanks	Solidification, evaporation, neutralization, precipitation	Solid hazardous waste (soil), TCLP	Sludge (solidified residue), disposal to TA 54, Area J	NA	Operational; RCRA Part B permit interim status; 1992 Volume: 378
TA-39 Open Detonation Facility	Detonation	Solid hazardous waste, reactive (filters, paper, rags, HE scrap)	Solid, TCLP, to air and soil	NA	Operational; RCRA Part B permit interim status; 1992 Mass: 44.01 kg/yr
TA-16 incinerator	Incineration	Solid hazardous waste, reactive (paper, plastic, rags, rubber, wood)	Solid, nonhazardous ash, disposal to TA-54, Area J landfill	368 kg/hr	Operational; RCRA Part B final permit
TA-16 (pressure vessels)	Filtration, open burning	Sludge hazardous waste, reactive, TCLP	Ash with sand; treatment to TA-54, Area L treatment tanks; filtered HE-contaminated wash-water; treatment to carbon-filter waste-water treatment unit	NA	Operational; RCRA Part B permit interim status; 1992 Mass: 3,068 kg/yr
TA-16 burn tables	Open burning	Solid hazardous waste, reactive, TCLP	Ash with sand; treatment to TA-54, Area L treatment tanks	NA	Operational; RCRA Part B permit interim status; 1992 Mass: 6,218 kg/yr
TA-16 flash pad	Open burning	Solid hazardous waste, reactive (glass, metal, equipment, carbon granules)	Flashed scrap and equipment, disposal to TA-54 Area J landfill	NA	Operational; RCRA Part B permit interim status; 1992 Mass: 22,455 kg/yr
TA-16 oil/solvent burn pan	Open burning	Liquid hazardous waste, ignitable, listed, reactive	Flashed to air	NA	Operational; RCRA Part B permit interim status; 1992 Volume: 1.03 m^3/yr

TABLE H.2.5–9.—*Hazardous Waste Treatment Capability at Los Alamos National Laboratory* [Page 2 of 2]

Treatment Unit	Treatment Method	Input Capability	Output Capability	Design Feedrate[a] (m^3/yr)	Comment
TA-14 open burning pad	Open burning	Solid hazardous waste, reactive (filters, paper, rags)	Solid nonhazardous ash; disposal to TA-54 Area J landfill	NA	Operational; RCRA Part B permit interim status; 1992 Volume: 0.28 m^3/yr
TA-14 open detonation pad	Detonation	Solid hazardous waste, reactive (HE scrap)	Solid hazardous waste; reactive, disposal to air and soil	NA	Operational; RCRA Part B permit interim status; 1992 Mass: 3,162 kg/yr

[a] For those facilities in use, this is a normal operating capacity; whereas, for facilities under design or construction this is a design capacity. Schedules and capacities for facilities under design or construction are subject to changes based on the availability of funds, results of treatability studies, permit issuance, and so forth.

Note: NA - not applicable; TCLP - Toxicity Characteristic Leaching Procedure.

Source: DOE 1994k.

TABLE H.2.5–10.—*Hazardous Waste Storage Capability at Los Alamos National Laboratory*

Storage Unit	Input Capability	Design Capacity[a] (m^3)	Comment
Area L storage, TA-54-31	Liquid hazardous waste, corrosive, ignitable, listed	1.67	Operational; RCRA Part B permit
Area L storage, TA-54-32	Liquid hazardous waste, reactive, corrosive, ignitable, listed	65.20	Operational; RCRA Part B permit
TA-54, Area L modular storage building	Solid hazardous waste (Labpack); corrosive, ignitable, listed, reactive	6.25	Operational; RCRA Part B permit

[a] Schedules and capacities for facilities under design or construction are subject to changes based on the availability of funds, permit issuance, and so forth.

Source: DOE 1994k.

H.2.6 Lawrence Livermore National Laboratory

The DOE Oakland Operations Office is the field organization responsible for the implementation of waste management plans at Lawrence Livermore National Laboratory (LLNL). The LLNL Hazardous Waste Management Division is responsible for preparing those plans. The Division is also responsible for processing all hazardous wastes, radioactive wastes, and mixed wastes generated at both the Livermore Site and Site 300. The Livermore Site and Site 300 do not generate or manage spent nuclear fuel or HLW. Both the Livermore Site and Site 300 are on the NPL for sites requiring environmental restoration in accordance with CERCLA and SARA. Because there is no spent nuclear fuel, HLW, or TRU waste associated with any of the proposed activities at the Livermore Site and Site 300 (secondary and case fabrication, HE fabrication, nonnuclear fabrication, NIF, and CFF), there will be no further discussion in this appendix of spent nuclear fuel, HLW, or TRU waste generation and management at the Livermore Site and Site 300.

Pollution Prevention. The *Waste Minimization and Pollution Prevention Awareness Plan* published on April 25, 1994, documents LLNL projections for present and future waste minimization and pollution prevention. The plan specifies those activities and methods used to reduce the quantity and toxicity of wastes generated at the site.

Low-Level Waste. LLNL has a relatively large inventory of noncertified LLW that must be characterized, certified, and disposed of. Most of this waste was generated between 1988 and 1993 and consists of roughly 7,000 drum equivalents. An ongoing multiphase project will ultimately conclude with the disposal of the entire LLNL legacy LLW inventory. This project includes the preparation of a waste disposal addendum to the LLNL waste disposal application that will cover legacy waste and any waste certification procedures.

Aqueous LLW is treated at Building 514, the Liquid Waste Treatment Facility. At the facility, containerized and bulk radioactive liquid wastes are transferred into one of the six 7,000-L (1,850-gal) tanks to be treated chemically. The tanks are used to treat both radioactive and mixed waste liquids. Following treatment, if the tank's contents are below established sewer discharge limits, the liquid is released to the sanitary sewer. The precipitate wastes from the chemical treatments are filtered to create a filter cake. The filter cake is then stabilized. Captured filtrate is either discharged to the sanitary sewer or retreated.

No liquid LLW is generated at Site 300. Most Site 300 solid LLW is generated from the detonation of test assemblies on firing tables. The debris consists of gravel and fragments of wood, metal, and glass; larger debris consists of tent poles and pieces of wood, steel, aluminum, concrete, plastic, glass, burlap bags, cables, and other inert testing materials. These parts are contaminated with depleted uranium and sometimes, thorium. Firing table operations have also periodically generated wastes containing tritium. LLW, including the gravel from firing table operations, is packaged in approved waste containers and transported to Building 804 for staging, pending shipment to the Livermore Site or shipment directly to NTS for disposal.

Mixed Low-Level Waste. Current inventories of mixed LLW at LLNL total approximately 457 m^3 (598 yd^3). Schedules for waste treatment vary by waste stream. Mixed waste (other than wastewater, which is treated at Building 514) is appropriately packaged and stored at the Area 514 complex or the Area 612 complex, pending establishment of a suitable onsite or offsite facility that can dispose of such waste according to applicable regulations. Descriptions of mixed waste treatment options, inventory, treatment, disposal and storage facilities for LLW, and mixed LLW are listed in tables H.2.6–1, H.2.6–2, and H.2.6–3.

Some mixed waste can be chemically or physically treated at LLNL. Existing treatment for mixed wastes includes neutralization, flocculation, chemical reduction and oxidation, precipitation, separation, filtration, solidification, size reduction, shredding, adsorption, and blending. Mixed wastes are currently treated in the Building 513 Solidification Unit, the Area 514 Wastewater Filtration Unit, and the Area 514 Wastewater Treatment Tank Farm Unit.

LLNL has requested regulatory agency approval to add centrifugation and evaporation treatment units, as well as to increase current treatment operations for mixed wastes. Also, mixed wastes are stored in appropriate units at the Livermore Site for extended periods until they can be shipped to an approved offsite treatment and/or disposal facility. Although LLNL does not have current existing treatment units to treat its organic liquid mixed waste, it is planning to develop treatment technology for these waste streams.

The matrices of the mixed LLW to be generated in the future include aqueous liquid, homogeneous solids, organic and inorganic debris, organic liquids, reactive metals, elemental lead, high efficiency particulate air (HEPA) filters, and elemental mercury. The aqueous liquid and homogeneous solids waste streams are projected to each generate 92 percent of the mixed LLW. Organic liquids will account for almost 3 percent of the future volume and the organic/inorganic debris is projected to account for approximately 4 percent of the mixed LLW. Reactive metals, elemental lead, HEPA filters, and elemental mercury account for the remaining 1 percent.

Soils from environmental restoration activities may contain low-level radioactivity (primarily tritium and some depleted uranium at Site 300) mixed with low concentrations of VOCs and possibly some metals (i.e., cadmium, lead, chromium, copper, nickel, zinc, beryllium, and mercury) in the soil matrix. The waste would primarily be generated during drilling operations and minor excavations. Environmental restoration drilling activities at LLNL are likely to occur through 1998. The generation rate of wastes from LLNL drilling is estimated to be 20 to 50 drums per year, or approximately 17 to 42 m^3 (22 to 55 yd^3) through 1998 (LLNL 1995h:6-2).

At Site 300, liquids (groundwater) from developing, testing, and purging wells that contain tritium and VOCs as the primary contaminants could potentially be generated. The total estimated volume of potential liquid mixed waste is less than 18,927 L/yr (5,000 gal/yr). This would correspond to 76 m^3 (100 yd^3) through 1998 (LLNL 1995h:6-2). Future generation of mixed waste at Site 300 is not anticipated.

Hazardous Waste. As a research facility, LLNL generates a variety of hazardous wastes, many in relatively small quantities. Almost all buildings generate hazardous wastes, ranging from common household items such as fluorescent light tubes, batteries, and lead-based paint to solvents, metals, cyanides, toxic organics, pesticides, asbestos, and PCBs. Table H.2.6–4 lists hazardous waste quantities shipped offsite from LLNL in 1994.

LLNL presently operates five hazardous waste management facilities. These are the Area 514 Facility, Area 612 Facility, Building 233 Facility, Building 693 Facility, and Building 419 Facility. The Area 514 and 612 facilities include treatment and storage units for hazardous and mixed wastes; the Building 233 facility is a container storage unit for hazardous and mixed wastes; the Building 693 Facility is a container storage unit for hazardous wastes, but will eventually be used for the storage of both hazardous and mixed wastes; and the Building 419 Facility includes inactive treatment units that are awaiting regulatory closure.

LLNL is currently operating its hazardous waste management activities under the interim status standards of the *California Code of Regulations*, Title 22, Part 66265. A RCRA Part B Permit application has been submitted to the State of California for continued operation, and a final permit is expected in 1996. Under interim status, LLNL receives hazardous and/or mixed wastes from Site 300.

Site 300 operates two hazardous waste management units. These units are only used for the treatment and long-term storage (i.e., greater than 90-day storage) of hazardous wastes. The Building 883 container storage area is a covered storage area on the southwest side of Building 883. The facility is designed primarily to hold hazardous waste before it is transferred to the Area 612 Facility at LLNL for treatment, storage, and disposal or sent directly offsite for disposal. It is currently permitted under the RCRA Part B Permit for Site 300. Table H.2.6–5 lists hazardous waste quantities shipped offsite from Site 300 in 1994.

LLNL generates several types of medical wastes consisting of biohazardous waste and sharps (i.e., needles, blades, and glass slides) waste from biomedical research, Center for Chemical Forensics, and health services facilities. In July 1991, LLNL registered with the Alameda County Environmental Health Services as a large-quantity generator of medical waste, and submitted an application for a medical waste treatment permit. The treatment permit was issued in August 1991 and is valid through July 1996.

TABLE H.2.6–1 *Mixed Low-Level Waste Streams at Lawrence Livermore National Laboratory* [Page 1 of 2]

Waste Description	Source Description	Inventory as of January 1995 (m^3)	Total Generation 1995-1999 Projection (m^3)	Treatment Option
Organic fluids and glass	Changing R&D activities which provide liquid organic fluids in glass vials	5.5	5	Treating or plan to treat onsite
Filter cake	Rotary drum vacuum filtration of LLNL wastewaters (Building 514)	105.9	110	Treating or plan to treat onsite
Inorganic trash	Changing R&D activities which generate cleanup trash and used safety equipment such as coveralls	8.7	7	Treating or plan to treat offsite
Wash waters	Laboratory-wide R&D	68.1	1,350	Treating or plan to treat onsite
Inorganic sludges and particulates	Onsite retention tank cleaning and surface spill cleanup	2.8	5	Treating or plan to treat onsite
Scrap metal	Onsite research and maintenance including lab	15.2	5	Treating or plan to treat offsite
Lead bricks	Used and discarded lead bricks which may have been used for shielding purposes	3.9	5	Treating or plan to treat offsite
Halogenated solvent	From/by phase separation from onsite waste water treatment processes	7.1	10	Treating or plan to treat onsite
Oils	Waste oils skimmed by phase separation from onsite waste water treatment processes	3.6	8.5	Treating or plan to treat onsite
Soil-1	Soil excavated from onsite trenching activities	10.1	10	Treating or plan to treat onsite
Lithium metal	Used and discarded laboratory waste from changing R&D activities	1.0	1.0	Treating or plan to treat onsite
Oils	Draining of vacuum pumps. Onsite R&D activities which use halogenated solvents	13.7	20	Treating or plan to treat onsite
HEPA filters	Generated by onsite research activities and facility maintenance	3	15	Treating or plan to treat offsite
Organic liquids	Changing biomedical and nuclear chemistry R&D activities	0.3	1	Treating or plan to treat onsite
Inorganic trash-3	Changing research and laboratory cleanup activities	50.7	50	Treating or plan to treat offsite
Lab packs with metals	Onsite R&D activities	0.8	1.5	Treating or plan to treat offsite
Metal chips and coolant	Depleted uranium turnings and chips from machining operations	3.2	unknown	Treatment options still being assessed
Contaminated soils	Waste generated from equipment maintenance	6.6	30	Treating or plan to treat onsite
Liquid mercury waste	Equipment maintenance	0.09	0.05	Treating or plan to treat offsite
Stabilized sludges and particulates	Sludges from tank bottoms and equipment cleanout that have been solidified/stabilized with cement	141.3	125	Treating or plan to treat onsite

TABLE H.2.6–1 *Mixed Low-Level Waste Streams at Lawrence Livermore National Laboratory* **[Page 2 of 2]**

Waste Description	Source Description	Inventory as of January 1995 (m^3)	Total Generation 1995-1999 Projection (m^3)	Treatment Option
Organic sludges and particulates	Sump waste, lab sink waste, dip tanks, etc.	1.2	5	Treating or plan to treat onsite
Other reactives	Contaminated equipment and containerized waste generated from onsite R&D activities	4.4	1	Treatment options still being assessed
Total		457.19	1,765	

Source: DOE 1995gg.

TABLE H.2.6–2. *Low-Level Waste and Mixed Low-Level Waste Treatment Capability at Lawrence Livermore National Laboratory* **[Page 1 of 2]**

Treatment Unit	Treatment Method	Input Capability	Output Capability	Total Capacity[a] (m^3/yr)	Comment
Building 513 shredding unit	Shredding, size reduction	Solid mixed LLW	Solid mixed LLW to Area 612 container storage units	$5.5x10^6$ kg/yr	RCRA Part A interim status; Closure date: 2009
Building 612 drum/container crushing unit	Size reduction	Solid mixed LLW	Solid mixed LLW (crushed empty drums) to Area 612 container storage unit	$1.248x10^6$ kg/yr	Permits: District Air; RCRA Part A interim status; Closure date: 2004
Area 514-1 cold vapor evaporation unit	Evaporation neutralization	Liquid mixed LLW	Liquid mixed LLW to Area 514 wastewater filtration	7,495	Permits: District Air; RCRA Part A interim status; Closure date: 2011
Area 514-1 centrifugation unit	Centrifugation separation	Liquid mixed LLW	Liquid mixed LLW to Area 514 wastewater filtration	7,495	Permits: District Air; RCRA Part A interim status; Closure date: 2011
Area 514 wastewater filtration unit	Filtration	Liquid mixed LLW	Solid mixed LLW to Area 612 container storage unit	3,731	Permits: RCRA Part A interim status; Closure date: 2004
Area 514 Wastewater Treatment Tank Farm	Liquid/solid separation, ion exchange, neutralization; leaching, oxidation, carbon adsorption, precipitation; deactivation, reduction, flocculation	Liquid mixed LLW	Liquid mixed LLW to Area 514 wastewater filtration	7,495	Permits: RCRA Part A interim status; Closure date: 2004
Area 514-1 carbon adsorption unit	Carbon adsorption, solvent extraction	Liquid mixed LLW	Liquid mixed LLW to Area 514 wastewater filtration	7,495	Permits: District Air; Closure date: 2011

TABLE H.2.6–2. ***Low-Level Waste and Mixed Low-Level Waste Treatment Capability at Lawrence Livermore National Laboratory*** **[Page 2 of 2]**

Treatment Unit	Treatment Method	Input Capability	Output Capability	Total Capacity[a] (m^3/yr)	Comment
Area 514-1/portable blending unit	Neutralization blending, flocculation	Liquid mixed LLW	Mixed LLW to Area 514 wastewater filtration	7,495	Permits: District Air; Closure date: 2011
Area 514-1/tank blending unit	Neutralization blending, flocculation	Liquid mixed LLW	Mixed LLW to Area 514 wastewater filtration	7,495	
Building 513 solidification unit	Solidification neutralization stabilization, immobilization	Liquid mixed LLW, solid mixed LLW	Solid mixed LLW to Area 612 container storage units	1,347	RCRA Part A interim status; Closure date: 2004
Building 612 size reduction unit	Size reduction, decontamination	Solid mixed LLW	Solid mixed LLW (size reduced) to Area 612 container storage units	1 x 10^6 kg/yr	RCRA Part A interim status; this unit replaces the size reduction unit in building 419. Closure date: 2011
Decontamination and Waste Treatment Facility	Will replace areas 514 and 612 using same type treatment methods	Liquid mixed LLW, solid mixed LLW; liquid LLW; solid LLW	Not determined	Not determined	The RCRA Part B permit application has not been submitted yet. This is a planned facility.

[a] For those facilities in use this is a normal operating capacity; whereas, for facilities under design or construction this is a design capacity. Schedules and capacities for facilities under design or construction are subject to changes based on the availability of funds, results of treatability studies, permit issuance, etc.

Source: DOE 1994n; LLNL 1996i:2.

TABLE H.2.6–3 ***Low-Level Waste and Mixed Low-Level Waste Storage at Lawrence Livermore National Laboratory*** **[Page 1 of 2]**

Storage Unit	Input Capability	Design Capacity[a] (m^3)	Comment
Receiving, segregation, and container storage (Area 612-4)	Liquid mixed LLW; solid mixed LLW	180.1	Container storage-RCRA Part A interim status; Closure date: 2009
Building 513 container storage unit	Solid mixed LLW	60	Container storage-RCRA Part A interim status; Closure date: 2004
Building 625 container storage unit	Liquid mixed LLW; solid mixed LLW	80.28	Container storage-RCRA Part A interim status; Closure date: 2009
Building 612 container storage unit	Liquid mixed LLW; solid mixed LLW	145.9	Container storage-RCRA Part A interim status; Closure date: 2009
Building 614 west cells container storage	Liquid mixed LLW; solid mixed LLW	2.55	Container storage-RCRA Part A interim status; Closure date: 2004
Area 514-2 container storage unit	Liquid mixed LLW; solid mixed LLW	39.4	Container storage-RCRA Part A interim status; Closure date: 2009

TABLE H.2.6–3 *Low-Level Waste and Mixed Low-Level Waste Storage at Lawrence Livermore National Laboratory* [Page 2 of 2]

Storage Unit	Input Capability	Design Capacity[a] (m^3)	Comment
Area 514-1 container storage unit	Liquid mixed LLW; solid mixed LLW	53.4	Container storage-RCRA Part A interim status; Closure date: 2009
Area 514 storage tank (514-R501 unit)	Liquid mixed LLW; liquid hazardous waste	84.5	Tank storage-RCRA Part A interim status; Closure date: 2004
Area 514-3 container storage unit	Liquid mixed LLW; solid mixed LLW	83.47	Container storage-RCRA Part A interim status; Closure date: 2009
Area 612 tank trailer storage unit	Liquid mixed LLW	19	Tank storage-RCRA Part A interim status; Closure date: 2009
Area 612-1 container storage unit	Solid mixed LLW	1,086.4	Container storage-RCRA Part A interim status; Closure date: 2004
Area 612-5 container storage unit	Solid mixed LLW	760.78	Container storage-RCRA Part A interim status; Closure date: 2004
Area 612-2 container storage unit	Liquid mixed LLW; solid mixed LLW	40	Container storage-RCRA Part A interim status; Closure date: 2009
Building 612 container storage unit	Liquid mixed LLW; solid mixed LLW; PCB TSCA mixed only	281.9	Container storage-RCRA Part A interim status; Closure date: 2014
Building 233 container storage unit	Liquid mixed LLW; solid mixed LLW	56.63	Container storage-RCRA Part A interim status; Closure date: 2023

[a] Schedules and capacities for facilities under design or construction are subject to changes based on the availability of funds, permit issuance, etc.
Source: DOE 1994k.

TABLE H.2.6–4 *Hazardous Waste Quantities Shipped Offsite in 1994, Lawrence Livermore National Laboratory* [Page 1 of 2]

Description	Number of Shipments Containing Description	Quantity (kg)	Estimated Volume[a] (m^3)
Articles, explosives, n.o.s.	6	12	<0.1
Barium nitrate	1	68	<0.1
Blue asbestos	8	321,113	214.1
Caustic alkali liquids, n.o.s.	17	3,828	3.8
Combustible liquid, n.o.s.	23	31,472	31.5
Compounds, cleaning liquid	3	91	<0.1
Corrosive solids, poisonous, n.o.s.	1	5	<0.1
Corrosive liquids, n.o.s.	41	11,755	11.8
Corrosive solids, n.o.s.	8	585	0.4
Corrosive liquids, oxidizing, n.o.s.	5	612	0.6
Corrosive liquids, poisonous, n.o.s.	3	151	0.2
Corrosive liquids, flammable, n.o.s.	3	37	<0.1
Environmentally hazardous substances, solid, n.o.s.	2	23,827	15.6
Environmentally hazardous substances, liquid, n.o.s.	1	438	0.4
Flammable solids, n.o.s.	10	977	0.7
Flammable liquids, corrosive, n.o.s.	12	302	0.3
Flammable liquids, n.o.s.	37	17,292	17.3
Flammable solids, poisonous, n.o.s.	1	12	<0.1
Flammable solids, corrosive, n.o.s.	1	32	<0.1
Flammable liquids, poisonous, n.o.s.	16	988	1.0
Hazardous waste, liquid	1	1,429	1.4
Hazardous waste, solid, n.o.s.	2	36,505	24.3
Hazardous waste, solid	3	37,025	24.7
Metal powders, flammable, n.o.s.	4	872	0.6
Nitrates, inorganic, n.o.s.	1	40	<0.1
Non-RCRA hazardous waste solid	53	287,054	191.4
Non-RCRA hazardous waste, liquid	60	62,121	62.1
Organochlorine pesticides, solid toxic, n.o.s.	1	8	<0.1
Oxidizing substances, liquid, corrosive, n.o.s.	2	211	0.2
Oxidizing substances, solid, corrosive, n.o.s.	2	16	<0.1
Oxidizing substances, solid, n.o.s.	7	149	0.1
Oxidizing substances, solid, poisonous, n.o.s.	5	65	<0.1
Oxidizing substances, liquid, n.o.s.	1	6	<0.1
Poisonous solids, corrosive, n.o.s.	1	6	<0.1
Poisonous liquids, corrosive, n.o.s.	4	288	0.3
Poisonous solids, n.o.s.	12	177	0.1
Poisonous liquids, n.o.s.	11	329	0.3
Polychlorinated biphenyls	20	21,779	14.5
Pyrophoric, liquids, n.o.s.	2	19	<0.1
Pyrophoric metals, n.o.s.	3	150	0.1
Pyrophoric solids, n.o.s.	1	15	<0.1

TABLE H.2.6–4 *Hazardous Waste Quantities Shipped Offsite in 1994, Lawrence Livermore National Laboratory* [Page 2 of 2]

Description	Number of Shipments Containing Description	Quantity (kg)	Estimated Volume[a] (m^3)
Substances, explosive, n.o.s.	1	8	<0.1
Substances which in contact with water emit flammable gases, liquid	5	39	<0.1
Substances which in contact with water emit flammable gases, solid	12	158	0.1

[a] For those shipments in which only a mass quantity was provided, a volume estimate was made based on density factors of 1,000 kg/m^3 for liquids and 1,500 kg/m^3 for solids.

Note: n.o.s. - not otherwise specified.

Source: DOE 1995h.

TABLE H.2.6–5. *Hazardous Waste Quantities Shipped Offsite in 1994, Lawrence Livermore National Laboratory Site 300*

Description	Number of Shipments Containing Description	Quantity (kg)	Estimated Volume[a] (m^3)
Combustible liquids, n.o.s.	5	30,030	30.0
Compounds, cleaning liquid	4	174	0.2
Corrosive liquids, n.o.s.	1	309	0.3
Non-RCRA hazardous waste liquid	10	34,036	34.0
Non-RCRA hazardous waste solid	8	28,316	18.9

[a] For those shipments in which only a mass quantity was provided, a volume estimate was made based on density factors of 1,000 kg/m^3 for liquids and 1,500 kg/m^3 for solids.

Note: n.o.s. - not otherwise specified.

Source: DOE 1995h.

Medical wastes from the Biomedical Sciences Division are autoclaved in Building 365 for sterilization before disposal as sanitary waste, except those biological wastes containing carcinogens. These wastes are inactivated chemically, or when this is not possible, disposed of in an appropriately labeled carcinogen/radioactive waste container. Sharps waste is sent to a commercial incinerator following sterilization.

Medical waste from Site 300 is generated at the Medical Facility, Building 877. These wastes are transported to LLNL where they are autoclaved at Building 365. The sterilized materials are then disposed of as sanitary waste.

Nonhazardous Waste. The Livermore Site discharges approximately 1.1 million liters per day (0.209 million gallons per day) of wastewater to the city of Livermore sewer system; this amount is less than 7 percent of the total flow to the city system (LLNL 1995d:6-1). This volume includes wastewater generated by Sandia National Laboratories (SNL) (Livermore). The wastewater contains sanitary sewage and industrial effluent from both LLNL and SNL and is discharged according to permit requirements and the city of Livermore Public Services Ordinance. The effluent is processed at the Livermore Water Reclamation Plant. As part of the Livermore-Amador Valley Wastewater Management Program, the treated sanitary wastewater is transported out of the valley through a pipeline and discharged into the San Francisco Bay. A small portion of the treated effluent from the Livermore Water Reclamation Plant is used for summer irrigation of the municipal golf course, which is next to the Livermore Water Reclamation Plant. Sludge from the treatment process is disposed of in sanitary landfills.

Administrative and engineering controls at the Livermore Site prevent potentially contaminated wastewater from being discharged directly to the sanitary sewer. Wastewater is collected and monitored at several different points from its generation to its release to the municipal collection system. LLNL completed construction of a diversion system to hold wastewater that is unacceptable for release to the Livermore Water Reclamation Plant. When an unacceptable discharge is detected by the monitoring system, the diversion system is automatically activated. Up to 775,000 L (205,000 gal) of potentially contaminated sewage can be held pending analysis to find the appropriate handling methods. The diverted effluent may be returned to the sanitary sewer, shipped for offsite disposal, or treated at LLNL's Hazardous Waste Management Facility.

Sanitary wastewater generated within the General Services Area at Site 300 is discharged to an onsite sewer lagoon. Other more remotely located buildings on Site 300 are serviced by septic systems and leach fields. Industrial wastewaters are contained in retention tanks and analyzed, and their proper disposition decided. These wastewaters may be shipped to LLNL for treatment and discharged to the sanitary sewer system or shipped directly to an offsite treatment and disposal facility. The nonhazardous rinsewaters from the HE machining, pressing, and formulation processes are disposed of by surface evaporation from two ponds.

LLNL does not have any onsite solid waste disposal facilities. After waste reduction and recycling, solid wastes are collected in dumpsters and other similar containers and transported to the Vasco Road Landfill for disposal. Solid waste generated at Site 300 is transported to the Corral Hollow Sanitary Landfill, approximately 6.44 km (4 mi) east of Site 300 on Corral Hollow Road. The San Joaquin County Public Works Department is currently evaluating alternatives for solid waste disposal, including expansion of the Corral Hollow Sanitary Landfill, siting of new landfills, and construction of a transfer station for disposal at another landfill.

The *California Integrated Waste Management Act* of 1989 mandates reductions in sanitary waste by counties. Sanitary waste must be reduced by at least 25 percent by 1995; the base year for this reduction is 1990. By 2000, the reduction must be 50 percent compared to the 1990 base. LLNL has already reduced this waste stream by over 40 percent from the 1990 base (LLNL 1995b:68).

H.2.7 Sandia National Laboratories

At the Albuquerque location of SNL, activities for R&D on national security and energy projects result in the generation and required management of TRU, low-level, mixed, hazardous, solid industrial, and sanitary wastes. SNL also has five spent nuclear fuel storage facilities: the Manzano Storage Structures, the Annular Core Research Reactor Facility, the Sandia Pulse Reactor Facility, the Hot Cell Facility, and the Special Nuclear Materials Storage Facility. Past activities associated with nuclear weapon development, engineering, and testing at the site has resulted in environmental contamination. The principal sources included tests on weapons and weapon components, discharges of radioactive liquids and hazardous chemicals into the environment, oil spills, disposal of radioactive waste and hazardous chemicals in landfills, rocket launches, and burning of waste, including HE. The contaminated facilities range from reactors to scrap yards. SNL is not on the NPL for sites requiring environmental restoration in accordance with CERCLA and SARA. Because there is no spent nuclear fuel, HLW, or TRU waste associated with any of the proposed activities at SNL (nonnuclear fabrication and NIF), there will be no further discussion of these wastes at SNL in this appendix.

Pollution Prevention. A formal Waste Minimization and Pollution Prevention Awareness Program was initiated at SNL in 1989 to comply with EPA regulations and DOE orders. A Waste Minimization and Pollution Prevention Awareness Plan was completed in December 1991 and updated in December 1992 and May 1994. The plan specifies those activities and methods required to reduce the quantity and toxicity of wastes generated at the site.

Low-Level Waste. Onsite disposal of LLW at SNL was terminated in December 1988 as a result of a DOE order. Currently, all newly generated LLW is stored temporarily above ground at generator sites or in transportation containers at the inactive Technical Area III disposal site. In 1994, approximately 53 m^3 (69 yd^3) of LLW was accepted at the Technical Area III storage site (SNL 1995g:3-5). This waste consisted primarily of fission product and uranium-contaminated waste on a volumetric basis, and tritium-contaminated waste on an activity basis. The total liquid LLW and solid LLW generated in 1994 as packaged for treatment or storage was 0.912 m^3 (1.19 yd^3) and 53.3 m^3 (69.7 yd^3), respectively (SNL 1995f:7). All LLW packages were stored at the Technical Area III storage site and shipped for disposal at NTS.

Mixed Low-Level Waste. Unique tests and experimental programs at SNL have generated small volumes of a broad variety of mixed wastes. The total SNL liquid mixed LLW and solid mixed LLW generated in 1994 as packaged for treatment or storage was 0.007 m^3 (2 gal) and 1.94 m^3 (2.54yd^3), respectively (SNL 1995f:7).

SNL has submitted a Part B Permit application for a permit under RCRA, as amended, to allow for the storage and treatment of mixed radioactive and hazardous wastes. In August 1990, SNL submitted a RCRA Part A Permit application (interim status) to the State of New Mexico for the storage and limited treatment of mixed waste. In October 1992, a permitting strategy in the form of a Letter Agreement was submitted to the State of New Mexico for the SNL mixed waste Part B Permit application. In November 1992, SNL submitted a RCRA Part B Permit application for mixed waste. This application and the Part A application were amended in August 1993 and December 1994 submittals to the state. In January 1995, SNL submitted a revised mixed waste Part A and Part B Permit application to the New Mexico Environment Department. Treatments in the combined permit application now include compaction, stabilization/solidification, shredding/baling, decontamination/waste segregation, pH neutralization, encapsulation, chemical stripping/dissolution, destruction/extraction, chemical precipitation, amalgamation, ion exchange, reverse osmosis, demineralization, and hazard separation.

The Environmental Restoration Program at SNL is being performed under a RCRA Hazardous and Solid Waste Amendments Permit. The permit outlines the corrective action or cleanup processes at specific sites at SNL. The Environmental Restoration Program currently has no existing mixed waste in inventory. It is likely that some mixed waste will be generated during corrective action activities such as RCRA closures, RCRA facility investigations, corrective measures studies, and the implementation of selective corrective measures. The possible waste forms include soil and soil cuttings from drilling and excavation, excavated material such as discarded equipment, contaminated groundwater, decontamination liquid from the cleaning of drilling and sampling equipment, and personal protective equipment (SNL 1995c:6-2).

Although there are currently no operational onsite mixed LLW treatment facilities at SNL, plans are underway to develop some limited capabilities to ensure that mixed LLW can be treated to meet the land disposal restrictions treatment standards using existing technologies. The mixed waste site treatment plan at SNL is heavily integrated with the work at other DOE sites that are tasked with developing mobile treatment units for use at multiple sites. This development involves proving-in new applications of technologies that are currently available but will require testing through treatability studies (SNL 1995c:iii).

Other waste streams, such as explosives, are being studied for onsite treatment by SNL because of its unique nature or handling requirements, or for development of treatment procedures that will facilitate eventual disposal, such as those required by the Nevada Operations Office for disposal at NTS. Offsite commercial treatment and disposal is an option for a small volume of scintillation waste and for waste that may not be treatable to meet the NTS Waste Acceptance Criteria (SNL 1995c:iii).

The Radioactive and Mixed Waste Management Facility at SNL Technical Area III was completed in 1990. Due to changes in regulations during construction, some facility upgrades are required before operations can begin. Once operational, mixed LLW will be treated in accordance with the strategies identified in the mixed waste Site Treatment Plan. This 557-m^2 (6,000-ft^2) facility will provide the means to open, treat, and repackage LLW and mixed LLW. The Radioactive and Mixed Waste Management Facility is expected to be operational in 1996 (SNL 1995g:3-5).

Currently, the Waste Operations Department operates the Technical Area III interim storage site. There are nine units described in the current RCRA Mixed Waste Part B Permit application, as amended in December 1994. The seven Manzano bunkers, the Radioactive and Mixed Waste Management Facility, and Building 6596 will be the main areas for mixed waste storage in the future. No additional storage capacity will be needed based on future generation rates. Most of these units are within the SNL technical areas although explosives are stored in the Manzano bunkers.

The mixed waste streams at SNL have been combined into 16 treatability groups, each with a preferred treatment option. Descriptions of the mixed waste treatability groups, volumes, preferred treatment option, and treatment site and facility are listed in table H.2.7–1. Treatment and storage facilities for LLW and mixed LLW are listed in tab H.2.7–2 and H.2.7–3.

Hazardous Waste. As a research facility, SNL generates a variety of hazardous wastes, many in relatively small quantities. All RCRA-regulated wastes generated (except mixed wastes) are transported offsite for disposal at RCRA-permitted treatment, storage, and disposal facilities. Chemical wastes generated by R&D activities are collected from generator locations, segregated according to DOT hazard class, and transported to the SNL RCRA-permitted Hazardous Waste Management Facility for storage. At the Hazardous Waste Management Facility, the wastes are consolidated and packaged according to DOT and EPA requirements. Packaged wastes are transported by DOT-certified carriers to RCRA-permitted treatment, storage, and disposal facilities or recyclers for final disposition.

During 1994, 691,700 kg (1,524,000 lb) of chemical wastes were managed by SNL's Chemical Waste Management Program, including 86,300 kg (190,300 lb) of RCRA-regulated hazardous waste and 605,000 kg (1,333,800 lb) of solid and recycled materials. A total of 29,780 packages were collected from SNL generators in 1994, packaged into 4,223 containers, and sent to treatment, storage, and disposal facilities and recyclers. The volume of RCRA hazardous waste processed in 1994 decreased from that reported in 1993; however, the quantity of solid and recycled material increases. The volume was influenced by the Kirtland Air Force Base solid waste landfill closure, Environmental Restoration Project remediation activities, and recycling operations (SNL 1995g:3-3).

SNL's Thermal Treatment Facility was issued a treatment permit in November 1994 by the New Mexico Environment Department to thermally treat residual explosives. In 1994, the Thermal Treatment Facility did not treat any residual explosives generated at SNL (SNL 1995g:3-3).

Hazardous waste quantities shipped offsite from SNL in 1994 are shown in table H.2.7–4. A summary of the hazardous waste treatment and storage facilities is shown in tables H.2.7–5 H.2.7–6.

TABLE H.2.7–1.—*Mixed Low-Level Waste Streams at Sandia National Laboratories* [Page 1 of 2]

Treatability Group	Number of Waste Streams	Inventory as of May 1995 (m^3)	Projected Generation 1995 to 1999[a] (m^3)	Preferred Treatment Option	Treatment Site and Facility
Inorganic debris (with an explosive component): neutron generators, thermal batteries, and four small waste streams contaminated with energetic materials	6	2.7	<1	Deactivation	Onsite treatability study
Inorganic debris (with a water reactive constituent): lithium batteries and activated metallic sodium	2	0.04	<1	Deactivation	Onsite treatability study
Reactive metals: pyrophoric metal powders and finely divided metal powders	7	0.02	<1	Deactivation/ stabilization	Onsite treatability study
Elemental lead: lead shielding, bricks, pigs, boxes, and gasket	3	0.04	<1[b]	Macroencapsulate	Onsite using Pantex MTU
Aqueous liquids (corrosive): liquid acids or bases (pH < 2.1 or >12.4)	2	0.02	<1	Neutralization and stabilization	Onsite treatability study
Elemental mercury: tritium-contaminated mercury from temperature and altitude chambers; and tritium and uranium-238 contaminated mercury	1	0.0001	<1[c]	Amalgamate	Onsite using Pinellas MTU
Organic liquids I: hazardous scintillation waste and methanol	1	0.2	0[d]	Incineration	Offsite commercial facility
Organic debris (with organic contaminants): swipes, wipes, and personal protective equipment contaminated with solvents	32	28	1[e]	Thermal desorption	Onsite using GJPO MTU
Inorganic debris (with TCLP metals): cadmium sheets or rods, circuit boards with lead or silver solder, batteries, cables, electronic devices, weapons components	42	7	15[f]	Macroencapsulate	Onsite using Pantex MTU
Heterogeneous debris: contains both organic (combustible) and inorganic (noncombustible) debris	10	29	155[g]	No data provided	Onsite
Organic liquids II: vacuum pump oils, mixed nonhalogenated solvents, and a grinding sludge with trichloroethylene	1	2.7	<1	Hydrothermal processing	Onsite using LANL MTU (Treatability study at LANL)
Organic debris (with TCLP metals): swipes, wipes, personnel protection equipment, and trash contaminated with metals	3	0.6	<1	Macroencapsulate	Onsite using Pantex MTU
Oxidizers: uranyl perchlorates, uranyl nitrates, thorium nitrates, and uranium oxynitrate	3	0.01	<1	Deactivation	Onsite treatability study
Aqueous liquids (organic contaminants): corrosive liquid with methanol	1	0.01	159[g]	Evaporation, oxidation	Treatability study at GJPO

TABLE H.2.7–1.—*Mixed Low-Level Waste Streams at Sandia National Laboratories* [Page 2 of 2]

Treatability Group	Number of Waste Streams	Inventory as of May 1995 (m^3)	Projected Generation 1995 to 1999[a] (m^3)	Preferred Treatment Option	Treatment Site and Facility
Soils <50 percent debris	None	0	89[g]	No current inventory at SNL	No current inventory at SNL
Cyanide waste: potassium cyanide with uranium-238	None	0.001	0	Oxidation	Treatability study at LANL
Total	114	70.3411	<428	-	-

[a] The quantities are estimates only.
[b] The generation rate for lead solids may change significantly as the Lead Bank Program progresses.
[c] A small amount may be generated at SNL (Livermore), and managed under the SNL Mixed Waste Site Treatment Plan at the Albuquerque location.
[d] Because of the use of nonhazardous scintillation liquids, it is assumed that no organic liquid mixed waste will be generated in the next 5 years.
[e] The generation rate of organic debris may greatly decrease because of the reduction of hazardous solvents.
[f] It is assumed that the generation of inorganic debris will remain comparable to the current rate.
[g] From the Environmental Restoration Program.
Note: GJPO - Grand Junction Projects Office, Colorado; MTU - Mobile Treatment Unit; TCLP - Toxicity Characteristic Leaching Procedure.
Source: DOE 1995gg; SNL 1995c.

TABLE H.2.7–2.—*Low-Level Waste and Mixed Low-Level Waste Treatment Capability at Sandia National Laboratories*

Treatment Unit	Treatment Method	Input Capability	Output Capability	Total Capacity[a] (m^3/yr)	Comment
Radioactive and Mixed Waste Management Facility	Compaction, solidification, neutralization, precipitation, shredding, and stripping	Liquid and solid mixed LLW, solid LLW	Compacted various waste forms, gamma assay of waste packages, mixing and solidification of liquid wastes, performed bench scale treatment of waste, and segregated and repackaged various waste types	Bench scale	Status: under construction Date available: December 31, 1996 Termination date: January 1, 2020

[a] Schedules and capacities for facilities under design or construction are subject to changes based on the availability of funds and permit issuance.
Source: DOE 1994n; DOE 1995gg.

TABLE H.2.7-3.—*Low-Level Waste and Mixed Low-Level Waste Storage at Sandia National Laboratories*

Storage Unit	Input Capability	Design Capacity[a] (m^3)	Comment
Annular Core Research Reactor	Liquid and solid mixed LLW and liquid and solid LLW	29	Currently not storing waste. Part B submitted November 8, 1992; amended August 30, 1993. Date available: unknown. Termination date: January 1, 2020.
Area III Interim Storage Site	Liquid and solid mixed LLW and liquid and solid LLW	2,520	Operational; RCRA interim status: August 31, 1993. Termination date: April 1, 2020.
Building 819	Liquid and solid mixed TRU, TRU, mixed LLW, and LLW	259	Operational; RCRA Part B permit application submitted; amended August 30, 1993. Termination date: April 1, 2020.
Building 6502 High Bay	Liquid and solid mixed LLW	424	Nonoperational due to upgrades/major repairs Date available: January 1, 1995. RCRA interim status. Termination date: January 1, 2020.
Building 6596 High Bay Waste Storage Facility	Liquid and solid mixed TRU, TRU, mixed LLW, and LLW	916	Nonoperational due to upgrades/major repairs. Termination date: July 16, 2020.
Explosives Storage Igloo	Solid mixed LLW	57	Operational; RCRA interim status: August 31, 1993. Termination date: April 1, 2020.
Manzano Facility (7057)	Liquid and solid mixed TRU, TRU, mixed LLW, and LLW	183	Operational; RCRA Part B submitted November 8, 1992, and amended August 30, 1993. Termination date: unknown.
Manzano Facility (7045)	Liquid and solid mixed TRU, TRU, mixed LLW, and LLW	183	Operational; RCRA Part B submitted November 8, 1992, and amended August 30, 1993. Termination date: unknown.
Manzano Facility (7063)	Liquid and solid mixed TRU, TRU, mixed LLW, and LLW	235	Operational; RCRA Part B submitted November 8, 1992, and amended August 30, 1993. Termination date: unknown.
Manzano Facility (7078)	Liquid and solid mixed TRU, TRU, mixed LLW, and LLW	235	Operational; RCRA Part B submitted November 8, 1992, and amended August 30, 1993. Termination date: unknown.
Manzano Facility (7055)	Liquid and solid mixed TRU, TRU, mixed LLW, and LLW	235	Operational; RCRA Part B submitted November 8, 1992, and amended August 30, 1993. Termination date: unknown.
Manzano Facility (7118)	Liquid and solid mixed TRU, TRU, mixed LLW, and LLW	235	Operational; RCRA Part B permit application submitted November 8, 1992, and amended August 30, 1993. Termination date: unknown.
Sandia Pulse Reactor Dense Pac	Solid mixed LLW and solid LLW	31	Operational; RCRA interim status. Termination date: April 1, 2000.
Sandia Pulse Reactor Nova Vault	Solid and liquid mixed LLW and solid and liquid LLW	19	Operational; RCRA interim status. Termination date: April 1, 2020.

[a] Schedules and capacities for facilities under design or construction are subject to changes based on the availability of funds, permit issuance, etc.

Source: DOE 1994n.

TABLE H.2.7–4.—*Hazardous Waste Quantities Shipped Offsite in 1994, Sandia National Laboratories* [Page 1 of 2]

Description	Number of Shipments Containing Description	Quantity (kg)	Estimated Volume [a] (m^3)
Aluminum chloride, anhydrous	1	3	< 0.1
Articles, explosive, n.o.s.	7	51	< 0.1
Batteries, wet, filled with alkali	2	5,461	3.6
Cartridges, power device	1	< 1	< 0.1
Combustible liquid, n.o.s.	21	1,179	1.2
Compressed gases, flammable, n.o.s.	18	572	1.1
Compressed gases, flammable, toxic, n.o.s.	2	< 1	<1
Compressed gases, n.o.s.	6	132	0.3
Corrosive liquids, flammable, n.o.s.	2	13	< 0.1
Corrosive liquids, n.o.s.	72	11,266	11.3
Corrosive liquids, poisonous, n.o.s.	5	316	0.3
Corrosive solids, n.o.s.	16	564	0.4
Cyanide solutions	3	224	0.2
Detonators, electric	1	< 1	< 0.1
Environmentally hazardous substances, liquid, n.o.s.	5	1,193	1.2
Environmentally hazardous substances, solid, n.o.s.	3	303	0.2
Flammable liquids, corrosive, n.o.s.	15	403	0.4
Flammable liquids, n.o.s.	87	9,775	9.8
Flammable liquids, poisonous, n.o.s.	3	60	< 0.1
Flammable solids, n.o.s.	24	358	0.2
Formaldehyde solutions	1	184	0.2
Hazardous waste, liquid, n.o.s.	58	18,611	18.6
Hazardous waste, solid, n.o.s.	84	56,202	37.5
Iron pentacarbonyl	1	4	< 0.1
Mercuric cyanide, solid	1	7	< 0.1
Mercury	4	175	0.1
Mercury compounds, liquid, n.o.s.	1	4	< 0.1
Oil	1	780	0.8
Oxidizing substances, liquid, corrosive, n.o.s.	17	677	0.7
Oxidizing substances, liquid, poisonous, n.o.s.	1	5	< 0.1
Oxidizing substances, liquid, n.o.s.	10	89	< 0.1
Oxidizing substances, solid, n.o.s.	12	116	< 0.1
Paint	1	3	< 0.1
Perchloric acid	2	19	< 0.1

TABLE H.2.7–4.—*Hazardous Waste Quantities Shipped Offsite in 1994, Sandia National Laboratories* **[Page 2 of 2]**

Description	Number of Shipments Containing Description	Quantity (kg)	Estimated Volume [a] (m^3)
Phosphorus pentafluoride	1	< 1	< 0.1
Phosphorus pentasulfide	1	3	< 0.1
Poisonous liquids, n.o.s.	24	1,751	1.8
Poisonous solids, n.o.s.	19	212	0.1
Polychlorinated biphenyls	3	1281	0.9
Propellant explosive, solid	4	1385	0.9
Pyrophoric liquids, n.o.s.	1	< 1	< 0.1
Pyrophoric solids, n.o.s.	1	12	< 0.1
Rocket motors	2	190	0.1
Substances, explosive, n.o.s.	5	22	< 0.1
Substances that when put in contact with water emit flammable gases, liquid	6	35	< 0.1
Substances that when put in contact with water emit flammable gases, solid	26	517	0.3

[a] For those shipments in which only a mass quantity was provided, a volume estimate was made based on density factors of 500 kg/m^3 for gases, 1,000 kg/m^3 for liquids, and 1,500 kg/m^3 for solids.

Note: n.o.s. - not otherwise specified.

Source: DOE 1995h.

TABLE H.2.7–5.—*Hazardous Waste Treatment Capability at Sandia National Laboratories*

Treatment Unit	Treatment Method	Input Capability	Output Capability	Total Capacity[a] (m^3/yr)	Comment
Elementary Neutralization Unit; (870)	Neutralization	Liquid hazardous waste, corrosive	Neutralized wastewater	Data not available at this time	Nonoperational due to upgrades/major repairs
Thermal Treatment Facility	Open Burning	Liquid and solid hazardous waste and reactive waste (absorbent materials, filters, paper, and rags)	Gas, solid hazardous waste, listed, TCLP, carbon ash/possible silver contamination	Limited to 9.1 kg/campaign	Standby mode, RCRA interim status

[a] For those facilities in use, this is a normal operating capacity; whereas, for facilities under design or construction this is a design capacity. Schedules and capacities for facilities under design or construction are subject to changes based on the availability of funds, results of treatability studies, and permit issuance.

Source: DOE 1994n.

TABLE H.2.7–6.—*Hazardous Waste Storage Capability at Sandia National Laboratories*

Storage Unit	Input Capability	Design Capacity[a] (m^3)	Comment
PCB Storage Facility (958W)	Liquid and solid hazardous and sanitary waste (also sludge) and PCBs	10	Operational; date available: June 1, 1993
Hazardous Waste Management Facility (959)	Liquid and solid hazardous waste (also sludge and gas)	Data not available at this time	Operational; final RCRA Part B permit application submitted: July 31, 1992
Hazardous Waste Management Facility (958)	Liquid and solid hazardous waste (also sludge and gas)	Data not available at this time	Operational; final RCRA Part B permit application submitted: July 31, 1992

[a] Schedules and capacities for facilities under design or construction are subject to changes based on the availability of funds and permit issuance.

Source: DOE 1994n.

Nonhazardous Waste. SNL liquid sanitary waste is sent to municipal treatment facilities. SNL contains over 24 km (15 mi) of sewer lines interconnected with those of Kirtland Air Force Base. In June 1994, SNL activated the liquid effluent control system to retain process wastewater for radiological screening prior to disposal into the sanitary sewer. SNL's policy prohibits the disposal of radiological material above regulatory levels into the sanitary sewer system. Discharges by SNL to the publicly owned treatment works are regulated by the city of Albuquerque Public Works Department, Liquid Waste Division, under the authority of the city's Sewer Use and Wastewater Control Ordinance (SNL 1995g:6-1). Solid sanitary waste is collected and taken to the Albuquerque Sanitary Landfill on a regular basis. The total solid sanitary waste generated in 1994 as packaged for disposal was 13,600 t (14,990 tons) (SNL 1995f:7).

The classified waste landfill at SNL is a Class D landfill located in Technical Area III. The unit is an outdoor facility, 0.983 ha (2.43 acres) in size, used for the disposal of classified solid waste generated at SNL R&D facilities. The landfill currently operates under a notice of intent, submitted annually to the State of New Mexico Solid Waste Bureau. The industrial wastes (called classified solid waste) disposed of at this landfill originate from the classified reapplication yard. The waste stream consists of toner cartridges, computer tapes, crates and pallets, weapon components, and related hardware. The remaining capacity of this landfill is 9,635 m^3 (12,600 yd^3) (DOE 1994k).

H.2.8 Nevada Test Site

After underground nuclear tests, radioactive and hazardous materials were extracted and analyzed. These activities have resulted in the accumulation of low-level, hazardous, and mixed wastes that must be treated, stored, and disposed of. The *Site Book for Waste Management* (May 1994), the *Waste Management Plan for the Nevada Test Site* (February 1995), and the *NTS Site Treatment Plan* and Federal Facility Compliance Act Consent Order (March 1996) and the NTS EIS (Draft, December 1995) detail waste management activities at NTS.

Radioactive and hazardous wastes (according to the current definition of hazardous wastes) generated from past nuclear testing activities were disposed of at Areas 2, 3, 5, 6, 8, 9, 12, and 23. These were mixed wastes and LLW composed of debris, drilling mud, decontamination wastes, laboratory, and classified wastes. Areas 3 and 5 are still currently active for waste storage and disposal. Area 3 receives offsite and onsite bulk waste for disposal in subsidence craters. A RCRA closure plan has been submitted to the Nevada Division of Environmental Protection for this facility. The Radioactive Waste Management Site in the north of Area 5 contains LLW management units and receives packaged classified and unclassified LLW. It also has TRU wastes from LLNL in storage, and a hazardous waste accumulation site. The NTS is not currently accepting mixed wastes from any locations. Mixed waste could be accepted from defense related generators within the State of Nevada; however, there is no mixed waste ready for disposal that meets the land disposal restrictions of RCRA. Mixed waste has been disposed of from out-of-state generators, and this practice is planned for the future contingent upon approval and permitting (RCRA Part B) of future mixed waste disposal units and on actions resulting from the Record of Decision (ROD) on the Waste Management PEIS.

In the past, waste disposal at NTS was accomplished through landfills, underground injection and leachfields on NTS, and through offsite disposal of hazardous wastes. A goal of the NTS Environmental Restoration Project is to remove or immobilize hazardous substances, pollutants, and contaminants, while achieving compliance with environmental laws and regulations. Environmental restoration activities will be guided by the ROD from the NTS EIS and be in accordance with the Site Treatment Plan.

Pollution Prevention. The Nevada Operations Office is an active participant in DOE's National Waste Minimization and Pollution Prevention Program. A comprehensive Waste Minimization Plan for NTS was completed in 1991, which defines specific goals, methods, responsibilities, and achievements for organizations. A waste minimization organization promotes waste minimization and pollution prevention and assures compliance with DOE orders at NTS. A report on waste generation and waste minimization is published annually. DOE publishes site-wide plans and guidance, and each contractor develops its own implementation plan. Plans and procedures have been developed, limiting the number and types of hazardous materials used on the site.

Since the initiation of the waste minimization program, several steam-cleaning operations have been eliminated, and half of the hazardous solvents used at NTS have been replaced with nonhazardous solvents. Recycling and reclamation activities have been established to reuse lead, silver, lubricating oil, and trichlorotrifluoroethane. Automatic decontamination equipment, recycling fabrication tool coolant systems, and continuous oil change and reburn systems have been placed in service to reduce hazardous waste generation. Closed loop effluent recycling for steam cleaning has eliminated the production of 17.8 million L (4.7 million gal) of wastewater annually and has reduced hazardous waste generation by 90 percent. Two solvent waste stills recycle 85 percent of all solvents and thinners used. Nonhazardous aqueous solution parts cleaners have eliminated the need for parts cleaning solvents.

The procurement of all materials is also reviewed for the opportunity to reduce the purchase of hazardous materials for NTS operations. In addition, an education and training program for all site personnel and for the surrounding community is helping to increase awareness of best practices and lessons learned in waste reduction.

Transuranic Waste. TRU and mixed TRU waste is stored at NTS on the TRU waste storage pad in Area 5. This waste was generated at LLNL and shipped to NTS between 1974 and 1990. All NTS TRU and mixed TRU waste is expected to be certified for disposal at WIPP in Carlsbad, NM, or another suitable repository should WIPP prove to be unsatisfactory. The Nevada Operations Office has the option to construct a TRU Waste Certification Building for breaching, sampling, and certifying containers of TRU waste to meet the WIPP Waste Acceptance Criteria which is expected to be finalized by June 1997 (NT DOE 1996b:4-61, 4-62). Other technologies, such as mobile characterization capabilities, are also being considered. This waste inventory consists of 612 m^3 (800 yd^3) of heterogeneous debris. The TRU waste is stored in the TRU Pad Cover Building on the TRU Waste Storage Pad to protect the containers from the environment. In addition, TRU and suspected TRU waste from weapons tests were emplaced in boreholes. Decisions to retrieve this waste or leave it in place will be based on performance assessments required by 40 CFR 191 and/or risk assessments required by CERCLA or RCRA. Table H.2.8–1 lists the mixed TRU waste storage units at NTS.

Low-Level Waste. Contaminated soils, created from past atmospheric nuclear weapons tests, occur at various locations on NTS. Some of this surface contamination has been and is planned to be removed and disposed of as waste. Although the debris from underground weapons tests remain underground, samples of this debris are brought to the surface for analysis and then must be disposed of as waste. The majority of LLW generated at NTS is disposed of in subsidence craters in Area 3. This area also receives substantial quantities of containerized bulk waste from other offsite DOE facilities. Some waste disposal units are being closed in this area, while others are being readied for future use. Area 5 receives low-level radioactive waste from both onsite and offsite generators. New disposal capacity is planned for this area, and the offsite generators will be required to meet the NTS Waste Acceptance Criteria (which includes periodic reviews by the Nevada Operations Office) to permit them to ship LLW for disposal at NTS.

Historically, the volume of waste received from offsite is approximately equal to or slightly greater than the volume of waste generated onsite. Recently onsite waste generation (other than environmental restoration waste) has declined due to cessation of nuclear testing. Offsite receipts currently dominate waste disposal activities at NTS. Remediation activities at NTS will produce waste streams that will have to be treated, stored, and disposed of. Offsite waste shipments must meet NTS Waste Acceptance Criteria that require that the waste be approved for disposal at NTS. Fifteen generators currently ship LLW to NTS, and an additional nine are applying for or are awaiting approval (NT DOE 1996c:4-61, 4-62). The LLW disposal capacity in use or planned at NTS is listed in table H.2.8–2.

Mixed Low-Level Waste. Mixed LLW is generated by DP-related support activities, environmental restoration activities, and activities supporting TRU waste disposal at WIPP or another suitable repository should the WIPP prove to be unacceptable. Wastes

TABLE H.2.8–1.—*Mixed Transuranic Waste Storage at Nevada Test Site*

Storage Unit	Input Capability	Total Area (m^2)	Comment
Asphalt storage pad (covered building)	Mixed TRU solid, mixed LLW	8,300 (1,995 in TRU pad cover building)	Available storage capacity on the TRU pad to be used for storage of future, onsite generated mixed LLW that does not meet RCRA land disposal restriction provisions.

Source: NT DOE 1996b.

TABLE H.2.8–2.—*Low-Level and Mixed Low-Level Waste Storage and Disposal at Nevada Test Site*

Disposal Unit	Input Capability	Total Capacity[a] (m^3)	Comment
Mixed waste, P03U management unit	Mixed LLW solid	118,908	Interim status. Onsite use only. RCRA Part A 1988. EA published, withdrawn. Will be considered in site-specific EIS.
LLW disposal, P04U	LLW solid, wood, metal, rubble, debris	66,946	Operational. Additional 616,300 m^3 capacity available for expansion
LLW disposal, P06U	LLW solid	27,002	Operational, reserved for future use
Classified shallow land burial, T02C	LLW solid, metal in approved containers	1,698	Operational, no remaining capacity
Shallow land burial, T03U	LLW solid, metal, debris, unclassified	7,086	Reserved for LLW disposal
Classified shallow land burial, T04C	LLW solid, metal in approved containers	1,518	Operational
Mixed waste storage pad	Mixed LLW solid	6,040[b]	Planned. RCRA Part B submitted in 1992
Bulk LLW disposal, U3AHAT	LLW solid, wood, metal, soil, biological	424,800	Operational

[a] Schedules and capacity for facilities under design or construction are subject to changes such as availability of funds and permit issuance.
[b] Estimated assuming no aisle space and containers stacked 2 m (6.6 ft) high.
Source: NT DOE 1996b; NT REECO 1994a.

were generated by the analytical activities supporting weapons tests and consisted of drilling muds and debris generated from tunnel reentry and rehabilitation. Additional wastes result from radiochemical analysis and decontamination of equipment and facilities used in sample extraction and analysis. NTS has received mixed wastes from other DOE sites and may receive additional waste in the future, pending the completion of the site treatment plans for all DOE sites and once proper permits are obtained. Mixed waste generated in the State of Nevada that meets the land disposal restrictions of RCRA can be disposed of in the Area 5 mixed waste disposal unit, Pit 3. Mixed waste not meeting land disposal restrictions can be stored on the TRU waste storage pad. A RCRA Part B permit application for a new mixed waste storage unit was submitted in January 1995.

Mixed LLW streams are being characterized to determine what technologies and capabilities are required for safe, environmentally sound, and compliant disposal. Construction of the Liquid Waste Treatment System, a central facility for treating liquid LLW and mixed LLW (contaminated effluents from environmental restoration and DP activities), has been funded and is being designed. Receiving/holding and evaporation reservoirs and associated mixed waste processes will be RCRA-permitted.

Table H.2.8–2 lists mixed LLW storage and disposal facilities at NTS. Table H.2.8–3 lists the mixed LLW streams inventory and 5-year projected generation at NTS. The total volume is 296 m^3 (388 yd^3), including a 20,425-kg (45,000-lb) empty spent shipping cask. Table H.2.8–3 lists mixed LLW waste streams at NTS.

Hazardous Waste. Hazardous wastes are generated from ongoing operations at NTS. Wastes consist of solvents, lubricants, fuel, lead, metals, and acids. Hazardous wastes are accumulated at various sites around NTS while they await shipment offsite to a RCRA-permitted facility. Over the next 5 years, additional satellite storage locations are planned. A separate accumulation site across the road from Area 5 is provided to avoid potential cross-contamination with radioactive waste. The generation of hazardous wastes at NTS is expected to decrease significantly because of the cessation of nuclear testing, the completion of environmental restoration activities, and the impact of waste minimization activities. Hazardous waste is stored on a 279-m^2 (3,000-ft^2) covered pad in Area 5 (NT REECO 1995a:33).

Nonhazardous Waste. Nonhazardous sanitary wastes are expected to be generated at the current rates for several years into the future, then decline due to the cessation of nuclear weapons testing. Recycling of paper, metals, glass, plastics, and cardboard has already resulted in some decreases in waste quantities.

TABLE H.2.8–3.—*Mixed Low-Level Waste Streams at Nevada Test Site*

Waste Matrix	Number of Waste Streams	Inventory Reported March 1996 (m^3)	Five-Year Projection	
			Number of Waste Streams	Total Generation
PCB contaminated soil	1	0.11	0	0
Lead contaminated soil	1	29.8	0	0
Bulk lead waste	4	2.49	0	0
Solvent sludge (Area 12)	1	0.11	0	0
Shipping cask	1	2.2	0	0
Treatability test facility solvent	1	0.21	0	0
Pico fluor	1	0	1	0.3
Analytical services solvent	1	<0.1	0	0
Cotter concentrate (A)	1	260	0	0
Cotter concentrate (B)	1	1.4	0	0

Source: NT DOE 1996b.

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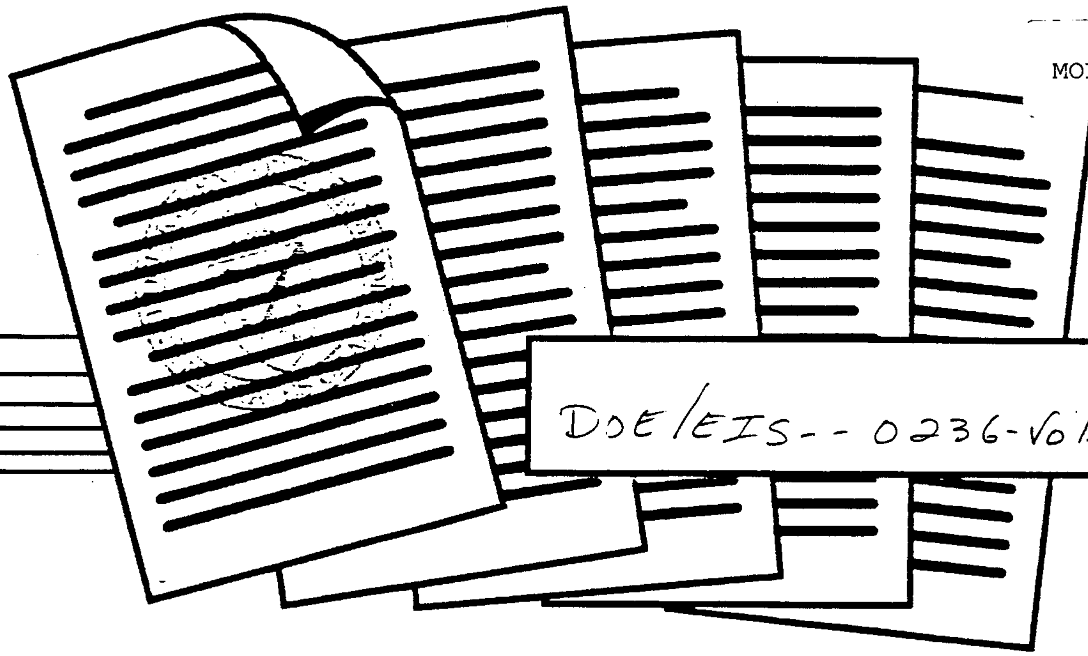

DOE/EIS--0236-Vol.3-Final

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DOE/EIS-0236
Vol 3 of 4

Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management

Volume III

United States Department of Energy

September 1996

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DOE/EIS-0236
Vol. 3 of 4

Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management

Volume III

United States Department of Energy

September 1996

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ABSTRACT: In response to the end of the Cold War and changes in the world's political regimes, the United States is not producing new-design nuclear weapons. Instead, the emphasis of the U.S. nuclear weapons program is on reducing the size of the Nation's nuclear stockpile by dismantling existing nuclear weapons. The Department of Energy (DOE) has been directed by the President and Congress to maintain the safety and reliability of the reduced nuclear weapons stockpile in the absence of underground nuclear testing. In order to fulfill that responsibility, DOE has developed a Stockpile Stewardship and Management Program to provide a single highly integrated technical program for maintaining the continued safety and reliability of the nuclear stockpile. The Stockpile Stewardship and Management PEIS describes and analyzes alternative ways to implement the proposed actions for the Stockpile Stewardship and Management Program.

Stockpile stewardship refers to activities associated with research, design, development and testing of nuclear weapons and the assessment and certification of the safety and reliability. The stockpile stewardship portion of the PEIS evaluates the potential impacts of three proposed facilities: the National Ignition Facility (NIF), the Contained Firing Facility (CFF), and the Atlas Facility. The stockpile stewardship alternatives involving these facilities could affect four sites: Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), Sandia National Laboratories (SNL), and Nevada Test Site (NTS).

Stockpile management refers to activities associated with the production, maintenance, surveillance, refurbishment, and dismantlement of the nuclear weapons stockpile. The stockpile management portion of this PEIS evaluates the potential impacts of carrying out stockpile management alternatives at eight sites: Oak Ridge Reservation (ORR), Savannah River Site (SRS), Kansas City Plant (KCP), Pantex Plant (Pantex), LANL, LLNL, SNL, and NTS. The stockpile management alternatives are assessed for nuclear weapons assembly/disassembly and for fabricating pits, secondaries and cases, high explosives, and nonnuclear components.

The Stockpile Stewardship and Management PEIS also evaluates the No Action alternative of relying on existing facilities and continuing the missions at current sites to achieve both the stockpile stewardship and management missions. The No Action alternative assesses the environmental impacts of the on-going Stockpile Stewardship and Management Program and provides a baseline against which alternatives can be evaluated.

DOE has identified the following preferred alternative for the Stockpile Stewardship and Management Program:

Stockpile Stewardship:
- Construct and operate NIF at LLNL
- Construct and operate CFF at LLNL
- Construct and operate the Atlas Facility at LANL

Stockpile Management:
- Secondary and Case Component Fabrication—downsize the Y-12 Plant at ORR
- Pit Component Fabrication—reestablish capability and appropriate capacity at LANL

- Assembly/Disassembly—downsize at Pantex
- High Explosives Fabrication—downsize at Pantex
- Nonnuclear Component Fabrication—downsize at KCP
- Based on the analyses performed to support this PEIS, the preferred alternatives for strategic reserve storage are as follows: (1) highly enriched uranium strategic reserve storage at Y–12; and (2) plutonium pit strategic reserve storage in Zone 12 at Pantex. The preferred alternatives for strategic reserve storage could change based upon decisions to be made in regard to the *Storage and Disposition of Weapons-Usable Fissile Materials Final PEIS*. Decisions on strategic storage will not be made in the upcoming ROD for the Stockpile Stewardship and Management Program. Storage decisions are not expected to be made until both the *Stockpile Stewardship and Management Final PEIS* and the *Storage and Disposition of Weapons-Usable Fissile Materials Final PEIS* are completed.

The preferred alternative for plutonium-242 oxide at SRS is to transport the material to LANL for storage.

Evaluation of impacts on land resources, site infrastructure, air quality, water resources, geology and soils, biotic resources, cultural and paleontological resources, socioeconomics, waste management, environmental justice, as well as radiological and hazardous chemical impacts during normal operation and accidents to workers and the public are included in the assessment. The PEIS presents unclassified information only. A classified appendix has also been prepared to support the PEIS.

PUBLIC COMMENTS: The public comment period on the Draft PEIS was conducted from March 8, 1996 to May 7, 1996. During the comment period, public hearings were held in Los Alamos, NM; Albuquerque, NM; Las Vegas, NV; Oak Ridge, TN; Kansas City, MO; Livermore, CA; Washington, DC; Amarillo, TX; Santa Fe, NM; and North Augusta, SC. The Draft PEIS was made available through mailings, requests to DOE's Office of Reconfiguration, and at DOE Public Reading Rooms. In preparing the Final PEIS, DOE considered comments received by mail, fax, handed in at hearings, transcribed from messages recorded by telephone, and those transcribed via Internet. In addition, comments and concerns identified during discussions at public hearings were considered.

In response to comments submitted after issuance of the Draft PEIS and due to additional technical details not available at the time of issuance of the Draft, Volumes I, II, and III of the Final PEIS contain revisions and changes. The revisions and changes made since the issuance of the Draft document are indicated by a double underline for minor word changes or by a sidebar in the margin for paragraph or larger changes. In addition, Volume I and each appendix in Volume III provide a unique reference list to enable the reader to further review and research selected topics. Volume IV (Comment Response Document) of the PEIS contains the comments received during public review of the Draft PEIS and the DOE responses to those comments. DOE has public reading rooms near each affected site and in Washington, DC where these referenced documents may be reviewed or obtained for review.

APPENDIX I

Appendix I

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ACRONYMS, ABBREVIATIONS, CHEMICAL SYMBOLS, AND UNITS OF MEASURE

Acronyms and Abbreviations

ABAG	Association of Bay Area Governments
APCR	Air Pollution Control Regulations (District Board of Clark County)
AQCR	air quality control region
AQMD	Air Quality Management District
BAAQMD	Bay Area Air Quality Management District
BACT	best available control technology
BART	Bay Area Rapid Transit
BEA	Bureau of Economic Analysis
CAA	*Clean Air Act*
CFR	Code of Federal Regulations
CNR	composite noise rating
CTBT	*Comprehensive Test Ban Treaty*
CWA	*Clean Water Act*
D&D	decontamination and decommissioning
DOE	Department of Energy
DOT	Department of Transportation
DP	DOE Office of the the Assistant Secretary for Defense Programs
EIB	Environmental Improvement Board
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ERPG-2	Emergency Response Guidelines-2
FR	*Federal Register*
HLW	high-level waste
HSWA	*Hazardous Solid Waste Amendments* of 1984
ICF	inertial confinement fusion
ICRP	International Commission on Radiological Protection
ISCST2	Industrial Source Complex Short Term Model, Version 2 (computer code)
LANL	Los Alamos National Laboratory
LEPC	Local Emergency Planning Committee
LLNL	Lawrence Livermore National Laboratory
LLW	low-level waste
MSL	mean sea level
NAAQS	National Ambient Air Quality Standards
NAC	Nevada Administrative Code
NEPA	*National Environmental Policy Act*
NIF	National Ignition Facility
NLVF	North Las Vegas Facility

NMAQCR	New Mexico Air Quality Control Region
NMAQD	New Mexico Air Quality District
NMR	New Mexico Regulations
NMSR	New Mexico State Road
Nova	laser facility at Lawrence Livermore National Laboratory
Novette	laser system at Lawrence Livermore National Laboratory
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NTS	Nevada Test Site
OSHA	Occupational Safety and Health Administration
PEIS	Programmatic Environmental Impact Statement
PSA	Project-Specific Analysis
PSD	Prevention of Significant Deterioration
R&D	research and development
RCRA	*Resource Conservation and Recovery Act*
ROD	Record of Decision
ROI	region of influence
SAAQS	State Ambient Air Quality Standards
SARA	*Superfund Amendments and Reauthorization Act* of 1986
Shiva	laser system at Lawrence Livermore National Laboratory
SNL	Sandia National Laboratories
SR	state road or state route
START I	Strategic Arms Reduction Talks I Treaty
START II	Strategic Arms Reduction Talks II Protocol
TA	technical area
TRU	transuranic
TSCA	*Toxic Substances Control Act*
UC	University of California
ULI	Urban Land Institute
USC	United States Code

Chemical Symbols

NOx	nitrogen oxides
PCB	polychlorinated biphenyl
PM	particulate matter
PM_{10}	particulate matter of aerodynamic diameter equal to or less than 10 micrometers
TNT	trinitrotoluene
TSP	total suspended particulates
VOCs	volatile organic compounds

Units of Measure

Btu	British thermal unit(s)
Ci	Curie(s)
cm	centimeter(s)
cm^2	square centimeter(s)
dB	decibel(s)
dBA	decibel(s), a-weighted
dpm	disintegration(s) per minute
ft	foot (feet)
ft^2	square foot (feet)
ft^3	cubic foot (feet)
gal	gallon(s)
ha	hectare(s)
hr	hour(s)
in	inch(es)
in^2	square inch(es)
J	joule(s)
kg	kilogram(s)
km	kilometer(s)
km^2	square kilometer(s)
kph	kilometers per hour
kV	kilovolt
L	liter(s)
lb	pound(s)
µg	microgram(s) (one-millionth of a gram)
µm	micrometer(s)
µs	microsecond(s)
m	meter(s)
m^2	square meter(s)
m^3	cubic meter(s)
m/s	meters per second
MBtu	thousand British thermal unit(s)
mg	milligram(s)
MGY	million gallons per year
MLY	million liters per year
mi	mile(s)
mi^2	square mile(s)
MJ	megajoule(s)
mph	mile(s) per hour
mrem	millirem
MW	megawatts
ng	nanograms
person-rem	radiation dose equivalent to population
ppm	part(s) per million

rad	unit of absorbed dose
rem	unit of radiation dose equivalent
s	second(s)
t	metric ton(s) (1,000 kg)
W	watts
yr	year(s)
°C	degree(s) Celsius
°F	degree(s) Fahrenheit

Metric Conversion Chart and Metric Prefixes

To Convert to Metric			To Convert from Metric		
If You Know	**Multiply By**	**To Get**	**If You Know**	**Multiply By**	**To Get**
Length					
inches	2.54	centimeters	centimeters	0.3937	inches
feet	30.48	centimeters	centimeters	0.0328	feet
feet	0.3048	meters	meters	3.281	feet
yards	0.9144	meters	meters	1.0936	yards
miles	1.60934	kilometers	kilometers	0.6214	miles
Area					
square inches	6.4516	sq. centimeters	sq. centimeters	0.155	sq. inches
sq. feet	0.092903	sq. meters	sq. meters	10.7639	sq. feet
sq. yards	0.8361	sq. meters	sq. meters	1.196	sq. yards
acres	0.40469	hectares	hectares	2.471	acres
sq. miles	2.58999	sq. kilometers	sq. kilometers	0.3861	sq. miles
Volume					
fluid ounces	29.574	milliliters	milliliters	0.0338	fluid ounces
gallons	3.7854	liters	liters	0.26417	gallons
cubic feet	0.028317	cubic meters	cubic meters	35.315	cubic feet
cubic yards	0.76455	cubic meters	cubic meters	1.308	cubic yards
Weight					
ounces	28.3495	grams	grams	0.03527	ounces
pounds	0.43560	kilograms	kilograms	2.2046	pounds
short tons	0.90718	metric tons	metric tons	1.1023	short tons
Temperature					
Fahrenheit	Subtract 32, then multiply by 5/9	Celsius	Celsius	Multiply by 9/5, then add 32	Fahrenheit

Prefix	Symbol	Multiplication Factor
exa-	E	$1\,000\,000\,000\,000\,000\,000 = 10^{18}$
peta-	P	$1\,000\,000\,000\,000\,000 = 10^{15}$
tera-	T	$1\,000\,000\,000\,000 = 10^{12}$
giga-	G	$1\,000\,000\,000 = 10^{9}$
mega-	M	$1\,000\,000 = 10^{6}$
kilo-	k	$1\,000 = 10^{3}$
hecto-	h	$100 = 10^{2}$
deka-	da	$10 = 10^{1}$
deci-	d	$0.1 = 10^{-1}$
centi-	c	$0.01 = 10^{-2}$
milli-	m	$0.001 = 10^{-3}$
micro-	µ	$0.000\,001 = 10^{-6}$
nano-	n	$0.000\,000\,001 = 10^{-9}$
pico-	p	$0.000\,000\,000\,001 = 10^{-12}$
femto-	f	$0.000\,000\,000\,000\,001 = 10^{-15}$
atto-	a	$0.000\,000\,000\,000\,000\,001 = 10^{-18}$

SUMMARY

I-S.1 INTRODUCTION

The U.S. Department of Energy (DOE) proposes to construct and operate the National Ignition Facility (NIF). The goals of NIF are to achieve fusion ignition in the laboratory for the first time by using inertial confinement fusion (ICF) technology based on an advanced design solid-state laser and to conduct high-energy-density experiments in support of national security and civilian applications.

The purpose of this project-specific analysis is to assess the environmental impacts of construction and operation of NIF. This document describes the project and its purpose and need, considers site alternatives and project design options, delineates the affected environments, assesses potential environmental impacts, and suggests mitigation measures. This analysis, as an appendix to the *Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management*, is equivalent to a stand-alone environmental impact statement on the proposed NIF.

I-S.2 PURPOSE AND NEED

NIF would provide a unique capability for DOE's science-based stewardship of the nuclear weapons stockpile. The goal of obtaining fusion ignition and burn would attract and challenge top scientific and engineering talent with a problem containing many of the same elements of physical understanding as those necessary for stewardship of the nuclear stockpile. Planned experiments with NIF, at temperatures and pressures near those that occur in nuclear weapon detonations, would provide the data needed to verify certain aspects of sophisticated computer models. These models are needed to simulate weapons physics and to provide insights on the reliability of the Nation's nuclear weapons stockpile. Specially designed NIF experiments could also address specific issues of modeling or physics that are of concern because of changes in weapons due to aging or remanufacture. Finally, NIF experiments could provide a unique source of radiation for studies on nuclear weapon effects.

NIF experiments could address, to various degrees, certain weapons issues connected with fusion ignition and boosting; weapon effects; radiation transport; and secondary implosion, ignition, and output. Most of these processes occur at very high energy density (i.e., at high temperatures and pressures) and are relevant to a weapon's reliability. NIF would achieve higher temperatures and pressures, albeit in a very small volume, than any other existing or proposed stockpile stewardship facility. It is also the only facility that would achieve fusion ignition. Safety issues principally connected with the high explosive and fissile material implosion in a weapon would not be addressed by NIF.

Present computer codes are not adequate to calculate all the high-energy-density phenomena that occur in an exploding nuclear weapon. The high temperatures and pressures achievable with NIF would be used to measure properties of matter at the extreme conditions expected and, thus, verify aspects of advanced computer models. If an unanticipated change relevant to the high-energy-density phase of weapon operation is observed in the weapon surveillance program, specially designed NIF experiments could aid weapons scientists in validating aspects of their integrated computer models to assess whether that change would adversely impact the weapon's reliability. It is important to have NIF operating well before the period 2005 to 2010, as weapons age beyond their original design lifetime.

As a multipurpose facility, NIF would also be important to the Nation's energy, basic science, and technology missions. Its data would determine whether ICF can be a viable source of electric power in the future. Achieving ignition, optimizing the various target gain curves, and providing initial data on fusion reactor materials would allow sound decisions to be made concerning inertial fusion energy development.

NIF experiments would also achieve the same temperatures and pressures that exist in the sun and other stars, providing new laboratory capabilities for exploring basic high-energy-density sciences such as astrophysics and plasma physics. As the world's largest optical instrument, NIF could spur high technology industries in such areas as optics, lasers, materials, high-speed instrumentation, semiconductors, and precision manufacturing.

Achievement of fusion ignition at NIF would fulfill a major goal of the ICF program. Both the National Academy of Sciences in 1990 and the Inertial Confinement Fusion Advisory Committee have recommended proceeding with an ignition facility based upon solid-state laser technology.

I-S.3 PROJECT DESCRIPTION

Conventional construction techniques would be used to build NIF. The extent and exact nature of such activities as site clearing, infrastructure improvements, and support facility construction required would depend on the specific location selected for NIF. Construction of NIF would be organized in the following sequential phases: (1) initial building construction, (2) special equipment structures installation, (3) final building construction, (4) final installation preparation, (5) clean component installation, and (6) final laser/target systems installation.

Once operational, NIF would provide the capability to perform the full range of target physics experiments leading up to and including ignition and burn. It would also allow researchers to design experiments studying weapons effects, weapons physics, fusion energy, and the basic sciences. NIF would consist of two main components: a collection of 192 laser generation and transport systems and a target area including a target chamber and associated equipment. An advanced, integrated sensor and computer system would control the lasers and collect data from diagnostic equipment. These elements would all be housed in one central facility. Required support facilities, such as assembly areas, maintenance areas, machine and mechanical shops, and offices would be located nearby. General site requirements would include control by DOE Office of the Assistant Secretary for Defense Programs (DP), significant ICF infrastructure, protection of the public and the environment, hazardous and radioactive waste management capability, and transportation services. The total land area requirement for NIF, including direct-support buildings, would be about 20 hectares (ha) (50 acres). Depending on the site selected, many of the NIF needs may be served by existing facilities, reducing the requirements of new land area to 3.2 to 18.2 ha (7.9 to 45 acres).

I-S.4 ALTERNATIVES

The alternatives considered in this analysis consist of five candidate locations at four DP sites (Lawrence Livermore National Laboratory [LLNL], Los Alamos National Laboratory [LANL], Nevada Test Site [NTS] - Area 22 main site location, North Las Vegas Facility [NLVF] location near NTS, and Sandia National Laboratories [SNL]), the No Action alternative, and two design capabilities. The designs under consideration consist of two operational capabilities, the Conceptual Design Option and the Enhanced Option.

I-S.4.1 Alternative Sites

DOE has selected one preferred (LLNL) and three alternative (LANL, NTS, and SNL) NIF sites that meet most of the following site criteria: DP-controlled Federal site, significant ICF infrastructure, adequate protection of the public and the environment, hazardous and radioactive waste management capability, and adequate transportation services for transport of targets. While the two NTS locations, Area 22 and NLVF, do not currently have ICF infrastructure, they have been included to ensure that DOE examines any potential lost efficiencies that might arise by taking advantage of the infrastructure that must be maintained at these sites in accordance with the presidential mandate to maintain a test-readiness posture.

Lawrence Livermore National Laboratory. LLNL is located about 64 kilometers (km) (40 miles [mi]) east of San Francisco in southern Alameda County. LLNL occupies 332 ha (821 acres). NIF would be situated on an 8.1-ha (20-acre) disturbed grassland area in the northeastern quadrant of LLNL, adjacent to existing ICF facilities.

Los Alamos National Laboratory. LANL is located in Los Alamos County, in north-central New Mexico, approximately 97 km (60 mi) north-northeast of Albuquerque. LANL occupies 11,300 ha (28,000 acres). NIF would be located on a 4-ha (10-acre) area in Technical Area (TA) 58, an undeveloped forested area adjacent to TA-3, the hub for LANL administration and support activities.

Nevada Test Site. Area 22 at NTS is located in southern Nye County in southern Nevada, about 105 km (65 mi) northwest of Las Vegas. NTS occupies about 350,000 ha (867,000 acres). NIF would be located on an 18.2-ha (45-acre) area within Area 22 in undeveloped creosote bush habitat, southwest of Mercury Base Camp in the southeastern portion of the NTS. NLVF is located in the city of North Las Vegas, Nevada, and occupies 32 ha (80 acres) zoned for general industry within the city. NIF would be located within a 3.2-ha (8.0-acre) previously disturbed, sparsely vegetated area in the northwestern portion of NLVF.

Sandia National Laboratories/New Mexico. DOE SNL site is located 11 km (6.5 mi) east of downtown Albuquerque in Bernalillo County, New Mexico. DOE owns 1,150 ha (2,842 acres) within the boundaries of the Kirtland Air Force Base military reservation and uses additional property through land withdrawals and land-use permits from Kirtland Air Force Base, the State of New Mexico, and the Isleta Pueblo. NIF would be located in an 11-ha (28-acre) disturbed grassland portion of the southern side of Technical Area II. The site is near SNL facilities that would be required for NIF support.

I-S.4.2 No Action

Under the No Action alternative, DOE would not construct and operate NIF. Without the facility, the Stockpile Stewardship and Management Program mission and the Nation's sustainable energy policy mission, as defined in the *National Energy Policy Act* of 1992, would be adversely affected. Key support elements of Stockpile Stewardship and Management, such as the goals of producing ignition and energy gain in ICF targets and performing fusion and high-energy-density physics or weapons-effects experiments in support of the Stockpile Stewardship and Management Program, would not be achieved.

The Stockpile Stewardship and Management Program would continue to use Nova and other facilities for a time, but fusion ignition and the much higher temperatures and pressures of NIF would not be available. Alternatives to achieve higher temperatures and pressures than are presently available may eventually be proposed, but they would not be available when several of the remaining types of nuclear weapons age beyond their original design lifetime, between 2005 and 2010. Thus, issues may arise that decrease confidence in the reliability of these weapons and increase the probability that the United States may need to invoke "supreme National interest" and withdraw from any Comprehensive Test Ban Treaty in effect (based on *Statement by the President on Goal for a Comprehensive Test Ban Treaty*, White House Office of the Press Secretary, August 11, 1995).

Without NIF, efforts to obtain the critical data needed to determine if the ICF approach, based on the neodymium glass solid-state laser design, would be a viable and practical energy source for electric power production would be delayed or abandoned. Other ICF-based methods proposed for achieving ignition (such as heavy ion acceleration, light ion diodes, krypton-fluoride lasers) are not developed to the point of being able to propose an ignition facility. As a result, these potential alternatives for ICF energy source demonstrations would have longer lead times and a higher integrated cost to achieve the mission proposed for NIF.

I-S.4.3 Operational Capability Options

Two operational capability options (Conceptual Design and Enhanced) have been proposed for NIF. The Conceptual Design Option would use an ICF approach called "indirect drive." In indirect drive, laser beams would illuminate and heat the interior surfaces of a small metal case (hohlraum) containing a deuterium-tritium-filled capsule. The beams would cause the case to emit x rays that would strike the fusion target capsule, resulting in compression and heating of the capsule to conditions igniting the fusion reaction. This option also includes basic experiments for weapons physics, nuclear weapons effects on other systems, and other user community needs.

The Enhanced Option would include the indirect drive operations of the Conceptual Design Option and a second approach called "direct drive." The Enhanced Option would provide the capability to perform an increased number of both yield and non-yield experiments to accommodate greater user needs. No hohlraum would be used in the direct drive approach. Instead, a large number of laser beams would be employed to ensure good uniformity of the driving force (laser light) over the face of the target. The laser beams would impinge directly on the deuterium-tritium-filled capsule to drive the fusion reaction. Because it is possible that NIF would be used for direct-drive experiments in its lifetime, operating conditions for both indirect- and direct-drive experiments have been developed and are being assessed.

I-S.5 Environmental Consequences

Table I-S.5–1 compares the potential environmental consequences of the No Action alternative with those of construction and operation of NIF at the alternative candidate sites. The comparison is based on the assessments in section I.4 of this analysis. Factors analyzed include land use and visual resources; air quality and noise; water resources; biotic resources; cultural and paleontological resources; socioeconomics; and radiological and chemical health, safety, and risk. Where they would differ, the potential impacts of the two operational scenarios (Conceptual Design Option and Enhanced Option), are also compared in table I-S.5–1. Table I-S.5–2 compares waste management issues for each candidate site.

The analyses in this appendix indicate that there would be few significant differences in the adverse environmental impacts among the candidate sites analyzed. The maximum 24-hour particulate matter 10 microns or smaller (PM_{10}) concentration in the air during site clearing would exceed applicable standards at LLNL and NLVF (table I-S.5–1). However, the ambient air quality impacts would be localized and of short duration. Uncommitted land requirements would be greatest at NTS (18.2 ha [45.0 acres]), although this acreage is less than 1 percent of the uncommitted land at NTS. Conversely, the least amount of uncommitted land that would be required for NIF would be 3.2 ha (7.9 acres) at NLVF. However, this acreage represents the largest percentage of uncommitted land at a candidate site (56 percent). Of greater significance would be the quality of the habitat of the uncommitted land that would be affected by NIF construction. The highest-quality habitats that would be affected would be forest (4.0 ha [9.9 acres]) at LANL or desert (18.2 ha [45 acres]) at NTS. At the other candidate sites, habitat disturbance would occur to grassland (LLNL and SNL) or to an area of sparse vegetation (NLVF) (table I-S.5–1). The risk of cancer to members of the public from a facility accident involving the release of radioactive material would be greatest at NLVF and SNL (table I-S.5–1), although the potential for the actual occurrence of such an accident would be extremely low.

NIF will comply with all applicable Federal, state, and local environmental regulatory requirements, including the *California Environmental Quality Act* if NIF is sited in the State of California. The candidate sites have also enacted several mitigative measures for construction actions that would also be applicable to NIF construction. While each of these mitigative measures may be minor, in combination they could significantly reduce impacts to the environmental resources of the selected site. The evaluations of environmental consequences of NIF construction and operation summarized in tables I-S.5–1 and I-S.5–2 are based on the assumption that the mitigative measures would be carried out if the proposed action were undertaken.

Even with mitigation, construction and operation of NIF could result in unavoidable residual adverse effects. These effects would include the disturbance of up to 18.2 ha (45 acres) of land to construct NIF and provide additional supporting infrastructure and access roads (table I-S.5–1). However, land required for NIF at any of the candidate sites would not conflict with site development or land use plans. Concentrations of PM_{10} and total suspended particulates in the air are expected to be close to or exceed the 24-hour ambient PM_{10} and total suspended particulates standards during peak construction periods under dry and windy conditions. Such exceedances are not uncommon for large construction projects. Loss of wildlife habitat within the disturbed areas would be unavoidable, thus resulting in some localized effects on biota. Few unavoidable adverse socioeconomic impacts would occur in any of the regions of influence for NIF candidate sites. No adverse disproportionate environmental justice concerns would be expected at any of the candidate sites, except for a minor potential to disproportionately impact minority populations in the region of influence for NLVF.

Over the 30-year operational life of NIF, the public would be exposed to a very small dose of radiation (table I-S.5–1). No cancer fatalities would be expected to occur from exposures associated with routine NIF operations under either the Conceptual Design or Enhanced options. A radiological accident at NIF would not cause any cancer fatalities to the public except possibly at NLVF (1 and 2 estimated cancer fatalities for the conceptual design option and enhanced option, respectively) and SNL (1 estimated cancer fatality for the enhanced option) (table I-S.5–1). The cancer fatality risk (cancer fatality per year) associated with radiological exposure from an accident involving transport of NIF tritium targets would range from 1×10^{-8} to 8×10^{-10}; whereas the nonradiological fatality risks associated with vehicular emissions and accidents would be in the range of 10^{-3} to 10^{-4} (table I-S.5–1).

Although each candidate site would implement waste minimization practices, the generation of additional wastes would be unavoidable. All candidate sites have

TABLE I-S.5–1.—*Comparison of Alternatives for the Proposed National Ignition Facility* [Page 1 of 4]

Environmental Resource Parameter	No Action	LLNL[a]	LANL[a]	NTS[a]	NLVF[a]	SNL[a]
Land Resources						
Uncommitted land requirements[b] (hectares)	None	8.1	4.0	18.2	3.2	10.5
Uncommitted land requirements (%)	None	11	1	<1	56	7
Number of buildings to be constructed	None	2	3	5	5	7
Conflicts with site development or land-use plans	No	No	No	No	No	No
Air Quality and Noise						
Predicted maximum 24-hour particulate matter 10 microns or smaller concentration during site clearing ($\mu g/m^3$)[c]/national standard ($\mu g/m^3$)	None	130/50[d]	124/150	175/150	183/150	52/150
Baseline emissions (t/yr)/baseline emissions plus NIF emissions (t/yr) during operation[e]						
Particulate matter 10 microns or smaller	Variable	3.36/3.52	2.56/2.74	86.8/86.9	0.78/0.99	3.76/3.96
Volatile organic compounds	Variable	13.10/13.66	2.89/3.45	ND/NA	3.45/4.02	1.65/2.22
Carbon monoxide	Variable	3.99/4.42	21.58/22.04	ND/NA	0.23/0.79	0.23/0.75
Nitrogen dioxide	Variable	23.50/25.29	53.88/55.79	ND/NA	1.07/3.35	1.07/3.22
Sulfur dioxide	Variable	0.37/0.40	0.70/0.73	71.1/71.1	0.07/0.11	0.07/0.11
Noise (qualitative)	No Effect	Minor[f]	Minor[f]	Minor[f]	Minor[f]	Minor[f]
Water Resources						
Construction						
Water requirement (MLY)	None	2.95	2.95	2.95	2.95	2.95
Water requirement as percent of current usage (%)	None	0.31	0.05	0.12	4.20	0.21
Operation						
Water requirement (MLY)	None	152	152	152	152	152
Water requirement as percent of current usage (%)	None	16	2.8	6.3	220[g]	11

TABLE I-S.5–1.—*Comparison of Alternatives for the Proposed National Ignition Facility* [Page 2 of 4]

Environmental Resource Parameter	No Action	LLNL[a]	LANL[a]	NTS[a]	NLVF[a]	SNL[a]
Biotic Resources						
Maximum habitat reduction[h] (hectares)	None	8.1	4.0	18.2	3.2	10.5
Habitat to be impacted	None	Grassland	Forest	Creosote bush desert	Sparse vegetation	Grassland
Wildlife disturbance[i]	None	Minor	Moderate	Moderate	Negligible	Minor
Potential impact to rare, threatened, or endangered species	None	Loss of noncritical, low-quality habitat for several species. Minor risk (mitigable) to white-tailed kite.	Loss of noncritical habitat for several species.	Loss of noncritical habitat for several species. Minor risk (mitigable) to desert tortoise.	None	Loss of noncritical, low-quality habitat for several species.
Cultural Resources (Qualitative)	No impacts	No impacts	No impacts	No impacts	No impacts	No impacts
Socioeconomics						
Construction[j]						
Total jobs	None	2,870	1,130	1,640	1,640	1,770
In-migrating population	None	1,600	2,200	2,340	2,340	3,065
Number of housing units	None	580	800	850	850	1,120
Number of trips generated (per day)	None	902	518	538	538	538
Public finance (% change over 1995 fund balance)	None	-0.03	4.40	0.21	0.21	0.06
Public services (increase in number of workers)	None	15	50	47	47	81
Environmental justice-disproportionate adverse health/environmental impacts on:						
- minority populations	None	None	None	None	Low	None
- low-income populations	None	None	None	None	None	None
Operation[k]						
Total jobs	0 to -153	890	600	620	620	670
In-migrating population	None	360	610	440	440	660
Number of housing units	None	130	220	160	160	240

TABLE I-S.5-1.—*Comparison of Alternatives for the Proposed National Ignition Facility* [Page 3 of 4]

Environmental Resource Parameter	No Action	LLNL[a]	LANL[a]	NTS[a]	NLVF[a]	SNL[a]
Socioeconomics (Continued)						
Number of trips generated per day	0 to -190	630	630	630	630	630
Public finance (% change over 1995 fund balance)	None	-0.02	0.71	0.04	0.04	0.01
Public services (increase in number of workers)	None	4	15	7	7	21
Environmental justice-disproportionate adverse health/environmental impacts on:						
- minority populations	None	None	None	None	Low	None
- low-income populations	None	None	None	None	None	None
Human Health (Radiological)						
Public (30-yr life of project)						
MEI dose (mrem)	None	1(3)	0.09 (0.3)	0.003 (0.01)	6 (18)	0.03 (0.1)
Population dose (person-rem)	None	2(6)	0.6 (2)	0.009 (0.03)	6 (18)	2 (6)
Cancer fatalities	None	None	None	None	None	None
Facility Accidents (Radiological)						
Public dose (person-rem)	None	260 (440)	290 (490)	41 (70)	3,000 (4,900)[l]	1,100 (1,800)
Cancer fatalities	None	None	None	None	1 (2)	0 (1)
Facility Accidents (Chemical)						
Distance to end of hazard zone from accident[m] (m)	None	237 (778)	237 (778)	239 (784)	237 (778)	237 (778)
Transportation Accidents[n] (Radiological)						
Public dose risk (person-rem/yr)	None	2.2×10^{-6} (1.8×10^{-5})	2.6×10^{-6} (2×10^{-5})	2.4×10^{-6} (1.9×10^{-5})	2.4×10^{-6} (1.9×10^{-5})	1.6×10^{-6} (1.2×10^{-5})
Cancer fatalities risk	None	1×10^{-9} (9×10^{-9})	1×10^{-9} (1×10^{-8})	1×10^{-9} (9×10^{-9})	1×10^{-9} (9×10^{-9})	8×10^{-10} (6×10^{-9})

TABLE I-S.5-1.—*Comparison of Alternatives for the Proposed National Ignition Facility* [Page 4 of 4]

Environmental Resource Parameter	No Action	LLNL[a]	LANL[a]	NTS[a]	NLVF[a]	SNL[a]
Transportation Impacts (Nonradiological) (Fatalities/Year)[o]						
Vehicular emissions	None	$1x10^{-3}$ ($2x10^{-3}$)	$8x10^{-4}$ ($2x10^{-3}$)	$8x10^{-4}$ ($2x10^{-3}$)	$8x10^{-4}$ ($2x10^{-3}$)	$2x10^{-3}$ ($4x10^{-3}$)
Accidents	None	$2x10^{-3}$ ($4x10^{-3}$)	$2x10^{-3}$ ($4x10^{-3}$)	$2x10^{-3}$ ($6x10^{-3}$)	$2x10^{-3}$ ($5x10^{-3}$)	$2x10^{-3}$ ($4x10^{-3}$)

[a] Value for Enhanced Option is given in parentheses only for parameters that differ from the Conceptual Design Option.

[b] Uncommitted land, as defined by each of the sites, is land that is currently open and available for NIF development. An additional 2 hectares would be temporarily required for a construction laydown area at LLNL. Construction laydown areas for the other sites would be located within the area designated for NIF.

[c] Estimated by combining baseline concentrations and NIF contributions based on dust control measures using water spray twice a day (with continuous water spraying and/or chemical dust suppressants for LLNL and NLVF sites).

[d] The 24-hour California state standards for particulate matter (50 $\mu g/m^3$) are more stringent than the national standards (150 $\mu g/m^3$).

[e] No action emissions would be equivalent to baseline emissions provided under the candidate site columns.

[f] Noise levels may be annoying during the peak construction activity associated with site clearing but would not require a hearing conservation plan.

[g] Current water supply capacity would be adequate to meet the additional requirements for NIF.

[h] Areas would be maximum habitat loss assuming total site clearing before any site revegetation or landscaping. An additional 2 hectares would be temporarily cleared for the construction laydown area at LLNL.

[i] Qualitative estimate of wildlife disturbance based on quality of habitat at and surrounding NIF location, which influences the number of wildlife species that may be present and the habituation of wildlife to human activities.

[j] Values provided are for the peak construction year only.

[k] The No Action alternative would not have measurable impacts on socioeconomics at the NTS or NLVF sites. However, at LLNL, LANL, and SNL, No Action could result in slightly reduced employment and associated effects. No Action could result in a reduction of 153 jobs (direct and indirect) and 190 fewer trips generated per day at LLNL; a reduction of 27 jobs and 38 fewer trips generated at LANL; and 29 fewer jobs and 38 fewer trips generated at SNL.

[l] Higher public dose for NLVF is due to higher population density near NLVF.

[m] The hazard zone refers to the area downwind of an accident where concentrations would be above emergency planning levels.

[n] Risks are presented from the manufacturing site yielding the largest risks.

[o] Collective population fatalities were calculated for 145 shipments (Conceptual Design Option) and 335 shipments (Enhanced Design). For example, a reported value of $4x10^{-3}$ fatalities suggests that no fatalities are expected for the proposed action. However, one single fatality out of the entire affected population might be expected over the course of 250 years if the same number of shipments were to continue for that length of time.

Note: ND – No data available; NA – Not applicable.

Source: Derived from tables and text contained in appendix I.

TABLE I-S.5-2.—*Comparison of Waste Management at the Candidate Sites*

Category	LLNL		LANL		NTS		NLVF		SNL	
	Current Capacity (m^3)	Adequate Current or Planned Capacity for NIF	Current Capacity (m^3)	Adequate Current or Planned Capacity for NIF	Current Capacity (m^3)	Adequate Current or Planned Capacity for NIF	Current Capacity (m^3)	Adequate Current or Planned Capacity for NIF	Current Capacity (m^3)	Adequate Current or Planned Capacity for NIF
Treatment										
Low-level										
Liquid	3,736 (34.1 per treatment episode)	Yes	9,000/yr (45/hr)	Yes	None	Yes	None	Yes[a]	Included in mixed low-level	Yes
Solid	None	Yes[a]	76	Yes	None	Yes	None	Yes[a]	Included in mixed low-level	Yes
Mixed										
Liquid	8,750[b]	Yes	None	Yes	None	Yes	None	Yes[a]	Data not available	Yes
Solid	11,800	Yes	None	Yes	None	Yes	None	Yes[a]	Data not available	Yes
Hazardous										
Liquid	97	Yes	Varies	Variable[b]	None	Yes[a]	None	Yes[a]	Data not available	Yes[a]
Solid	None	Yes[a]	Varies	Variable	None	Yes[a]	None	Yes[a]	Data not available	Yes[a]
Disposal										
Low-level										
Liquid	None	Yes[a]	None	Yes	None	Yes	None	Yes[a]	None	Yes
Solid	None	Yes[a]	24-28 ha area available	Yes	650,000	Yes	None	Yes[a]	None	Yes
Mixed										
Liquid	None	Yes[a]	None	Yes	None	Yes	None	Yes[a]	None	Yes
Solid	None	Yes[a]	None	Yes	90,626	Yes	None	Yes[a]	None	Yes
Hazardous										
Liquid	None	Yes[a]	None	Yes	None	Yes[a]	None	Yes[a]	None	Yes[a]
Solid	None	Yes[a]	None	Yes	None	Yes[a]	None	Yes[a]	None	Yes[a]

[a] Shipped offsite.
[b] Varies depending on the waste stream.
Source: Andrews and Tobin 1995; Bowers 1995; NTS 1996.

current or planned capacity to handle wastes associated with construction and operation of NIF; however, this would entail offsite shipment of some of the wastes for all sites but LANL (table I-S.5–2).

Resources that would be committed irreversibly or irretrievably during construction and operation of NIF include concrete, steel, fuel, and power. Land set aside at disposal facilities to accommodate radiological and hazardous chemical wastes from NIF represents an irreversible commitment of resources because wastes in belowground disposal areas may not be completely removed at the end of the project. This land could be perpetually unusable because the substrata would not be available for other potential intrusive uses, such as mining, utilities, or foundations for other facilities. However, the surface area appearance and biological habitat lost during construction and operation of the disposal facilities could, to a large extent, be restored. Consumption of operating supplies, miscellaneous chemicals, and gases, while irreversible, would not constitute a permanent drain on local resources or involve any material in critically short supply in the United States as a whole. Materials consumed or reduced to unrecoverable forms of waste, such as radioactive waste, are also irretrievable.

Adequate land exists at each of the five candidate location sites to support ongoing programs and other foreseeable short-term uses of undeveloped areas. The use of land for NIF would enhance the long-term productivity of the selected site in two ways. First, NIF represents long-term research and development functions compatible with historic nuclear weapons support and would require a technically competent, skilled, and stable workforce. Second, in light of current reductions in the nuclear weapons stockpile, the lack of new weapons development or production, the moratorium on nuclear testing, and concerns about safety and reliability in the aging stockpile, DOE plans to downsize or consolidate existing facilities and provide upgraded or new experimental and computational capabilities that would enhance the long-term productivity of the selected sites.

Land clearing and construction activities for NIF would eliminate habitat and destroy or displace wildlife. Construction of new facilities could result in short-term disturbances of previously undisturbed biological habitats. These disturbances could cause long-term reductions in the biological productivity of an area.

Cumulative impacts would result from the addition of the incremental effects of the construction and operation of NIF to the effects of other past, present, and reasonably foreseeable future actions at the selected site. PM_{10} emissions from construction of NIF would be an incremental addition to the already existing environmental impact of dust emissions to the atmosphere. Minor changes in stormwater runoff are expected due to removal of grass cover during NIF construction and increased runoff from pavement during facility operations. Construction of NIF would replace natural habitat with areas of pavement and buildings. Depending upon the candidate site selected, this conversion could extend the influence of urbanized/industrial habitats into natural areas, increase fragmentation of natural habitat, and cause minor loss of habitat used by rare species. However, no critical habitat for federally threatened or endangered species would be affected. Radiological doses to the general public from NIF operations would be no more than 20 percent of the dose from all other candidate site operations and no more than one-millionth of the dose to the population from normal background radiation. The risk of a NIF accident-related cancer fatality occurring to a member of the public over the 30-year lifetime of the facility would be less than 1 in 700,000. NIF would be considered a low-hazard, radiological facility. Such a facility uses radionuclides (for nonreactor purposes) and has other hazards (such as chemicals needed at the facility). Low hazard implies that there are minor onsite and negligible offsite consequences.

I-S.6 U.S. Department of Energy's Preferred Alternative

Council on Environmental Quality regulations require that an agency identify the preferred alternative for a proposed Federal action in a final environmental impact statement (40 *Code of Federal Regulations* 1502.14[e]). The preferred alternative is the alternative that DOE believes would best fulfill its statutory mission, giving consideration to environmental, economic, technical, and other factors. The preferred operational option for NIF is the Enhanced Option (indirect and direct drive). The preferred NIF siting alternative is at LLNL. The Record of Decision will describe DOE's decision on the operational capability and siting of NIF.

APPENDIX I: NATIONAL IGNITION FACILITY PROJECT-SPECIFIC ANALYSIS

I.1 INTRODUCTION

I.1.1 The National Ignition Facility Proposal

As part of its Stockpile Stewardship and Management Program, the U.S. Department of Energy (DOE) proposes to construct and operate the National Ignition Facility (NIF) (DOE 1995b). NIF would contain the world's largest solid-state laser system, which would be used to achieve ignition of nuclear fusion in the laboratory for the first time. NIF would perform fusion, high-energy-density, and radiation-effects experiments in support of stewardship of the Nation's stockpile of nuclear weapons and other basic and applied science objectives.

NIF would consist of 192 laser beams that would be focused into a small target containing a spherical capsule of fusion fuel, positioned in the center of a large spherical target chamber. The energy of the lasers would be deposited into the target in a few billionths of a second, causing the fuel capsule inside the target to implode, thereby compressing and heating the fuel. This process would force atomic nuclei sufficiently close together so that the rate of fusion reactions would become very large. This reaction rate would, in fact, be so rapid that a significant fraction of the fuel would burn up before the target flew apart in a miniature explosion; that is, while the target was held together only by its own inertia. This method for achieving fusion ignition and energy gain is called inertial confinement fusion (ICF). Ignition occurs when the fusion reactions become self sustained; i.e., a significant portion of the fusion reactions result from self heating of the fuel beyond that achievable by the lasers alone. Energy gain occurs when the amount of fusion energy produced by the target exceeds the amount of laser energy supplied to ignite the target. The NIF capsule's fusion yield is expected to be up to 10 times the laser driver energy required to produce fusion ignition.

In January 1993, the Secretary of Energy confirmed the need for NIF and authorized a collaborative effort by the three DOE defense laboratories and the University of Rochester's Laboratory for Laser Energetics to produce the Conceptual Design Report for NIF. The Conceptual Design Report was completed in April 1994. In October 1994, the Secretary of Energy approved initiation of the next phase of the NIF Project, including preliminary design, safety analysis, cost and schedule validation, and *National Environmental Policy Act* (NEPA) analysis preparation that would include public involvement. This NIF Project-Specific Analysis (PSA), prepared as part of the *Stockpile Stewardship and Management Programmatic Environmental Impact Statement* (PEIS), represents that NEPA analysis. This PSA is equivalent to a project-specific EIS. However, it is referred to as a PSA to avoid confusion with the term PEIS. As a part of the Stockpile Stewardship and Management PEIS, this PSA shares certain elements (such as data) common to the main document. However, some of the data described in this PSA are necessarily more detailed than some of the data cited in the Stockpile Stewardship and Management PEIS analysis.

I.1.2 History and Background

Three decades of research and development by U.S. laboratories and private industry has led to the design of NIF. Soon after the invention of the laser in the early 1960s, scientists recognized that the laser might be used to drive an ICF capsule to ignition and that this technology could be used to achieve some of the high-energy-density conditions (such as high temperatures and pressures) that occur in the detonation of nuclear weapons. It was also recognized that if more energy could be produced than that required to ignite a target, such fusion technology might one day also be used to generate electrical power.

Since then, a series of laser systems, each several times more powerful than its predecessor, have been constructed and operated. The first of these laser systems, a single beam system called Longpath, was completed in 1970 and was used experimentally for 5 years, until a two-beam system called Janus was completed in 1974. Janus demonstrated laser-driven compression, heating, and thermonuclear burn of fusion fuel for the first time. Although neither Janus nor any of the subsequent lasers were large enough to produce target ignition, each advanced the state of the art in solid-state laser technology, and each contributed significantly to a sounder understanding of how ICF targets work.

Experimentation on the most recent of these systems, the 10-beam Nova laser, has led to an even greater understanding of ICF targets. Nova has been used not only for target physics experiments, but also for weapons physics experiments of the type that would be done at NIF, although the NIF experiments would be done at much larger energies (a factor of 40 to 50 times more energy available). Thus, the Nova experiments have established the principles and measurement techniques that would be used at NIF. More than 10,000 experiments have been conducted with Nova during its 10 years of operation. DOE is also now conducting target physics research at the Omega Upgrade Facility located at the University of Rochester. This new laser system is similar in energy to Nova but has a larger number of beams and can better address issues of directly driven laser targets than can Nova, which specializes in indirectly driven targets (see chapter 3). In its Enhanced Option mode, NIF would be capable of performing experiments with both types of targets.

During the 1980s, a program to study the physics of ICF capsules with the much larger energies available from underground nuclear explosions was successfully conducted. The very positive results of the Nova program, combined with the positive results from underground nuclear tests in the Halite/Centurion program, have led to the development of specifications for a future system to create target ignition and energy gain, i.e., for NIF. A 1990 study by the National Academy of Sciences (NAS 1990), which reviewed both the laboratory and the underground nuclear test data, recommended proceeding with an ignition facility based on a solid-state laser as the next step in the ICF program. NIF is proposed as that next step.

Achievement of fusion ignition at NIF would fulfill a major goal of the ICF program. The ICF program was initiated in 1971 to develop capabilities that would support the Nation's nuclear weapons deterrent and that have longer-term potential for commercial energy. Confidence in ignition at NIF is based on 24 years of ICF research and major program reviews, most recently the continuous monitoring of ICF progress by the ICF Advisory Committee. That panel of independent experts tracked the successful accomplishment of the objectives set out by the National Academy of Sciences recommendations in 1990 and advised DOE that the program was technologically ready to proceed with NIF, both from the standpoint of the understanding of target physics and from the standpoint of the readiness of the laser technology (DOE 1990). In 1994, the Beamlet laser, a full-scale prototype NIF beamline, demonstrated that the laser technology selected for NIF would perform as specified.

The ability to predict the performance of ignition capsules is based on similar calculations of physics that predict some aspects of nuclear weapons performance. Ignition is a "first-level" test of our weapons analysis capability. Achieving laboratory ignition with laser-driven inertial fusion is widely recognized as a major scientific challenge that will attract and stimulate highly capable scientists. While much of the science is useful to nuclear weapons analyses, NIF is not a weapon, and the ICF approach cannot be directly extended to become a weapon. Much of the research at NIF can be open to the broad scientific community. Thus, NIF experiments can advance both our weapons analysis capability and civilian science and energy interests.

I.1.3 Environmental Review Process

DOE's NEPA compliance for the Stockpile Stewardship and Management Program includes preparation of the Stockpile Stewardship and Management PEIS. Because NIF would be an integral part of a science-based Stockpile Stewardship and Management Program, the NEPA process for NIF is being conducted as part of the NEPA process for Stockpile Stewardship and Management. This NIF PSA is, therefore, included as an appendix to the Stockpile Stewardship and Management PEIS. The PSA was prepared according to the Council on Environmental Quality's "Regulations for Implementing the Procedural Provisions of the *National Environmental Policy Act*" (40 CFR 1500-1508) and DOE's NEPA implementing procedures and guidelines (10 CFR 1021). The purpose of this NIF PSA is to provide an environmental evaluation of the impacts of construction and operation of NIF as a basis for DOE's decision on whether or not to proceed with such a facility. As discussed in section I.1.1, this document is in the strictest sense a project-specific EIS, but it is referred to as a PSA to avoid confusion with the term PEIS.

The first step in the Stockpile Stewardship and Management PEIS process was to publish a Notice of Intent to prepare an EIS in the *Federal Register* (60 FR 31291, June 14, 1995). The Notice of Intent described the project and solicited comments on preliminary plans for the scope of the Stockpile Stewardship and Management PEIS. The Notice of Intent also announced DOE's plan for gathering scoping comments on the significant issues and concerns related to the proposed action and alternatives that should be addressed in the PEIS. To ensure public input to the planning and preparation of the PEIS, public scoping meetings were held during July and August 1995. At each meeting, representatives of DOE explained the purpose of the meeting, the role of the Federal Government, and the PEIS process. During the remainder of each meeting, DOE received comments from agencies, groups, and individuals and invited interested parties to submit any additional comments by August 11, 1995, the close of the PEIS scoping period. Concerns and suggestions resulting from the scoping process are summarized and evaluated in the Stockpile Stewardship and Management PEIS Implementation Plan, which states how the comments are to be incorporated into the scope of the Stockpile Stewardship and Management PEIS. The Implementation Plan also summarizes the proposed action and alternatives (designs, sitings, and No Action), outlines issues to be addressed in the PEIS, and discusses the subsequent procedures for the PEIS preparation. The Stockpile Stewardship and Management Draft PEIS was subsequently prepared and published in February 1996.

The publication of, and call for comments on, the Stockpile Stewardship and Management Draft PEIS were announced in the Notice of Availability published in the *Federal Register*. DOE invited comments from all interested parties to correct factual errors or to provide insights on any matter related to this environmental analysis. The 60-day public comment period for the Draft PEIS began on March 8, 1996 and ended on May 7, 1996. However, late comments were accepted to the extent practicable.

After considering the comments received, DOE revised the Stockpile Stewardship and Management Draft PEIS, as appropriate. This Final PEIS was distributed to those who received the Stockpile Stewardship and Management Draft PEIS, those who commented on the Draft PEIS, and any other interested parties.

Following completion of the Stockpile Stewardship and Management Final PEIS, but at least 30 days after it is issued, DOE will issue a Record of Decision (ROD). The ROD will explain all factors, including environmental impacts, that DOE considered in reaching its decisions regarding Stockpile Stewardship and Management, including NIF. The ROD will specify the alternatives that are considered to be environmentally preferable. This NIF PSA is a critical element in the ROD and the basis for the environmental comparison of alternatives related to NIF. DOE anticipates that, in addition to considering the environmental impacts as presented in the PEIS, the ROD will be based on cost, national security, and infrastructure considerations. If mitigation measures, monitoring, or other conditions are adopted as part of the agency's decision, they will be summarized in the ROD as applicable and included in a Mitigation Action Plan that would accompany the ROD. The Mitigation Action Plan would explain how and when mitigation measures would be implemented and how DOE would monitor the mitigation measures to judge their effectiveness.

I.1.4 Organization of the National Ignition Facility Project-Specific Analysis

This NIF PSA consists of eight chapters. Chapter I.1 (Introduction) describes the NIF background and the environmental review process. Chapter I.2 (Purpose and Need for the National Ignition Facility) describes mission-related reasons why DOE needs to construct and operate NIF. Chapter I.3 (Proposed Action and Alternatives) describes the facilities required for NIF and the operations that would be associated with NIF. Chapter I.3 also includes a discussion of the No Action alternative and an overview of the four DOE sites, providing five alternate locations for NIF.

Chapter I.4 (Affected Environment and Environmental Impacts) describes the natural and human resources at the alternate NIF locations and identifies the impacts that could occur to these resources from construction and operation of NIF and from the No Action alternative. This chapter also addresses mitigation commitments and recommendations, adverse effects that cannot be avoided, irreversible and irretrievable commitments of resources, the relationship between short-term uses and long-term productivity, and cumulative impacts. Chapter I.5 (Environmental, Occupational Safety and Health Permits, and Compliance Requirements) discusses environmental regulations, Executive Orders, permits, and laws applicable to NIF construction and operation.

Chapter I.6 (List of Preparers) includes a list (including credentials) of the technical staff who prepared the NIF PSA. Chapter I.7 (Glossary) defines selected technical terms used within this PSA. Chapter I.8 includes a list of references.

I.2 Purpose and Need for the National Ignition Facility

I.2.1 General Background

Under the *Atomic Energy Act* of 1954, as amended (42 *United States Code* 2011 et seq.), the U.S. Department of Energy (DOE) is charged with providing nuclear weapons to support the Nation's nuclear deterrent policy. Thus, DOE must maintain a Complex with sufficient capabilities and capacity to meet current and future weapons requirements. This mission is accomplished in a way that protects the environment and the health and safety of workers and the public.

Recent changes in the global political situation and in national security needs have necessitated corresponding changes in the way DOE must meet its responsibilities regarding the Nation's nuclear weapons. As a result of international arms control agreements (the Strategic Arms Reduction Talks [START I] Treaty and the START II protocol and unilateral decisions by the U.S. Government), the Nation's stockpile will be significantly reduced by 2003. Consequently, the Nation has halted the development of new nuclear weapons, begun closing portions of the DOE weapons complex, and is considering further consolidation and downsizing of the remaining elements in the Complex. In addition, the Nation is observing a moratorium on nuclear testing and is pursuing a *Comprehensive Test Ban Treaty* (CTBT). However, international nuclear dangers remain and, as the President has emphasized, nuclear deterrence will continue to be an important element of the U.S. national security posture. Thus, DOE's responsibilities for ensuring the safety and reliability of the Nation's nuclear stockpile and for maintaining expertise in nuclear weapons generally will continue for the foreseeable future.

In announcing the indefinite extension of the nuclear test moratorium in July 1993, President Clinton reaffirmed the importance of maintaining confidence in the enduring U.S. stockpile by alternative means and the need to ensure that the Nation's nuclear deterrent remains safe, secure, and reliable during a test ban. In 1994, by Presidential Decision Directive and Act of Congress (Public Law 103-160), DOE was directed to establish a Stockpile Stewardship and Management Program to ensure the continued safety and reliability of the remaining weapons and the preservation of the core intellectual and technical competencies of the United States in nuclear weapons in the absence of nuclear testing. Subsequent Presidential decisions established that the United States would seek a "zero-yield" CTBT (August 1995) and that all three of the Nation's nuclear weapons laboratories would be required to ensure the highest continued confidence in the stockpile.

Thus, DOE was required to develop a Stockpile Stewardship and Management Program that would not include any level of nuclear testing but would support the following objectives:

- Full support at all times of the Nation's nuclear deterrent with safe and reliable nuclear weapons while transforming the current Complex (laboratories and production facilities) to one that is more appropriate for a smaller stockpile

- Preservation of the core of intellectual and technical competencies of the weapons laboratories. Without nuclear testing, confidence in the Nation's nuclear stockpile will depend largely on the continued availability of competent people who must make the scientific and technical judgments related to the safety and reliability of nuclear weapons

- Ensurance that the activities needed to maintain the Nation's nuclear deterrent are consistent with the Nation's arms-control and nonproliferation objectives

The purpose and need section that follows (section I.2.2) discusses the National Ignition Facility's (NIF) role in supporting objectives 1 and 2 above. Objective 3 (nonproliferation) was evaluated for NIF in a recent DOE study—*The National Ignition Facility and the Issue of Nonproliferation* (DOE 1995a). That study, prepared by the Office of Arms Control and Nonproliferation of DOE, has been the subject of extensive public involvement, interagency review, and review by outside experts. The study concludes that (1) the technical proliferation concerns at NIF are manageable and therefore can be made acceptable, and (2) NIF can contribute positively to U.S. arms control and nonproliferation policy goals.

To ensure the continued safety and reliability of the enduring stockpile while achieving a CTBT, the President and the Department of Defense have emphasized the importance of a strong science-based stockpile stewardship program, including NIF. It is important to establish a firm commitment to this program before the issue of ratification of a CTBT arises.

I.2.2 Purpose and Need

I.2.2.1 *Stockpile Stewardship and Management Program*

Although DOE is confident today that the Nation's nuclear weapons stockpile is safe and reliable, it is expected that problems could develop in the future. A recent interlaboratory study, *Stockpile Surveillance: Past and Future* (Johnson et al. 1995), documents the historical evidence. Nuclear weapons, of necessity, contain materials that react with one another slowly even when the weapon is simply being stored. These slow interactions can and have, over time, caused defects in weapons that adversely affect safety and/or reliability. These processes are called "aging." Also, design or manufacturing defects have been found after a weapon enters the stockpile or is remanufactured. The DOE historical database on such incidents shows that there have been hundreds of cases that have necessitated some kind of corrective action because of safety or reliability concerns. Because nuclear weapons in the future will be expected to remain in the stockpile beyond their designed lifetimes, it is to be expected that such incidents will increase.

The Stockpile Stewardship and Management Program (DOE 1995b) defines a science-based program intended to satisfy the three program objectives stated in section I.2.1. Science-based stockpile stewardship would provide the expert judgment, underpinned by scientific understanding, advanced calculations, and modern experimental facilities, to predict, identify, evaluate, and render solutions to problems that affect safety and reliability of the remaining stockpile in the absence of underground testing. The stockpile stewardship program would not replace nuclear testing completely because complex interactions between processes cannot be experimentally simulated. However, for weapons that have been tested before (and all the weapons expected to remain in the stockpile have been tested), the previous nuclear test database will provide a benchmark that can be used to evaluate future problems with the stockpile.

Building upon existing capabilities, the DOE science-based stockpile stewardship program includes an accelerated strategic computing initiative and several new experimental facilities that are required to provide the data needed to verify the models and help assess specific problems that arise. The stewardship program consists of three major components that are used to evaluate stockpile surveillance data: (1) experimental capabilities and facilities, (2) scientific evaluation by competent scientists of the information from the experimental capabilities and facilities, and (3) validation of the computer models using the accelerated strategic computing initiative. These three components lead to the development of a corrective action to resolve the identified problem.

I.2.2.2 *Physical Processes in Nuclear Weapons*

Because nuclear tests would not be available, more sophisticated and comprehensive computer models would be needed to conduct essential evaluations. For confidence to be established in these new models, experimental facilities must be able to provide data on all processes in the relevant physical regimes that occur in weapons. The relevant physical regimes may be divided into the following groups:

1. Detonation of high explosive and implosion of fissile material
2. Conditions for criticality of fissile material
3. Fusion ignition and boosting
4. Radiation transport
5. Secondary implosion
6. Secondary ignition, burn, and output
7. Nuclear weapon effects on other systems

The DOE program proposes a set of experimental facilities, each designed to address one or more of these areas in a complementary fashion.

A general understanding of a nuclear weapon would be helpful to better understand these seven categories and their relationship to stockpile stewardship and management and NIF. Modern thermonuclear weapons consist of two stages: a primary stage (fission trigger) and a secondary stage (fusion). The purpose of the primary is to produce x rays to implode the secondary, thereby causing ignition. The secondary is the stage that produces high yields for modern U.S. strategic weapons–typically hundreds of kilotons. The primary contains a subcritical pit of fissile material, generally plutonium, surrounded by a layer of chemical high explosive. The high explosive is detonated, burns rapidly, and compresses the pit. The implosion of the pit increases the density of the fissile material to super criticality, leading to a fission chain reaction and rapid heating. X rays from the hot exploding primary are then channeled by a radiation case to the secondary, where they implode the secondary, creating temperatures and pressures great enough to ignite a fusion reaction in the secondary.

To increase their efficiency, modern primaries can employ a process called boosting. In boosted primaries, the pit contains the hydrogen isotopes deuterium and tritium gas that is compressed and heated. The deuterium and tritium gas undergoes fusion, producing copious quantities of energetic neutrons that flood the compressed pit. The extra burst of neutrons causes significant additional fission reactions that "boost" the primary yield to a much higher value. If the primary fails to boost properly, its yield may be inadequate to drive the secondary, resulting in weapon failure.

I.2.2.3 *The National Ignition Facility as Part of the Stockpile Stewardship and Management Program*

NIF would provide an essential capability for the DOE's science-based stewardship of the nuclear weapons stockpile. The basic goal of NIF is to achieve ignition of thermonuclear fusion in the laboratory by imploding and igniting a small capsule containing a mixture of deuterium and tritium. The goal of obtaining fusion ignition and burn at NIF would attract and challenge top scientific and engineering talent with a problem containing many of the same elements of physical understanding as those necessary for stewardship of the nuclear stockpile. Achieving fusion ignition and conducting experiments at such high temperatures and densities in NIF would make it possible to study the properties of material under conditions close to those they would be subjected to in a nuclear weapon detonation. Thus, specific experiments can be conducted with weapons materials to measure relevant equations of state (what pressures are created at high temperature), opacity (how a material absorbs and emits radiation), and hydrodynamics (how a material moves in response to forces applied). These experiments apply to several of the regimes of interest listed in section I.2.2.2. The following discussion focuses on how NIF can be used to evaluate weapons concerns relevant to the physical regimes in that list.

NIF experiments could examine the growth and control of hydrodynamic instabilities, which are important both in making inertial confinement fusion (ICF) targets ignite and burn and in making nuclear weapons perform reliably. Hydrodynamic instabilities ultimately lead to mixing of some quantity of one material with another. This mix can affect both ignition and burn processes (regimes 3 and 6). NIF experiments can determine how fusion fuels ignite and what helps and what hinders the ignition process (such as how much mix is tolerable).

High-temperature transport of radiation in complex geometries and materials (regime 4) can be examined to test the ability of computer models to predict this transport. Deposition and re-emission of radiation and the general transport problem constitute a very complex process. This process must be understood in order to predict the transport of radiation necessary to ignite ICF targets. In addition, radiation transport experiments can be designed to simulate weapons radiation transport conditions more closely than those in the basic ICF ignition target.

Output calculations must be done on the ICF ignition targets so that the performance of the target can be properly measured. Again, however, specific targets can be designed to alter the output radiation. These experiments can be used to test the computer codes used to calculate the output of weapons.

NIF targets, either the basic type for ignition or specially altered ones, would produce copious x rays, neutrons, gamma rays, and other radiation. These emissions can be used to assess the consequences of nuclear effects (regime 7) in electronic systems or other hardware intentionally exposed to these radiations. The survivability of military hardware subjected to various nuclear effects is an important factor in assuring reliability of that hardware.

In addition to its role in attracting and maintaining core scientific and engineering capability and in helping to verify the calculational capability of the more sophisticated computer models, NIF would also play a role in evaluating specific problems that arise in the stockpile, as mentioned in section I.2.2.2. As the stockpile surveillance program reveals an unanticipated change due to aging or remanufacture, a weapons expert will estimate which of the weapons physics processes listed in section I.2.2.3 could be affected. If any of the high-energy-density process (regimes 3 through 7) could be affected, then a NIF experiment may be designed to measure the physical properties of the change. For example, if the chemical composition of a material (such as a glue joint) has changed for some reason, it may be necessary to determine the opacity (how a material absorbs and emits radiation) of the changed material. Computer models are not able to predict the opacity of all materials under all temperatures and pressures. Thus, it may be necessary to put some of the changed material into a NIF target, raise its temperature and pressure to near those that would occur when the weapon is exploded, and measure its opacity (regime 4). These measurements would then be compared with the computer model predictions, and the physics model would be refined until an agreement was reached. The computer model could then be used to evaluate whether the given change in properties causes an integrated change in performance that adversely affects the reliability of the weapon. This evaluation would determine whether the altered weapon could remain in the stockpile (or be placed in the stockpile in the case of a remanufactured weapon).

In conclusion, NIF would address, to some degree, weapons processes that occur in physical regimes 3 through 7 in the list in section I.2.2.2. These processes are the ones that occur at very high energy density (high temperatures and pressures). These processes are very important in assessing a weapon's reliability. NIF would achieve higher temperatures and pressures, albeit in a very small volume, than any other proposed stockpile stewardship facility. It would also be the only facility that would achieve fusion ignition. The principal safety issues for a nuclear weapon that involve the high explosive and fissile material implosion, relevant physical regimes 1 and 2, could not be addressed in NIF.

The nuclear weapons expected to remain in the stockpile will age beyond their original design lifetime between the years 2005 and 2010. It is important to have NIF in place and operating successfully well before this period so that the facility can be used to help verify the new computer models before problems may begin arising more rapidly. The goals of completing construction of NIF in 2002 and achieving ignition by 2005 would allow this to happen, first with nonignition target experiments and later with ignition experiments.

I.2.3 Other Benefits of the National Ignition Facility

NIF would be a multipurpose facility used for both national security and civilian applications. The most significant potential long-term civilian application of ICF is the generation of electric power. DOE is pursuing two distinct approaches to fusion energy: magnetic fusion energy and inertial fusion energy. Development of inertial fusion as a source of electrical power depends upon achieving ignition in NIF. This approach to inertial fusion energy is consistent with the recommendations of the National Academy of Science's *Second Review of the Department of Energy's Inertial Confinement Fusion Program* (NAS 1990) and the *Fusion Policy Advisory Committee Report* (DOE 1990). Many studies (such as Meier 1994; Moir 1994) have described viable power plant designs that could be developed once high-gain targets are understood. Furthermore, the International Atomic Energy Agency report, *Energy from Inertial Fusion* (IAEA 1995), describes possible engineering development paths to a demonstration fusion power plant once ignition is established on NIF. These development paths are most efficiently accomplished if NIF can first be used to (1) determine the beam energy required for ignition, (2) map out the target gain curves, and (3) understand the post-ignition dynamics of the environment inside a reaction chamber. Thus, early achievement of ignition in NIF is needed to allow the pursuit of an efficient, timely, inertial fusion energy development program.

NIF would also establish new capabilities for the basic sciences. Because fusion targets would provide temperatures and pressures similar to those found in the sun and other stars, data from NIF high-energy-density experiments would interest scientists working in such fields as astrophysics, material sciences, nonlinear optics, x-ray sources, plasma physics, and computational physics. For example, astrophysicists could do experiments that study some of the processes that occur during primordial nucleosynthesis (the original formation of all elements), stellar evolution, and spectacular events such as a supernova explosion.

As the world's largest optical instrument, NIF could spur high-technology industries in the areas of optics, lasers, materials, high-speed instrumentation, semiconductors, and precision manufacturing. Past ICF developments, for example, have led to manufacturing capabilities for precision optics that enabled the development of correcting optics to fix the initial problem of the Hubble space telescope. The ICF need for high-speed target diagnostics led to the development of a low-cost micro-impulse radar that has many commercial applications (12 industrial licenses have already been granted). Commercial applications derived from NIF could include flexible, low-cost, laser-based manufacturing; advanced x-ray lithography for integrated circuit manufacturing; high-density information storage; improved flat-panel display technology; advanced health care technologies; new materials; and new scientific instrumentation.

NIF would play a major role in U.S. science and technology early in the next century. Its civilian and defense missions would maintain weapons technology and expertise for continuing national security objectives, assess a new energy option, contribute to the basic high-energy-density sciences, and enhance industrial competitiveness through numerous technology advances.

I.2.4 Relationship of the National Ignition Facility to Other Department of Energy Environmental Impact Statements

DOE prepared this programmatic environmental impact statement (PEIS) to assess the alternatives for conducting the Stockpile Stewardship and Management Program, including the action described in this NIF Project-Specific Analysis (PSA). The PEIS also evaluates the No Action alternative and provide an assessment of environmental impacts to support programmatic and siting decisions.

However, for NIF and certain other facilities, the PEIS includes both a programmatic assessment and site-specific assessments of the construction and operation impacts at the reasonable candidate sites. The site-specific assessments consider the environmental impacts associated with siting of these facilities and provide a basis for deciding whether or not to proceed with construction.

DOE is currently preparing site-wide EISs for two of the five sites proposed as alternative locations for NIF: the Nevada Test Site (NTS) and the Los Alamos National Laboratory (LANL). The projected completion dates for these EISs are late 1996 for LANL and NTS. A site-wide EIS for the Lawrence Livermore National Laboratory, the preferred NIF location, was issued in 1992. The site-wide EISs address the continued operation of the sites, including near-term (within 5 to 10 years) proposed projects. The site-wide EISs provide an opportunity to address the cumulative impacts of all reasonably-foreseeable activities and provide a mechanism for coordinating site and agency planning for complex facilities by providing an opportunity for review of the potential collective environmental effects associated with large, diverse facilities. The EISs evaluate a range of different alternatives, including the alternative of continuing current operations.

DOE's *Draft Waste Management Programmatic Environmental Impact Statement*, issued in August 1995, addresses the long-term management and safe treatment, storage, and disposal of radioactive, hazardous, and mixed wastes. NIF would generate these types of wastes, and the treatment, disposal, and storage of NIF wastes would be compatible with any decisions resulting from the waste management PEIS.

DOE is proceeding with two other actions related to the Stockpile Stewardship and Management Program: the Dual-Axis Radiographic Hydrodynamic Test Facility EIS (DOE 1995c) and the Tritium Supply and Recycling PEIS (DOE 1995d). DOE determined that implementing the ROD on these two facilities will not prejudice any decisions in the Stockpile Stewardship and Management Program.

I.3 Proposed Action and Alternatives

I.3.1 Overview

This chapter describes the alternatives analyzed in this Project-Specific Analysis (PSA) for the construction and operation of the National Ignition Facility (NIF) at one of five candidate locations at four alternate sites: Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), Nevada Test Site (NTS) Area 22 main site location and North Las Vegas Facility (NLVF) location near NTS, or Sandia National Laboratories (SNL). The NIF Conceptual Design Report (LLNL 1994b) describes the proposed action in detail and establishes the technical feasibility of the project. Section I.3.2 describes the proposed action and includes a description of NIF and its operations. Section I.3.3 describes the No Action alternative. Section I.3.4 describes the five locations at the four alternative sites, including their selection, location, infrastructure requirements, and site-specific aspects of NIF construction and operations. Section I.3.5 discusses other alternatives not considered in detail. Section I.3.6 summarizes and compares the impacts of construction and operation of NIF at the four alternative sites.

I.3.2 Proposed Action

The proposed action is to construct and operate NIF, which would be capable of achieving fusion ignition by the inertial confinement fusion (ICF) process. Two options for NIF operations have been proposed. The Conceptual Design Option would use an ICF approach called indirect drive. The current research program on ICF has emphasized development of the indirect drive approach, and the experimental program currently planned for NIF uses that approach. In indirect drive, laser beams would illuminate and heat the interior surfaces of a metal case (hohlraum) containing a deuterium-tritium-filled capsule. The beams would cause the case to emit x rays that would in turn strike the fusion target capsule and drive the fusion reaction (figure I.3.2–1). Targets used for indirect drive would contain sub-milligram levels of tritium.

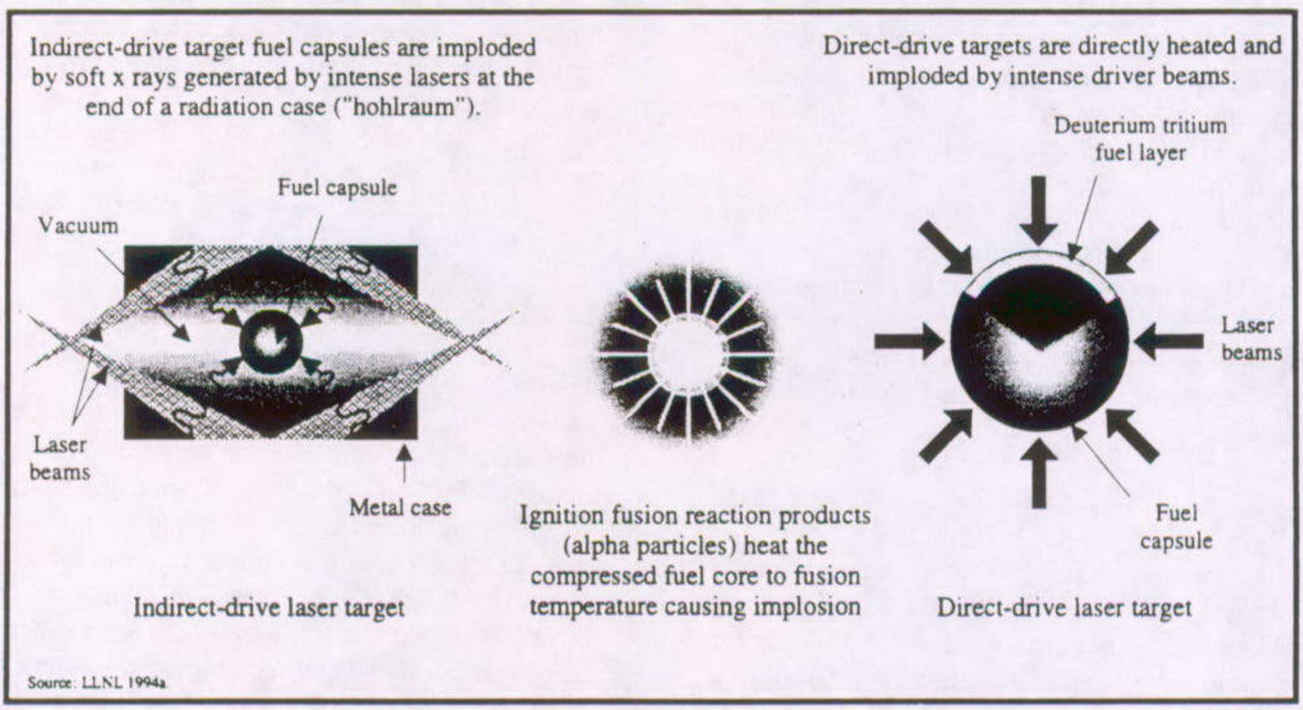


Figure I.3.2–1.—*Schematic Diagram of Indirect Drive and Direct Drive Methods of Achieving Inertial Confinement Fusion.*

An Enhanced Option would include the above indirect drive operations and a second approach called direct drive. The Enhanced Option would also include the ability to perform an increased number of experiments to accommodate greater user needs. No hohlraum would be used in the direct drive ICF method. Instead, a large number of laser beams would impinge directly on the outer surface of the capsule containing the tritium and deuterium (figure I.3.2.–1). Targets for direct drive would contain milligram levels of tritium. Achieving ICF by direct drive is theoretically possible, and an experimental feasibility program is currently underway at the Omega Upgrade Facility at the University of Rochester Laboratory for Laser Energetics in New York and at the Naval Research Laboratory in Washington, D.C. Because it is possible that NIF would be used for direct-drive experiments in its lifetime, operating conditions for both indirect- and direct-drive experiments have been developed and are assessed in this PSA.

I.3.2.1 *National Ignition Facility Components*

NIF would consist of three main elements: a laser system and optical components, a target chamber placed within a target area, and an advanced integrated computer system to control the lasers and diagnostic equipment. These three elements would be housed in a single environmentally controlled building called the Laser and Target Area Building (figure I.3.2.1–1). The entire NIF complex (figure I.3.2.1–2) would require a maximum area of about 20 hectares (ha) (50 acres). Depending on the site selected, many of the NIF needs may be served by existing facilities (see section I.3.4), reducing the requirements for a full 20 ha (50 acres) of new land area.

I.3.2.1.1 Laser and Target Area Building

The Laser and Target Area Building would be an environmentally controlled facility housing the laser and target area systems and the integrated computer system. The majority of the building would contain laser optics. This reinforced concrete and structural steel building would be constructed to be vibration isolated, provide radiation confinement and control, and include all necessary machine control and diagnostic systems. It would consist of two laser bays, two optical switchyards, a target chamber in a target area, target diagnostic facilities, capacitor areas, control rooms, and operations support areas (figure I.3.2.1–1). The floor plan would have a U-shaped layout, with the laser bays forming the legs of the "U" and the optical switchyards and target room forming the connection (LLNL 1994b).

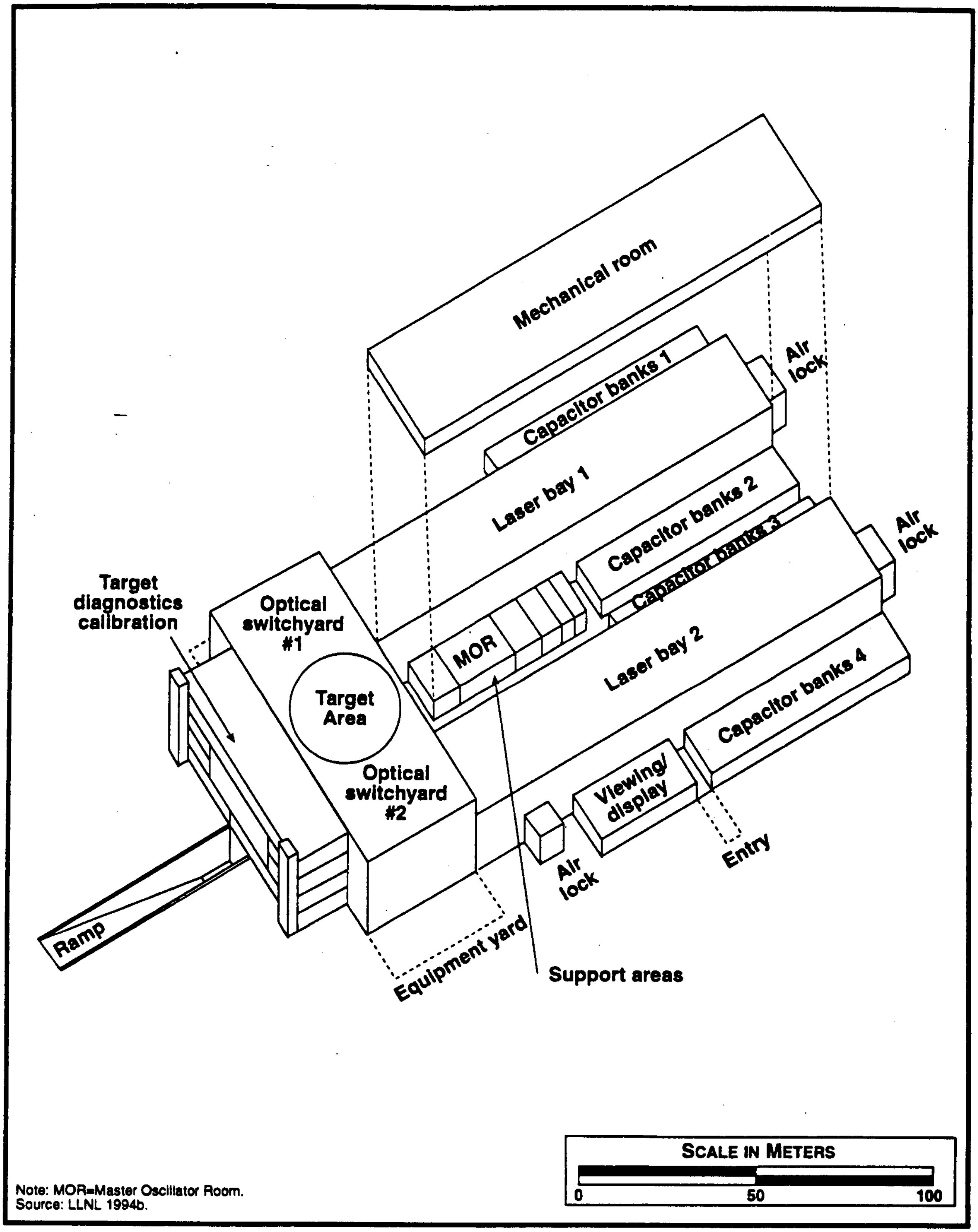
I.3.2.1.1.1 *Laser System*

A laser is a device that produces a beam of monochromatic (single-color) "light" in which the waves of light are all in phase. This condition creates a beam that has relatively little divergence (scattering) and has a high concentration of energy per unit area of the beam. The NIF laser system would generate and deliver high-power optical pulses to a target suspended in the target chamber. Multiple laser beams would be used to uniformly irradiate the required target surface area.

The NIF laser would contain 192 independent laser beams, or beamlets. Each beamlet would have a square aperture of slightly less than 40-centimeter (cm) (16-inch [in]) beam width. Beamlets, each of which would have a unique beam path, or beamline, to the chamber, would be grouped in 48 2x2 groupings at the target chamber. The 192 beamlines would require more than 10,000 discrete optical components. Figure I.3.2.1.1.1–1 illustrates a schematic diagram of the path of one beamlet from origin to the target.

I.3.2.1.1.2 *Target Area*

The NIF target area (figure I.3.2.1.1.2–1) would provide confinement of tritium and activation products by providing physical barriers and by controlling air flow. In addition shielding would provide protection from neutron and gamma radiation. The target area would consist of the following major subsystems: target chamber, target emplacement positioner, target diagnostics, target diagnostic control room, support structures, environmental protection, and vacuum and other auxiliary systems (LLNL 1994b). The primary tritium confinement would be provided by the target (vacuum) chamber and tritium collection system, which would be designed to capture tritium exhausted from the test



3092/SSM

FIGURE I.3.2.1–1.—***Overview of the National Ignition Facility Laser and Target Area Building.***

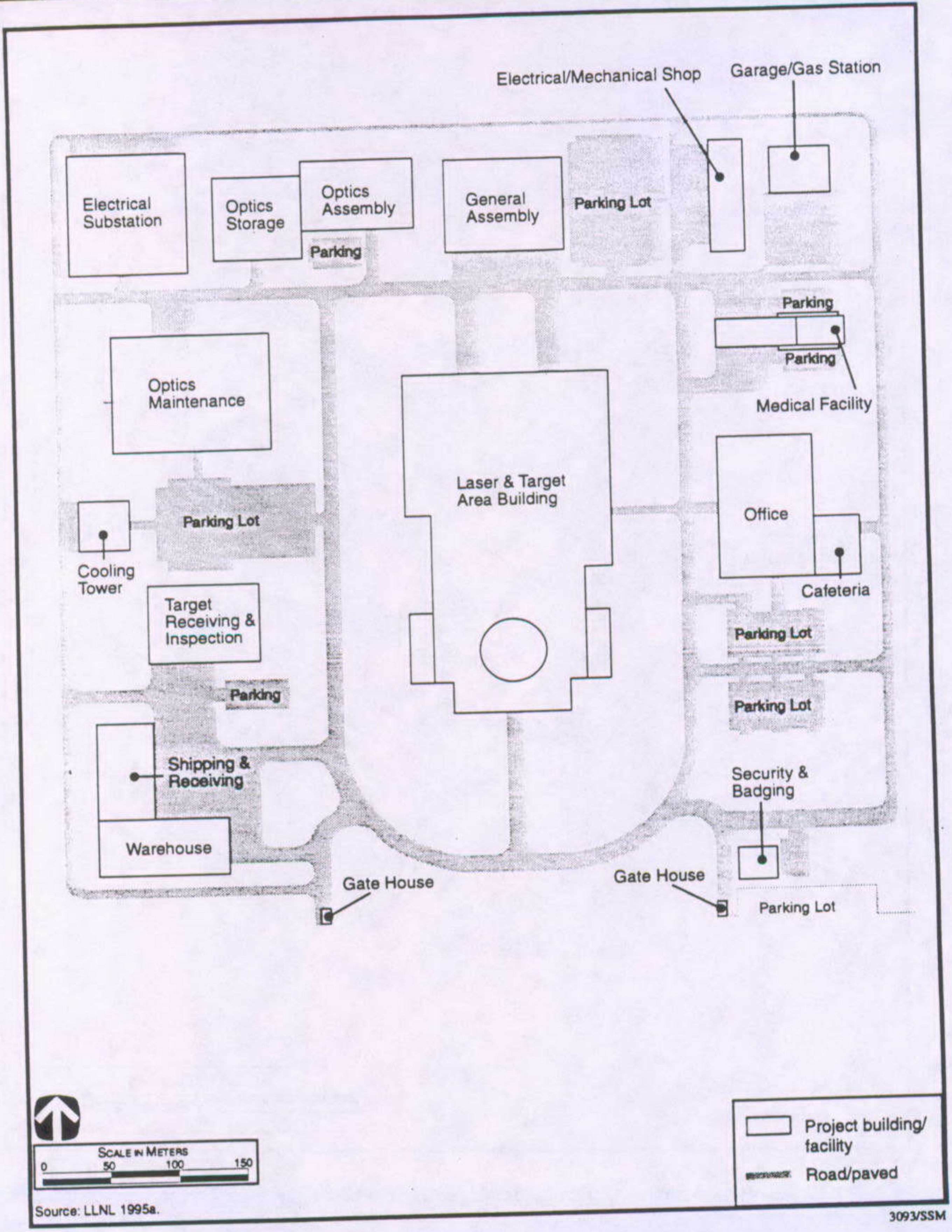
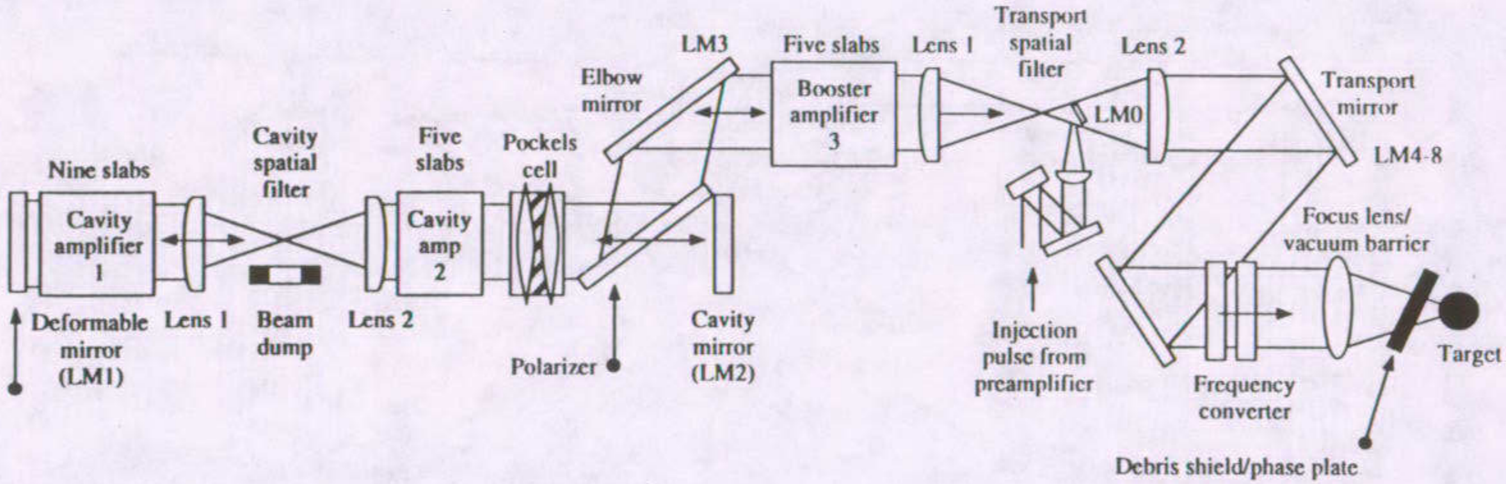


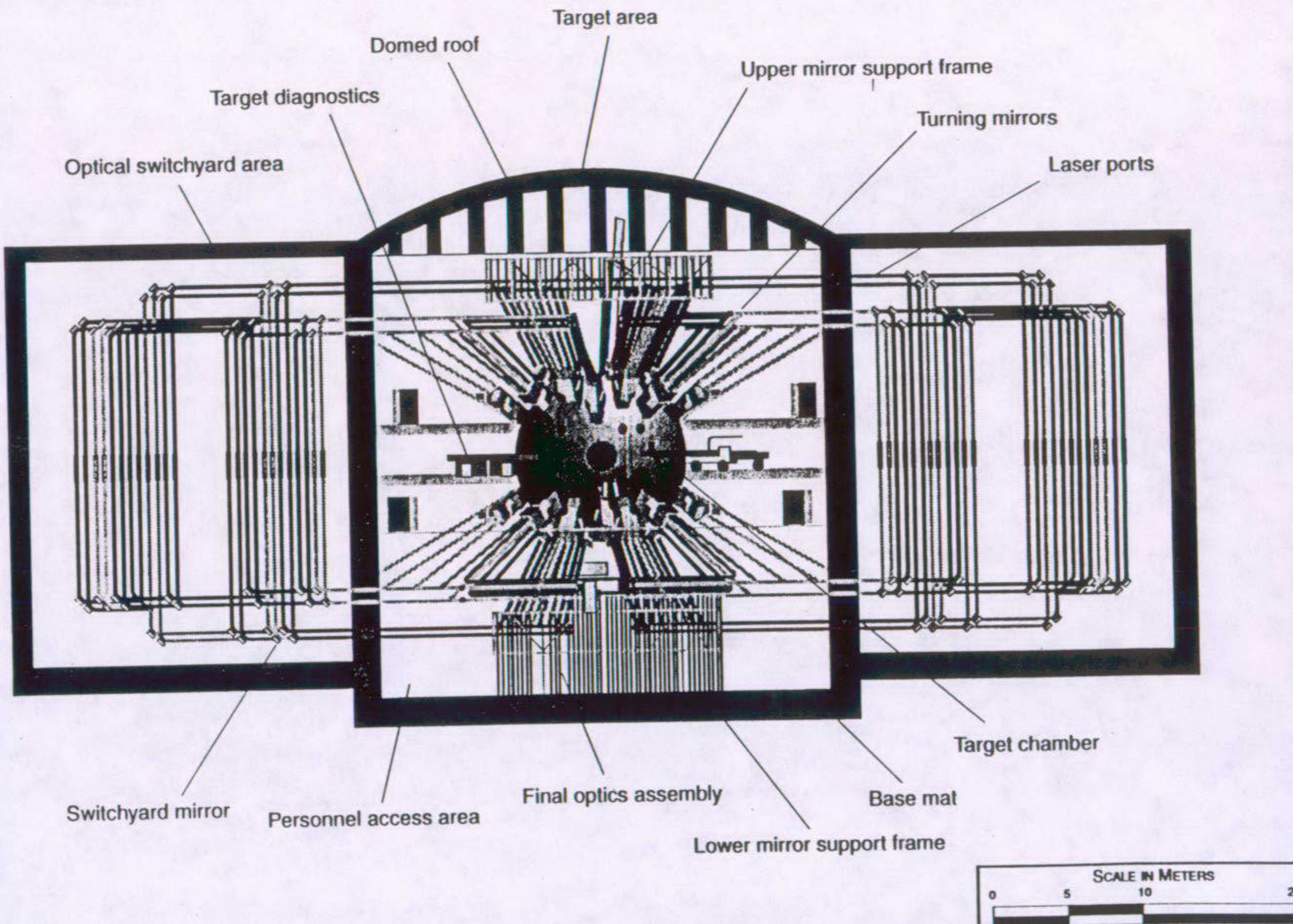
FIGURE I.3.2.1–2.—*National Ignition Facility Generic Site Plan.*



Note: LM – laser mirror.
Source: LLNL 1994a.

3094/SSM

FIGURE I.3.2.1.1.1–1.—*Schematic Diagram of the Path of One Beamlet of the National Ignition Facility Laser.*



Source: LLNL 1994b.

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FIGURE I.3.2.1.1.2–1.—*Cutaway View of the National Ignition Facility Target Area Showing Major Subsystems.*

chamber. The secondary tritium confinement would be the Target Area Building structure, which would be provided with a heating, ventilation, and air conditioning system capable of operating at a negative pressure during and immediately after shots of greater than 1 megajoule (MJ). The building structure would act as the confinement for air activation products. The final exhaust release point from the heating, ventilation, and air conditioning system would be elevated. The airborne radiation releases at the building release points would be measured and the target area would have monitors to allow detection of conditions requiring corrective or protective actions.

Environmental protection systems, including tritium-handling systems, target storage, and decontamination equipment used to clean the target chamber components, would be located adjacent to the target chamber and target chamber room. X-ray, optical, and neutron measurement instruments would be arranged around the chamber to help evaluate the success of each target experiment. Structural support of the target diagnostics, as well as of the target positioner, final optic assemblies, and turning mirrors, would be provided by target area structures. The target area would also provide the following subsystems: the target area auxiliary systems, material handlers, the chamber personnel transporter, and the diagnostics and classified control rooms.

I.3.2.1.1.3 *Target Chamber*

The NIF target chamber would be a 10-meter (m) (33-feet [ft]) internal-diameter spherical aluminum shell with walls 10 cm (4 in) thick (figure I.3.2.1.1.3–1), and the exterior of the chamber would be encased in 40 cm (16 in) of concrete to provide neutron shielding. The target chamber would be supported vertically by a hollow concrete pedestal and horizontally by radial joints connected to the cantilevered floors. The aluminum wall of the chamber would provide a vacuum barrier and mounting surface for the first wall panels, which protect the aluminum from soft x rays and shrapnel. The vacuum system would provide a 10^{-6} torr vacuum level for target experiments (LLNL 1994b).

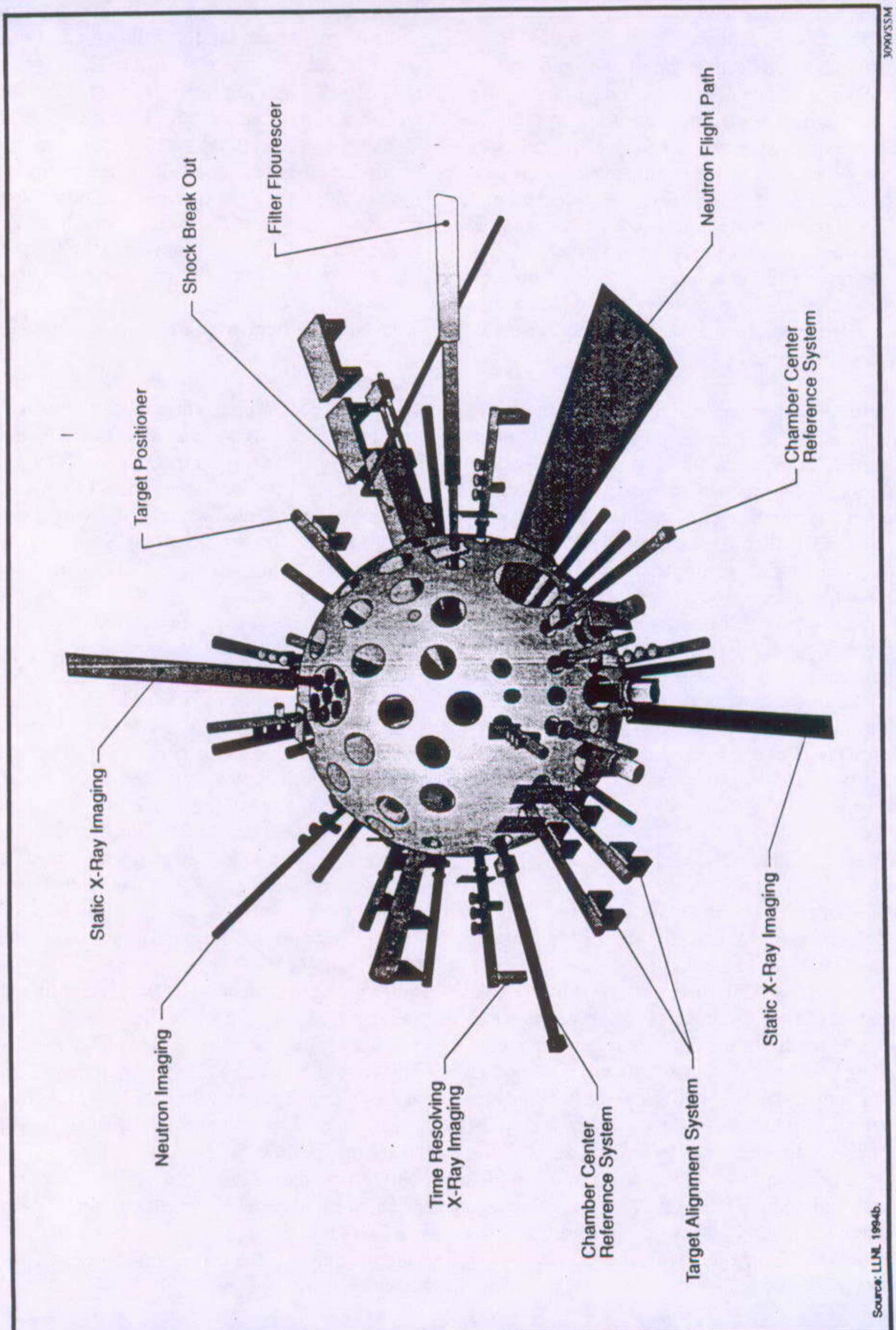
The laser beams would enter the chamber in two conical arrays from the top and two conical arrays from the bottom. At the poles and in the equatorial regions of the chamber, diagnostic equipment would be inserted through the chamber wall. Unconverted laser light that hit the opposite wall would be absorbed by the light-absorbing panels located adjacent to and slightly smaller than the opposing beam port. The target chamber would also include the target emplacement and positioning/alignment systems and planned diagnostics.

I.3.2.1.1.4 *Integrated Computer Control System*

The computer control system would be an integrated network of conventional computer systems providing the hardware and software needed to support full operational activities. The system would include the computer controls to manage the complex laser optical system and would have to meet security requirements to handle classified information.

I.3.2.1.1.5 *Sequence of Events During an Ignition Shot*

A shot would begin as weak laser pulses at four separate frequencies (or colors of light) in the master oscillator room (figure I.3.2.1–1). Each pulse is launched into an optical fiber system that amplifies and splits the pulse into 192 separate fibers, 48 of each color. The four colors are used to smooth the intensity (power per unit area) of the laser spot on the target. The power in the laser pulse at this point is a little less than a watt. Typical pulses are a few nanoseconds long, so the energy is a few nanojoules. The optical fibers carrying the pulses then spread out to 192 preamplifiers. The preamplifiers are located beneath the focal plane at the center of the large transport spatial filters, which are located between the laser components and the target chamber (figure I.3.2.1.1.1–1). Within the preamplifier, the pulse is amplified by a factor of about one million, to about a millijoule. The laser pulse then enters spatial beam-shaping optics and a flashlamp-pumped, four-pass rod amplifier, which converts it to about a 1-joule pulse with the spatial intensity profile needed for injection into the main laser cavity.



Source: LLNL 1994b.

FIGURE I.3.2.1.1.3–1.—*Target Chamber with Typical Diagnostic Equipment.*

The pulse of laser light from the preamplifier reflects from a small mirror (labeled LM0, figure I.3.2.1.1.1–1). The laser light comes to a focus at the focal plane of the transport spatial filter, and passes through booster amplifier 3, reflects from the polarizer, is amplified further in cavity amplifier 2, goes through a second spatial filter (the cavity spatial filter), then passes through cavity amplifier 1, and reflects from the deformable mirror (mirror LM1, figure I.3.2.1.1.1–1). The beam then reflects back through cavity amplifier 1, the cavity spatial filter, and cavity amplifier 2.

In the interim, the Pockels cell (figure I.3.2.1.1.1–1) is energized. This component rotates the plane of polarization of the laser light from horizontal to vertical. Therefore, the laser light pulse passes through the polarizer and strikes cavity mirror LM2, which redirects the pulse back to the Pockels cell, which rotates the polarization back to horizontal. The pulse then continues towards the deformable mirror LM1. It then reflects back from LM1, through cavity amplifier 1, the cavity spatial filter, and cavity amplifier 2 again. By this time the Pockels cell has been de-energized so that it no longer rotates the polarization of the pulse. Thus, the laser pulse reflects from the polarizer and is further amplified by booster amplifier 3 to an energy of about 17 kilojoules for a typical ignition target pulse shape. The pulse then passes through the transport spatial filter on a path slightly displaced from the input path, thus just missing the injection mirror LM0.

The laser pulse then travels through a long beam path reflecting from several transport mirrors (LM 4 through 8) until it reaches the target chamber. (For simplicity, figure I.3.2.1.1.1–1 does not show all of these mirrors.) Mounted on the target chamber is a frequency converter that changes the infrared laser pulses to ultraviolet light. The focusing lens then brings the four color pulses (192 separate fibers or 48 for each color pulse) to a focus at a single spot at the center of the target chamber. The debris shield/phases plate (figure I.3.2.1.1.1–1) protects the focusing lens from any target fragments, and it may also have a pattern etched into its surface to reshape the distribution of laser intensity in the focal spot on the target.

The target would be a small spherical capsule whose hollow interior would contain a thin annular layer of liquid or solid DT fuel (a mixture of deuterium and tritium isotopes of hydrogen). The outer surface of the capsule is rapidly heated and evaporated, either by the absorption of soft x rays under indirect drive or by direct heating by lasers under direct drive (see figure I.3.2.–1). The rocket effect caused by the evaporated outer capsule creates an inward pressure causing the capsule to implode in about 4 nanoseconds. The implosion heats the DT fuel in the core of the capsule to about 50 million degrees Celsius (90 million degrees Fahrenheit), sufficient to cause the innermost core of the DT fuel to undergo fusion. The fusion reaction products deposit energy in the capsule, further increasing the fuel temperature and the fusion reaction rate. Core fuel ignition occurs when the self-heating of the core DT fuel due to the fusion reaction product deposition becomes faster than the heating due to compression. The ignition of the core would then propagate the fusion burn into the compressed fuel layer around the core. This will result in the release of much more fusion energy than the energy required to compress and implode the core.

The energy in one pulse would be about equal to the caloric energy in one candy bar (1.8 MJ, or 400 food calories). However, the peak power for a few nanoseconds would be equal to about 500 terawatts (500×10^{12} watts), instantaneously exceeding the steady-state power capacity in the entire United States by about a factor of 1,000 (LLNL 1994a).

I.3.2.1.2 Target Receiving/Inspection Area

NIF would require a facility at which to receive and inspect targets fabricated at another site (LLNL 1995b). This area would require several Class 100 (Airborne Particulate Cleanliness Class) clean rooms and inspection laboratories in a vibration-free environment. This facility would also include cryogenic laboratories and a central chemical waste system. The facility would have to meet security requirements to handle classified equipment.

I.3.2.1.3 Other Areas

Optics Assembly Area/Clean Room. The optics assembly area/clean room would be used to clean, coat (for example, with Sol-gel as an optics dielectric), inspect, and assemble the NIF's optics and crystals (LLNL 1995b).

General Assembly Area. The general assembly area would be used to assemble mechanical and electrical components not requiring a clean-room environment (LLNL 1995b). The facility would be equipped to handle large and heavy assemblies. This area would also be used for assembly welding.

Optics Maintenance Area. The optics maintenance area would be used for refurbishing, cleaning, and coating of both laser glass and optical components (LLNL 1995b). This specialized area would require vibration isolation, temperature and humidity controls, and Class 100 clean rooms.

Optics Storage Area. During the NIF operational phase, spare parts would be stored in the optics storage area. Because of the size and mass of many of these components the storage area would provide for truck and forklift access (LLNL 1995b).

Radioactive Storage Area. The radioactive storage area would be an intermediate storage area used to store components that come out of the target area before they can be decontaminated.

Electrical and Mechanical Shops. The electrical and mechanical shops would house the machine tools to be used for repairs, maintenance, and special fabrication required for daily operations of the NIF laser and its auxiliary systems (LLNL 1995b).

Support Facilities. NIF would require the following additional support facilities (LLNL 1995b): (1) shipping, receiving, and central stores; (2) medical building; (3) cafeteria; (4) garage and gas station; (5) fire station; and (6) security and badging. All of these services currently exist within the infrastructures of the candidate sites and could be used by NIF.

I.3.2.1.4 Facility Construction

Conventional construction techniques would be used to build NIF. The extent and exact nature of such activities as site clearing, infrastructure improvements, and support facility construction required would depend on the specific location selected for NIF. Construction of NIF would be organized in the following sequential phases: (1) initial building construction, (2) special equipment structures installation, (3) final building construction, (4) final installation preparation, (5) clean component installation, and (6) final laser/target systems installation.

As conceptually designed, about 20 ha (50 acres) of land area would be required for NIF. Figure I.3.2.1–2 shows an overall conceptual plan of a generic NIF site, including all required buildings and improvements. Within this area, all direct and support buildings for NIF would require 4.7 ha (11.6 acres). There would also be 4.1 ha (10.1 acres) of access roads and 1.9 ha (4.7 acres) of parking space (LLNL 1995b). The remaining 9.3 ha (23.0 acres) would consist of open space (e.g., landscaped lawns). The actual amount of land required at the selected host site would be less, as all of the candidate sites have existing facilities that could meet some of the infrastructure requirements for NIF (see section I.3.4). During construction, about 2.0 ha (4.9 acres) of land would be required for a construction laydown area. The laydown area would be located within or near the location designated for the NIF (see section I.3.4). Following construction, the laydown area would be restored to its preconstruction condition or incorporated into the landscaping design selected for the site.

I.3.2.2 *Facility Operations*

The NIF experimental plan comprises several stages:

- Start-up experiments to activate core diagnostics and to validate laser performance
- Hohlraum tuning experiments to attain minimum asymmetry in x-ray drive

(indirect-drive approach only, laser symmetry experiments for direct drive)

- Cryogenic pre-ignition experiments for detailed study of capsule implosions
- User experiments for weapons physics, weapons effects, and other user groups
- Ignition experiments
- Ignited burn experiments to obtain basic data for inertial confinement energy development, basic scientific research on high-density plasmas, and research relative to various military-related applications

When the laser "fires" on a target, all 192 laser beams are synchronized such that after grouping in 48 2x2 groupings at the chamber, they simultaneously "hit" the target. The target is compressed and heated, creating intense fusion reactions. Ignition is defined as occurring when heating of the compressed target by fusion products is just adequate to create an advancing front, or wave, of fusion reactions across the target, heating or "igniting" the entire fuel in the target to reaction conditions.

The numbers and types of "shots" needed to achieve ignition have been estimated on the basis of experience with other large laser systems–such as Nova (many of the activities for NIF would have parallels with Nova, such as hohlraum symmetry and plasma diagnostic activation) and the NIF Beamlet Demonstration Project. Relatively low laser energies would be required for most of the early shots; shaped pulses greater than 1 MJ would be required for very few shots before the demonstration of ignition. It is estimated that approximately 1,600 target shots, in addition to approximately three months of downtime for installation of a cryogenic target positioner, would be required to attain ignition (LLNL 1994b). Concurrently, other target experiments would be carried out for various user communities.

I.3.2.2.1 Conceptual Design Operations

It is expected that once ignition is achieved, NIF would be operated within the constraints specified for an operational baseline in the Conceptual Design. This baseline, or Conceptual Design Option, is the 192-beam, indirect drive operation mode for NIF. The estimated parameters for the Conceptual Design Option are as follows:

- Maximum design yield: 20 MJ
- Annual total yield: 385 MJ/year (yr)
- Tritium throughput: 600 Curies (Ci)/yr
- Maximum tritium inventory: 300 Ci
- Tritium effluent: 10 Ci/yr

I.3.2.2.2 Enhanced Option Operations

The enhanced NIF operational capabilities, or Enhanced Option, would include the indirect drive and user capabilities described above plus direct-drive capabilities and additional test-specific capabilities that might be desired by the user communities. In addition, the Enhanced Option would include the ability to perform an increased number of yield experiments per year to accommodate greater user needs. Enhanced capability operations would involve some design changes to the Conceptual Design Option Facility. By diverting the 24 beamlines (96 beamlets) from the indirect-drive configuration for direct drive, an additional 24 beam ports would be placed evenly spaced half above and half below the chamber equator. Final optics assemblies already modified for direct drive would be placed permanently at these ports. The final turning mirrors that direct the laser beams to their final optics assemblies would be adjusted with motors to direct the selected beams away from their usual final optics assemblies and toward another final mirror that would send the beams through the new final optics assemblies in a direct-drive mode. A different target positioner would be required for direct-drive target insertion and positioning. A new target shroud that could be removed much more quickly than that for indirect drive would also be required. Equipment decontamination systems would also be upgraded for the Enhanced Option. The Enhanced Option Facility would use the same utilities and consumables (for example, electricity, water, fuel, and oil) as the Conceptual Design Option Facility.

Under the Enhanced Option, NIF would have the capability to do both direct and indirect drive target experiments (although several days would be necessary to switch from one mode to another). The facility would also have the capacity to handle more experiments per year (both yield and no-yield types) to accommodate greater user needs than permitted by the Conceptual Design Option operations. The estimated operating parameters for the Enhanced Option are as follows:

- Maximum design yield: 20 MJ[1]
- Annual total yield: 1,200 MJ/yr
- Tritium throughput: 1,750 Ci/yr
- Maximum tritium inventory: 500 Ci
- Tritium effluent: 30 Ci/yr

I.3.2.2.3 Security

Both classified and unclassified activities would be conducted at NIF, and appropriate security and badging requirements would be implemented. Because many uncleared visitors are expected to use the facility, security features would be designed to allow easy access for visitors while at the same time maintaining effective physical and technical security where necessary.

Security requirements would include those for physical protection of classified matter; physical protection of Department of Energy (DOE) property and unclassified facilities; protective program operations; and personnel security, including issuance, control, and use of badges, passes, and credentials. In addition, telecommunication services would be designed to be capable of handling both classified and unclassified information.

I.3.3 No Action Alternative

Under the No Action alternative, NIF would not be constructed or operated. NIF's experiments related to science-based stockpile stewardship (see section I.2.2) would not be realized. If NIF were not built, the ability of the Stockpile Stewardship and Management Program to obtain the fusion and high-temperature/density data that would have been available with NIF would be hampered or delayed. The Stockpile Stewardship and Management Program would continue to use Nova and other facilities for as long as they produced useful data, but the existing facilities are not capable of reaching the temperatures and pressures that are anticipated for NIF. If other technologies were proposed to obtain higher temperatures and pressures than those available from existing facilities, such technologies would not be operational by the period 2005 to 2010. When enduring stockpile weapons age beyond their original design lifetimes, confidence in the reliability of such weapons may decrease significantly, and the probability would increase that the United States might have to invoke "supreme National interest" and withdraw from any test moratorium or *Comprehensive Test Ban Treaty*.

Under the No Action alternative, many operations at LLNL, LANL, SNL, and NTS would continue as described in the existing environment subsections of chapter I.4. However, all existing NIF-dependent functions of the ICF program would be discontinued at LLNL, LANL, and SNL. The number of employees at each of these sites would decrease somewhat as a result. For the purposes of the socioeconomic analysis in this PSA, it is assumed that employment at LLNL would decrease by 100, employment at LANL would decrease by 20, and employment at SNL would decrease by 20. There would be no change in employment at NTS or NLVF related to the No Action alternative.

[1] Maximum credible yield is 45 MJ for bounding accident evaluation.

I.3.4 Alternative Sites

This PSA evaluates the impacts of construction and operations of NIF at five locations at four alternative sites: LLNL in California, LANL in New Mexico, Area 22 and NLVF associated with NTS in Nevada, and SNL in New Mexico. The selection of these four sites was based on a two-step process. Three alternative sites were identified on the basis of the following primary site criteria (LLNL 1995b):

- Federal site controlled by the U.S. Department of Energy Office of the Assistant Secretary for Defense Programs (DP)
- Significant ICF programs consisting of ICF-related experimental facilities and personnel working on ICF studies (also called ICF infrastructure)
- Adequate protection of the public and the environment
- Hazardous and radioactive waste management capability
- Adequate transportation services for transportation of targets

Three sites met the first two criteria: LLNL, LANL, and SNL. Significant ICF infrastructure exists at LANL, LLNL, and SNL and the University of Rochester; however, the latter is not a DP facility. All three DP sites have locations that could accommodate NIF; all three sites have the capabilities to construct and operate NIF with adequate protection of the public and environment; all three sites manage both hazardous and radioactive wastes; and all three sites have adequate transportation services for transporting targets. No other sites within the DOE system meet these criteria.

In her October 1994 approval letter for Key Decision 1, Energy Secretary Hazel O'Leary announced LLNL as the preferred NIF site and LANL, NTS, and SNL as alternative sites. NTS meets four of the above five criteria, lacking only a significant ICF infrastructure. However, NTS has a long history of nuclear weapons testing and was added as an alternative site, on the basis of the presidential mandate to maintain a test readiness posture. NTS has proposed two possible locations for NIF. One is NTS Area 22 in the southeastern area of the site, and the other is NLVF, located in the city of North Las Vegas. These two locations, one remote and one within an urban area, well represent alternatives for locating NIF at NTS. The other alternative sites do not have such diversity of alternative locations, and each has selected one proposed location for NIF.

LLNL has been selected as the preferred site because of its prominence as a leading center for laser science, engineering, and technology. The laboratory has been in the forefront of laser and fusion technology, having constructed several large lasers and fusion experiments, including Shiva, Nova, the Atomic Vapor Laser Isotope Separation project, and the Magnetic Fusion Test Facility. LLNL has the required combination of existing facilities, equipment, infrastructure, and technical and management personnel required to build and operate NIF (LLNL 1994c).

Final site selection will result from this PSA and the Record of Decision (ROD), which will also include consideration of the information and evaluations presented in the *Stockpile Stewardship and Management Programmatic Environmental Impact Statement*. For clarity, the following terminology is used in this document: the word site refers to a DOE-controlled Federal site, such as LANL or NTS; the word location refers to the proposed location of NIF within the larger DOE-controlled Federal site. Table I.3.4–1 lists the facilities required for NIF operations at each site.

I.3.4.1 *Lawrence Livermore National Laboratory*

I.3.4.1.1 Location Description

LLNL is a multipurpose scientific engineering research facility operated by the University of California for DOE. LANL was founded on the site of a former U.S. Navy maintenance base in 1952. LLNL's mission is to serve as a national resource of scientific, technical, and engineering capability with a special focus on national security. Over the years, this mission has evolved to include a wide variety of activities, including ICF, laser isotope separation, magnetic fusion energy, biomedical and environmen-

TABLE I.3.4–1.—*Facilities Required for National Ignition Facility Operations at Each of the Candidate Sites* [Page 1 of 2]

Required Facility	Size Required (m^2)	LLNL	LANL	NTS	NLVF	SNL
Laser and target area bldg.	16,722	New facility	New facility TA-58	New facility	New facility	New facility
Target receiving/inspection	1,393	B298 ICF Target Development, Receiving, and Inspection	TA-35-213	New facility	C-3 High Intensity Source Laboratory	New facility
Optics assembly area	1,858	New facility and B391 High Bay	New facility TA-58	New facility	New facility	New facility
General assembly area	2,787	B166 ICF High Bay and B391 High Bay	New facility TA-58	6-800 Heavy Duty Shop (1,866 m^2), 6-624 Heavy Duty Shop (1,187 m^2)	A-1 High Bay	New facility
Optics maintenance area	3,716	B391 Nova, B321 Optics Fabrication, B392 ICF R&D and Storage Area, B432 High Bay and Optics Metrology Area, new facility (same as Optics Assembly Area)	TA-3-287 (upgrade)	New facility	New facility	New facility
Optics storage area	2,090	B392 ICF R&D and storage area, B381 High Bay	TA-3-105 (upgrade)	New facility	New facility	New facility
Radiological storage area	127	B331 Tritium Facility	Existing facility in TA-54	Building 610 about 3.2 km from NIF location	New facility	Existing facility in Technical Area III
Office building	7,432	B481 ICF Office Building	TA-3-40, TA-3-287, TA-3-105, TA-3-100 New facility (1,860 m^2)	23-117 A&E Bldg. (2,104 m^2) 23-600 L.L. & Eng. (3,498 m^2) 23-113 REECo Trn. (962 m^2) 23-112 REECo Safety (889 m^2)	Conversion of B-1 or new facility	New facility and shared space (3,716 m^2) with Buildings 952 and 960 of Technical Area IV
Electrical and mechanical shops	1,115	B511 Maintenance Shop, B383 Machine Shop, B321 Machine Shop	TA-3-39	23-710 Crafts Bldg. (1,919 m^2)	A-1 Low Bay	Building 840 of Technical Area I

TABLE I.3.4–1.—*Facilities Required for National Ignition Facility Operations at Each of the Candidate Sites* [Page 2 of 2]

Required Facility	Size Required (m^2)	LLNL	LANL	NTS	NLVF	SNL
Warehouse	2,787	B041 Warehouse, B531 Warehouse, and other onsite storage areas	TA-3-30 TA-3-142	23-W1, W2, W3, W3A, W4, W4A, W5	A-2 Warehouse	New facility
Shipping, receiving, and stores	1,300	B411 Central Stores	TA-3-30	23-W6 (1,300 m^2) W5A, W7	A-2 Warehouse	Building 857 of Technical Area-I
Medical facility	278	B663 Medical Services	TA-43	23-650 Medical Facility	C-1 Medical Facility	Building 831 of Technical Area-I
Cafeteria	743	T4675 Central Cafeteria	TA-3-261	23-300 Cafeteria	C-1 Cafeteria	Building 861 of Technical Area I
Garage, gas station	223	B611 Garage	TA-3-36	23-750 Fleet Service	Not required onsite	Buildings 873, 874, 875, and 876 of Technical Area I
Fire station	650	B323 Fire Station	TA-3-41	23-425 Mercury Fire Station (929 m^2)	Not required onsite	Existing facility at Kirtland Air Force Base
Security and badge office	223	B071 West Badge Office, B271 Security	TA-3-490	23-1000 Badge Office	C-1 Administrative Security	Building 800 of Technical Area I

Source: LLNL 1996.

tal research, environmental restoration, and waste management.

The LLNL site is about 64 kilometers (km) (40 miles [mi]) east of San Francisco in southern Alameda County, California. Figure I.3.4.1.1–1 shows the regional location of LLNL. The site occupies an area of 332 ha (821 acres), including land that serves as a buffer zone around the northern and western borders of the site.

As proposed at LLNL, NIF would require construction of two buildings—the Laser and Target Area Building and the Optics Assembly Area—with the remaining building requirements met with existing facilities (see table I.3.4–1). Figure I.3.4.1.1–2 shows the proposed location for the Laser and Target Area Building and the Optics Assembly Building within the existing LLNL complex. The location was selected because it is accessible to the support facilities and functions that would be required to operate and maintain the NIF systems (LLNL 1995b).

The two new buildings would be situated on an 8.1-ha (20-acre) area in the northeastern quadrant of the LLNL site, adjacent to existing ICF facilities (figure I.3.4.1.1–2). The buildings would be constructed in an area where large laser and optical systems have been operating for several years.

Several existing facilities would be modified as necessary, and used to perform supporting functions for NIF. These facilities include: B166 (ICF High Bay), B298 (ICF Target Development, Receiving, and Inspection), B321 (Optics Fabrication), B331 (Tritium Facility), B381 (High Bay), B391 (Nova and High Bay), and B392 (ICF R&D and Storage Area). The current operation of these facilities is covered in the LLNL sitewide Environmental Impact Statement/Environmental Impact Report (DOE and UC 1992). The impacts of any modifications and operation of these facilities have also been evaluated in this PSA. The main impact of these facilities is the inventories of hazardous chemicals used for optics processing. These have been considered in the generation of wastes, effluents, and the postulated accidents for NIF described in chapter 4 of this PSA. The general use facilities (i.e., office building, electrical and mechanical shops, warehouses, shipping and receiving, stores, medical facility, garage, cafeteria, fire station, security, and badge office) serve LLNL as a whole and require no modification to accommodate the addition of NIF.

The LLNL site is located within the California Coast Ranges, an area of north-northwest trending ranges and valleys. The Livermore Valley, an exception to this trend, forms an east-west structural basin defined by branches of the San Andreas fault system. LLNL occupies a smooth land surface that slopes gently to the northwest. Several fault zones traverse the Livermore Valley. LLNL lies within Seismic Zone 4, and the area's seismicity makes earthquake-resistant construction a necessity (LLNL 1995a). The proposed NIF location has been subjected to geological, soil, and vibrational studies, and the site characteristics were determined to be sufficient for the proposed NIF building and equipment designs (LLNL 1994d, 1995b).

I.3.4.1.2 Infrastructure Requirements

Existing utilities at LLNL include electrical power, natural gas, domestic water, cooling water, demineralized water, sewer, compressed air, life-safety alarms, and a voice/data communications system. Most of the utility systems are configured as loops to provide increased reliability and isolation for repair and maintenance. All utilities meet the requirements of current LLNL missions and have the capacity to support NIF (LLNL 1995c).

I.3.4.1.3 Construction and Operations

The construction of the Laser and Target Area Building and the Optics Assembly Building at LLNL would require the relocation of an underground storm drain; currently no other buildings or structures exist at the proposed NIF location. Construction would not require decontamination and decommissioning (D&D) of existing structures, and the area contains no known contaminated soils or previous waste dumps that would require remediation. It is anticipated that the small, incremental amounts of waste that would be generated during construction would be handled by the existing waste treatment and management systems.

During construction a staging area of about 2 ha (4.9 acres) would be required. There are three siting options for this staging area. The staging area would be graded and covered with a chip seal over an

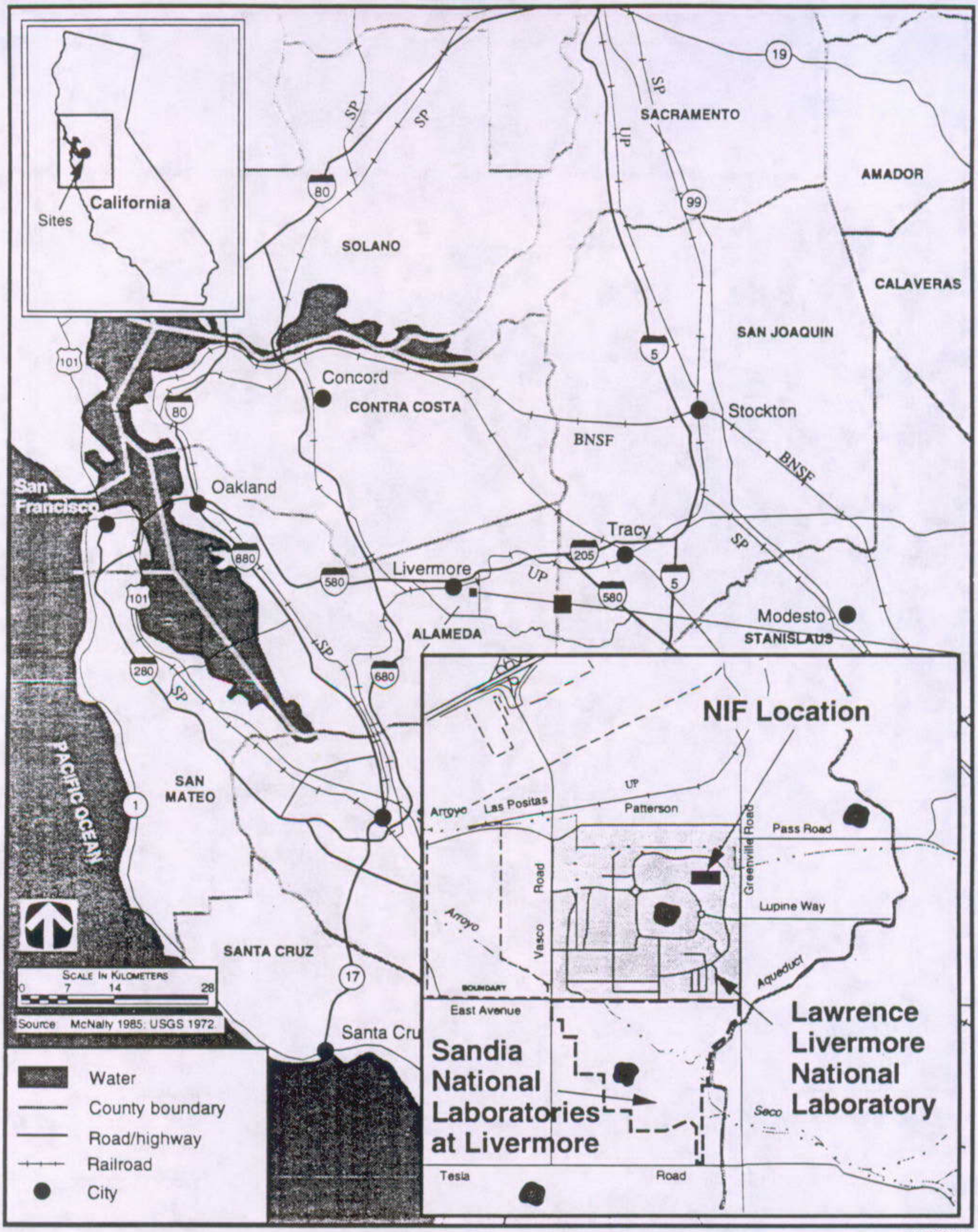


FIGURE I.3.4.1.1–1.—*Regional Location of Lawrence Livermore National Laboratory.*

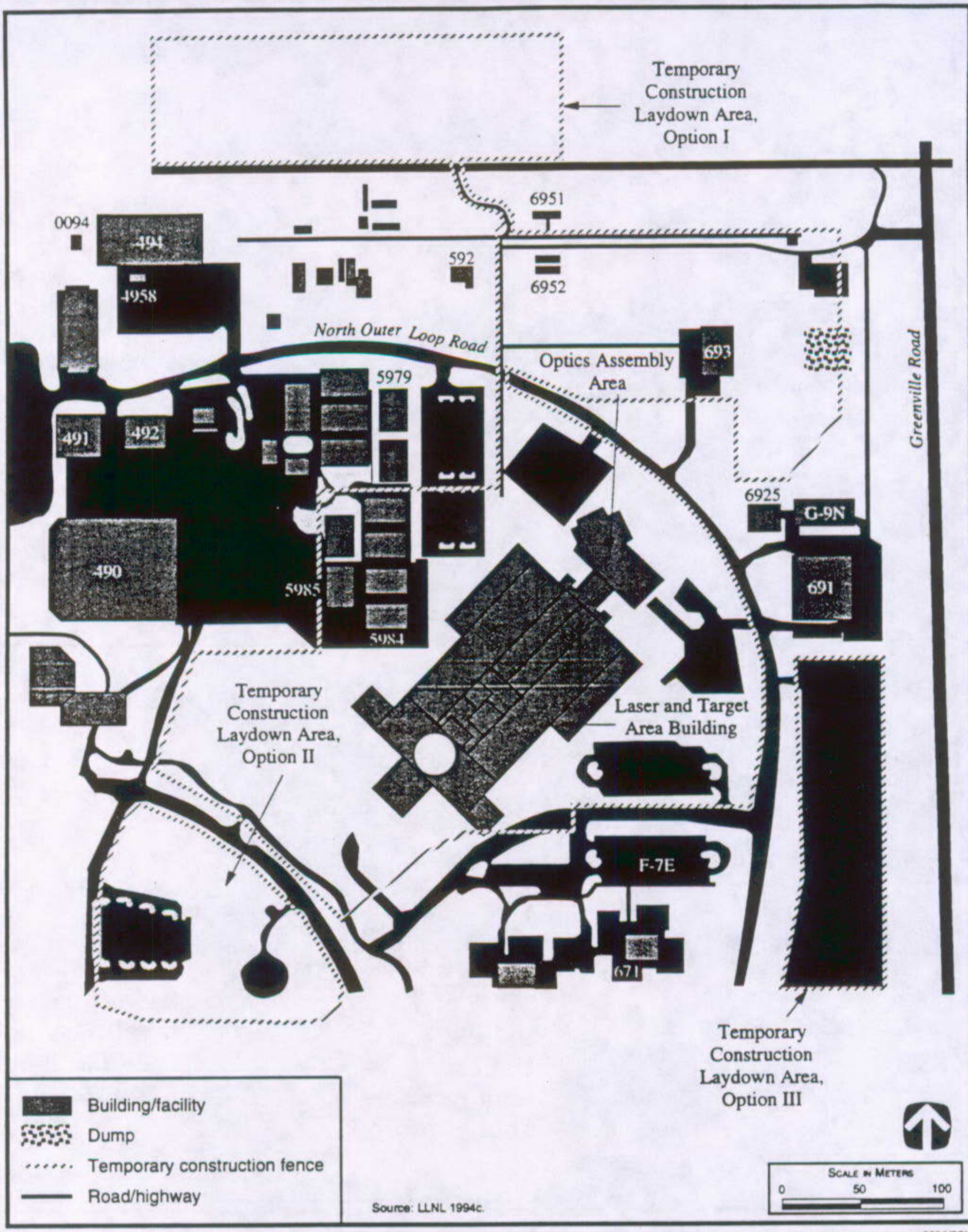


FIGURE I.3.4.1.1–2.—*Proposed Location for the National Ignition Facility at Lawrence Livermore National Laboratory.*

aggregate base. The selected staging area would be cleared and fenced during the construction period. Staging Area option I is across Arroyo Las Positas from the proposed NIF location. A temporary access road, including a bridge across the arroyo, would also be required for movement of construction materials between the option I laydown area and the NIF site. The proposed access road would connect the county's Patterson Pass Road with LLNL's existing Avenue T. Avenue T and other existing LLNL roadways would also be improved to handle the increased traffic. A security post would be installed along the access road. The proposed access road would be 7.3 m (24 ft) wide with 1 m (3 ft) shoulders, and would be about 152 m (500 ft) long. It would be constructed using asphalt over an aggregate base. The bridge would be about 12-18 m (40-60 ft) long and 7.3 m (24 ft) wide. All supporting structures would be located on the tops of the channel banks, out of Arroyo Las Positas. The bridge would be designed so as not to reduce the capacity of the arroyo or increase the risk of flooding. The 100-year floodplain is contained within the channel of the arroyo which is approximately 12-18 m (40-60 ft) wide. Option II would require the removal of a small helipad, while option III would require elimination of a recreational field. The chip seal and fencing at the staging area would be removed upon completion of NIF construction, and the area would be returned to its pre-project condition. If option I is selected, the present plans are to remove the bridge and access road. However, they are being designed as permanent structures so that they could be left in place and used as another entrance to LLNL. The security post would also be removed unless needed for continued use. The arroyo channel banks would be restored to their pre-project condition after the bridge is removed.

I.3.4.2 *Los Alamos National Laboratory*

I.3.4.2.1 Location Description

LANL is a DOE research and technology development facility operated under contract by the University of California. LANL was established in 1943 to provide facilities for research, design, and testing of nuclear weapons and nuclear materials. Over the past 50 years, LANL's mission has evolved in response to national policy to include research in energy, materials science, nuclear safeguards and security, biomedical science, computational science, environmental protection and cleanup, and other basic science research (DOE 1995c).

LANL and the associated residential areas of Los Alamos and White Rock are located in Los Alamos County, in north-central New Mexico, approximately 97 km (60 mi) north-northeast of Albuquerque, 40 km (25 mi) northwest of Santa Fe, and 32 km (20 mi) southwest of Espanola, New Mexico (figure I.3.4.2.1–1).

The proposed LANL location for NIF is Technical Area (TA)-58, which is an undeveloped area adjacent to TA-3, the hub for LANL administration and support activities (figure I.3.4.2.1–2). The new construction proposed at this location includes the Laser and Target Area Building, the Optics Assembly Area, the General Assembly Area, and office space required for NIF.

Table I.3.4–1 lists the existing LANL facilities that satisfy NIF space requirements. Two of the existing facilities listed, TA-3-287 and TA-3-105, would be adequate to support additional NIF functions after significant modification and upgrading. These two buildings, the Scyllac Building (TA-3-287) and the Sherwood Building (TA-3-105), would be designated for use as the Optics Maintenance Area and the Optics Storage Area, respectively. Both of these facilities are in fair to good condition, have been well maintained, and contain no contamination or other environmental hazards (ICF Kaiser Engineers and LANL 1994a). An existing facility in TA-54 could serve as the Radiological Storage Area.

LANL lies within Seismic Zone 2. LANL operates a seismic hazards program that monitors seismicity through a seismic network and conducts studies in paleoseismology. Potential earthquake magnitude and intensity values are used in design considerations at the site.

I.3.4.2.2 Infrastructure Requirements

LANL's existing utility network includes 600 km (400 mi) of lines for six primary utilities: electricity, telecommunications, water, sanitary sewer, radioactive liquid waste, and natural gas. LANL's Long Range Utilities Development Plan includes several proposed upgrades and improvements that would bring the system up to the standards required for the NIF systems. A utility corridor now extends along the

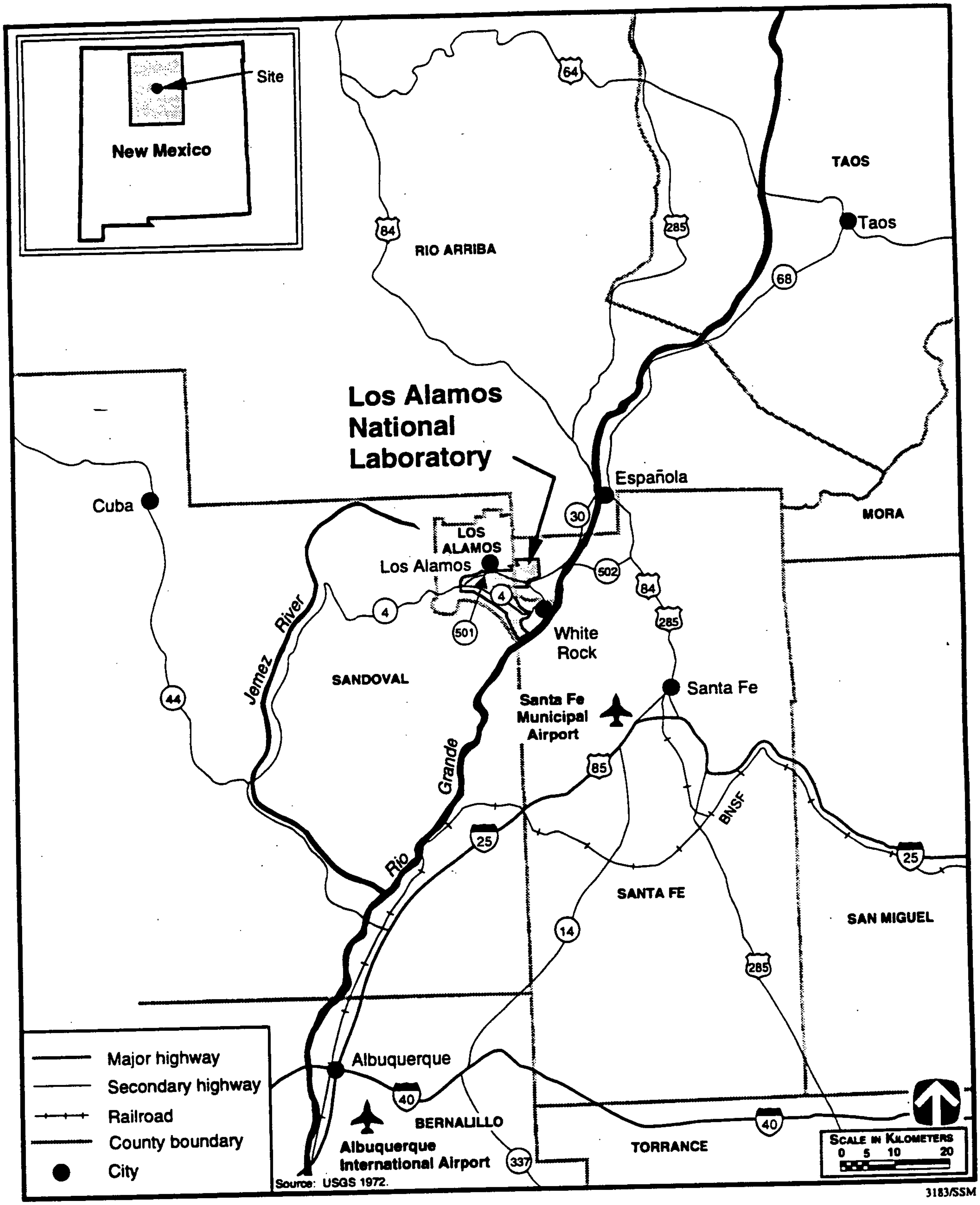


FIGURE I.3.4.2.1-1.—*Regional Location of Los Alamos National Laboratory.*

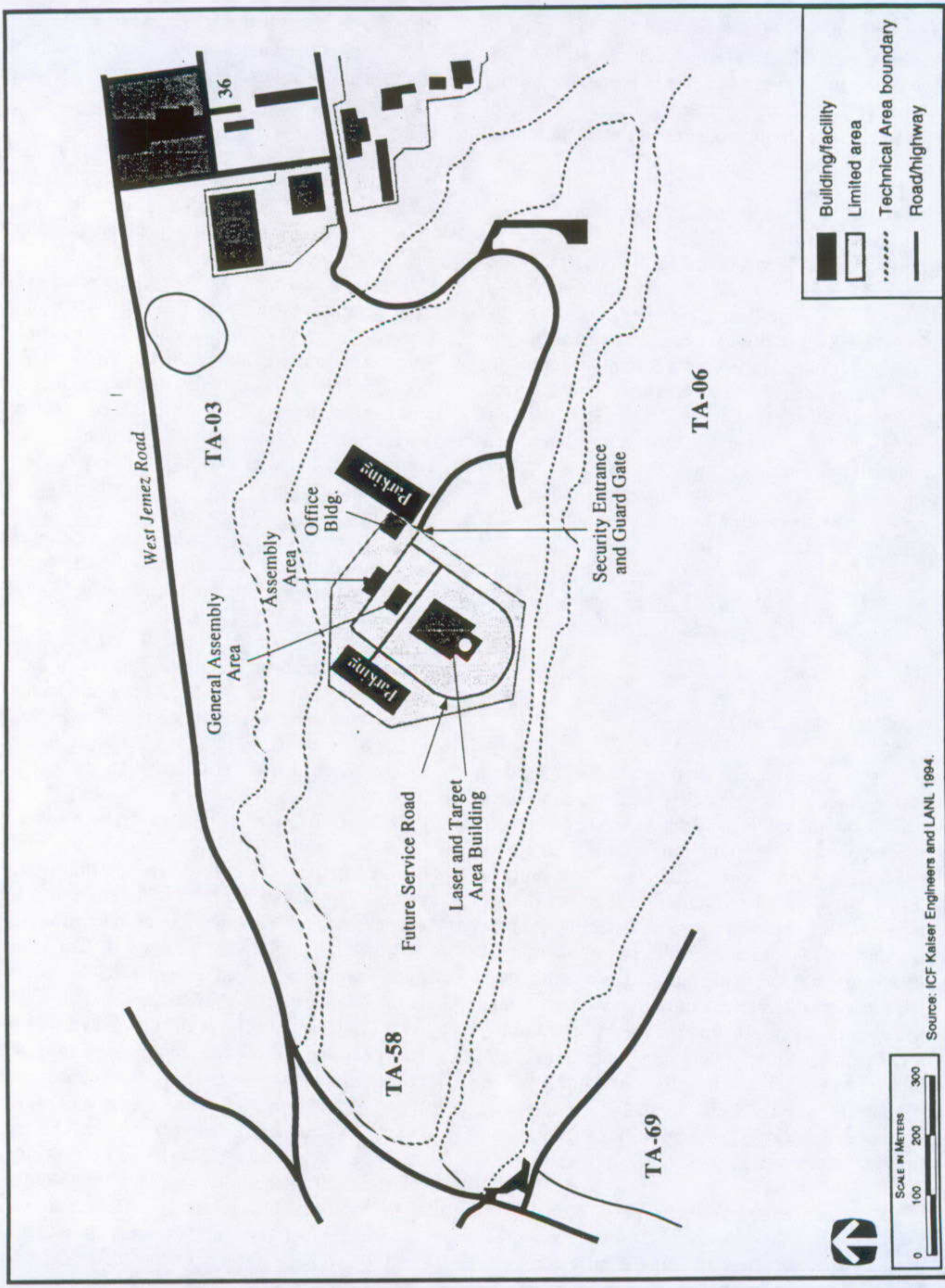


FIGURE I.3.4.2.1–2.—*Proposed Location for the National Ignition Facility at Los Alamos National Laboratory.*

eastern boundary of the proposed NIF location and, with some modifications and conditions noted below, would be sufficient to support NIF project requirements. This corridor presently includes lines for water, telecommunications, electricity, and natural gas (LANL 1990a).

I.3.4.2.3 Construction and Operations

The proposed NIF location at LANL is a large, undeveloped tree-covered area. Preparation of the TA-58 location would require tree removal and clearing and some leveling and filling to create a construction site suitable for NIF. The TA-58 location has no known solid waste management units that would require remediation. Because the volcanic Bandelier tuff underlying the area is an unusually strong foundation material, NIF buildings could be constructed entirely with concrete slabs on grade rather than with piers to stabilize the foundation of the target area. Present solid waste management facilities are adequate to handle the wastes generated during construction activities. The construction laydown area would be located within the area designated for NIF.

I.3.4.3 *Nevada Test Site*

I.3.4.3.1 Location Description

NTS was established in 1950 and has been used for underground testing of nuclear weapons and evaluation of the effects of nuclear weapons on military communications systems, electronics, satellites, sensors, and other items. Underground nuclear testing was halted in October 1992, but the site maintains the capability to resume testing if authorized by the President. In addition to maintaining underground nuclear testing program capabilities, NTS maintains nuclear emergency search team program capabilities, supports the Yucca Mountain Site Characterization Program, supports arms control and treaty verification activities, and provides support to other DOE and non-DOE missions. NTS is operated for DOE by several management and operating contractors.

NTS occupies approximately 350,000 ha (867,000 acres) in southern Nye County in southern Nevada, approximately 105 km (65 mi) northwest of Las Vegas, NV (figure I.3.4.3.1–1). The town of Indian Springs and the Indian Springs Air Force Auxiliary Field, in northwestern Clark County, NV, are 39 km (24 mi) southeast of the closest NTS boundary.

The proposed NTS location for NIF is Area 22, located southwest of Mercury Base Camp (figure I.3.4.3.1–2). This proposed location is a remote, flat desert setting with sparse vegetation. It is directly accessible by Jackass Flats Highway. Table I.3.4–1 lists the facilities that would be constructed at NTS Area 22 and those existing facilities that would be converted to meet NIF requirements. The Laser and Target Area Building, Optics Assembly Area, Target Receiving and Inspection, Optics Maintenance Area, and Optics Storage Area would be constructed as new facilities. Most other NIF requirements would be met by converting existing facilities at Mercury Base Camp. Building 610, located about 3.2 km from the NIF location, would be used for the Radiological Storage Area. In addition, two existing buildings in Area 6 (about 52 km [32 mi] from the NIF location) would be used for general maintenance (Raytheon Services Nevada 1995).

The region has been tectonically active in the near past and has numerous faults. NTS lies in an area of moderate historic seismicity on the southern margin of the Southern Nevada East-West Seismic Belt in Seismic Zones 2 and 3 (DOE 1995d).

I.3.4.3.2 Infrastructure Requirements

Major utilities, including telecommunications, natural gas, water, and electricity, are accessible to the proposed NIF location from Mercury Base Camp, located 3.2 km (2.0 mi) away. A 138-kilovolt overhead power line passes within 0.4 km (0.25 mi) of the NIF location, and adequate commercial power to NTS is available from the Nevada Power Company and the Valley Electric Association. A new electrical substation would have to be constructed for the project (Raytheon Services Nevada 1995). Water supply and storage are adequate to meet NIF requirements; supply is from six wells on NTS. An underground pipeline about 3.2 km (2 mi) long would have to be constructed to connect the NIF facilities to the site water supply system. Sewage disposal facilities would also have to be constructed for the project; adequate space exists for ponds or a sewage plant.

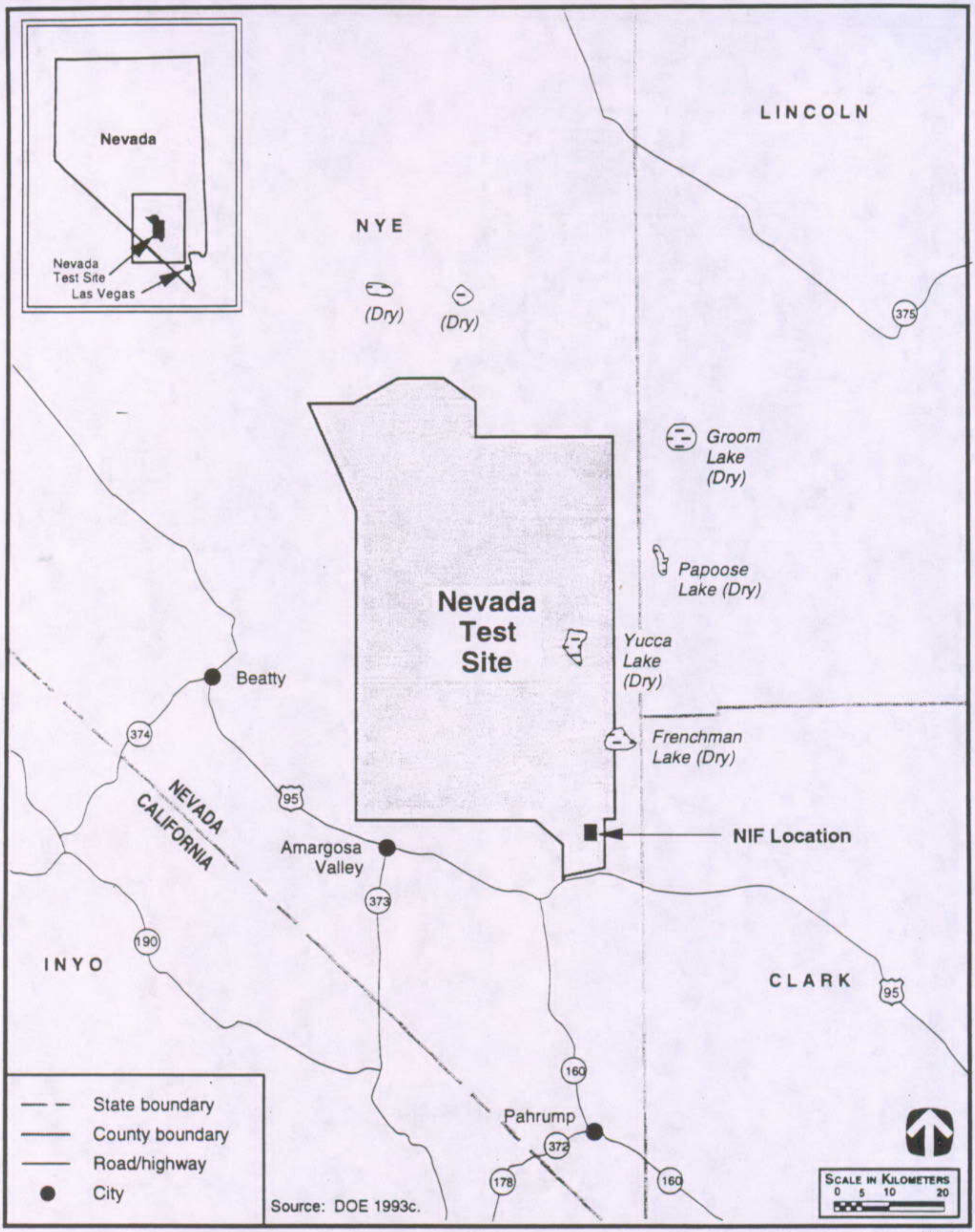


FIGURE I.3.4.3.1–1.—*Regional Location of Nevada Test Site.*

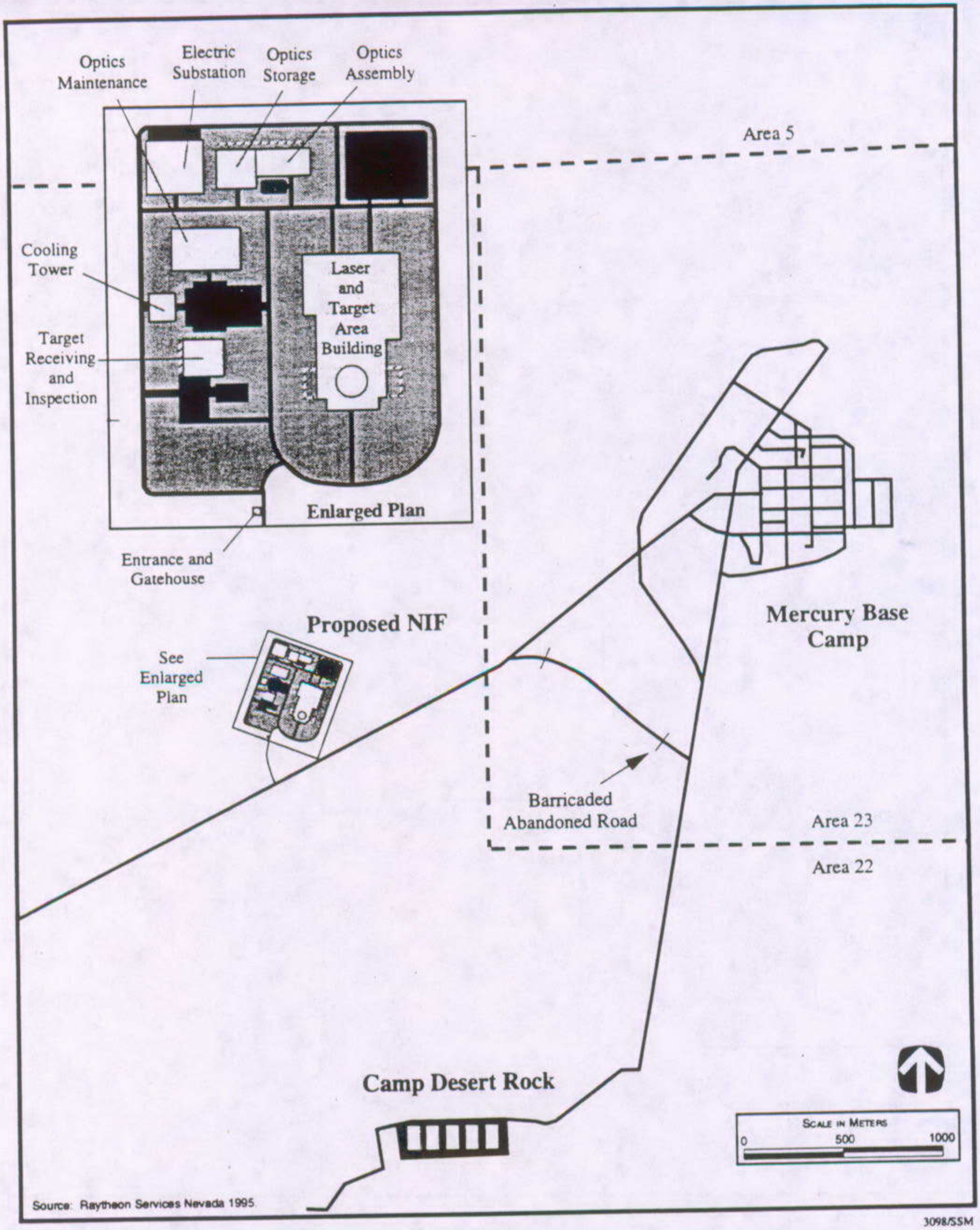


FIGURE I.3.4.3.1–2.—*Proposed Location for the National Ignition Facility at Nevada Test Site Area 22.*

I.3.4.3.3 Construction and Operations

During site preparation, the ground at Area 22 would have to be cleared of existing vegetation. The site is relatively level, undisturbed desert land and would require minimal site preparation. Currently, no buildings or other facilities are located in the vicinity. Construction would not require D&D of existing structures and there are no known contaminated soils or previous waste dumps in the area that would require remediation. Small amounts of waste generated during construction would be handled by the existing waste treatment and management systems. A cement batch plant would be set up in the area to accommodate construction needs and reduce transportation requirements. The construction laydown area would be located within the area designated for NIF.

I.3.4.4 *North Las Vegas Facility*

I.3.4.4.1 Location Description

The overall mission of NLVF is to support the Nevada Operations Office and the LLNL, LANL, and SNL weapons test programs. The mission includes prestaging activities, as well as fabrication, assembly, and testing of field diagnostic systems that collect data from underground nuclear detonations at NTS (DOE 1994b). NLVF is located in the city of North Las Vegas, NV, which is part of the three-city metropolitan area encompassing Las Vegas, Henderson, and North Las Vegas (figure I.3.4.4.1–1).

The proposed NIF location is within the NLVF perimeter, west of Losee Road, north of Carey Avenue, east of Commerce Street, and south of Brooks Road within the city limits of North Las Vegas, NV. New facilities that would be required at the NLVF for NIF include the Laser and Target Area Building, the Optics Assembly Area, the Optics Maintenance Area, the Optics Storage Area, Target Receiving and Inspection Area, Radiological Storage Area, and possibly office facilities (table I.3.4–1). As shown in figure I.3.4.4.1–2, the proposed layout would use a large portion of the existing open space to position NIF buildings (DOE 1992, 1995e). The immediate area is zoned for general industrial activity. The proposed location for NIF consists of previously graded land with sparse vegetation.

The NLVF is within the Las Vegas Valley. Rugged mountain ranges surround the low-lying alluvial filled valley. The valley consists primarily of fine-grained Miocene and Pliocene sedimentary rocks. NLVF is located within Seismic Zone 2.

I.3.4.4.2 Infrastructure Requirements

The proposed NIF location at NLVF is readily accessible to all utilities. Existing electrical, wastewater, and water supply capacities are adequate to meet NIF requirements, but connections would be necessary for the project. The nearest water supply is a city of Las Vegas well about 0.16 km (0.25 mi) south of the site. Although domestic water supplies appear to be adequate, a source of low-conductivity cooling water would have to be developed at the site. Connections with local sewer lines would also be necessary (DOE 1995e).

I.3.4.4.3 Construction and Operations

During site preparation for new facilities, the ground would have to be cleared of vegetation. Construction would not require D&D of existing structures, and there are no known contaminated soils or previous waste dumps in the area that would require remediation. Small amounts of waste generated during construction would be handled by the existing waste treatment and management systems in the city of Las Vegas. The construction laydown area would be located within the area designated for NIF.

I.3.4.5 *Sandia National Laboratories*

I.3.4.5.1 Location Description

SNL is a DOE research and development (R&D) facility at Albuquerque, NM. SNL was established in 1949. During more than four decades of existence, its mission has expanded from an original focus on nuclear weapons R&D to include research on other advanced military technologies, energy programs, arms verification, and applied research in numerous scientific fields, including an extensive program in materials research (IT Corporation 1992).

SNL is located 10.5 km (6.5 mi) east of downtown Albuquerque in Bernalillo County (figure I.3.4.5.1–1), within the boundaries of the 21,044-ha (52,000-acre)

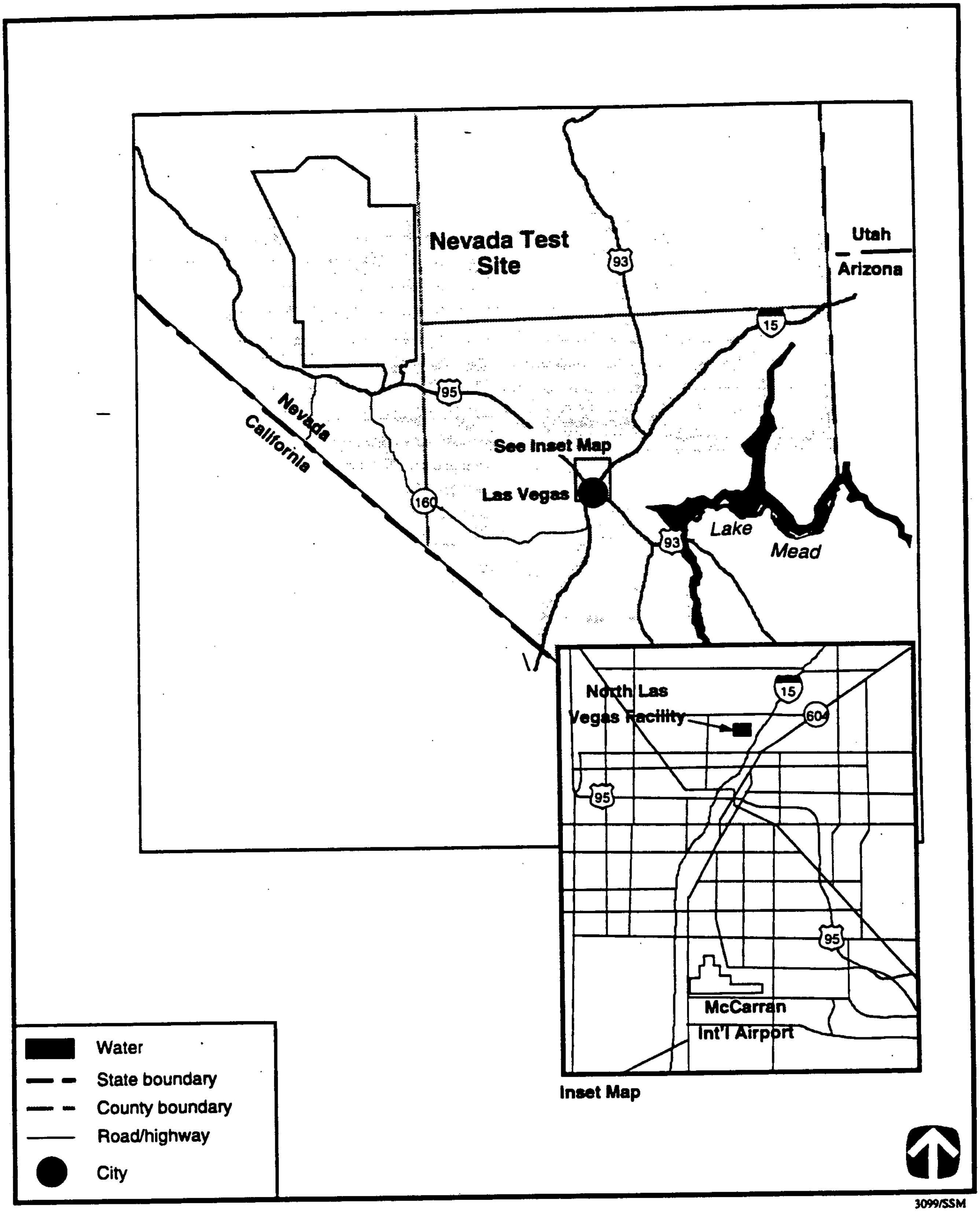


FIGURE I.3.4.4.1–1.—*Regional Location of the North Las Vegas Facility.*

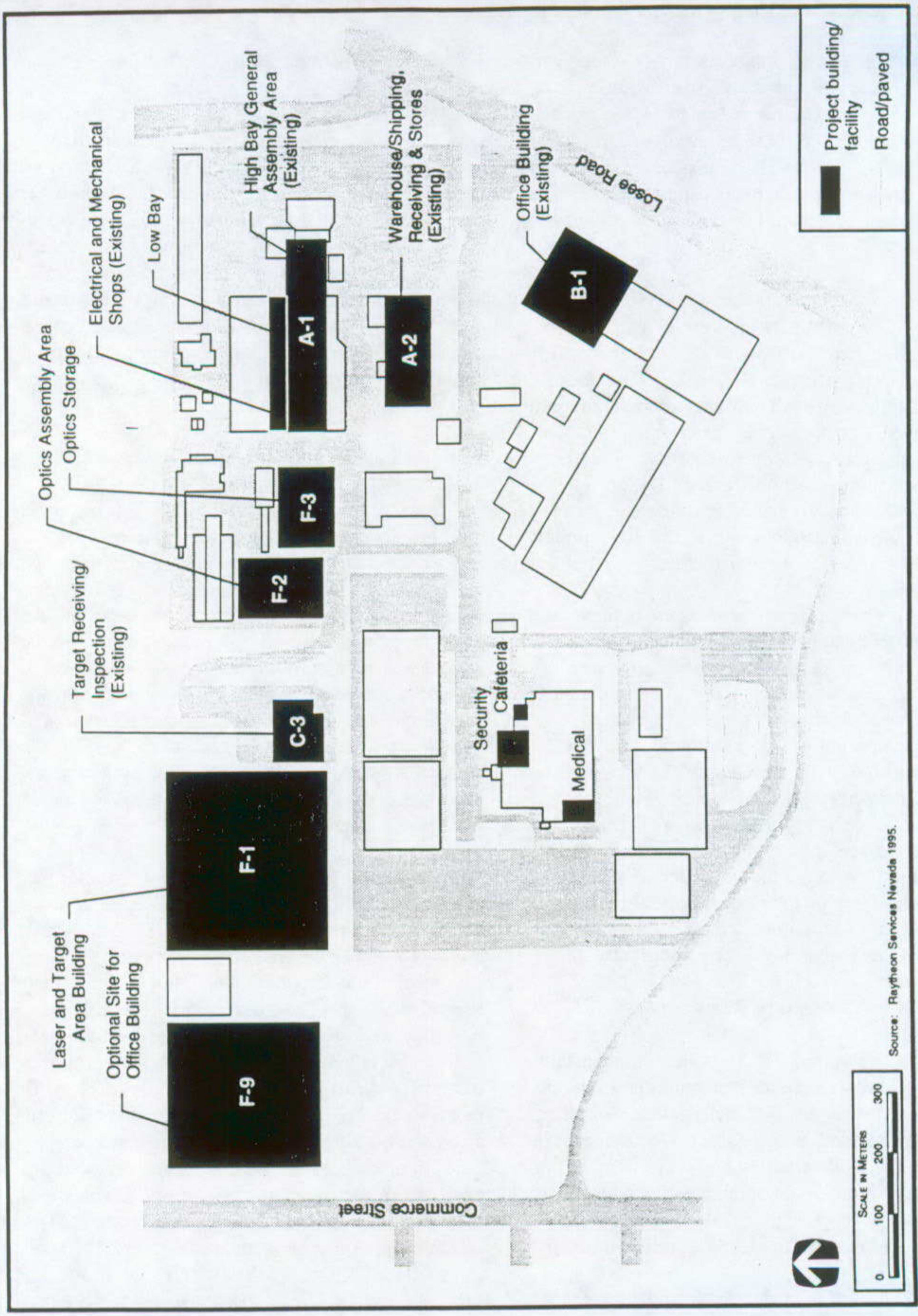


FIGURE I.3.4.4.1–2.—*Proposed Location for the National Ignition Facility at North Las Vegas Facility.*

Kirtland Air Force Base military reservation. DOE owns 1,150 ha (2,842 acres), and additional areas are provided to DOE primarily for testing and safety buffers through land withdrawals and land-use permits from Kirtland Air Force Base, the State of New Mexico, and the Isleta Pueblo. Laboratory operations are conducted at five TAs and several remote test areas situated in the eastern part of Kirtland Air Force Base.

The preliminary location proposed for NIF at SNL is an 11-ha (27.5-acre) plot of level, largely cleared, undeveloped property on the southern side of Technical Area II (figure I.3.4.5.1–2). This location has sufficient space for all new construction proposed for NIF at SNL, including the Laser and Target Area Building, Optics Assembly Area, Target Receiving, Optics Maintenance and Storage, Radiological Storage Area, and warehouse facilities. This location is near all SNL facilities required for NIF support (table I.3.4–1) (Boyes 1995; SNL 1995a).

SNL lies on a sequence of sedimentary, igneous, and Precambrian basement rocks. The northern and western sections rest on Miocene to Quaternary gravels, sands, silts, and clays deposited in the basin that was formed by uplift of the mountains to the east. The eastern portion of SNL is primarily underlain by Precambrian rocks. This portion of the site is cut by the Tijeras, Hubble Springs, Sandia, and Manzano faults. SNL is located in Seismic Zone 2. The facility is situated in a region of high seismic activity, but the activity is of low magnitude and intensity. Possible geologic concerns include potential ground shaking and rupturing associated with regional seismic activity and the faults intersecting on the site.

I.3.4.5.2 Infrastructure Requirements

Existing utility systems at SNL include electricity, domestic water, wastewater treatment, telecommunications, and natural gas. Electricity, water, and natural gas are supplied to SNL by Kirtland Air Force Base. Although the SNL utilities show signs of aging, recent efforts to upgrade components of the system have improved service (SNL 1995a). Current supply capacities are adequate to meet the projected requirements for NIF.

I.3.4.5.3 Construction and Operations

The proposed SNL location is relatively cleared and would require little preparation before construction activities. Several drainage ditches would be rerouted before construction began. Construction would not require D&D of existing structures, and there are no known contaminated soils or previous waste dumps in the area that would require remediation. Small amounts of waste generated during construction would be handled by the existing waste treatment and management systems. The construction laydown area would be located within the area designated for NIF.

I.3.5 Alternatives Not Considered in Detail

NIF is an advanced-design, solid-state laser facility in the preliminary design phase of engineering. As a result, there are ongoing discussions of possible design alternatives that might maximize facility performance, reduce cost, or better meet the needs of users. An example of such a set of alternatives would be the arrangement of laser beams in the laser arrays. Most of these alternatives are suggestions as to the design and arrangement of internal machine components, and they would not affect the performance of the facility in a way that relates to the assessment of environmental consequences. For this reason, these types of alternatives have not been addressed in this PSA.

Several technologies are under development as drivers for ICF targets. The major programs in the United States are solid-state lasers, heavy-ion accelerators, light-ion diodes (pulsed power technology), and gaseous krypton-fluoride lasers. Design studies have been conducted for all these technologies showing how they could be used as drivers for inertial fusion power plants and for ICF research facilities. For example, point designs for each driver were developed for the study of the Laboratory Microfusion Facility (a high-target-gain facility considered by DOE in the late 1980s). Such studies revealed that each driver has advantages and disadvantages over the others for the power plant application, and, as yet, no clear choice can be made among them. However, for the Ignition Facility, the 1990 review of the ICF program by the National Academy of Sciences examined the status and rate of progress of each of the driver technologies.

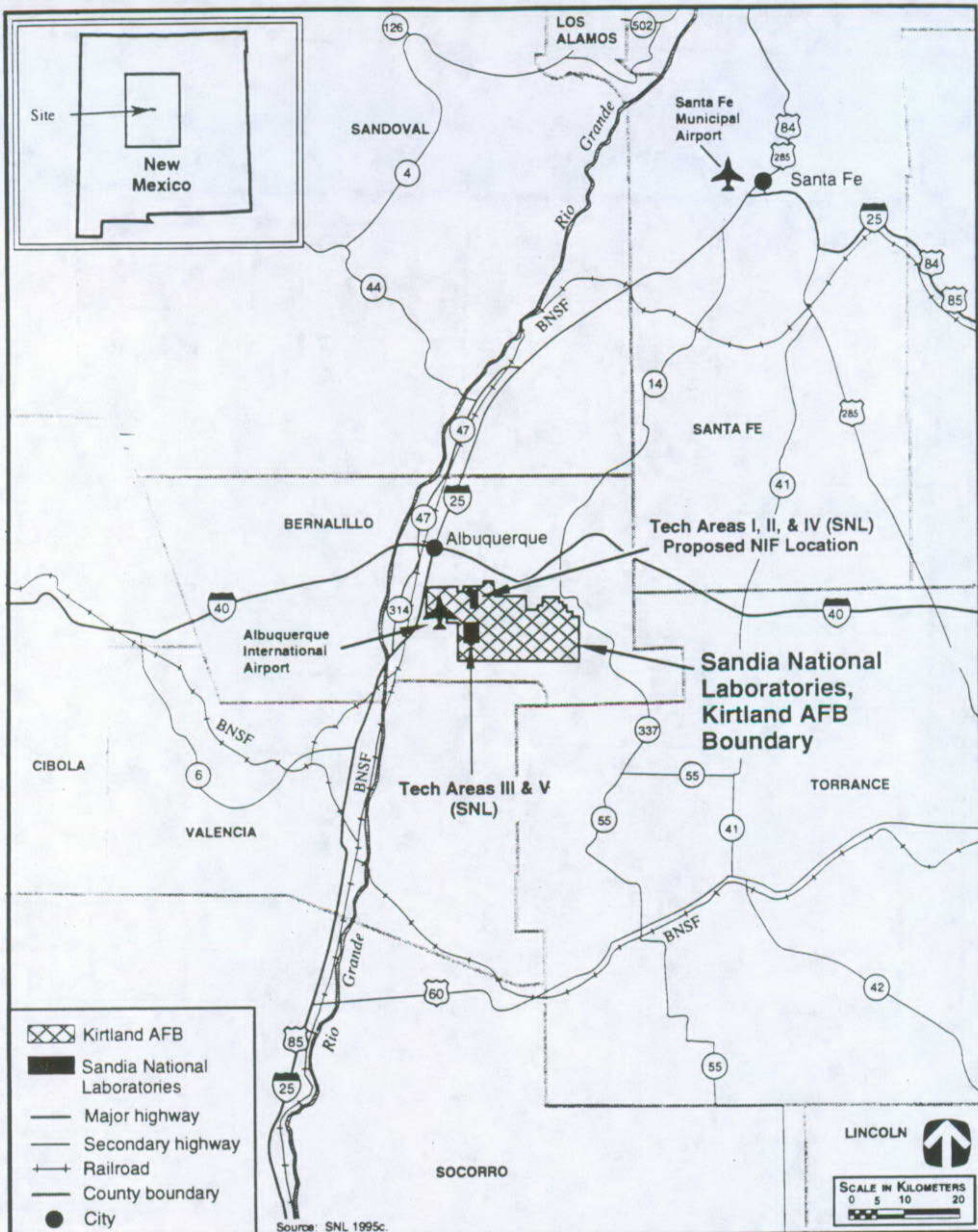


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FIGURE I.3.4.5.1–1. *Regional Location of Sandia National Laboratories.*

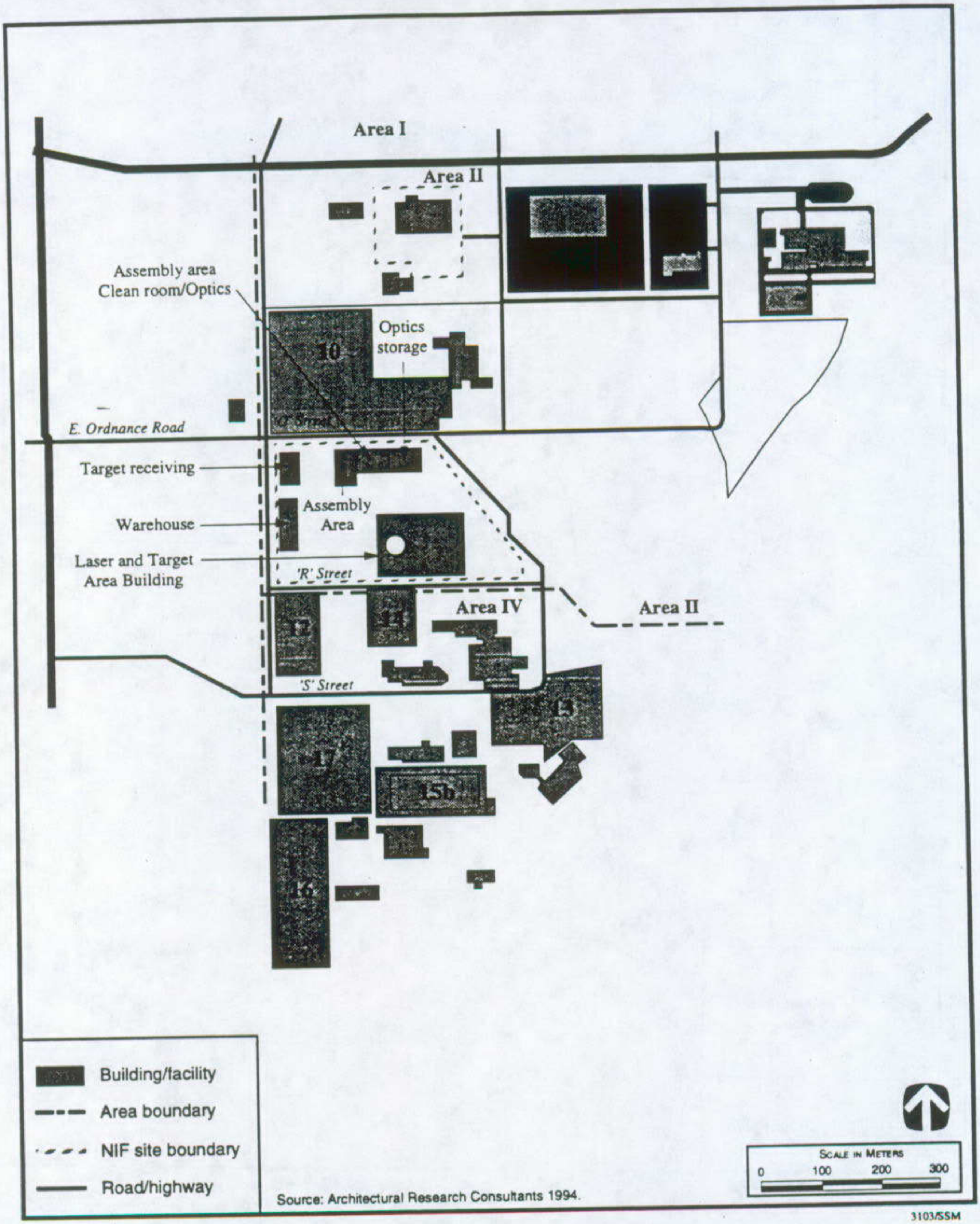

FIGURE I.3.4.5.1–2.—*Proposed Location for the National Ignition Facility at Sandia National Laboratories.*

The National Academy of Sciences recommended that DOE focus the ICF program on achieving an Ignition Facility within about 10 years and concluded that the only driver technology capable of accomplishing that objective within that time period was the solid-state laser. It is also clear that because of the longer required development times and the earlier comparisons between drivers for the Laboratory Microfusion Facility, the integrated cost of the program up to the ignition experiment would be larger for the alternatives than for NIF as designed. The present NIF design incorporates that recommendation. Because of these recommendations and conclusions, the alternative drivers were not considered in detail in this PSA.

Several NIF user proposals for future tests using heavy materials have been identified, but lack sufficient definition to determine if they are feasible or even possible. These proposals include suggestions for tests with fissionable materials (isotopes such as uranium-238 and thorium-232), and users are preparing papers describing these postulated experiments. Initial evaluations indicate that NIF would retain its classification as a low-hazard, radiological facility for postulated experiments with small amounts of these identified fissionable materials. However, at this time, the feasibility of such experiments remains highly speculative, and experiments of this type are not reasonably foreseeable. Thus, such tests are not considered in this document. Furthermore, postulated experiments that use fissile materials (isotopes such as uranium-232, uranium-235, and plutonium-239) are even less defined; no experiments of this type are foreseen in planned NIF operations; and thus they are not considered in this document. DOE recognizes and acknowledges that any future determination to conduct experiments that have implications beyond the currently defined operational envelope and safety analysis would require both additional safety analysis and *National Environmental Policy Act* (NEPA) action, in addition to possible facility modifications.

NIF has been designed to achieve a very large step in development of ICF. When and whether this step of indirectly driven fusion ignition with hydrogen (deuterium and tritium targets) will actually be achieved is not certain. If experiments on the Omega Upgrade Facility are successful in the later 1990s, the next reasonable step is to attempt ignition using directly driven targets on NIF. Both indirectly and directly driven target experiments have been assessed in this PSA in the Enhanced Option mode. NIF, as described in the Conceptual Design Report (LLNL 1994b) and in this PSA, relies on a U-shaped building configuration. Evaluations of costs and engineering of the laser components of NIF have considered other configurations for the Laser and Target Area Building. One such suggestion is for an in-line building. Such a change in building configuration would require realignment of the building at its proposed locations. This realignment would primarily affect the distance of the target chamber to the site boundary. It is likely that such a building configuration would position the target chamber at the same distance or farther from the site boundary, resulting in no change or slightly reduced radiological impact to the public for both normal operations and accident conditions. Because alternative building configuration bounds the upper limits of these impacts, other building configurations are not evaluated in further detail in this PSA.

I.3.6 Summary and Comparison of Impacts

This section summarizes and compares the environmental impacts that would occur from the construction and operation of NIF at the five candidate sites and from the No Action alternative. A comparison of the Conceptual Design Option (indirect drive) with the Enhanced Option (indirect and direct drives) is also provided. Tables I.3.6.1–1 and I.3.6.8–1 compare impacts from the construction and operation of NIF at the candidate sites under both operational scenarios. The following sections supplement the impacts and comparisons summarized in those tables.

I.3.6.1 *Land Use and Visual Resources*

Construction and operation of NIF would be consistent with existing land uses at all of the candidate sites. Table I.3.6.1–1 presents the acreage and percentage of a candidate site's uncommitted land required for NIF and the number of buildings that would have to be constructed at each candidate site. With the exception of foreground view impacts at LANL, only minor visual impacts from NIF construction would occur at the candidate sites.

TABLE I.3.6.1–1.—*Comparison of Alternatives* [Page 1 of 4]

Environmental Resource Parameter	No Action	LLNL[a]	LANL[a]	NTS[a]	NLVF[a]	SNL[a]
Land Resources						
Uncommitted land requirements[b] (hectares)	None	8.1	4.0	18.2	3.2	10.5
Uncommitted land requirements (%)	None	11	1	<1	56	7
Number of buildings to be constructed	None	2	3	5	5	7
Conflicts with site development or land use plans	No	No	No	No	No	No
Air Quality and Noise						
Predicted maximum 24-hour particulate matter concentration 10 microns or smaller during site clearing ($\mu g/m^3$)[c]/national standard ($\mu g/m^3$)	None	130/50[d]	124/150	175/150	183/150	52/150
Baseline emissions (t/yr)/baseline emissions plus NIF emissions (t/yr) during operation[e]						
Particulate matter 10 microns or smaller	Variable	3.36/3.52	2.56/2.74	86.8/86.9	0.78/0.99	3.76/3.96
Volatile organic compound	Variable	13.10/13.66	2.89/3.45	ND/NA	3.45/4.02	1.65/2.22
Carbon monoxide	Variable	3.99/4.42	21.58/22.04	ND/NA	0.23/0.79	0.23/0.75
Nitrogen dioxide	Variable	23.50/25.29	53.88/55.79	ND/NA	1.07/3.35	1.07/3.22
Sulfur dioxide	Variable	0.37/0.40	0.70/0.73	71.1/71.1	0.07/0.11	0.07/0.11
Noise (Qualitative)	No Effect	Minor[f]	Minor[f]	Minor[f]	Minor[f]	Minor[f]
Water Resources						
Construction						
Water requirement (MLY)	None	2.95	2.95	2.95	2.95	2.95
Water requirement as percent of current usage (%)	None	0.31	0.05	0.12	4.20	0.21
Operation						
Water requirement (MLY)	None	152	152	152	152	152
Water requirement as percent of current usage (%)	None	16	2.8	6.3	220[g]	11

TABLE I.3.6.1-1.—*Comparison of Alternatives* [Page 2 of 4]

Environmental Resource Parameter	No Action	LLNL[a]	LANL[a]	NTS[a]	NLVF[a]	SNL[a]
Biotic Resources						
Maximum habitat reduction[h] (hectares)	None	8.1	4.0	18.2	3.2	10.5
Habitat to be impacted	None	Grassland	Forest	Creosote bush desert	Sparse vegetation	Grassland
Wildlife disturbance[i]	None	Minor	Moderate	Moderate	Negligible	Minor
Potential impact to rare, threatened, or endangered species	None	Loss of non-critical, low-quality habitat for several species. Minor risk (mitigable) to white-tailed kite.	Loss of non-critical habitat for several species.	Loss of non-critical habitat for several species. Minor risk (mitigable) to desert tortoise.	None	Loss of non-critical, low-quality habitat for several species.
Cultural Resources (Qualitative)	No impacts	No impacts	No impacts	No impacts	No impacts	No impacts
Socioeconomics						
Construction[j]						
Total jobs	None	2,870	1,130	1,640	1,640	1,770
In-migrating population	None	1,600	2,200	2,340	2,340	3,065
Number of housing units	None	580	800	850	850	1,120
Number of trips generated (per day)	None	902	518	538	538	538
Public finance (% change over 1995 fund balance)	None	-0.03	4.40	0.21	0.21	0.06
Public services (increase in number of workers)	None	7	50	47	47	81
Environmental justice - disproportionate adverse health/environmental impacts on:						
- minority populations	None	None	None	None	Low	None
- low-income populations	None	None	None	None	None	None

TABLE I.3.6.1-1.—*Comparison of Alternatives* [Page 3 of 4]

Environmental Resource Parameter	No Action	LLNL[a]	LANL[a]	NTS[a]	NLVF[a]	SNL[a]
Socioeconomics (Continued)						
Operation[k]						
Total jobs	0 to -153	890	600	620	620	670
In-migrating population	None	360	610	440	440	660
Number of housing units	None	130	220	160	160	240
Number of trips generated per day	0 to -190	630	630	630	630	630
Public finance (% change over 1995 fund balance)	None	-0.02	0.71	0.04	0.04	0.01
Public services (increase in number of workers)	None	4	15	7	7	21
Environmental justice - disproportionate adverse health/environmental impacts on:						
- minority populations	None	None	None	None	Low	None
- low-income populations	None	None	None	None	None	None
Human Health (Radiological)						
Public (30-yr life of project)						
MEI dose (mrem)	None	1(3)	0.09 (0.3)	0.003 (0.01)	6 (18)	0.03 (0.1)
Population dose (person-rem)	None	2(6)	0.6 (2)	0.009 (0.03)	6 (18)	2 (6)
Cancer fatalities	None	None	None	None	None	None
Facility Accidents (Radiological)						
Public dose (person-rem)	None	260 (440)	290 (490)	41 (70)	3,000 (4,900)[l]	1,100 (1,800)
Cancer fatalities	None	None	None	None	1 (2)	0 (1)

TABLE I.3.6.1–1.—*Comparison of Alternatives* [Page 4 of 4]

Environmental Resource Parameter	No Action	LLNL[a]	LANL[a]	NTS[a]	NLVF[a]	SNL[a]
Facility Accidents (Chemical)						
Distance to end of hazard zone from accident[m] (m)	None	237 (778)	237 (778)	239[l] (784)	237 (778)	237 (778)
Transportation accidents[n] (Radiological)						
Public dose risk (person-rem/yr)	None	$2.2x10^{-6}$ ($1.8x10^{-5}$)	$2.6x10^{-6}$ ($2x10^{-5}$)	$2.4x10^{-6}$ ($1.9x10^{-5}$)	$2.4x10^{-6}$ ($1.9x10^{-5}$)	$1.6x10^{-6}$ ($1.2x10^{-5}$)
Cancer fatalities risk	None	$1x10^{-9}$ ($9x10^{-9}$)	$1x10^{-9}$ ($1x10^{-8}$)	$1x10^{-9}$ ($9x10^{-9}$)	$1x10^{-9}$ ($9x10^{-9}$)	$8x10^{-10}$ ($6x10^{-9}$)
Transportation Impacts (Nonradiological) (Fatalities/Year)[o]						
Vehicular emissions	None	$1x10^{-3}$ ($2x10^{-3}$)	$8x10^{-4}$ ($2x10^{-3}$)	$8x10^{-4}$ ($2x10^{-3}$)	$8x10^{-4}$ ($2x10^{-3}$)	$2x10^{-3}$ ($4x10^{-3}$)
Accidents	None	$2x10^{-3}$ ($4x10^{-3}$)	$2x10^{-3}$ ($4x10^{-3}$)	$2x10^{-3}$ ($6x10^{-3}$)	$2x10^{-3}$ ($5x10^{-3}$)	$2x10^{-3}$ ($4x10^{-3}$)

[a] Value for Enhanced Option is given in parentheses only for parameters that differ from the Conceptual Design Option.

[b] Uncommitted land, as defined by each of the sites, is land that is currently open and available for NIF development. An additional 2 hectares (acres) would be temporarily required for a construction laydown area at LLNL. Construction laydown areas for the other sites would be located within the areas designated for NIF.

[c] Estimated by combining baseline concentrations and NIF contributions based on dust control measures using water spray twice a day (with continuous water spraying and/or chemical dust suppressants for LLNL and NLVF sites).

[d] The 24-hour California state standards for particulate matter 10 microns or smaller (50 $\mu g/m^3$) are more stringent than the national standards (150 $\mu g/m^3$).

[e] No action emissions would be equivalent to baseline emissions provided under the candidate site columns.

[f] Noise levels may be annoying during the peak construction activity associated with site clearing but would not require a hearing conservation plan.

[g] Current water supply capacity would be adequate to meet the additional requirements for NIF.

[h] Areas would be maximum habitat loss assuming total site clearing before any site revegetation or landscaping. An additional 2 hectares (acres) would be temporarily cleared for the construction laydown area at LLNL.

[i] Qualitative estimate of wildlife disturbance based on quality of habitat at and surrounding the NIF location, which influences the number of wildlife species that may be present and the habituation of wildlife to human activities.

[j] Values provided are for the peak construction year only.

[k] The No Action alternative would not have measurable impacts on socioeconomics at the NTS or NLVF sites. However, at LLNL, LANL, and SNL, No Action could result in slightly reduced employment and associated effects. No Action could result in a reduction of 153 jobs (direct and indirect) and 190 fewer trips generated per day at LLNL; a reduction of 27 jobs and 38 fewer trips generated at LANL; and 29 fewer jobs and 38 fewer trips generated at SNL.

[l] Higher public dose for NLVF is due to higher population density near NLVF.

[m] The hazard zone refers to the area downwind of an accident where concentrations would be above emergency planning levels.

[n] Risks are presented from the manufacturing site yielding the largest risks.

[o] Collective population fatalities were calculated for 145 shipments (Conceptual Design Option) and 335 shipments (Enhanced Design). For example, a reported value of $4x10^{-3}$ fatalities suggests that no fatalities are expected for the proposed action. However, one single fatality out of the entire affected population might be expected over the course of 250 years if the same number of shipments were to continue for that length of time.

Note: ND – No data available; NA – Not applicable.

Source: Derived from tables and text contained in appendix I.

I.3.6.2 *Air Quality and Noise*

Short-term (i.e., 24-hour) fugitive dust emissions of particulate matter 10 microns or smaller (PM_{10}) during construction would vary among the candidate sites (table I.3.6.1–1). The PM_{10} from each construction site activity would depend on the local meteorology, soil conditions, and the amount of land disturbed during construction. Windy conditions, dry loose soil, and large area disturbance of land would result in the highest PM_{10} emissions. The construction activity contribution of ambient PM_{10} concentration is additive to the background concentration of PM_{10} when compared to the ambient air quality standard. Thus, the higher the background concentration for the same source contribution, the higher the total concentration. The maximum percent of the Federal or state standard that would occur at the candidate sites would range from a low of 35 percent at SNL to a high of 260 percent at LLNL (table I.3.6.1–1). The latter case is for the more stringent California state standard. Emissions for LLNL would be 87 percent of the Federal standard for PM_{10}.

Annual air pollutant emissions from NIF operations would be primarily from fuel combustion, which is assumed to be the same for all candidate sites. Boiler fuel, the primary source of air pollutant emissions, was assumed to be natural gas for all sites except NTS, which would use liquefied petroleum gas. The effect that NIF operations would have on air pollutant emissions would depend on the candidate site's level of emissions before NIF operations (table I.3.6.1–1). No difference in air quality impacts would exist between the Conceptual Design and Enhanced options.

For all candidate sites, noise impacts would be minor. During construction, localized impacts would be greater for those areas with lower ambient noise values. A high ambient value at NLVF would counteract the short distance from construction activities, leading to no annoying noise at the nearest public residences. At NTS, the ambient noise level is very low, and the distance to the nearest residence is very far; therefore, no noticeable noise impacts from construction would occur. Site clearing would cause minor noise impacts at the other candidate sites (LLNL, LANL, and SNL). Impacts during construction for either the Conceptual Design or Enhanced options would be very minor at nearby site buildings or offsite public residences.

I.3.6.3 *Water Resources*

Operation of NIF would require 152 million liters per year (MLY) (40 million gallons per year) of water under either the Conceptual Design or Enhanced options. This water need would range from 2.8 percent of current water use at LANL to 220 percent of current water use at NLVF (table I.3.6.1–1). The current water supply and wastewater treatment capacities at LLNL are expected to be sufficient to meet the requirements of NIF. Planned utility upgrades would be required at LANL to meet water and wastewater needs. At NTS, a 3.2-km (2.0-mi) underground water pipeline would be required to provide water to the NIF location, and sewage treatment and disposal facilities would have to be constructed. At NLVF, current water supply capacity would be adequate to meet the 220-percent increase in water demand. For SNL, agreement with Kirtland Air Force Base and the city of Albuquerque would be required to obtain additional water supply and to discharge additional wastewater.

I.3.6.4 *Biotic Resources*

The maximum amount of land (and percentage of uncommitted land) that would be required for NIF at each candidate site is summarized under Land Resources in table I.3.6.1–1. These areas can be conservatively viewed as the maximum amount of habitat that would be lost or modified for NIF. The relative disturbance to wildlife from construction of NIF would be related to the quality of habitat that would be impacted by construction. Quality, in turn, is related to the type of habitat within which NIF would be constructed and to the degree of development within the immediate area of NIF at the candidate site.

The NLVF site has the most disturbed habitat, and it is also the most developed among the candidate sites. Expected impacts to biota at NLVF would be negligible, with no impacts expected to rare, threatened, or endangered species. The vegetative communities at LLNL and SNL are more developed than at NLVF, but are still indicative of formerly disturbed sites. The areas surrounding these two sites have also been partially developed. Thus, impacts to biota at these two candidate sites would be minor. Because habitats at these two sites could be used by rare, threatened, or endangered species (but are not preferred habitats), the potential for negligible impacts to listed species exists at these sites. NIF locations at LANL and NTS would be within higher-quality habitats (forested and desert habitats, respectively) than occur at the other candidate sites. Also, these two sites do not have extensive developments in the immediate area. Thus, impacts to biota at these two sites would be considered moderate, with a minor chance of impacts to rare, threatened, or endangered species. There would be no difference in impacts to biotic resources between the Conceptual Design and the Enhanced options.

I.3.6.5 *Cultural and Paleontological Resources*

No impacts would be expected to archaeological sites, historic structures, important paleontological remains, or Native American cultural resources at any of the candidate sites. However, a field survey is in progress at NTS to determine if prehistoric or historic archaeological sites occur in the area proposed for NIF. If any significant sites are found, mitigation measures would be developed in consultation with the Nevada State Historic Preservation Officer.

I.3.6.6 *Socioeconomics*

Data on the peak number of jobs, in-migrating population, number of housing units required, increase in local jurisdiction (revenues and expenditures), and number of daily vehicle trips associated with the construction of NIF at the candidate sites are provided in table I.3.6.1–1. Traffic congestion increases would be expected at LLNL, LANL, NLVF, and SNL.

Slight disproportionate effects could occur to minority populations at LANL and NLVF. No other disproportionate affects to minority and/or low-income populations due to NIF construction and operation would be expected. The construction and operation of NIF is not projected to cause major adverse environmental or human health impacts at four of the five candidate sites. Consequently, no environmental justice issues would be likely at those four sites. However, a cancer fatality is projected within the impact zone for the NLVF site under accident conditions (table I.3.6.1–1). The minority population within the impact zone and close to NLVF site is disproportionately large compared with the population of Nevada as a whole. Thus, there would be a potential environmental justice issue for the NLVF site should NIF be constructed and operated there.

I.3.6.7 *Radiation and Hazardous Chemicals*

NIF would be considered a low-hazard, radiological facility. Such a facility uses radionuclides (for nonreactor purposes) and has other hazards (such as chemicals needed at the facility). Being low-hazard implies that there are minor on site and negligible offsite consequences. Potential radiological impacts from normal NIF operations to the general public surrounding all candidate sites would be inconsequential. Estimated radiation doses vary among sites. The greatest calculated radiation dose for the entire operational life of NIF is 18 person-rem to the general public. No cancer fatalities would be expected to occur. Radiological impacts from the Conceptual Design Option would be about one-third of those from the Enhanced Option.

Under postulated accident conditions, radiological impacts to the public and workers would be minor. The highest calculated radiation dose is 4,900 person-rem. At most, two cancer fatalities could occur if an accidental release occurred. Because of the extremely low accidental release frequency ($2x10^{-8}$/yr), the risk of radiation-caused cancer fatalities from the postulated accident at any site is essentially zero. Radiological impacts from the postulated accident under the Conceptual Design Option would be about one-half of those under the Enhanced Option.

During transportation of the targets, there would be essentially no radiological impacts to the public. The risk of fatality due to physical trauma from transportation accidents would also be negligible. Impacts would be similar among all target manufacturing sources to target use site pairs because the risks would be dominated by truck transportation from the sites to the nearest airports. The larger variable distance between airports would not contribute significantly to the risk because of lower accident probabilities associated with flying compared with driving.

A wide range of nonradiological chemical releases were considered from operation of NIF. Four release scenarios were identified as having the potential for the greatest worker and offsite consequences. The modeling of each of the scenarios for each candidate site revealed that no offsite nonradiological impacts would occur. Concentration values above the level that would cause irreversible health effects would only occur within about 200 m (655 ft) from a release point. For the most part, workers inside other buildings within the 200-m (655-ft) radius from a nonradiological chemical release would be protected by the building structures themselves. Protective action distances would be only slightly less for the Conceptual Design Option than for the Enhanced Option.

I.3.6.8 *Waste Management*

Table I.3.6.8–1 compares waste management at the candidate sites. The low-level solid radioactive wastes generated by NIF would be handled in a similar manner at LLNL, NLVF, and SNL. It is currently planned that low-level solid radioactive waste would be treated and disposed of at an onsite treatment facility that is planned for completion in 1997. The mixed wastes would be disposed of at the mixed waste disposal unit currently being planned at NTS for wastes that meet *Resource Conservation and Recovery Act* (RCRA) land disposal requirements. If these two treatment facilities are not available when needed, the wastes could be stored onsite for up to one year or shipped to offsite facilities capable of treating and disposing of low-level radioactive wastes and mixed wastes. Hazardous wastes would be sent offsite to a permitted treatment, storage, and disposal facility. Wastes at these three sites would be shipped to and disposed of at NTS and low-level liquid radioactive wastes and mixed wastes generated by NIF at NLVF would be treated and disposed of at treatment and disposal facilities currently being planned to be built at NTS. The State of Nevada has filed a lawsuit objecting to the acceptance of radioactive (mixed and low-level) wastes at NTS without DOE developing a site-wide EIS under NEPA (*State of Nevada* v. *Hazel R. O'Leary, United States Department of Energy*, Docket: CV-S-94-00576-PMP [RLH]). DOE issued a Draft EIS for NTS and offsite locations in the State of Nevada (DOE/EIS 0243) in January 1996 (see section 1.7.5.). DOE expects to issue an ROD by the time any NIF-generated waste would be available for shipment to NTS. NTS is currently accepting low-level radioactive waste streams from certain existing shippers. Also under an agreement between DOE and the State of Nevada, no mixed waste from offsite is currently being accepted for storage or disposal at NTS. NTS has submitted a revised Part B Permit application to include a separate storage and disposal unit for solid mixed wastes. Such application is currently pending action by the Nevada Division of Environmental Protection.

The following discussions on environmental impacts of waste management assume that NTS will accept offsite waste shipments from NIF. If these facilities are not available when needed, the wastes from NIF could be shipped to offsite commercial facilities. The hazardous wastes generated by NIF operations at the three sites would be sent to an offsite commercial disposal facility.

The majority of low-level radioactive waste generated at LANL would be managed and disposed of onsite. Some of the mixed wastes would be treated onsite in a hazardous waste treatment facility that is planned for LANL. The mixed waste that could not be treated onsite would be transported to NTS for treatment and disposal when NTS has received an appropriate permit from the State of Nevada. The hazardous waste generated by NIF at LANL would be treated, stored, and disposed of at facilities currently in operation or being constructed at LANL.

At NTS, solid low-level radioactive wastes would be disposed of onsite. Low-level radioactive liquid waste would be treated and disposed of at an onsite treatment facility that is planned for completion in 1997. The mixed wastes would be disposed of at the mixed waste disposal unit currently being planned at NTS for wastes that meet RCRA land disposal requirements. If these two treatment facilities are not available when needed, the wastes could be stored onsite for up to one year or shipped to offsite facilities capable of treating and disposing of low-level radioactive wastes and mixed wastes. Hazardous wastes would be sent offsite to a permitted treatment, storage, and disposal facility.

TABLE I.3.6.8–1.—*Comparison of Waste Management at the Candidate Sites*

Category	LLNL		LANL		NTS		NLVF		SNL	
	Current Capacity (m^3)	Adequate Current or Planned Capacity for NIF	Current Capacity (m^3)	Adequate Current or Planned Capacity for NIF	Current Capacity (m^3)	Adequate Current or Planned Capacity for NIF	Current Capacity (m^3)	Adequate Current or Planned Capacity for NIF	Current Capacity (m^3)	Adequate Current or Planned Capacity for NIF
Treatment										
Low-Level										
Liquid	3,736 (34.1/treatment episode)	Yes	9,000/yr (45/hr)	Yes	None	Yes	None	Yes[a]	Included in mixed low-level	Yes
Solid	None	Yes[a]	76	Yes	None	Yes	None	Yes[a]	Included in mixed low-level	Yes
Mixed										
Liquid	8,750	Yes	None	Yes	None	Yes	None	Yes[a]	Data not available	Yes
Solid	11,800	Yes	None	Yes	None	Yes	None	Yes[a]	Data not available	Yes
Hazardous										
Liquid	97	Yes	Varies	Variable[b]	None	Yes[a]	None	Yes[a]	Data not available	Yes[a]
Solid	None	Yes[a]	Varies	Variable	None	Yes[a]	None	Yes[a]	Data not available	Yes[a]
Disposal										
Low-Level										
Liquid	None	Yes[a]	None	Yes	None	Yes	None	Yes[a]	None	Yes
Solid	None	Yes[a]	24-28 ha area available	Yes	650,000	Yes	None	Yes[a]	None	Yes
Mixed										
Liquid	None	Yes[a]	None	Yes	None	Yes	None	Yes[a]	None	Yes
Solid	None	Yes[a]	None	Yes	90,626	Yes	None	Yes[a]	None	Yes
Hazardous										
Liquid	None	Yes[a]	None	Yes	None	Yes[a]	None	Yes[a]	None	Yes[a]
Solid	None	Yes[a]	None	Yes	None	Yes[a]	None	Yes[a]	None	Yes[a]

[a] Shipped offsite.
[b] Varies depending on the waste stream.
Source: Andrews and Tobin 1995; Bowers 1995; NTS 1996.

I.4 AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS

I.4.1 Lawrence Livermore National Laboratory

I.4.1.1 *Affected Environment*

The following sections describe the affected environment associated with the construction and operation of the National Ignition Facility (NIF) at Lawrence Livermore National Laboratory (LLNL). Land use, air quality and acoustics, water resources, biotic resources, cultural and paleontological resources, socioeconomics, radiation and hazardous chemicals, and waste management are described.

I.4.1.1.1 Location and Land Use

The LLNL 332-hectare (ha) (821-acre) site is east of the city of Livermore, California; immediately to the south is Sandia National Laboratories (SNL), Livermore (figure I.3.4.1.1–1). Although their primary missions are similar, LLNL and SNL are separate facilities. Also located south of LLNL are agricultural areas devoted to grazing, orchards and vineyards, some low-density residential areas, and a business park to the southwest. A very small amount of low-density residential development lies east of LLNL, and a business park is located to the north. A parcel of open space to the northeast has been rezoned to allow development of a center for heavy industry (LLNL 1994d). A high-density residential area lies west of the site. Figure I.4.1.1.1–1 shows generalized land use at LLNL and vicinity.

The majority of the LLNL site is designated "industrial," and the perimeter areas on the western and northern portions of the site are designated "industrial" or "agricultural." The southwestern and southeastern quadrants of the site are the most crowded. The proposed location for NIF at LLNL is in the northeastern quadrant of the site adjacent to existing inertial confinement fusion (ICF) facilities (figure I.3.4.1.1–2).

Slopes at the LLNL site are nearly level. Soils are loamy textured, shallow to very deep soils occur on older fans and floodplains. The erosion potential is slight to moderate. No prime or unique farmland soils are located at LLNL.

I.4.1.1.2 Air Quality and Acoustics

This discussion of existing air quality and acoustics includes a review of the meteorology, climatology, and atmospheric dispersion characteristics near LLNL. No meteorological data were available for the proposed NIF location, so the nearest local and regional monitoring information was used to describe expected site conditions.

I.4.1.1.2.1 *Meteorology and Climatology*

The climate at LLNL and the surrounding region is characterized by mild, rainy winters and warm, dry summers. The annual average temperature at LLNL is 15.0 degrees Celsius (°C) (59.0 degrees Fahrenheit [°F]); average daily temperatures range from 7.9 °C (46.2 °F) in January to 21.0 °C (69.8 °F) in July. The average annual precipitation is 37.8 centimeters (cm) (14.9 inches [in]) (LLNL 1995a). The prevailing winds are from the southwest to west at an annual average wind speed of 3.3 meters per second (m/s) (7.4 miles [mi] per hour [hr] [mph]) (LLNL 1992). The 1994 annual wind rose for LLNL is shown in figure I.4.1.1.2.1–1. During 1994, unstable conditions occurred approximately 29 percent of the year, neutral conditions occurred about 35 percent of the year, and stable conditions occurred the remaining 36 percent (LLNL 1995d). Atmospheric dispersion improves as the wind speed increases and atmospheric conditions become more unstable.

I.4.1.1.2.2 *Ambient Air Quality*

National Ambient Air Quality Standards (NAAQS) exist for the criteria air pollutants ozone, carbon monoxide, nitrogen dioxide, sulfur oxides (measured as sulfur dioxide), particulate matter with a diameter of less than 10 microns (PM_{10}), and lead (40 *Code of Federal Regulations* [CFR] 50). California has established state ambient air quality standards for these pollutants, as well as standards for suspended sulfates, hydrogen sulfide, vinyl chloride (chloroethene), and visibility reducing particles. In addition, the Bay Area Air Quality Management District (BAAQMD) has established a monthly ambient concentration limit for beryllium (LLNL 1994d), which is the same as the National Emission Standard for Hazardous Air Pollutants for beryllium (40 CFR 61.32). Applicable NAAQS and California state and BAAQMD ambient air quality standards are presented in table I.4.1.1.2.2–1.

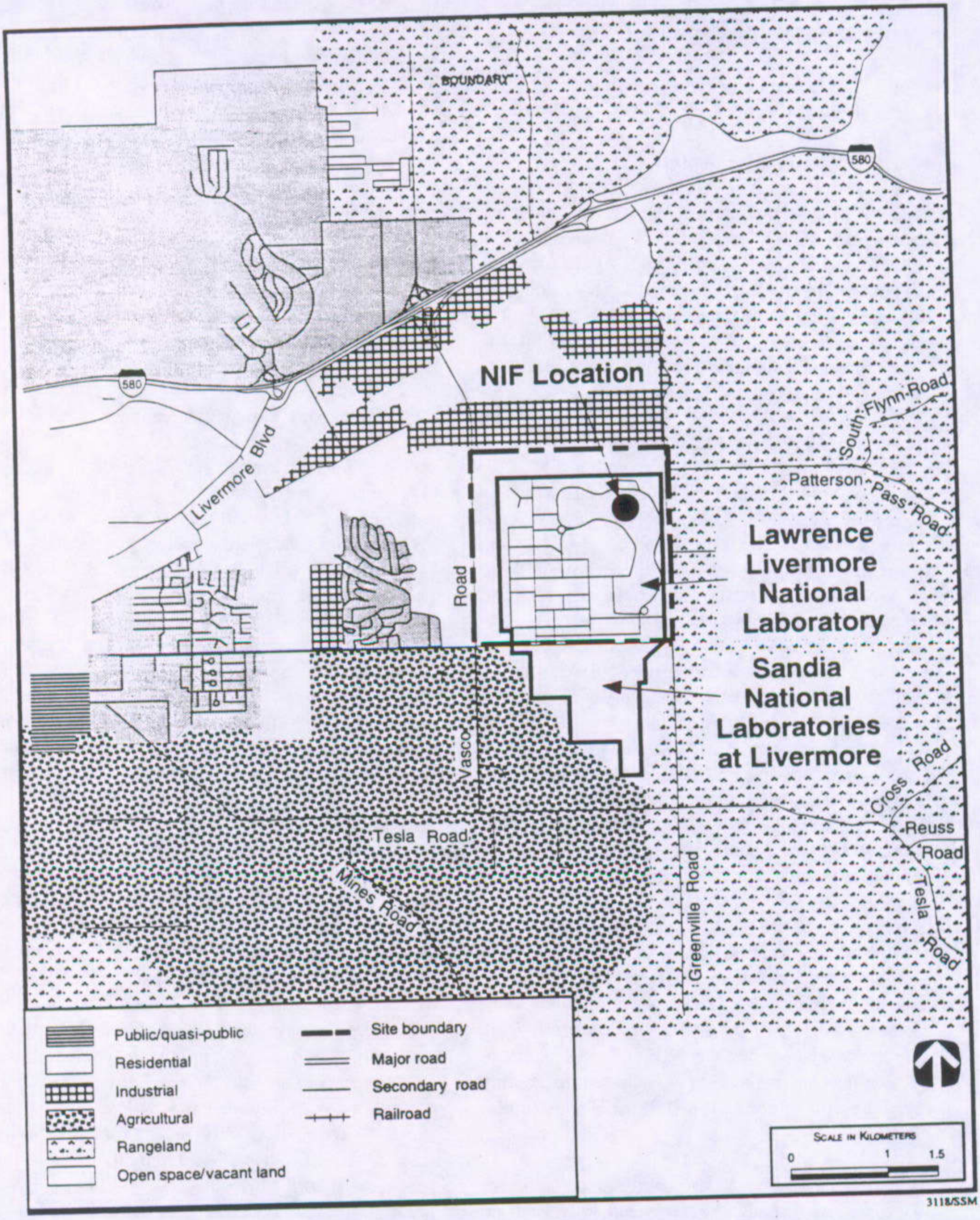

FIGURE I.4.1.1.1–1.—*Generalized Land Use at Lawrence Livermore National Laboratory and Vicinity.*

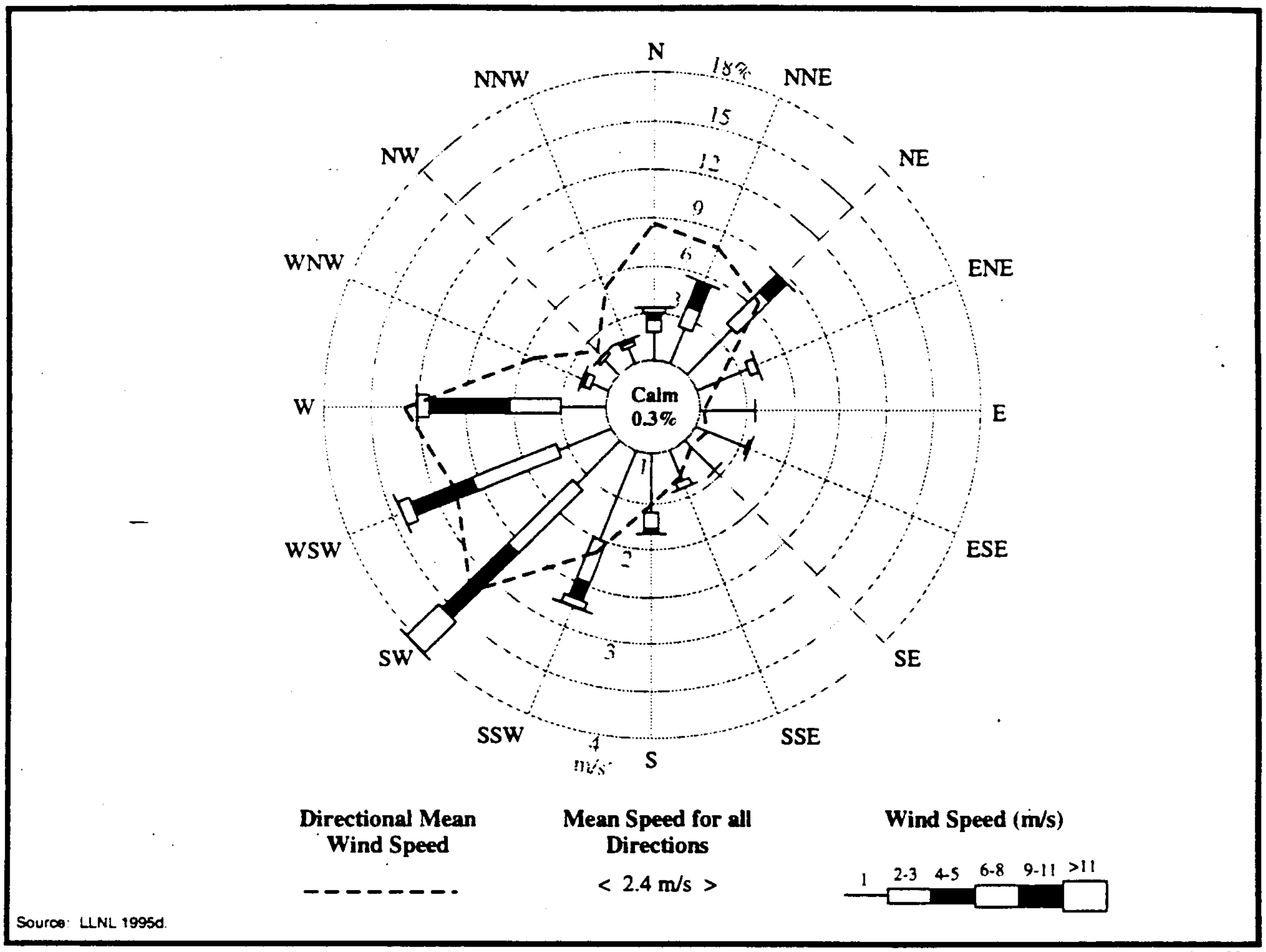

FIGURE I.4.1.1.2.1–1.—*Wind Distribution at Lawrence Livermore National Laboratory, 1994.*

LLNL is located within the San Francisco Bay Area Basin, designated by the Federal Government as the San Francisco Bay Intrastate Air Quality Control Region (AQCR 30). The Bay Area Basin is in attainment for all national ambient air quality standards except carbon monoxide in an urban area that includes the northern tip of Alameda County (40 CFR 81.305). This nonattainment area does not include LLNL. The Bay Area Basin is designated nonattainment for the state ozone and PM_{10} and has an unclassified state designation for hydrogen sulfide and visibility reduction (CARB 1994). (With the exception of one county designated as attainment and four counties and part of a fifth county designated as unclassified, all of California is designated as nonattainment for the state 24-hour PM_{10}.) In general, pollutant emission increases in an area designated nonattainment for a specific pollutant are subject to more stringent permitting requirements than if the area is designated as attainment.

The BAAQMD is responsible for air pollution control from stationary sources and attainment of air quality standards in the San Francisco Bay Area, including Alameda County. The district operates ambient air monitors throughout the San Francisco Bay Area Air Basin to determine compliance with national and state ambient air quality standards. The BAAQMD monitor closest to LLNL is the Livermore Old First Street Station located in downtown Livermore. In addition, LLNL maintains 8 onsite and 11 offsite particulate monitors that measure airborne beryllium concentrations. The most recently published data show violations in calendar year 1993 of the state and national ozone standards and the state 24-hour PM_{10} standard (see table I.4.1.1.2.2–1 and Lazaro et al. 1996).

Federal Prevention of Significant Deterioration (PSD) regulations limit increases in criteria pollutant concentrations resulting from emissions from new

TABLE I.4.1.1.2.2–1.—***Comparison of Baseline Ambient Air Concentrations with Most Stringent Applicable Regulations and Guidelines at Lawrence Livermore National Laboratory***

Pollutant	Averaging Time	Most Stringent Regulation or Guideline ($\mu g/m^3$)	1993 Baseline Concentration[a] ($\mu g/m^3$)
Criteria Pollutant			
Carbon monoxide	8-hour	10,000[b,c]	4,600
	1 hour	23,000[c]	7,000
Lead	Calendar quarter	1.5[b]	0.01
	30-day	1.5[c]	0.01
Nitrogen dioxide	Annual	100[b]	36
	1 hour	470[c]	210
Ozone	1 hour	180[c]	250 [d]
Particulate matter 10 microns or smaller	Annual arithmetic mean	50[c]	24.3
	Annual geometric mean	30[c]	20.9
	24-hour	50[c]	84 [d]
Sulfur dioxide	Annual	80[b]	ND [e]
	24-hour	105[c]	ND
	3-hour	1,300[b]	ND
	1 hour	655[c]	ND
Mandated by State			
Hydrogen sulfide	1 hour	42	ND
Suspended sulfates	24-hour	25	6.9
Vinyl chloride (chloroethene)	24-hour	26	ND
Visibility-reducing particles	8-hour (10 a.m.-6 p.m. PST)	[f]	ND
Mandated by BAAQMD			
Beryllium	30-day	0.01	0.000137
Other Air Pollutants			
Particulate ammonium-10μm	24-hour	NS[g]	1.50
Particulate chloride-10μm	24-hour	NS	3.61
Particulate nitrate-10μm	24-hour	NS	20.8
Particulate sulfate-10μm	24-hour	NS	4.7
Suspended nitrates	24-hour	NS	22.5
Total suspended particulates	24-hour	NS	93.0

[a] For short-term standards, baseline concentration is highest concentration for year for state standards, second highest for Federal standards.
[b] Federal standard (40 CFR 50).
[c] State standard.
[d] Exceeds most stringent regulation or guideline.
[e] ND - no data available.
[f] In sufficient amount to produce an extinction coefficient of 0.23 per km due to particles when the relative humidity is less than 70 percent.
[g] NS - no data available.
Note: BAAQMD - Bay Area Air Quality Management District.
Source: CARB 1993; Lazaro et al. 1996; LLNL 1994a.

sources above a baseline concentration. The allowable concentration increases (called increments and presented in Lazaro et al. 1996), depend on the PSD classification of the area. Class I areas allow the smallest increases. The area surrounding LLNL contains several PSD Class I areas. The closest such areas are Point Reyes National Wilderness Area, approximately 90 kilometers (km) (55 miles) to the west-northwest; Desolation National Wilderness Area and Mokelumme National Wilderness Areas (160 to 180 km [100 to 110 mi]) to the northeast; and Emigrant National Wilderness Area, Hoover National Wilderness Area, and Yosemite National Park (215 to 230 km [135 to 145 mi]) to the east-northeast and east.

The primary emission sources of criteria pollutants at LLNL are numerous boilers, solvent cleaning operations, stand-by electric generators, and various experimental, testing, and process sources. Emissions estimates for these sources are presented in section I.4.1.2.2.

I.4.1.1.2.3 *Acoustic Conditions*

Major noise emission sources within LLNL include various experimental facilities, equipment, and machines. LLNL is bordered by highways along its entire boundary. In the vicinity of a highway, traffic contributes to ambient noise levels, especially during peak hours. Across the highways bordering the site, the main land uses are light industrial to the north and south, urban residential to the west, agricultural to the southwest, and open rangeland to the east. The acoustic environment along the LLNL boundary is generally assumed to be that of an urban location, with typical average daytime sound levels of 55 to 65 decibel A-weighted (dBA).

I.4.1.1.3 Water Resources

The LLNL site is in the eastern Livermore Valley. Only intermittent streams flow into the eastern Livermore Valley from the surrounding uplands and low hills. Two intermittent streams flow through the LLNL site: Arroyo Las Positas and Arroyo Seco (figure I.4.1.1.3.–1). The proposed NIF location is in the drainage of Arroyo Las Positas. Arroyo Las Positas drains an area of 13.3 square kilometers (km^2) (5.16 square miles [mi^2]) east of the LLNL site. The channel is not well defined and usually carries only storm runoff. The channel enters the site from the east, is diverted along a ditch around the northern edge of the site, and exits the site at the northwestern corner. Arroyo Seco has a drainage area of 36.3 km^2 (14.0 mi^2) upstream of Sandia National Laboratories, Livermore. The headwaters of the arroyo are in the hills southeast of the LLNL site. The channel is well defined in the LLNL area and is dry for at least six months of the year.

Surface drainage and infiltration at LLNL are generally good, but infiltration decreases locally with increasing clay content in soils (U.S. Department of Energy [DOE] and University of California [UC] 1992). About one-fourth of stormwater runoff within the LLNL site drains into the Central Drainage Basin (figure I.4.1.1.3.–1), which collects runoff from the southeastern quadrant of the LLNL site. During extreme wet weather, the basin can overflow through culverts into storm drains that discharge into Arroyo Las Positas. The remainder of the site drains either directly or indirectly into the two arroyos through storm sewers and ditches (DOE and UC 1992; LLNL 1994d).

Groundwater at the LLNL site occurs in an unconfined zone overlying a series of semiconfined aquifers. The two geologic units containing the most important aquifers are the surface valley-fill deposits and the Livermore Formation. The aquifers in the Livermore Valley are locally recharged by precipitation, irrigation, stream runoff from precipitation, and controlled releases from the South Bay Aqueduct and gravel pits west of the city of Livermore. Groundwater withdrawal from the Livermore Valley is mainly for agricultural use, municipal use, and gravel quarrying. In the vicinity of the LLNL site, agricultural withdrawal is still a major source of groundwater drawdown. Depth to groundwater at the LLNL site varies from about 34 m (110 feet [ft]) in the southeast corner to 9 m (30 ft) in the northwest corner (DOE and UC 1992).

Water used at LLNL (including Sandia National Laboratories, Livermore) is primarily surface water purchased from the city of San Francisco Hetch Hetchy Aqueduct and from the Alameda County Flood and Water Conservation District, Zone 7. A small amount of treated groundwater is used for irrigation and cooling tower makeup. In 1990, 983 million liters (L) (260 million gallons [gal]) and

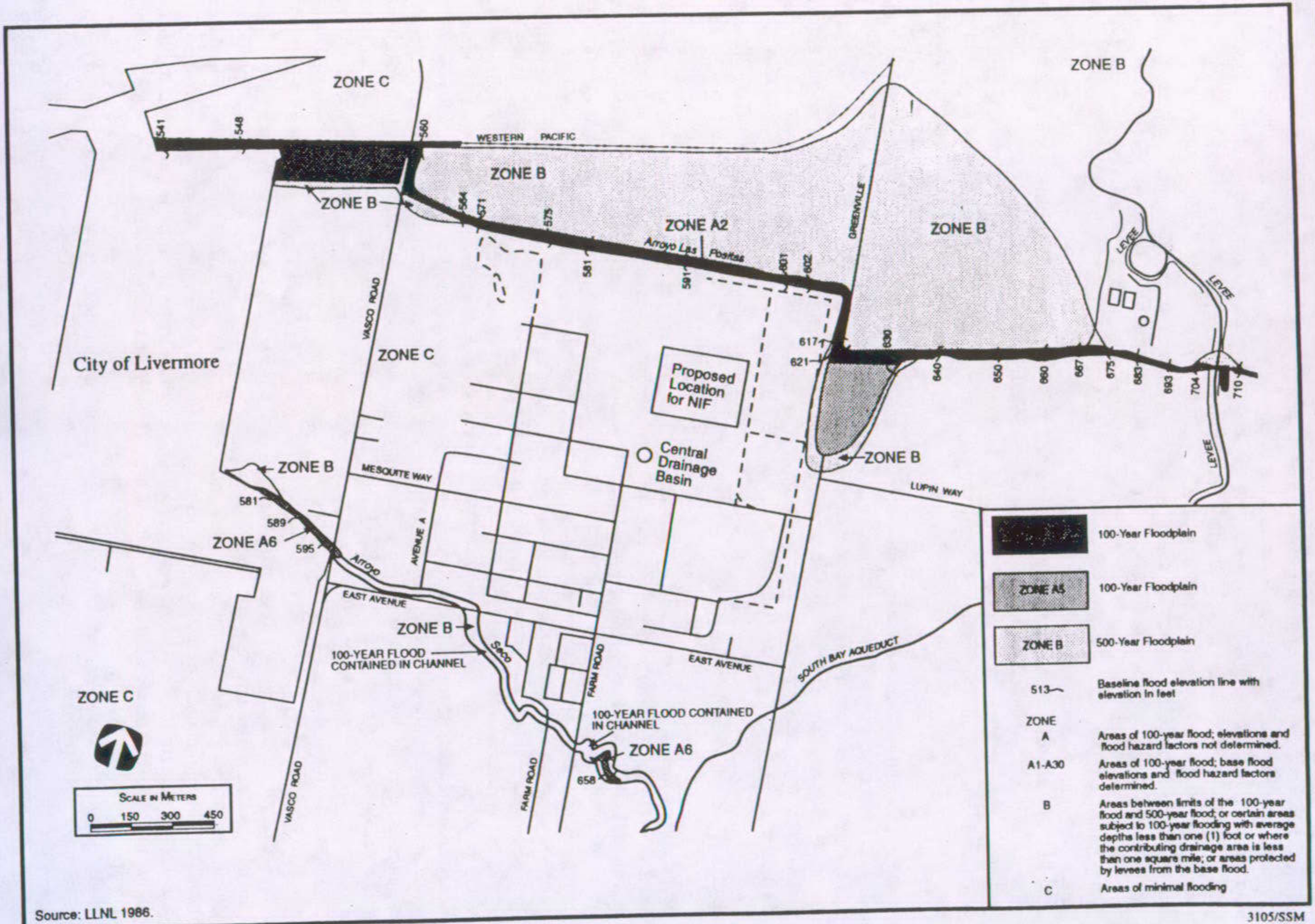

FIGURE I.4.1.1.3–1.—*Surface Water Features, Including Floodplain Map, of the Lawrence Livermore National Laboratory Area.*

74.1 million L (19.6 million gal) of water were obtained from the two sources, respectively. The water is primarily used for industrial cooling processes, the sanitary system, and irrigation. The LLNL site (excluding Sandia National Laboratories, Livermore) currently uses 970 million liters per year (MLY) (256 million gallons per year [MGY]) annually (LLNL 1995c) and used an average of 990 MLY (262 MGY) from 1986 through 1990 (DOE and UC 1992).

Beginning in 1988, LLNL started implementing water conservation measures such as (1) reducing landscape watering by 35 percent below the projected 1989 level, (2) reducing blowdown from cooling towers to minimal operable levels, (3) limiting use of water for car washes, and (4) eliminating the washing of sidewalks and driveways (DOE and UC 1992).

The city of Livermore Water Reclamation Plant handles sewage from the LLNL site and Sandia National Laboratories, Livermore. The plant currently receives an average of 6.205 MLY (1.643 MGY). The facility is being expanded to treat 11.753 MLY (3.103 MGY) (DOE and UC 1992). LLNL discharges about 402 MLY (110 MGY) of wastewater to the city of Livermore sewer system. This volume includes wastewater from Sandia National Laboratories, Livermore, which is discharged into the LLNL sewer system. LLNL tests and pretreats all wastewater before it leaves the site.

I.4.1.1.4 Biotic Resources

LLNL is within the Southern and Central California Plains and Hills Ecoregion (Omernik 1986). This ecoregion is dominated by annual grasslands. A generalized overview of the habitats and biota that occur at LLNL are provided by DOE and UC (1992). Agricultural, industrial, and residential developments have limited the diversity of wildlife in the area of LLNL. About 259 ha (640 acres) (78 percent) of the 332-ha (821-acre) LLNL site is developed. The developed portions of LLNL are planted with ornamental vegetation and lawns; the undeveloped lands in the security areas (including the proposed NIF and laydown locations) are primarily dominated by nonnative grasses and forbs. Common plant species include ripgut brome, slender oat, star thistle, Russian thistle, turkey mullein, sweet fennel, and Italian ryegrass (DOE and UC 1992). Relatively small areas of other habitats at LLNL hold a special significance, either because of their uniqueness or because of their importance as habitat to biota. These areas are primarily limited to remnant riparian habitats in Arroyo Seco along the southwestern corner of LLNL. These areas contain native tree species such as red willow and California walnut and introduced species such as black locust and almond (DOE and UC 1992). No wildlife refuges or sanctuaries occur at LLNL.

The wildlife of LLNL consists primarily of species adapted to habitats that have been disturbed by humans and that are tolerant of human presence (DOE and UC 1992). Common species at LLNL include the western fence lizard, western meadowlark, American crow, American robin, Anna's hummingbird, white-throated swift, California quail, house sparrow, scrub jay, European starling, house finch, house sparrow, desert cottontail, black-tailed jackrabbit, feral house cat, and California ground squirrel. Raptors that have been observed at LLNL include the red-tailed hawk, Cooper's hawk, sharp-shinned hawk, ferruginous hawk, red-shouldered hawk, black-shouldered kite, American kestrel, burrowing owl, turkey vulture, and golden eagle. Red and gray foxes, coyotes, and raccoons are also known to exist throughout LLNL (DOE and UC 1992).

Wetlands at LLNL are limited to three small areas totaling 0.15 ha (0.36 acre) located at, and downstream from, culverts (DOE and UC 1992). Saltgrass and sedge dominate the two wetlands that exist along Arroyo Las Positas; the other wetland is dominated by cattails, with saltgrass and sedge also existing. Other plant species existing in these wetlands include willow, curly dock, ryegrass, and Hooker's evening primrose. These wetlands are located 300 m (1,000 ft) and more from the proposed NIF construction area.

Aquatic habitats are limited to intermittent drainages (in the two arroyos that cross the site), ditches, and a 1.6-ha (4-acre) water retention basin at LLNL. The water retention basin, located southwest of the proposed NIF location near the center of LLNL, is the only water body that contains fish (mosquito fish). It also could provide habitat suitable for waterfowl, tricolored blackbirds, sensitive amphibians, and sensitive aquatic invertebrates. Runoff from this basin could eventually increase riparian habitat within Arroyo Las Positas (DOE and UC 1992). Kingfishers and pied-billed grebes have been observed at the basin (LLNL 1994d).

A list of rare, threatened, and endangered Federal and state species that could exist at LLNL is provided in Lazaro et al. (1996). Most of the listed species would be more likely to exist in the less disturbed habitats of LLNL, although several of the species could forage or inhabit the grassland habitat identified for NIF and/or laydown locations (such as western burrowing owls). During detailed surveys conducted in 1991, no sensitive species were encountered at LLNL (DOE and UC 1992). During the summer of 1994, a nesting pair of white-tailed kites, a state-protected species, was noted in a stand of eucalyptus trees near the East Gate (LLNL 1994a). No designated critical habitats for federally listed species exist at LLNL.

I.4.1.1.5 Cultural and Paleontological Resources

No prehistoric or historic archaeological sites or historic structures exist on the proposed locations for NIF at LLNL. The uppermost 0.6 to 1.2 m (2 to 4 ft) of sediment at the proposed site is composed of redeposited fill that would not contain any undisturbed archaeological remains. Results of an intensive pedestrian survey (employing 15 m [50 ft] transects) conducted in July 1990 noted the disturbed character of the surficial sediment and absence of archaeological remains (Bennett 1994). The fill unit overlies alluvium of Pleistocene age that was deposited at least 15,000 years ago (Dresen and Weiss 1985) and thus antedates the earliest documented human settlement in the region (therefore, has little or no probability of containing archaeological remains). Paleontological remains (which would represent late Quaternary fauna) have not been recovered from the alluvium (Dresen and Weiss 1985). Consultation is in progress with Native American groups to identify any important cultural resources on LLNL.

I.4.1.1.6 Socioeconomics

Socioeconomic characteristics discussed here include the regional economy, population and housing, public finance and public service infrastructure, and local transportation. Regional economic statistics are based on a regional economic study area that encompasses 22 counties around LLNL, as defined by the U.S. Bureau of Economic Analysis (BEA). The economic study area is a broad labor and product market-based region linked by trade among economic sectors within the region. Statistics for population and housing, public finance, and public service infrastructure are based on the region of influence (ROI), a three-county area (Alameda, Contra Costa, and San Joaquin counties) in which nearly 93 percent of all LLNL employees reside. Lazaro et al. (1996) lists counties included in the economic study region and the counties included in the ROI. Assumptions, assessment methodologies, and supporting data for each technical area are also presented in Lazaro et al. (1996).

I.4.1.1.6.1 *Regional Economy*

The regional economic study area for LLNL includes the San Francisco-Oakland-San Jose Consolidated Metropolitan Statistical Area, consisting of the following Primary Metropolitan Statistical Areas: Oakland, San Francisco, San Jose, Santa Cruz, Santa Rosa-Petaluma, and Vallejo-Fairfield-Napa. Between 1988 and 1995, employment in the economic study area was projected to increase from 4,555,600 to 5,117,400. BEA projects a compounded average annual rate of growth of 1.2 percent from 1995 to 2003 (527,124 jobs) (BEA 1990). The unemployment rate in the area is expected to decrease from 6.5 percent in 1995 to 4.4 percent in 2010 (Association of Bay Area Governments 1993).

In 1995, LLNL employed approximately 8,300 people, accounting for 0.2 percent of employment in the regional economic study area. The distribution of LLNL employees by place of residence in the ROI is presented in Lazaro et al. (1996).

I.4.1.1.6.2 *Population and Housing*

The ROI has experienced significant population growth between 1980 and 1990, with an average annual increase of about 2 percent, bringing the 1990 total to about 2.5 million. By the year 2000, population in the ROI is expected to grow to approximately 2.9 million (U.S. Department of Commerce 1994; BEA 1990).

Between 1980 and 1990, the number of housing units in the ROI increased approximately 19 percent, from

832,559 to 986,553 (see table I.4.1.1.6.2–1). The number of housing units in Alameda County increased from 444,607 units in 1980 to 504,109 units in 1990 (13.4 percent). Housing units in Contra Costa County increased from 251,917 units in 1980 to 316,170 units in 1990 (25.5 percent). Housing units in San Joaquin County increased from 136,001 units in 1980 to more than 166,274 units in 1990 (22.3 percent). The number of housing units in the ROI is expected to increase about 16 percent over the period 1990 to 2000. The rental vacancy rate in the ROI is approximately 5 percent (U.S. Department of Commerce 1994; Urban Land Institute [ULI] 1995).

The residential building permit volume within the ROI remained strong between the mid- to late-1980s; however, with the national and local recession and a slowing of new household formation, permit volume in the region dropped between 1990 and 1993. The market rebounded somewhat in 1994. The largest percent of new construction within the ROI since 1989 has been within Contra Costa County, where most NIF employees would reside (ULI 1995).

Contra Costa County has historically been the Bay Area's strongest market for residential development, followed by Alameda County. Most new construction has been within southern Alameda County and eastern Contra Costa County, a trend that is likely to continue. Substantial new construction is also planned within central Contra Costa County east of San Roman and north of Dublin (ULI 1995).

The rental apartment market, which experienced some overbuilding in the 1980s, has improved in the 1990s. Production has declined sharply since 1989, reflecting a market adjustment to overbuilding and changes in the Federal tax code. Because of the public construction volume during the 1980s and the subsequent slow economy, rental rate increases since 1985 have generally been lower than the rate of inflation. With high land and construction costs, rental rates do not justify new construction. Despite the lack of new construction, vacancy rates remained about 5 percent in 1993 and 1994. Vacancy rates have not declined because of the doubling up that has occurred in the depressed economy and the large number of renters who have taken advantage of favorable prices and interest rates to purchase homes.

The counties within the ROI are far more receptive to residential development than the San Francisco area on the western side of the bay. The ROI is likely to continue to experience strong residential development activity. Substantial inventories of suitable land remain, particularly in the southern portion of Alameda County and the eastern portion of Contra Costa County near LLNL (ULI 1995).

I.4.1.1.6.3 *Public Finance and Public Services Infrastructure*

Public financial characteristics of the local jurisdictions in the ROI that are most likely to be affected by construction and operation of NIF at LLNL are summarized in this section. The data reflect total revenues and expenditures of each jurisdiction's general fund, special revenue funds, and (as applicable) debt service, capital project, and expenditure trust funds. Major revenue and expenditure categories and revenues less expenditures for counties and cities are presented in table I.4.1.1.6.3–1. Table I.4.1.1.6.3–2 summarizes public service levels for community services, health care, and education.

I.4.1.1.6.4 *Local Transportation*

Vehicular access to LLNL is primarily from Interstate 580 by the Vasco Road and Greenville Road interchanges. LLNL can be entered through security gates along Vasco Road, East Avenue, and Greenville Road. Specific access points include Westgate Drive, Mesquite Way, Southgate Drive, Avenue J, and East Gate Drive (DOE and UC 1992). Table I.4.1.1.6.4–1 lists the site access roads at LLNL, the average daily traffic volumes for each route, and the estimated levels of service at key local intersections.

Traffic concerns in the ROI have reinforced attempts to restrict residential development. However, these restrictions have pushed residential development to the urban fringes, worsening traffic congestion. Among the solutions being instituted for the region's transportation problems are numerous improvements now under way or planned for the region's public transit systems. Several extensions of the Bay Area Rapid Transit (BART) system are currently under construction, including a new line of Dublin and Pleasanton and an extension of the Concord line to Pittsburgh (ULI 1995).

TABLE I.4.1.1.6.2–1.—*Population and Housing Data for the Lawrence Livermore National Laboratory Area*

Category	1980	1990	1996	1997	1998	1999	2000	2001	2002	2003
Estimated ROI population	2,109,052	2,538,312	2,767,679	2,795,646	2,823,903	2,852,453	2,881,300	2,905,074	2,929,049	2,953,227
Estimated total housing units	832,559	986,553	1,078,949	1,094,349	1,109,748	1,125,148	1,140,547	1,155,946	171,346	1,186,745
Estimated vacant owner units	23,722	28,541	31,750	32,075	32,579	33,048	33,589	34,094	34,598	35,103
Estimated vacant renter units	16,585	19,238	21,357	21,731	22,088	22,444	22,800	23,156	23,513	23,869
Estimated total vacant units in ROI	40,307	47,779	52,945	53,806	54,667	55,528	56,389	57,250	58,111	58,972

Source: Historical data from U.S. Department of Commerce 1994; projections by Halliburton-NUS 1995.

TABLE I.4.1.1.6.3–1.—*Public Finance—Lawrence Livermore National Laboratory Area*

Revenues and Expenditures[a]	Alameda County	City of Livermore	City of Pleasanton	Contra Costa County	San Joaquin County	City of Manteca	City of Tracy
Local sources (percent)	43	90	94	35	26	86	86
State sources (percent)	36	10	6	65	74	14	14
Federal sources (percent)	21	0	0	0	0	0	0
Total revenues (dollars)	988,275,000	28,841,041	33,901,086	598,723,000	381,106,067	12,086,164	14,375,044
General government (percent)	6	19	21	12	6	10	14
Public safety, health, and community services (percent)	93	75	79	87	94	88	84
Debt service (percent)	0	6	0	1	0	2	0
Other (percent)	1	1	0	1	0	0	2
Total expenditures (dollars)	1,037,595,000	29,572,914	31,449,570	609,924,000	373,471,380	11,283,214	14,697,326
End-of-year fund balance (dollars)	120,596,000	13,129,925	10,803,206	27,014,000	13,607,115	3,327,880	2,243,365

[a] If reporting body did not distinguish between state and Federal revenue sources, the total for all intergovernmental revenue was combined and reported under the "State sources" heading.

Source: Alameda County 1994; Contra Costa County 1994; San Joaquin County 1994; city of Livermore 1994; city of Pleasanton 1994; city of Tracy 1994; city of Manteca 1994.

TABLE I.4.1.1.6.3-2.—*Public Services—Lawrence Livermore National Laboratory Area*

Part I: Education

County/School District	Enrollment	Pupil-Teacher Ratio	Per Pupil Expenditure ($)
Alameda County	188,076	28.4:1[a]	4,538
Contra Costa County	132,951	22.9:1[a]	4,192
San Joaquin County	119,115	NA	4,347

Part II: Level of Service per 1,000 Population

County/Jurisdiction	Police Protection	Fire Protection	General Government	Physicians
Alameda County	0.5	0.1	7.9	2.7
City of Livermore	1.0	0.8	5.5	NA
City of Pleasanton	1.2	0.8	6.6	NA
Contra Costa County	0.6	0.4[b]	7.7	2.6
San Joaquin County	0.3	NA[c]	12.8	1.6
City of Manteca	1.0	0.6	5.9	NA
City of Tracy	1.1	0.6	5.1	NA

[a] Pupil-teacher ratio is for grades 1–8.

[b] Contra Costa Fire Protection District is the largest fire protection district in Contra Costa County; however, other districts also provide service throughout the county.

[c] General Government number includes firefighters. Fire services in San Joaquin County are provided by approximately 27 fire protection districts, including city fire departments.

Note: NA - not applicable.

Source: Contra Costa County 1994; Alameda County 1994; Contra Costa County School Districts 1994; American Medical Association 1994; Federal Bureau of Investigation 1993; San Joaquin County Schools 1995a; San Joaquin County Schools 1995b; city of Pleasanton Personnel Department 1995; city of Manteca Personnel Department 1995; city of Manteca Fire Department 1995; Contra Costa Fire Protection Department 1995; Alameda County Fire Department 1995.

Freeway improvements are also under way in the region, including replacement of Cypress Freeway, improvements to major interchanges in Walnut Creek, and construction of a high-occupancy vehicle ramp from Interstate 80 to the Bay Bridge. There are numerous ongoing seismic retrofit projects (California Department of Transportation 1995). With general political resistance to infill housing development, most affordable housing is being produced in remote locations within the region and beyond in Solano and San Joaquin counties. These areas are poorly served by public transportation and are located along increasingly congested traffic arteries, such as Interstate 205. With the focus of new housing development likely to continue in these areas, traffic congestion is projected to worsen (ULI 1995).

LLNL is served by several public transportation providers. San Joaquin County provides bus access to LLNL from the San Joaquin Valley, Wheels Transit Service serves LLNL from the Tri-Valley region, and BART provides express buses during peak commuting hours (ULI 1995).

Major railroads in the ROI are the Atchison, Topeka, and Santa Fe Railroad, the Southern Pacific Transportation Company, and the Union Pacific Railroad. The Union Pacific passes within 1.6 km (1 mi) of LLNL; however, there is no direct rail access to LLNL.

The ROI is served by several airports, including Oakland International, San Jose International, Stockton Metropolitan, and San Francisco International Airport. The Livermore Municipal Airport serves local air traffic.

I.4.1.1.6.5 *Environmental Justice*

Environmental justice concerns the potential for high and adverse environmental or human health impacts to disproportionately affect minority or low-income populations. For this assessment, environmental justice is evaluated for impacts within the site region, defined as an 80 km (50 mi) radius around the site, and within the local area. Lazaro et al. (1996) presents the demographic analysis of minority and low-income population distributions on a regional and local basis.

In the LLNL site region in 1990, 7 percent of the population was low income and 41 percent was minority. These values are lower percentages of both low-income and minority persons than the California state averages (12 percent low income and 43 percent minority). However, within that area, census tracts closer to LLNL tend to have a higher proportion of minority population but a lower proportion of low-income population than do census tracts farther from the site.

TABLE I.4.1.1.6.4–1.—*Baseline Traffic on Lawrence Livermore National Laboratory Access Roads*

Route	From	To	Estimated 1995 AADT	Estimated 1995 LOS
Patterson Pass Road	Vasco Road	Greenville Road	1,040	A
East Avenue	Vasco Road	Greenville Road	11,250	A
East Avenue	Buena Vista Avenue	Vasco Road	13,800	A
East Avenue	Hillcrest Avenue	Buena Vista Avenue	18,700	A
Telsa Road	Vasco Road	Greenville Road	2,600	A
Telsa Road	Buena Vista Avenue	Vasco Road	6,400	A
First Avenue	N. Mines Road	Las Positas Road	28,300	B
Vasco Road	Brisa Street	Patterson Pass Road	18,300	A
Vasco Road	Westgate Drive	Mesquite Way	13,500	B
Vasco Road	East Avenue	Telsa Road	4,150	A
Greenville Road	Patterson Pass Road	Lupin Way	5,200	A

Note: AADT - average annual daily trips; LOS - level of service.
Source: DOE and UC 1992.

I.4.1.1.7 Radiation and Hazardous Chemicals

I.4.1.1.7.1 *Radiation Environment*

Many of the activities that take place at LLNL involve handling radioactive materials and operating radiation-producing equipment. A detailed discussion of the radiation environment, including background, radiological releases, and doses to members of the public is presented in the publication *Environmental Report 1993* (LLNL 1994d). The concentrations of radioactivity in various environmental media (air, water, soil) in the site region are also presented in that report.

Calculated radiological doses were used to estimate the potential health impacts to the public and onsite workers at LLNL from any releases of radioactivity. The annual doses to an individual, the surrounding population (within 80 km [50 mi]), and workers are summarized in table I.4.1.1.7.1–1; corresponding health risks are also presented in the table. These values are in addition to those from natural background, consumer products, and medical sources, which total about 365 millirems (mrem) per year. Background radiation doses are unrelated to LLNL operations. Regulatory limits that specify the maximum effective dose equivalent to individual members of the public and occupational workers are also presented in table I.4.1.1.7.1–1. The doses to the public presented in table I.4.1.1.7.1–1 are within regulatory limits (DOE 1990) and are small compared to background radiation. The onsite worker doses are also within regulatory limits.

I.4.1.1.7.2 *Hazardous Chemical Environment*

The background chemical environment important to human health consists of the atmosphere, which may contain hazardous particulates or vapors that can be inhaled; drinking water, which may contain hazardous chemicals that can be ingested; and other environmental media with which people may come in contact (for example, soil through contact or via the food pathway). Exposure pathways to LLNL workers during normal operation may include inhaling the workplace atmosphere, drinking LLNL potable water, and possibly other contact with hazardous materials associated with work assignments. The maximum daily quantities of hazardous materials stored in 1992 are listed in table I.4.1.1.7.2–1. The potential for health impacts varies from facility to facility and from worker to worker, and depends on the operations performed, as well as the materials handled. However, workers are protected from hazards specific to the workplace through (1) appropriate training, (2) engineering controls, (3) work practices, (4) administrative controls, (5) monitoring, and (6) protective equipment. LLNL workers are also protected by adherence to Occupational Safety and Health Administration (OSHA) and U.S. Environmental Protection Agency (EPA) standards that limit atmospheric and drinking water concentrations of potentially hazardous chemicals. Appropriate monitoring, which reflects the frequency and amounts of chemicals utilized in the operation processes, ensures that these standards are not exceeded.

TABLE I.4.1.1.7.2–1.—*Maximum Daily Quantities of National Ignition Facility-Related Hazardous Materials Stored at Lawrence Livermore National Laboratory*

Hazardous Material	Quantity
Acetone	3,577 kg
Alumina	3,345 kg
Ammonium hydroxide	2.23 kg
Copper	55.8 kg
Ethyl alcohol	13,244 L
Hafnium oxide	1,115 kg
Mercury	1,238 kg
Sodium hydroxide	9,455 kg
Tetraethyl orthosilicate	1,904 kg

Note: kg - kilograms; L - liters.
Source: DOE and UC 1992.

I.4.1.1.8 Waste Management

LLNL currently operates four waste management facilities. The Area 514 and Area 612 facilities contain treatment and storage units for hazardous and mixed wastes. The Building 693 facility is currently a container storage unit for mixed hazardous waste, *Toxic Substances Control Act* (TSCA)-regulated waste (such as polychlorinated biphenyls), and radioactive waste. The Building 233 container storage unit is currently used to store mixed waste, low-level waste (LLW), and transuranic (TRU) waste.

TABLE I.4.1.1.7.1–1.—*Annual Radiation Doses to the General Public and Onsite Workers from Normal Operations at Lawrence Livermore National Laboratory*

Receptor	Atmospheric Releases		Liquid Releases		Total		
	Regulatory Limit[a]	Calculated	Regulatory Limit[a]	Calculated[b]	Regulatory Limit[a]	Calculated	Risk[c]
Individual Dose							
Average exposed individual[d] (mrem)	10	$1.3x10^{-4}$	4	0.0	100	$1.3x10^{-4}$	$6.5x10^{-11}$
Maximally exposed individual (mrem)	10	$6.5x10^{-2}$	4	0.0	100	$6.5x10^{-2}$	$3.3x10^{-7}$
Population Dose[e]							
Population within 80 kilometers (person-rem)	f	$7.6x10^{-1}$	f	0.0	f	$7.6x10^{-1}$	$3.8x10^{-4}$
Worker Dose[g]							
Average worker (mrem)	NA	NA	NA	NA	5,000	2.1	$8.4x10^{-7}$
Maximally exposed worker (mrem)	NA	NA	NA	NA	5,000	1,300	$5.2x10^{-4}$
Total worker[h] (person-rem)	NA	NA	NA	NA	None	18.3	$7.3x10^{-3}$

[a] The regulatory limits for individuals are given in DOE Order 5400.5. The 10 mrem/yr limit from airborne emissions is required by the *Clean Air Act*. The 4 mrem/yr limit is required by the *Safe Drinking Water Act*, and the total dose of 100 mrem/yr is the limit from all pathways combined. The occupational limit for workers is 5,000 mrem/yr (10 CFR 835).
[b] The calculated dose values listed in this column conservatively include all water pathways, not just the drinking water pathway.
[c] Based on latent fatal cancer risk factors of $5x10^{-7}$/mrem for individuals, $5x10^{-4}$ /person-rem for population, and $4x10^{-7}$/mrem for workers (ICRP 1991).
[d] Obtained by dividing the population dose by the number of people living within 80 km (50 mi) of the site.
[e] Estimated for a population of approximately 6 million.
[f] No regulatory limit exists for population doses; however, a 100 person-rem value for the population is found in proposed 58 FR 16268 (10 CFR 834).
[g] Worker doses were estimated on the basis of readings from monitoring devices called thermoluminescent dosimeters.
[h] The number of badged workers in 1994 was approximately 8,700.

Note: NA - not applicable.

Source: LLNL 1994d.

The current waste management practices at LLNL are outlined in table I.4.1.1.8–1. Wastes relevant to NIF that are managed at LLNL from research activities include LLW, mixed wastes, and hazardous and nonhazardous wastes. The exact nature of some of the LLNL waste is classified information. The NIF project is expected to generate low-level, mixed, hazardous, and nonhazardous wastes during operation; none of these wastes would be classified.

I.4.1.1.8.1 *Low-Level Waste*

Both liquid and solid LLW are generated and managed by LLNL. LLW solids at LLNL consist of gloves, absorbent paper, plastics, glass, and other solid materials contaminated with low-level radioactive materials. Liquid and solid LLW are processed or stored at the Building 514 and 612 complexes. Wastewater from retention-tank systems that exceed site radiological discharge limits or any special limits established for that tank, and that cannot be adjusted for discharge or released to the sanitary sewer, is treated as LLW. Smaller quantities of liquids may be accumulated in containers of various sizes and types. Nonreleasable wastewater is pumped into portable tanks for treatment at the Wastewater Treatment Tank Farm at the Building 514 Facility, where it is containerized and transferred into one of six 7,003-L (1,850-gal) treatment tanks for chemical treatment. These tanks are used to treat both radioactive and mixed liquid wastes. After treatment, if the analysis indicates that the contents of a treatment tank are within established sewer discharge limits, the liquid is discharged to the sanitary sewer. If the contents are not within discharge limits, they are retreated.

I.4.1.1.8.2 *Mixed Low-Level Waste*

Some of the generated mixed liquid LLW is treated at the Area 514 Wastewater Treatment Tank Farm before discharge to the sanitary sewer system so that hazardous constituents and radionuclides can be removed and this wastewater can be discharged within the allowable limits of the National Pollutant Discharge Elimination System (NPDES) permit. The residual solids from this treatment process may contain hazardous constituents such as oils and solvents, toxic metals, decontamination solutions, and dyes. Mixed LLW is treated or stored at the Area 514 Wastewater Treatment Tank Farm and Building 612 complexes.

I.4.1.1.8.3 *Hazardous Waste*

Hazardous wastes are generated by the numerous research and development (R&D) activities conducted at LLNL. Storage areas for nonradioactive and radioactive (or mixed) wastes are located at Area 612, Area 514, Building 233, and Building 833. Wastes that contain polychlorinated biphenyls and other wastes regulated by the TSCA are stored in Building 693. Nonradioactive, hazardous liquid waste may be stored in drums and portable tanks, pending consolidation and/or offsite transportation. A commercial waste handler transports the nonradioactive solid and liquid hazardous waste drums to an appropriately permitted disposal, treatment, or recycle facility. LLNL hazardous waste management units operate under *Resource Conservation and Recovery Act* (RCRA) interim status with an approved Part A Permit. Building 693 operates under interim standards and is used to store containerized RCRA-, TSCA-, and California-only regulated waste.

Wastewater may be accumulated in retention tanks, carboys, or drums at the various source locations throughout LLNL. The materials are then analyzed, and the determined waste contaminant levels are compared to LLNL and city of Livermore discharge limits. If the contaminant levels are below the regulatory limits, the material is released to the sanitary sewer. Industrial wastewater that contains constituents at concentrations greater than allowed by the city of Livermore discharge limits is managed as hazardous waste.

Hazardous wastes may be shipped through licensed commercial transporters to various offsite commercial RCRA-permitted treatment, storage, and disposal facilities.

The newly redesigned Decontamination and Waste Treatment Facility is planned to replace and upgrade current facilities used to process, treat, and store hazardous, radioactive, and mixed wastes. The Decontamination and Waste Treatment Facility would receive LLNL and other Oakland, California, generated medical waste, hazardous waste, LLW, and mixed LLW for consolidation, processing, treatment, and packaging before shipment and disposal offsite at a commercial RCRA-permitted facility.

TABLE I.4.1.1.8–1.—*Current Waste Management at Lawrence Livermore National Laboratory*

Category	1994 Generation (m^3)	Treatment Method	Treatment Capacity (m^3/yr)	Storage Method	Storage Capacity[a] (m^3)	Disposal Method	Disposal Capacity (m^3)
Low-Level							
Liquid	181	Neutralization, filtration, solidification, precipitation, oxidation, flocculation, blending	3,736 (34.1/ treatment episode)	Hazardous Waste Management Division Facilities	627	Treated wastewater discharged to city of Livermore sanitary sewer if within approved limits	None
Solid	307	Shredding, drum crushing, compaction	NA	Hazardous Waste Management Division Facilities	2,297	Shipped to Nevada Test Site	NA
Mixed Low-Level							
Liquid	51	Neutralization, filtration, solidification, precipitation, oxidation, flocculation, blending	8,750	Hazardous Waste Management Division Facilities	627	Treated wastewater discharged to city of Livermore sanitary sewer if within approved limits	NA
Solid	20	Shredding, drum crushing, compaction	11,800	Hazardous Waste Management Division Facilities	2,297	None	None
Hazardous							
Liquid	342	Shipped to offsite RCRA-permitted treatment, storage, and disposal facility, except for silver recovery	97	Hazardous Waste Management Division Facilities	76.9	Shipped to offsite RCRA-permitted treatment, storage, and disposal facility	NA
Solid	237	Shipped to offsite RCRA-permitted treatment, storage, and disposal facility, except for silver recovery	NA	Hazardous Waste Management Division Facilities	98	Shipped to offsite RCRA-permitted treatment, storage, and disposal facility	NA
Nonhazardous (Sanitary)							
Liquid	456,000	None	NA	Retention tanks	829 (spill control capacity 882,622 L)	Discharged to city of Livermore sanitary sewer system	NA
Solid[b]	6,425 t	None	NA	Hazardous Waste Management Division Facilities	NA	Offsite landfill	NA

[a] Storage capacity may include several storage units that may be permitted for several waste types.
[b] This waste is not tracked by volume, and the weight of material is too variable to reliably convert.
Note: NA - not applicable.
Source: ·drews and Tobin 1995; Bowers 1995.

I.4.1.1.8.4 *Nonhazardous Waste*

Solid nonhazardous wastes generated by LLNL consist of paper, plastics, glass, organic, and other wastes. LLNL does not have onsite solid waste disposal facilities. Solid wastes are collected in dumpsters and similar containers in such a manner as to ensure that they do not contain hazardous or radioactive wastes and transported to the Vasco Road Landfill for disposal.

If industrial wastewater generated by LLNL operations exceeds permissible discharge limits and is treatable by permitted LLNL waste treatment units, the water is processed to meet the release criteria and then monitored as it is discharged to ensure that permissible discharge limits are not exceeded. These wastes enter the city of Livermore's sewer system and are then processed at the city's Water Reclamation Plant. The treated wastewater is piped to San Francisco Bay for discharge, except for a small volume that is used for summer irrigation of the municipal golf course adjacent to the Livermore Water Reclamation Plant. Sludge from the treatment plant is disposed of in offsite landfills.

LLNL has an onsite sewage diversion and retention system that is capable of containing approximately 757 cubic meters (m^3) (26,700 cubic feet [ft^3]) of potentially contaminated sewage until it can be analyzed and appropriate handling methods implemented. If the liquids cannot be processed for discharge, they are packaged for treatment or disposal at an offsite facility. Treatment residues, or solids generated from the treatment process, are also packaged for treatment or disposal at an offsite facility.

I.4.1.2 *Environmental Impacts*

The following sections describe the potential environmental impacts for land use and visual resources, air quality and noise, water resources, ecological resources, cultural and paleontological resources, and socioeconomics from constructing and operating NIF at LLNL. In addition, impacts associated with radiation, hazardous chemicals, and waste management are described.

I.4.1.2.1 Land Use and Visual Resources

I.4.1.2.1.1 *Land Use*

Impacts to land use at LLNL from construction and operation of NIF would be limited to the clearing of land, minor and temporary disruptions to contiguous land parcels, and a slight increase in vehicular traffic. No significant impacts to onsite or offsite land uses are anticipated from the project. The proposed location for the two buildings requiring construction for NIF would occupy a large parcel of relatively flat, vacant land in the northeastern corner of LLNL (figure I.3.4.1.1–2). The proposed location is in a section of LLNL where similar types of research and experimentation already occur. Therefore, no conversion of existing land use would result. The NIF buildings would require the clearing of an estimated 8 ha (20 acres) of land for structures, walkways, building access, and buffer space. Such acreage would account for approximately 11 percent of the land currently available for development inside the LLNL site boundaries (Gawronski 1995). An additional 2.0 ha (4.9 acres) would be cleared for a construction laydown area (figure I.3.4.1.1–2). This area would be restored after NIF construction is completed. No impacts to land use (including zoning) on land outside of LLNL or in nearby communities would be expected.

With appropriate erosion and sediment control measures, soil impacts during construction of NIF would be short term and minor. Seismic risks would be taken into account during construction and operation of NIF.

I.4.1.2.1.2 *Visual Resources*

With the exception of minor, temporary impacts (fugitive dust, equipment exhaust, etc.) associated with construction activities, no impacts to the visual character of LLNL or to surrounding visual resources would be expected. The Laser and Target Area and the Optics Assembly buildings would be constructed in a sector of LLNL that has similar structures. The plot that would contain the two new facilities consists of grassland and a few trees that are visually uniform and not distinct or unique. Because so much of LLNL is developed, views into the installation from surrounding points would not be altered by the two new buildings.

I.4.1.2.2 Air Quality and Acoustics

I.4.1.2.2.1 *Air Quality*

The potential air quality impacts resulting from construction and operation of NIF are discussed separately because the air pollutant emissions generated during construction would not occur during NIF operations.

Construction Emissions. Estimated construction emissions, including site-clearing emissions and emissions associated with facility construction, are listed in table I.4.1.2.2.1–1. The construction emission estimates are based on characteristics of the proposed LLNL location and on construction vehicle exhaust and fugitive emissions. Site clearing would occur the first year, followed by facility construction during the next four years (LLNL 1995b).

TABLE I.4.1.2.2.1–1.—*Estimated National Ignition Facility Construction Emissions for the Lawrence Livermore National Laboratory Location*

Pollutant	Total Emissions (t/yr)[a]
Particulate matter 10 microns or smaller	14.51[b]
Volatile organic compounds	0.44
Carbon monoxide	1.23
Nitrogen dioxide	3.76
Sulfur dioxide	0.43
Lead	Negligible

[a] Metric tons (1,000 kg) per year.

[b] Includes 4.17 t/yr (4.60 ton/yr) of fugitive emissions for site clearing, using water spray control that occurs during a 30-day period in the first year and 10 t/yr (11.02 ton/yr) of facility construction emissions that occur for 11 months during the first year of construction.

Source: Lazaro et al. 1996.

The site-clearing phase of construction, which would continue for about one month, would produce the greatest amount of fugitive dust (particulate matter of 10 microns or less [PM_{10}]) emissions. The Industrial Source Complex, Short-Term Model, Version 2 (ISCST2, Version 93109 [EPA 1992a-b]) was used to determine the impact of site-clearing activities on ambient air quality. The Industrial Source Complex dispersion model is the EPA's preferred regulatory modeling tool for most applications in simple terrain (EPA 1995a). The ISCST2 Model was chosen because the general area from NIF location to nearby receptors of concern is relatively flat and is characterized as simple terrain. The data selected for modeling air quality were 1994 surface meteorological data from the LLNL site (LLNL 1995d). The surface wind speeds and directions are summarized in an annual wind rose (see figure I.4.1.1.2.1–1). In addition, a constant mixing height of 600 m (1,970 ft) was used throughout the year (LLNL 1995d). Detailed emission inventories associated with site clearing and facility construction; meteorological data used; and air quality model, assumptions, and model input parameters are presented in Lazaro et al. (1996).

The national and state 24-hour PM_{10} standards are 150 and 50 micrograms (μg)/m^3, respectively. The 24-hour average PM_{10} background concentration of 84 μg/m^3 is already above the State Ambient Air Quality Standard (SAAQS) of 50 μg/m^3 (see table I.4.1.1.2.2–1). Accordingly, site clearing should be conducted so as to minimize further impacts on ambient air quality. With a conventional water-spraying dust control system (that is, 50-percent control for excavation and 60-percent control for traffic on unpaved roads), maximum 24-hour average PM_{10} concentrations of 104 μg/m^3 over background are predicted at the site boundary (about 350 m [1,150 ft] east of the proposed NIF location). Operation with additional dust control measures that involve continuous water spraying and/or use of a chemical dust suppressant, would reduce PM_{10} dust emissions from excavation by 75 percent and PM_{10} emissions from traffic on unpaved roads by 90 percent. These measures would bring maximum 24-hour average PM_{10} concentrations down to 46 μg/m^3 over the background concentration. Including background concentration, maximum 24-hour concentrations would still be higher than the SAAQS for PM_{10}. The ambient air quality impacts associated with site clearing would be limited to the area just outside the site boundary, which the general public is expected to occupy infrequently. In addition, site clearing at LLNL would be expected to last for only a month, so ambient air quality impacts associated with site clearing would be local and temporary.

Modeling efforts showed that over a year, the six highest 24-hour PM_{10} concentration levels in descending order would be 62, 50, 43, 43, 43, and 36 μg/m^3 above the background concentration. These levels were predicted for an area near the eastern boundary, which is the closest to the NIF location. In addition, annual average PM_{10} concentrations were estimated for the entire one-year construction period, which consists of one month for site clearing, followed by facility construction. The estimated highest annual arithmetic mean PM_{10} concentration level of 5 μg/m^3 above the background concentration is well below the state standard of 30 μg/m^3 in terms of geometric mean. (Note that the arithmetic mean is greater than or equal to the geometric mean.) As a consequence, long-term ambient air quality impacts associated with NIF construction would be minor. However, short-term ambient air quality impacts resulting from site clearing could be moderate, although local and temporary in extent. Additional regulatory information is provided in section I.5.2.1.

Emissions During Operations. Air pollutant emissions from operation of NIF at LLNL are expected to occur primarily from fuel combustion and solvent cleaning of the debris shields. Emissions of solvent volatile organic compounds (VOCs) (ethanol) from debris shield cleaning are estimated at about 0.50 metric tons per year (t/yr) (0.55 ton/yr) (LLNL 1995b). Other potential air pollutant emission sources not considered significant are target destruction under either the Conceptual Design or Enhanced options, emissions from vehicles used for freight shipments and employee commuting, and emissions from welding operations at the Fabrication Facility.

As indicated in table I.4.1.2.2.1–2, estimated air pollutant emissions due to NIF operation are well below 1 t/yr (1.1 ton/yr), except for nitrogen dioxide, which is below 2 t/yr (2.2 ton/yr). Estimated air pollutant emissions from NIF operations are less than 10 percent of LLNL 1994 emissions, except for carbon monoxide, which is approximately 11 percent of 1994 emissions. Existing ambient concentrations for these pollutants (see section I.4.1.1.2.2, table-I.4.1.2.2.1–1) are well below the ambient air quality standards except for PM_{10} and ozone. The increase of 0.16 t/yr (0.18 ton/yr) PM_{10} is less than 5 percent of LLNL 1994 emissions and is not expected to cause a measurable increase in the 24-hour and annual average ambient concentrations. VOC emissions related to NIF operations are estimated to increase by less than 5 percent for the existing emissions at LLNL. Estimated NIF VOC operating emissions at LLNL are 0.56 t/yr (0.61 tons/yr). Total 1995 VOC emissions for the BAAQMD are 269,248 t/yr (296,173 tons/yr) and from fuel combustion are 6,654 t/yr (7,319 tons/yr). Therefore, NIF contribution of VOCs to production of ozone would be almost insignificant (Mangat 1995). On the basis of this information, it can be concluded that NIF operations would have no adverse impact on air quality and would not contribute to a violation of the ambient air quality standards.

The NIF annual energy requirements based on heat and hot water demand for the Laser and Target Area Building and all necessary support facility buildings are listed in table I.4.1.2.2.1–3. All candidate sites would require construction of the Laser and Target

TABLE I.4.1.2.2.1–2.—*Annual Emission Increases with National Ignition Facility Operation at Lawrence Livermore National Laboratory*

Pollutant	1994 Emissions[a] (t/yr)	Projected NIF Emissions (t/yr)[a]	1994 Emissions Plus NIF (t/yr)	NIF Percent of 1994 Emissions
Particulate matter 10 microns or smaller	3.36	0.16	3.52	8.8
Volatile organic compound	13.10	0.56	13.66	4.3
Carbon monoxide	3.99	0.43	4.42	11
Nitrogen dioxide	23.50	1.79	25.29	7.61
Sulfur dioxide	0.37	0.03	0.40	9
Lead	<0.01	Negligible	<0.01	Negligible

[a] Emissions based on site-estimated natural gas external combustion, diesel internal combustion, and volatile organic compound solvent cleaning (0.5 t/yr [0.55 ton/yr]) and emission factors (EPA 1995c; Lazaro et al. 1996).

Source: EPA 1993; Zahn 1995.

Area Building. None of the candidate sites would require construction of the full complement of support facilities that are represented by the annual support facilities energy demand in table I.4.1.2.2.1–3. Therefore, NIF annual energy demand and resulting air pollutant emissions differ among sites based on the area of new buildings required. The ratio of the sum of new support building construction area to the sum of the area for all NIF required support buildings was used to adjust support building energy demand for each candidate site (see table I.3.4–1 for a listing of new buildings required by NIF for each candidate site).

Table I.4.1.2.2.1–2 lists the estimated LLNL annual air pollutant emissions on the basis of the anticipated NIF annual energy requirements provided in table I.4.1.2.2.1–3, adjusted to recognize that at LLNL only one new support building (area of 1,858 square meters [m^2] [20,000 square feet {ft^2}]) would be required out of the total complement of support buildings (area of 26,722 m^2 [287,643 ft^2]) indicated in table I.3.4–1. Published emission factors (EPA 1995b) were used to estimate the emissions. Emissions of VOCs from solvent cleaning are included. For comparative purposes, table I.4.1.2.2.1–2 includes the LLNL 1994 site-wide emissions. More detailed information on emission estimates is provided in Lazaro et al. (1996).

The BAAQMD may require that NIF external combustion facilities (boilers) be equipped with the best available control technology (BACT) for criteria and organic pollutants (Regulation 2, Rule-301) (BAAQMD 1995). BACT will be determined by the permitting process. EPA New Source Performance Standards would limit boiler nitrogen oxide air pollutant emissions according to the boiler-rated heat input. Gas-fired boilers with rated heat input greater than 105,600 megajoules per hour (MJ/hr) (100 million British thermal units per hour [Btu/hr]), but not over 264,000 MJ/hr (250 million Btu/hr), are limited to New Source Performance Standard nitrogen oxide emissions ranging from 43 to 86 nanograms per joule (ng/J) (depending on the heat release rate, which is a function of the furnace volume [40 CFR 60.44b]). There are no New Source Performance Standard emission limits for gas-fired boilers with a rated heat input at or less than 105,600 MJ/hr (40 CFR 60.40c).

VOC emissions, primarily ethanol (see Lazaro et al. 1996), from solvent cleaning of debris shields and treatment/refurbishment of optics and laser components would require no controls but might require emission offsets from the Small Facility Banking Account (Regulation 2, Rule 2-302). The Small Facility Banking Account was established by BAAQMD to provide emission offsets for small air pollutant emission facilities such as NIF. Additional regulatory information is presented in section I.5.2.1.

I.4.1.2.2.2 *Acoustics*

During the site-clearing phase of construction of NIF at the LLNL site, noise from construction equipment would cause an increase of 14 decibels (dB) (from 55-dBA to 69 dBA) in the average outdoor daytime sound level at the location of the maximally exposed individual 800 m (2,600 ft) east-northeast of the NIF target chamber room location on the eastern side of Greenville Road. The Composite Noise Rating

TABLE I.4.1.2.2.1–3.—*Estimated Annual Energy Requirements for the National Ignition Facility*

Facility	Use	Fuel Type	Annual Energy Consumption
NIF Laser and Target Area Building	Heating, ventilation, and air conditioning	Natural gas	2.11×10^7 MJ
	Domestic hot water	Natural gas	3.11×10^5 MJ
	Stand-by power	Diesel	320 L
NIF Support Facilities[a]	Heating, ventilation, and air conditioning and hot water	Natural gas	1.95×10^7 MJ
	Stand-by power	Diesel	5,500 L

[a] Represents energy consumption for all required NIF support facilities. See table I.3.4–1 for a list of NIF support facilities.

Note: MJ - megajoule(s); L -liter(s).

Source: LLNL 1995b; White 1995e.

(CNR) rank, adjusted for the estimated preexisting background level and for temporal and conceptual characteristics of the sound, is expected to be "F." Noise with CNR ranks "A" through "D" is generally considered to be acceptable, with "A" representing essentially no impacts. Rankings above "D" are usually addressed with mitigative measures unless the source is temporary.

The average outdoor daytime sound level at the nearest laboratory building would be expected to increase by 4 dB, to 59 dBA. The adjusted CNR rank for the resulting sound would be "B." This "B" rating for modified CNR refers to general activity outside the nearest laboratory building, as compared to ambient background levels. Noise from NIF construction is not included in the "B" rating. The average daytime sound level at the residential area approximately 1.6 km (1.0 mi) west of the construction site would not be expected to increase over the existing average daytime sound level, estimated to be 61 dBA.

These noise level predictions are estimates based on the assumptions given in Lazaro et al. (1996). The noise levels produced during construction are not expected to have a significant impact on LLNL employees or on staff working inside the veterinary hospital (nearest offsite public receptor). Complaints of annoyance may be expected from hospital employees working outside the hospital during heavy construction periods. However, noise levels are not expected to result in hearing loss or interference with speech.

I.4.1.2.3 Water Resources

Construction of NIF at LLNL would be expected to have minor to negligible effects on water quality. The current water supply and wastewater treatment capacities are expected to be sufficient to meet the requirements of NIF.

During construction, about 2.95 MLY (0.78 MGY) of water would be required (LLNL 1995b). The wastewater generated during construction would be handled by the existing sewer and treatment systems. The wastewater volume would be less than the water requirement of consumptive uses, such as incorporation into concrete and evaporation. Sanitary sewer discharges from LLNL go to the city of Livermore wastewater collection system, which is currently being renovated to reduce infiltration and inflow experienced during periods of heavy rainfall.

Water and wastewater utility requirements for NIF operations at LLNL are shown in table I.4.1.2.3–1. The total raw water supply required for NIF would be about 152 MLY (40 MGY), of which about 18 MLY (4.7 MGY) would be for domestic use. The additional sanitary wastewater volume from NIF operations is estimated to be 18 MLY (4.7 MGY). A sewer diversion facility protects against accidental release of contaminants not usually associated with sewage into the Livermore treatment plant (LLNL 1994d). The wastewater volume at the LLNL site would increase about 4.5 percent as a result of NIF operations. The sewer diversion facility is capable of handling the projected increase. Wastewater containing nonsewage-related contaminants would be pretreated before release to the Livermore treatment plant.

Potential impacts of stormwater runoff from both the NIF and construction laydown locations on surface water quality are expected to be minor because NIF would be operated under the Livermore Site Industrial Activity Stormwater Pollution Prevention Plan

TABLE I.4.1.2.3–1.—*Water and Wastewater Utility Capacity at Lawrence Livermore National Laboratory*

Utility System	Current Usage	NIF Requirement[a]	Projected Usage, Including NIF[b]	Current Capacity[b]
Water supply (MLY)	967[b]	152	1,119	3,980
Wastewater treatment (MLY)	402[c]	18	420	2,340

[a] From LLNL 1995b.
[b] From LLNL 1995b and Paisner 1995.
[c] From LLNL 1994d.

to be developed in accordance with California Department of Transportation specification Section 7–1.0G and LLNL's General Construction Activity Stormwater Permit. The proposed bridge spanning Arroyo Las Positas to the staging area (option I) would be constructed so that its structure and supports would not increase the risk of a 100-year flood breaching the banks of the arroyo. The proposed NIF location has minimal flooding potential because it is outside the 500-year floodplain of Arroyo Las Positas although the staging area (option I) would be within the 500-year floodplain (figure I.4.1.1.3.–1). The staging area (option I) would not be used to store highly volatile, toxic, or water reactive materials. Therefore, locating the staging area in the 500-year floodplain would pose no environmental risk.

However, the proposed NIF location is within the 2000-year floodplain for Arroyo Los Positas. Nevertheless, severe flooding at NIF due to overflow of the arroyo would be relatively slow to develop. This would allow the opportunity to secure radioactive and hazardous material inventories and move them to a safe location. A severe flood could result in facility and equipment damage, but the likelihood of such an event would be small over the 30-year operational lifetime of NIF.

Potential effects of NIF on groundwater would be minor to negligible. No groundwater would be used for NIF, and no wastewater would be discharged to aquifers. Groundwater recharge at the LLNL site might be slightly reduced because of additional paved surface areas. Potential impacts of stormwater runoff on groundwater quality are expected to be negligible because NIF would be operated under the Industrial Activity Stormwater Pollution Prevention Plan.

I.4.1.2.4 Biotic Resources

I.4.1.2.4.1 *Terrestrial Resources*

The NIF location at LLNL would occupy a 8.1-ha (20.0-acre) parcel of grassland. The 2.0 ha (4.9 acres) areas designated as optional sites for the temporary staging area contain grassland (option I) or maintained lawns (options II and III) (figure I.3.4.1.1–2). Vegetation within these areas would be eliminated by construction and spoils disposal, resulting in a minor loss of habitat. This loss would be considered a slight adverse impact. Construction could also affect nearby vegetation through the deposition of dust and other particulates from soil disturbance and from the operation of vehicles and large machinery. This deposition could inhibit photosynthesis and, if chronic, result in a limited amount of plant mortality. In addition, soil compaction caused by heavy machinery could destroy the plants and indirectly damage roots of plants from adjacent areas by reducing soil aeration and altering soil structure. However, impacts from dust and compaction would be temporary, localized, and limited to common species that are found in disturbed areas. The quality of the vegetative community at the proposed NIF location is marginal, and since construction would occur in an area of previous disturbance, potential impacts are considered negligible.

Impacts to wildlife from NIF construction would include (1) loss and alteration of habitat and (2) disturbance of individual animals by noise and human activity. Suitable alternative habitats, and escape pathways to those habitats, exist for displaced individuals. However, these animals could face stronger competitive pressures, potentially resulting in the loss of individual animals. It is unlikely that construction activities would be a threat to the continued survival of any local wildlife populations.

The areas occupied by NIF buildings, equipment, access roads, and parking lots would be unavailable to wildlife for the life of the project. The construction laydown area would be unavailable to wildlife during the construction period. It would be restored to existing conditions following construction. Vegetation should be reestablished within a few growing seasons. Some portions of the NIF site, particularly those around the main buildings, would be landscaped with lawns and scattered bushes and trees. Such habitat currently exists around other LLNL facilities and is of limited use to many wildlife species. Nevertheless, species adapted to suburban areas would readily inhabit or utilize these areas.

Few impacts would occur to terrestrial biota during operation of NIF. Increased traffic and local disturbances could lead to increased losses of road-killed individuals of some species, but this impact is not considered significant.

I.4.1.2.4.2 *Wetlands and Aquatic Resources*

It is DOE policy (10 CFR 1022) to avoid impacts to wetlands to the maximum extent practicable, in compliance with Section 404 of the *Clean Water Act* and Executive Order 11990 (*Protection of Wetlands*). Because the proposed NIF location is nearly 300 m (1,000 ft) from the nearest wetland, the construction and operation of NIF would not be expected to affect wetlands at LLNL. The location of the temporary access bridge across Arroyo Las Positas for the option I staging area would be about 100 m (328 ft) east of the nearest wetland, and, thus, would not impact wetland habitat. The option I staging area would be the closest alternate laydown area to the wetland. It would be at least 23 m (75 ft) from the nearest wetland. Temporary barriers would be used to prevent inadvertent impacts to the wetland.

The potential for adverse impacts to aquatic resources would be extremely low because no waterbodies are located in the immediate vicinity of the construction area. Generally, impacts to surface waters from construction activities occur as a result of (1) habitat destruction or modification from construction activities within the waterbody or (2) increases in turbidity, sedimentation, or chemical contamination from runoff. Overall, construction impacts to aquatic resources at LLNL would not be considered significant because (1) critical habitats (such as spawning or rearing areas) for important species (recreational, commercial, or listed species) do not occur at the proposed NIF location and therefore would not be affected and (2) increased sedimentation, habitat removal or modification, or potential spills (such as of fuel) would be localized, short term, and mitigable. The increase in impervious land surface associated with NIF could increase runoff, which could accelerate erosion of unstable soils and add to the contaminant load entering nearby waterbodies. However, a stormwater pollution prevention plan would be implemented to control such events (section I.4.1.2.3). Landscaping around new NIF buildings would also minimize surface erosion and site runoff.

I.4.1.2.4.3 *Rare, Threatened, and Endangered Species*

No deleterious impacts to listed species would be expected from construction or operation of NIF. NIF would be located on previously disturbed grassland habitat that is surrounded primarily by developed laboratory facilities. Thus, NIF location does not provide suitable habitat for the listed species that could exist at LLNL. White-tailed kites have nested near the East Gate of LLNL. Mitigative measures that would be taken so that NIF construction traffic would not affect this species (that is, rerouting traffic during nesting) are discussed in section I.4.7. However, construction of the option I staging area and its access road could impact the western burrowing owls by reducing potential foraging habitat or disrupting resident individuals. Nevertheless, loss of foraging area is not expected to adversely affect this species, and burrows of this species would be avoided during construction.

I.4.1.2.5 Cultural and Paleontological Resources

Construction and operation of NIF would have no effects on archaeological sites or historic structures listed on or eligible for the *National Register of Historic Places* (NRHP) or important paleontological remains because these resources are absent in the affected area. Consultation is in progress to determine whether the proposed project could affect Native American cultural resources.

I.4.1.2.6 Socioeconomics

Locating NIF at LLNL would have a minor impact on socioeconomic conditions in the economic study region and in the ROI described in section I.4.1.1.6. This is because LLNL is located in a diverse regional economy with extensive inter- and intraregional, national, and global economic interactions and linkages. Also, because the NIF partnership would include representatives from government, industry, and the academic sectors throughout the United States, procurement and investment would be dispersed over a number of different regions, damping the concentration of economic effects of the program.

The following sections describe the effects of constructing and operating NIF on the host region's economy and employment, and on population and housing, public finances, public services, and local transportation in the ROI.

I.4.1.2.6.1 *Regional Economic Impacts*

Slight changes in employment and levels of economic activity in the economic study region would occur from local spending of employee wages, procurement of goods and services (including construction materials), and other local investment associated with constructing and operating NIF. In addition to creating new jobs (direct) at the site, indirect job opportunities, such as community support services, would also be created in the economic study area as a result of these new direct jobs. The total new jobs created (direct and indirect) would contribute slightly to reduce unemployment and increase income and economic output in the regional economy during both the construction and operation of NIF. Table I.4.1.2.6.1–1 presents the potential impacts to the regional economy if NIF were located at LLNL.

The construction force for NIF at LLNL would peak at approximately 470 direct jobs in 1998. Construction-related procurement would indirectly create nearly 2,400 additional jobs in the economic study area. Employment for operation would begin phasing in as construction neared completion. Direct employment related to operations is projected at 330, with more than 560 indirect jobs created throughout the economic study area. As a result of constructing and operating NIF, the baseline compounded average annual growth rate from 1995 to 2003 would increase by 0.002-percentage points.

Peak earnings associated with the 470 direct jobs created in 1998 are projected at approximately 27.1 million dollars. Construction-related procurement would indirectly create more than 60 million dollars in regional earnings. Direct earnings related to operations are projected to reach nearly 14 million dollars, with 16.5 million dollars in indirect earnings added to the regional economy.

I.4.1.2.6.2 *Population and Housing*

Construction. Population in-migration resulting from NIF construction phase demands would begin in 1996 and peak in 1998, with a projected cumulative total of nearly 1,600 people moving into the ROI over the 3-year period (table I.4.1.2.6.1–1). This population increase would result in demand for an additional 580 housing units in the ROI. Baseline projections of the ROI housing market from 1996 (NIF construction start date) through 1998 indicate that nearly 54,000 housing units would be available over the 3-year period. The demand for additional housing units in the LLNL region for NIF-related in-migration would absorb approximately 1 percent of the estimated supply of vacant housing stock in the ROI. Most of this housing demand would be temporary and would primarily affect the renter segment of the ROI housing market. The NIF project would stimulate little demand for new housing construction because of the number of vacant housing units within the ROI and the proximity of LLNL to many communities in northern California with the ability to provide both temporary and permanent housing for in-migrating workers.

Operations. Population in-migration resulting from NIF operation phase demands could result in an additional 360 people moving into the ROI. While additional demand for housing would be longer term relative to construction, no perceptible strain on the market is expected, assuming that the general conditions associated with the housing market continue.

I.4.1.2.6.3 *Public Finance*

Construction. Given the population and economic growth associated with NIF during the construction phase, fiscal balances (revenues and expenditures) are expected to increase slightly for all the jurisdictions within the ROI. Short-term public financial impacts would peak during 1998 and would then decline as construction neared completion in 2002. Since the largest percentage of socioeconomic impacts are expected to occur in Alameda County (assuming current residential patterns), that county would experience larger fiscal impacts than elsewhere in the ROI (table I.4.1.2.6.1–1).

Operations. The increase in population and economic growth as a result of NIF operations would slightly increase fiscal balances (revenues and expenditures) for all counties within the ROI, with the greatest impact in Alameda County. Fiscal impacts would remain relatively stable from the initial impact in 2003 through the duration of NIF operations.

I.4.1.2.6.4 *Public Services*

By 1998, Alameda County would need to hire five additional teachers and three additional doctors to maintain its current level of service. By 2003, when operations start, Alameda County would only need

TABLE I.4.1.2.6.1–1.—*Potential Socioeconomic Impacts in the Lawrence Livermore National Laboratory Area*

	NIF Alternative Change Over Reference Baseline		Reference Baseline	
Parameters	Peak Construction 1998[a]	Operations 2003[b]	1996 to 2002[a]	2003[b]
Regional Employment				
Direct jobs	470	330		
Indirect jobs	2,400	560		
Total jobs	2,870	890	70,000 additional jobs projected annually	50,000 additional jobs projected
Regional Aggregate Earnings[c]				
Direct earnings	27.07	13.81		
Indirect earnings	62.08	16.47		
Total earnings	89.15	30.28		
Regional Population Migration				
ROI in-migrating population	1,600	360	29,000 additional people annually	24,200 additional people
Regional Housing Demand				
Number of housing units in the ROI	580	130	55,000 vacant housing units (annual average)	59,000 vacant housing units
Local Transportation				
Number of trips generated at site per day	902	630		
Public Finance				
Percent change over 1995 fund balance (Alameda County)	-0.03	-0.02	NA[d]	NA
Public Services (LOS)				
Change in service demand (Alameda County)				
Police	0	0	762[d]	832
Fire	0	0	92[d]	100
General	7	2	11,230[d]	12,264
Physicians	3	1	3,923[d]	4,285
Teachers	5	1	7,001[d]	7,646

[a] Construction period would be 1996 to 2002, with peak construction projected to occur in 1998.
[b] Operating period would be 2003 to 2033, with impacts throughout the period projected to remain stable.
[c] Regional earnings are in millions of constant 1994 dollars.
[d] Projected 1998 fund balance for Public Finance, and projected 1998 level of service (LOS) for Public Services.
Source: Model results.

one additional teacher and one additional doctor over the baseline conditions to maintain their level of service (table I.4.1.2.6.1–1).

I.4.1.2.6.5 *Local Transportation*

In 1995, LLNL employed about 8,300 persons. Direct employment generated by the NIF project at LLNL for the life cycle of the project (1996 to 2033) would range from a maximum of 470 new jobs in 1998 to a minimum of 80 new jobs in 2001. The 470 new jobs at LLNL have the potential to generate up to 902 new vehicle trips per day (table I.4.1.2.6.1–1). These additional trips could increase congestion on roads around LLNL, particularly East Avenue (table I.4.1.2.6.5–1).

Indirect jobs could affect traffic flow within the LLNL region, depending on where those jobs were located. However, if the new indirect jobs were sufficiently dispersed, the road network in the San Francisco metropolitan area would likely handle new trips generated by indirect jobs associated with NIF.

I.4.1.2.6.6 *Environmental Justice*

Minorities, but not low-income persons, are clustered disproportionately in the local vicinity of the LLNL site (section I.4.1.1.6.5). Thus, the local area impacts from the construction and operation of NIF could disproportionately affect minorities. However, none of the local area environmental or health impacts from the construction and operation of NIF would be highly adverse or significant. Therefore, no environmental justice issues for local area impacts have been identified for this site.

For the population in the region within 80 km (50 mi) of LLNL, both minorities and low-income populations are in lower proportion to other populations than in California as a whole (section I.4.1.1.6.5). Thus, no environmental justice issues for regional impacts are identified for this site.

I.4.1.2.7 Radiation and Hazardous Chemicals

This section describes potential radiological and hazardous chemical impacts that could result from normal operations and postulated accidents of NIF at LLNL. Methods, data, and assumptions used in estimating these impacts are presented in Lazaro et al. (1996).

I.4.1.2.7.1 *Normal Operations*

The general public living in areas surrounding the LLNL site and workers at LLNL may be exposed to small quantities of radionuclides released and radiation emitted from routine NIF operations; however, the expected level of radioactive releases and radiation emissions would be well within regulatory limits. No impacts from hazardous chemicals should occur because only minute quantities of hazardous VOCs are expected to be emitted during routine NIF operations. Impacts from routine transportation of tritium targets would also not be expected, because there would be no detectable levels of radiation outside the packages carrying the low-energy beta-emitting tritium targets.

Table I.4.1.2.7.1–1 summarizes the potential impacts of radiation exposures from the Conceptual Design and the Enhanced options of NIF operations at LLNL.

TABLE I.4.1.2.7.1–1.—*Potential Radiological Impacts from Normal Operations of the National Ignition Facility at Lawrence Livermore National Laboratory*

Receptor	Conceptual Design Option	Enhanced Option
Maximally Exposed Individual		
Dose (mrem/yr)	0.04	0.1
Percent of natural background	0.01	0.03
30-year fatal cancer probability	$6x10^{-7}$	$2x10^{-6}$
Population Within 80 Km		
Dose (person-rem/yr)	0.07	0.2
Percent of natural background	$3x10^{-6}$	$8x10^{-6}$
30-year fatal cancers	0	0
Workers Onsite		
Dose (person-rem/yr)		
Non-NIF workers	0.06	0.2
NIF workers	10	10
30-year fatal cancers	0	0

Source: Model results.

Impacts to the Public. For the Enhanced Option, the estimated radiation dose from all NIF sources to a

TABLE I.4.1.2.6.5–1.—*Future Traffic Impacts from National Ignition Facility Project on Lawrence Livermore National Laboratory Access Roads*

Route	From	To	Estimated 1995 AADT	Estimated Background and Peak Project Year AADT (1998)	Estimated Percent Change in AADT Between 1995 and Peak Construction Year (%)	Estimated 1995 LOS	Estimated Background and Peak Construction Year LOS (1998)
Patterson Pass Road	Vasco Road	Greenville Road	1,040	1,145	10	A	A
East Avenue	Vasco Road	Greenville Road	11,250	11,520	2	A	B
East Avenue	Buena Vista Avenue	Vasco Road	13,800	14,080	2	A	A
East Avenue	Hilcrest Avenue	Buena Vista Avenue	18,700	19,000	2	A	A
Telsa Road	Vasco Road	Greenville Road	2,600	2,700	4	A	A
Telsa Road	Buena Vista Avenue	Vasco Road	6,400	6,590	3	A	A
First Avenue	N. Mines Road	Las Positas Road	28,300	28,850	2	B	B
Vasco Road	Brisa Street	Patterson Pass Road	18,300	18,900	3	A	A
Vasco Road	West Gate Drive	Misquitte Way	13,500	14,200	5	B	B
Vasco Road	East Avenue	Telsa Road	4,150	4,400	6	A	A
Greenville Road	Patterson Pass Road	Lupin Way	5,200	5,370	3	A	A

Note: AADT - annual average daily trips; LOS - level of service.
Source: DOE and UC 1992.

maximally exposed member of the public located about 400 m (1,300 ft) east of NIF is 0.1 mrem/yr, which is much less than the dose limit of 100 mrem/yr resulting from all pathways combined (DOE 1990). The likelihood of the maximally exposed individual contracting a fatal cancer would be 1 in 500,000 for the entire operational life of NIF (dose/yr x 30-yr x fatal cancer risk factor of $5x10^{-4}$/rem). The estimated radiation dose to the surrounding public is 0.2 person-rem/yr; no cancer fatalities would be expected to occur in the public for the entire NIF operations at LLNL. For the Conceptual Design Option, estimated radiation impacts would be about one-third the impacts of the Enhanced Option; therefore, no adverse health effects would result.

Impacts to Workers. In addition to exposure to the radionuclides, the general LLNL workers outside NIF could be exposed to direct radiation resulting from high-yield experiments at NIF. For the Enhanced Option, the estimated radiation dose to these non-NIF workers at LLNL is 0.2 person-rem/yr. No cancer fatalities would be expected to occur among workers for the entire NIF operations at LLNL. For the Conceptual Design Option, estimated radiation impacts would be about one-third the impacts for the Enhanced Option and would carry extremely low risk of adverse health effects.

Potential radiation exposures inside NIF would be kept as low as reasonably achievable through facility design, material selection, shielding, and administrative controls. The design objective is to keep the individual radiation worker dose equivalent to or less than 500 mrem/yr. On average, it is estimated that a NIF worker would receive approximately 30 mrem/yr.

I.4.1.2.7.2 *Postulated Accidents*

Radionuclides and hazardous chemicals could be released by accidents either at NIF or during the transportation of tritium targets from the site of production to NIF. Tables I.4.1.2.7.2–1 and I.4.1.2.7.2–2 summarize potential radiological and transportation impacts to the public and workers from postulated facility and transportation accidents, respectively. A description of each accident scenario evaluated is provided in Lazaro et al. (1996).

TABLE I.4.1.2.7.2–1.—***Potential Radiological Impacts from Postulated Bounding Accident Involving the National Ignition Facility at Lawrence Livermore National Laboratory***

Receptor	Conceptual Design Option	Enhanced Option
Maximally Exposed Individual		
Dose (rem)	0.1	0.2
Fatal cancer probability	$5x10^{-5}$	$8x10^{-5}$
Risk (cancer fatalities/yr)	$1x10^{-12}$	$2x10^{-12}$
Population Within 80 Km		
Dose (person-rem)	260	440
Fatal cancers	0	0
Risk (cancer fatalities/yr)	$3x10^{-9}$	$4x10^{-9}$
Workers Onsite		
Dose (person-rem)	29	49
Fatal cancers	0	0
Risk (cancer fatalities/yr)	$2x10^{-10}$	$4x10^{-10}$

Source: Model results.

Radiological Impacts

Impacts to the Public. The public could be exposed to radionuclides released from a postulated accident at NIF. The bounding accident assumes an earthquake occurring at the time of a maximum-yield experiment with an accidental release frequency of $2x10^{-8}$/yr. For the Enhanced Option, the estimated radiation dose to the maximally exposed member of the public is 0.2 rem. The likelihood of the maximally exposed individual contracting a fatal cancer from this exposure is 1 in 12,000. The estimated radiation dose to the surrounding public is 440 person-rem. No cancer fatalities would be expected to occur among the public following an accident at NIF. For the Conceptual Design Option, estimated radiation impacts are about one-half the impacts from the Enhanced Option. No adverse health effects would be expected to result.

Table I.4.1.2.7.2–1 also indicates that the risk of radiation-caused cancer fatalities from the postulated accident at LLNL would be essentially zero when the anticipated extremely low accident frequency during NIF operations is taken into account. The risk is the product of the estimated radiation dose, fatal cancer risk factor of $5x10^{-4}$, and accident release frequency of $2x10^{-8}$/yr.

TABLE I.4.1.2.7.2-2.—*Potential Radiological Risks and Consequences of Transporting Tritium Targets from Manufacturing Facilities to Lawrence Livermore National Laboratory*

Manufacturing Facility	Conceptual Design Option	Enhanced Option
General Atomics		
Dose risk (person-rem/yr)	9.0×10^{-7}	7.1×10^{-6}
Fatality risk (cancer fatalities/yr)	5×10^{-10}	4×10^{-9}
Nonradiological accident[a] (fatalities/yr)	6×10^{-4}	1×10^{-3}
Nonradiological vehicular emissions (fatalities/yr)	1×10^{-3}	2×10^{-3}
Los Alamos		
Dose risk (person-rem/yr)	2.2×10^{-6}	1.8×10^{-5}
Fatality risk (cancer fatalities/yr)	1×10^{-9}	9×10^{-9}
Nonradiological accident[c] (fatalities/yr)	2×10^{-3}	4×10^{-3}
Nonradiological vehicular emissions (fatalities/yr)	4×10^{-4}	9×10^{-4}
Savannah River		
Dose risk (person-rem/yr)	1.8×10^{-6}	1.4×10^{-5}
Fatality risk (cancer fatalities/yr)	9×10^{-10}	7×10^{-9}
Nonradiological accident[c] (fatalities/yr)	6×10^{-4}	1×10^{-3}
Nonradiological vehicular emissions (fatalities/yr)	4×10^{-4}	9×10^{-4}
University of Rochester		
Dose risk (person-rem/yr)	1.9×10^{-6}	1.5×10^{-5}
Fatality risk (cancer fatalities/yr)	9×10^{-10}	7×10^{-9}
Nonradiological accident[c] (fatalities/yr)	3×10^{-4}	8×10^{-4}
Nonradiological vehicular emissions (fatalities/yr)	4×10^{-4}	9×10^{-4}
Maximum Consequence Accident		
Population[b,c]		
Dose (person-rem)	0.33	3.3
Fatal cancers	2×10^{-4}	2×10^{-3}
Maximally Exposed Individual[b,d]		
Dose (rem)	1.2×10^{-4}	1.2×10^{-3}
Fatal cancer probability	6×10^{-8}	6×10^{-7}

[a] Collective population fatalities were calculated for 145 shipments (Conceptual Design Option) and 335 shipments (Enhanced Option). For example, a reported value of 4×10^{-3} fatalities suggests that no fatalities are expected for the proposed action. However, one single fatality out of the entire affected population might be expected over the course of 250 years if the same number of shipments were to continue for that length of time.

[b] The most severe accidents assume that 100 percent of the target tritium is released in an oxide form during an accident. Accident consequences results were determined using RISKIND computer program which is described in Yuan et al. 1993. Stable weather conditions (Pasquill stability class F) with a wind speed of 1 m/s (2.2 mph) were assumed.

[c] The maximum consequences would result from an accident occurring in an urban environment. The population was assumed to extend at a uniform density of 3,861 persons/km^2 (10,000 person/mi^2) to a radius of 80 km (50 mi) from the accident site. The population exposure pathways for urban environments include inhalation and resuspended inhalation. Urban environments were not assumed to produce food for local use or export, hence no ingestion dose was included.

[d] The maximally exposed individual was assumed to be at the location of maximum exposure. The location of the maximally exposed individual was assumed to be 380 m (1,247 ft) from the accident under stable weather conditions. Individual exposure pathways include acute inhalation during passage of the plume. No ingestion dose was considered.

Note: The transportation risk assessment assumed 100 percent of the tritium targets are manufactured and transported to NIF from each site. In practice, tritium targets would be produced and transported from more than one manufacturer. The transportation risk assessment was performed for offsite transportation only. Transportation risks from onsite tritium targets were assumed to be negligible compared with risks from offsite transportation.

Source: Model results.

Impacts to Workers. For the Enhanced Option, the estimated radiation dose to all workers at LLNL is 49 person-rem. No cancer fatalities would be expected to occur to workers following the postulated accident at LLNL. For the Conceptual Design Option, the estimated radiation impacts are about one-half the impacts of the Enhanced Option. No adverse health effects would be expected. The risk of radiation-caused cancer fatalities would be essentially zero considering the extremely low frequency potential for the postulated accident to occur. LLNL has a comprehensive emergency plan, which would be expanded to incorporate NIF, to ensure protection of workers in case of an accident or natural disaster.

Transportation Impacts. Radiological impacts associated with the transportation of tritium targets would result from a release of tritium into the environment following a transportation accident. Since tritium is a pure beta emitter with no associated gamma radiation, radiological risks associated with routine (incident-free) transportation operations are considered to be negligible. The potential radiological impacts of transporting tritium targets were calculated for truck and air travel. Trucks were assumed to be used to transport the tritium targets from the manufacturing sites to the nearest major airport, while cargo aircraft were assumed to be used to transport the targets to Oakland International Airport. After arriving at the airport, the targets would be transferred to a truck for shipment to NIF at LLNL.

Table I.4.1.2.7.2–2 presents the risks associated with the transportation of tritium targets from each of the tritium manufacturing facilities to NIF at LLNL. Radiological risk from transportation activities is defined as the product of the accident consequence (dose) and the probability of the accident occurring, and is calculated by considering a wide range of accidents, from high-probability, low-consequence events to low-probability, high-consequence events (see Lazaro et al. 1996). Estimated latent cancer fatality risks are obtained by multiplying the dose risk by 0.0005 latent cancer fatalities per person-rem (International Commission on Radiological Protection [ICRP] 1991). Latent cancer fatality risks range from $5x10^{-10}$ to $9x10^{-9}$ per year for all cases. Nonradiological impacts associated with the ground transport of tritium targets are calculated under both routine (incident-free) and accident conditions. Nonradiological population risks for routine operations are calculated by multiplying the distance traveled by truck in urban population density zones by a risk factor for latent mortality from pollutant inhalation (Rao et al. 1982). Nonradiological population risks resulting from vehicular accidents are calculated in a similar manner by multiplying the state-specific accident fatality rate by the distance traveled by truck in the state.

Maximally exposed individual and population doses were calculated for a transportation accident involving the release of the entire tritium cargo (assumed to be five tritium targets). Radiological impacts resulting from a potential maximum consequence accident were assessed for a general population located in an urban population density zone. Maximally exposed individuals were assumed to be exposed and unshielded as the plume passed at a distance resulting in the largest dose to the individual. Radiological consequences were assessed using worst-case weather conditions (Pasquill Stability Class F) for both the collective population and the maximally exposed individual. For assessment purposes, it was assumed that the entire tritium cargo was released to the environment in oxide form. The estimated number of latent cancer fatalities from the maximum-severity transportation accident was calculated by multiplying the population-committed effective dose equivalent by 0.0005 latent cancer fatalities per person-rem (ICRP 1991). Table I.4.1.2.7.2–2 summarizes the impacts resulting from a maximum-consequence accident involved in the transportation of tritium targets.

Hazardous Chemical Impacts. A number of possible chemical accidents were studied in terms of their potential impacts on workers and the public outside the LLNL site boundaries. The four possible accidents likely to have the greatest impacts were studied in detail. The range of accidents considered (including an aircraft crash) and the four selected for more detailed study are discussed in Lazaro et al. (1996). The four accident scenarios considered in detail were as follows:

- A mercury release from the ignitron switches
- A combined alumina/silica release from the target chamber
- A carbonyl fluoride release from the optics treatment area

- A hydrogen fluoride release from the optics treatment area

The nearest public facility to the release points for accidents 1 and 2 is the veterinary hospital to the east. The nearest public facility to the release points for accidents 3 and 4 is the industrial park to the north.

A modeling study was conducted for each of the four release scenarios. More details, including predicted concentrations, are provided in Lazaro et al. (1996). The modeling study applied a dispersion model to each of the releases and used a health criterion representative of acute impacts from an exposure that might happen once in a lifetime. The health criterion (Emergency Response Planning Guidelines-2 [ERPG-2] level) was the concentration below which, if exposure occurred for an hour, would still allow the exposed individual to avoid irreversible health effects by taking emergency action. The results of the modeling yield the following conclusions:

- The threat zone from each of the four accidents would not extend to the boundary with the public under either typical or extreme meteorological conditions

- Nearby buildings and personnel outside would be at risk if any of the four accidents occurred. The assumption was made that the release would not be inhibited by walls of the NIF Laser and Target Area Building, and the wind would take the plume away from the building. The distances beyond which concentrations would fall below the ERPG-2 level for each of the accidents are as follows:

  - Mercury scenario—237 m (778 ft) for both the Conceptual Design and Enhanced options
  - Alumina/silica scenario—171 m (561 ft) for Conceptual Design Option and 231 m (758 ft) for Enhanced Option
  - Carbonyl fluoride scenario—99 m (325 ft) for both the Conceptual Design and Enhanced options
  - Hydrogen fluoride scenario—101 m (331 ft) for both the Conceptual Design and Enhanced options

The personnel in nearby buildings would likely be protected because the release (typically lasting 15 minutes) would pass by the buildings with little infiltration. Personnel in the Laser and Target Area Building and those outside in the immediate vicinity might be affected.

I.4.1.2.8 Waste Management Impacts

This section evaluates potential effects of wastes that would be generated by NIF on current waste management practices at LLNL during construction, normal operation, and the decommissioning of NIF at LLNL.

I.4.1.2.8.1 *Waste Generation and Management During Construction and Operation*

The estimated amounts and types of wastes that would be generated during construction of NIF are listed in table I.4.1.2.8.1–1. Most construction wastes would be nonhazardous and would be handled under conventional construction regulations. Adequate capacity exists at LLNL to handle these wastes. Any hazardous wastes would be handled accordingly, as discussed below.

TABLE I.4.1.2.8.1–1.—*Estimated Amounts and Types of Wastes Generated During Construction of the National Ignition Facility at Lawrence Livermore National Laboratory*

Waste Type	Amount Generated (m^3)
Nonhazardous (sanitary liquid)	14,000
Nonhazardous (sanitary solid)	500
Other nonhazardous (liquid)	900
Other nonhazardous (solid)	900

Source: LLNL 1994b.

Table I.4.1.2.8.1–2 lists the quantities of wastes generated by category for both the Conceptual Design and Enhanced options (Andrews and Tobin 1995). The following discussions describe the proposed disposition of the wastes (using current practices) shown in that table. During operation, various low-level, mixed, hazardous, and nonhazardous wastes would be handled at NIF. Treatment or storage of NIF waste stream would not affect current treatment and/or storage capacities. The quantities of these waste streams at LLNL are presented in tables I.4.1.2.8.1–2 and I.4.1.2.8.1–3. Waste handling

TABLE I.4.1.2.8.1–2.—*National Ignition Facility Waste Estimates for Low-Level, Mixed, and Hazardous Wastes for Both the Conceptual Design and the Enhanced Options (Per Year of National Ignition Facility Operation)*

		Low-Level		Mixed		Hazardous			
						LTAB		OAA	
Source of Waste	Cleaned[a] (m^3)	Solid (m^3)	Liquid (m^3)	Solid (m^3)	Liquid (m^3)	Solid (m^3)	Liquid (m^3)	Solid (m^3)	Liquid (m^3)
1. Vacuum pump oil					0.20				
Chamber pump down					***0.20***				
2. Molecular sieves		0.37							
Tritium processing system		***0.98***							
3. Personal protective equipment and wipes	1.88	0.18	0.60	0.34	0.40				
General cleaning	***4.88***	***0.46***	***1.56***	***0.88***	***1.04***				
4. Pre- and HEPA filters		0.02							
Chamber Ventilation		***0.02***							
Target chamber decontamination									
Chamber hardware decontamination									
5. Hardware from chamber	0.06	0.25							
Diagnostics target positioner	***0.06***	***0.25***							
6. Debris shield	0.24 ea				1.40				
	0.63 ea				***3.74***				
7. Capacitors, oil filled						7.5		0.5	
						7.5		***0.5***	
8. General chemicals							0.50		1.80
							0.50		***4.10***
Conceptual design total/yr		0.82	0.60	0.34	2.00	7.5	0.50	0.5	1.80
Enhanced total/yr		***1.71***	***1.56***	***0.88***	***4.98***	***7.5***	***0.50***	***0.5***	***4.10***

[a] Articles cleaned by wiping, carbon dioxide blasting, and other decontamination methods. These materials would be handled as solid low-level radioactive wastes.

Note: Numbers in bold italics refer to waste estimates for the Enhanced Option; LATB - Laser and Target Area Building; OAB - Optics Assembly Building; HEPA - high-efficiency particulate air.

Source: Andrews and Tobin 1995; Bowers 1995.

TABLE I.4.1.2.8.1–3.—*National Ignition Facility Waste Estimates for the Conceptual Design and the Enhanced Options After Implementation of Waste Minimization Techniques*

		Low-Level		Mixed		Hazardous			
						LTAB		OAA	
Source of Waste	Cleaned[a] (m³)	Solid (m³)	Liquid (m³)	Solid (m³)	Liquid (m³)	Solid (m³)	Liquid (m³)	Solid (m³)	Liquid (m³)
1. Vacuum pump oil					0				
Chamber pump down					***0***				
2. Molecular sieves		0.04							
Tritium processing system		***0.09***							
3. Personal protective equipment and wipes	1.88	0.18	0.30	0.25	0.30				
General cleaning	***4.88***	***0.46***	***0.78***	***0.65***	***0.78***				
4. Pre and HEPA filters		0.02							
Chamber Ventilation		***0.02***							
Target chamber decontamination									
Chamber hardware decontamination									
5. Hardware from chamber	0.06	0.12							
Diagnostics target positioner	***0.06***	***0.12***							
6. Debris shield	0.24 ea				0				
	0.63 ea				***0***				
7. Capacitors, oil filled						1.38		0.5	
						1.38		***0.5***	
8. General chemicals							0.5		0.18
							0.5		***0.41***
Conceptual design total/yr		0.36	0.30	0.25	0.30	1.38	0.5	0.5	0.18
Enhanced total/yr		***0.69***	***0.78***	***0.65***	***0.78***	***1.38***	***0.5***	***0.5***	***0.41***

[a] Articles cleaned by wiping, carbon dioxide blasting, and other decontamination methods. These materials would be handled as solid low-level radioactive wastes.

Note: Numbers in bold italics refer to waste estimates for the Enhanced Option; LATB - Laser and Target Area Building; OAB - Optics Assembly Building; HEPA - high-efficiency particulate air.

Source: Andrews and Tobin 1995; Bowers 1995.

methods would be the same for both the Conceptual Design and Enhanced options. While total waste quantities would be somewhat higher for the Enhanced Option, no changes in handling methods would be necessary. Successive sections cover how developing technologies might be applied to minimize waste streams and, finally, disposition of wastes from decommissioning.

Low-Level Waste. The solid LLW processed during NIF operations would be disposed of at the Nevada Test Site (NTS). LLNL presently generates waste streams similar to those that would be produced by NIF, and those wastes are currently approved for disposal at NTS. Further details and a discussion of low-level liquid waste handling are presented in section I.4.1.1.8.1.

Mixed Waste. Solid mixed wastes would be sent to an appropriately licensed commercial mixed waste disposal site. LLNL presently has a contract with a commercial handler for disposal of certain mixed waste streams that meet the waste acceptance criteria, and this agreement would be extended to include NIF mixed wastes.

If an acceptable mixed waste stream contained only "characteristic" hazards (non-listed hazards specific to NIF) and it met the appropriate treatment standards listed in 40 CFR 268, the waste would be approved for shipment to NTS. However, if the mixed waste stream contained a listed hazard, it would be shipped to an approved commercial handler after being stabilized and meeting land requirements. The mixed aqueous waste from cleaning the debris shield would be neutralized, stabilized, and shipped to NTS for disposal as an approved waste stream. If this waste were found to be contaminated with listed solvents not approved for NTS disposal, the stabilized waste would be sent to a commercial handler instead.

Hazardous Waste. LLNL currently disposes of large quantities of hazardous waste by a well-established system using onsite consolidation and shipment to commercial handlers. Capacitors and general chemicals are currently disposed of under this procedure. Under this approach, NIF solid hazardous wastes would be shipped to an approved commercial RCRA treatment, storage, and disposal facility.

Nonhazardous Waste. Storm drains would be available in the NIF site with a capacity adequate for local rainfall at a design-basis flood level. This capacity would be based on a low-hazard-use building under DOE Standard 1020-94, Section 6.1.3. Nonhazardous solid waste generation at the NIF site is estimated to total 6,000 m^3/yr (7,848-yd^3/yr). This solid waste would be handled following general regulations.

Possible Waste Minimization During Operation. Several actions or technologies have been identified that, if successfully implemented, could significantly reduce or even eliminate certain forms of waste now projected for NIF (Andrews and Tobin 1995). In addition, some steps might be taken to reuse or recycle waste material. The proposed technology and procedures are briefly described here, and an estimate of the possible reduced waste streams is shown in table I.4.1.2.8.1–3. These estimates assume successful development of various new methodologies that are proposed to minimize the waste streams. As such, they represent an optimistic lower limit of waste generation at NIF. Comparing these projections to those in table I.4.1.2.8.1–2 indicates that wastes might be reduced significantly (by a factor of 2 to 10). The following discussion identifies some important aspects of the minimization plan.

The lifespan of a molecular sieve could be extended if subatmospheric chamber flushing were employed. The use of lower flushing pressure would reduce vapor loading. Further reductions might be achieved if chamber tritium (following laser beam target strikes) were pumped directly to liquid helium cryo panels.

Minimizing the scrap hardware removed from the chamber would be accomplished by concentrating on three design areas: utilizing activation-resistant materials, minimizing weight and volume of structures, and discouraging the use of temporary setups.

Implementation of an oil-less vacuum roughing pump system would eliminate 200 L (52.8 gal) of liquid mixed waste. Such pumps have only recently become available and would be evaluated for use at NIF; however, their cost and dependability remain uncertain.

Cleaning of the debris shields with carbon dioxide pellets could remove the anti-reflective coating and activated particulate matter. If successful, this procedure could significantly reduce or even eliminate the production of radioactive sodium hydroxide, which is currently listed as liquid mixed waste.

A large fraction of the general chemical waste from the Optics Assembly Area would involve the anti-reflective coating solution. One method for reducing this waste would be to distill the ethanol from the waste solution and reuse it as a cleaner.

Capacitors in the Laser and Target Area Building would be the predominant source of hazardous waste. This source could be reduced by purchasing advanced capacitor units with a longer service life. This decision, however, would depend on the development and cost of such capacitors.

In addition to reducing or eliminating the liquid LLW from debris shield cleaning, carbon dioxide cleaning might also further reduce solid LLW. Far fewer wipes would be needed for general decontamination purposes if a "general decontamination carbon dioxide station" were developed and functional. Other liquid LLW streams, as well as solid mixed and liquid mixed streams, might also be reduced with such a system because carbon dioxide could possibly remove activated particulates, as well as tritium contamination, and eliminate the need for solvents.

Existing Waste Management Capabilities at LLNL. Comparison of the waste volumes that would be generated by NIF (see table I.4.1.2.8.1–2) with current waste handling at LLNL provides an indication of the capability of the existing facilities at LLNL to accommodate the various waste management tasks associated with NIF.

For reference, table I.4.1.1.8–1 shows the current waste management capacity at LLNL. Table I.4.1.2.8.1–4 summarizes, in broad categories, the total yearly NIF waste generation estimates for the Conceptual Design and Enhanced options. Table I.4.1.2.8.1–4 is a condensed version of the earlier detailed flows given in table I.4.1.2.8.1–2.

Table I.4.1.2.8.1–4 shows the potential impact of NIF on waste storage at LLNL. Existing storage capacity (except for hazardous waste) appears to be adequate to handle NIF waste for a number of years. Table I.4.1.2.8.1–5 compares the NIF waste generation rate to the annual handling/treatment capacity at LLNL. This table indicates that NIF waste could generally be treated by current LLNL facilities without a large adverse impact.

In summary, the information presented in tables I.4.1.2.8.1–4 and I.4.1.2.8.1–5 indicates that the added NIF wastes would not represent a significant impact on the existing waste storage capacity nor on the waste treatment capacity at LLNL, since the management of NIF wastes at LLNL would not represent a significant extension of current practices or capabilities. The added impact of NIF wastes on the environment would be minimal and would fall within present regulatory requirements.

I.4.1.2.8.2 *Waste Management at Lawrence Livermore National Laboratory During National Ignition Facility Decommissioning*

The decontamination and decommissioning (D&D) activities for NIF would not add a significant burden to operations at LLNL. This type of activity is common throughout the DOE complex, and LLNL has experienced staff capable of carrying out these types of activities. The procedures proposed by LLNL for decommissioning NIF after its projected 30 years of operation are summarized below (Tobin and Latkowski 1995). The major activated/contaminated components would be located in the target area, so this facility would pose the most complex operation.

Decommissioning of NIF Laser. All assemblies and equipment would be removed from the laser bays, pulse power bays, master oscillator room, and control room. The support systems, piping, and wiring in the laser bays would also be removed. Minimum disassembly would be done on laser components. Glass would be stored in the simplest, least costly manner. Detached assemblies or subassemblies would fall into three categories: those immediately transferable to other DOE projects, those of possible use in the future, and those not likely to be reused. The items in the first category would be reassigned; the items in the second category would be packaged and stored; and the items in the third category would be disposed of through salvage. Several components, namely ignitrons and capacitors, would be handled as wastes. As shown in table I.4.1.2.8.2–1 the volume of the resulting waste would total about 313 m^3 (409 yd^3).

TABLE I.4.1.2.8.1–4.—*Impact of Estimated National Ignition Facility-Generated Waste on Waste Storage at Lawrence Livermore National Laboratory*

Category	NIF-Generated Waste/Year (m^3)		Years to Fill Storage with NIF Flow Alone[a]		Is Existing or Planned Storage Capacity Adequate
	Solid	Liquid	Solid	Liquid	
Low-Level[b]					
Conceptual design total	2.98	0.60	2,000	500	Yes
Enhanced total	7.25	1.56	800	200	Yes
Mixed					
Conceptual design total	0.34	2.0	7,000	300	Yes
Enhanced total	0.88	4.98	2,600	100	Yes
Hazardous[c]					
Conceptual design total	8.0	2.3	12,250	30	Yes, Marginally (liquid)
Enhanced total	8.0	4.6	12,250	20	Yes, Marginally (liquid)

[a] In order to translate the solid waste mass into an expression of volume and to calculate the values shown for the number of years to fill storage capacity with NIF flow alone, the following values for the densities of the materials were assumed: molecular sieves: density of diatomaceous earth (0.22 g/cm^3); personal protective equipment and wipes: density of paper (0.4 g/cm^3); pre- and high-efficiency particulate air filters: density of charcoal (1.8 g/cm^3); paper capacitors: density of paper (0.4 g/cm^3); hardware from the chamber: density of 50 percent aluminum and 50 percent stainless steel (5.3 g/cm^3).

[b] The total amount of the low-level waste was found by adding the values in the column "Cleaned" of table I.4.1.2.8.1–2 to the column "Low-Level" of the same table. The density of the debris shield was assumed to be the density of iron (7.87 g/cm^3). The density of low-level liquid waste was assumed equal to 1.0 g/cm^3. The amount of the "cleaned" personal protection equipment and wipes/general cleaning was added to the solid low-level radioactive waste.

[c] The values for the hazardous waste are the sum of the Laser and Target Area Building and Target Area Building and Optics Assembly Area values.

Source: Calculated from table I.4.1.1.8–1 and Tobin 1995.

TABLE I.4.1.2.8.2–1.—*Estimated Quantities of Waste from Laser Decommissioning*

Item	Volume (m^3)	Mass (t)
500 ignitron switches - required recycle, Hg, 0.44 L, 6 kg each; EPA 40 CFR 268.42	1.0	3.0
4400 Capacitors - low hazard waste; castor oil on dielectric paper, 140 kg, 0.07 m^3 each	312	616
Total	313	619

Note: Hg - mercury.

Source: Tobin and Latkowski 1995.

Decommissioning of NIF Target Area. Two issues dominate the complexity or ease with which structures in the target area would be decommissioned at the end of NIF operation: (1) the extent of tritium contamination and (2) the contact dose due to long-lived activation products induced in large structures such as the target chamber, space frame/mirror support frames, and concrete.

Semipermanent facility features that contain materials of concern for neutron activation, such as cable runs and diagnostics, would be maintained during NIF operations in such a way that contact dose rates would allow their reuse in other facilities. This condition would be achieved through a combination of periodic change-out, radioactive decay time, and shielding. If proven successful, the carbon dioxide system proposed for waste minimization would be adapted to meet NIF decontamination needs. As proposed, frequent cleaning of equipment and inner chamber surfaces exposed to tritium and activated debris would significantly reduce (if not virtually eliminate) the need for major end-of-life decontamination. NIF operations would be designed both to minimize the quantity and extent of contamination and to reduce the hazard level of wastes. NIF decom-

TABLE I.4.1.2.8.1–5.—*Comparison of National Ignition Facility Waste to Annual Treatment Capacity at Lawrence Livermore National Laboratory*

Category	Ratio of NIF Waste Generation to Annual Treatment Capacity[a]	Treatment Capacity (m^3/yr)	Is Treatment Capacity Adequate
Low-Level			
Liquid			
Conceptual design total	$3.7x10^{-2}$	3,736 (34.1 m^3/treatment episode)	Yes
Enhanced total	$9.7x10^{-2}$		Yes
Solid			
Conceptual design total	NA	Shipped offsite	Yes[b]
Enhanced total	NA	Shipped offsite	Yes
Mixed			
Liquid			
Conceptual design total	$2.2x10^{-4}$	$8.75x10^{3}$	Yes
Enhanced total	$5.6x10^{-4}$		
Solid			
Conceptual design total	$3x10^{-5}$	$1.18x10^{4}$	Yes
Enhanced total	$7x10^{-5}$		Yes
Hazardous			
Liquid			
Conceptual design total	$2.3x10^{-2}$	$9.7x10^{1}$	Yes
Enhanced total	$4.74x10^{-2}$		Yes
Solid			
Conceptual design total	NA	Shipped offsite	NA
Enhanced total	NA	Shipped offsite	NA

[a] The following values for the densities of the materials were assumed: molecular sieves: density of diatomaceous earth (0.22 grams per cubic centimeter [g/cm^3]); personal protective equipment and wipes: density of paper (0.4 g/cm^3); pre- and high-efficiency particulate air filters: density of charcoal (1.8 g/cm^3); paper capacitors: density of paper (0.4 g/cm^3); hardware from the chamber: density of 50 percent aluminum and 50 percent stainless steel (5.3 g/cm^3).

[b] Shipped offsite.

Note: NA - not applicable.

Source: Calculated from table I.4.1.1.8–1 and Tobin 1995.

missioning operations would be designed to maximize reuse and recycle of all components of the target area. For present estimates, it is conservatively assumed that the tritium decontamination levels required to allow material to be reused in uncontrolled areas or to be scrapped is 10-disintegrations per minute per square centimeter (dpm/cm^2) (62.5-dpm/square inches [in^2]) of removable tritium or 50-dpm/cm^2 (312.5-dpm/in^2) of removable and fixed tritium (generally in compliance with DOE 1990). Material from NIF would be decontaminated to this level before being disposed of or reused in an uncontrolled area. It is assumed that items useful for other DOE facilities that contain or use tritium would be packaged and shipped to those locations rather than undergo extensive decontamination, pending cost/benefit safety analysis. LLNL assumed that the contact dose rate level required to allow material with induced radioactivity to be reused in uncontrolled areas or to be scrapped is the level permitted by DOE O 441.1. Such material would be held in storage at the NIF site until the contact dose rate level decayed to this level or until it could be disposed of as radioactive waste. The waste quantities are listed in table I.4.1.2.8.2–2. Values are provided for both a minimal case, which assumes a 385-MJ annual release over the projected 30-year operational period, and an expanded case, with a 1,200-MJ annual release. The chamber support structures represent the largest volume (3,058 m^3 [4,000 yd^3]) to be handled, with a total volume of all components being about 4,400 m^3 (5,755 yd^3).

TABLE I.4.1.2.8.2–2.—*National Ignition Facility Target Area Low-Level Radioactive Waste Quantities from Decommissioning*

Item	Volume (m³)	Mass (t)
Vacuum system	34	54
Tritium system	16	36
Diagnostics manipulators	12	3.6
Target positioner	2 (4)	1 (2)
Chamber shielding	282 (567)	310 (620)
Chamber plates	6.3	8.5
Laser light absorbers	1.3 (2.0)	1.9 (3.0)
Chamber support structures	3,058	3,364
Target area beam transport	220 (330)	111 (161)
Final optics hardware	754 (1,204)	545 (815)
Total	4,386 (5,233)	4,425 (5,057)

Note: Values shown assume a 30-year life with 385-megajoule yields. Values in parentheses assume 1,200-megajoule annual yields.

Source: Tobin and Latkowski 1995.

Handling of these components would require careful application of as low as reasonably achievable practices. Estimated dose rates encountered during decommissioning for these components are shown in table I.4.1.2.8.2–3. Assuming careful planning and handling of the disassembly, it is estimated that the occupational exposure involved would be on the order of background rates (table I.4.1.2.8.2–4). The operations required would be unique, but would be within the capability of LLNL personnel, considering LLNL's prior experience with decommissioning large facilities and LLW handling.

TABLE I.4.1.2.8.2–3.—*Estimated Contact Dose Rates of Key National Ignition Facility Components*

Component	30-day Dose Rate (mrem/hr) (385 MJ/1,200 MJ)	3-year Dose Rate (mrem/hr) (385 MJ/1,200 MJ)
Final transport mirror mounts/motors	0.006/0.019	0.004/0.012
Final optics hardware	<3.1/9.7	<0.29/0.9
Diagnostics manipulators	3.4/10.6	0.31/0.97
Target positioner	0.08/0.25	0.007/0.022
Target chamber plates	0.17/0.53	0.015/0.047
Unconverted laser light absorbers	0.005/0.016	0.0013/0.004
Borated "shotcrete" chamber shielding	0.2/0.62	0.052/0.16
Chamber support concrete rods	0.12/0.37 (w/1 at% B)[a]	0.004/0.012 (w/1 at% B)
Vacuum system	28.7/89.5 (if steel) 7.04/2.2 (if aluminum)	3.14/9.8 (if steel) 1.32/4.1 (if aluminum)
Mirror support structure	0.003/0.009	0.001/0.003
Chamber shell	0.84/2.6	0.074/0.23
Concrete walls		
Direct shine areas	0.14/0.44 (w/1 at % B)	0.014/0.044 (w/1 at % B)
Behind shielding	0.02/0.062 (w/1 at % B)	0.001/0.003 (w/1 at % B)
Concrete chamber pedestal	0.12/0.37 (w/1 at % B)	0.004/0.012 (w/1 at % B)

[a] w/l at% B - with 1 atom % boron.

Note: Values shown assume 30-year life with 385-megajoule yields and 1,200-megajoule annual yields.

Source: Tobin and Latkowski 1995.

TABLE I.4.1.2.8.2–4.—*Estimated Decommissioning Effort and Occupational Exposure for the National Ignition Facility Target Area for 385- and 1,200-Megajoule Annual Yields*

Component	Description	Effort (Person months)	Dose Rates (μrem/hr)	Dose (mrem)	Dose per worker (mrem, average)
Target Area Beam Transport					-
Support structures	80 t	22.1	1 (3)	3.9 (12.1)	-
Tubes	14 t	4	0 (0)	0 (0)	-
Mirrors/motors	388 (582) ea	18 (27)	4 (12)	12.7 (57)	-
Final Optics Assemblies					-
Optics	768 ea	13.2	0 (0)	0 (0)	-
Hardware	48 (72) ea	14.1 (21.6)	290 (900)	735 (3,421)	-
Target Diagnostic Systems					-
Diagnostics	12 ea	3.6	310 (970)	196 (612)	-
Support systems and TIM	12 ea	1.2	310 (970)	65 (204)	-
Vacuum	1 ea	1.2	310 (970)	65 (204)	-
Target positioner	1 ea	0.4	7 (22)	0.5 (1.5)	-
Target Chamber					-
Spherical shell	87 t	50	74 (230)	651 (2,030)	-
Plates	325 ea	18.3	15 (47)	48 (151)	-
Laser light absorbers	192 (288) ea	14.4 (21.6)	1.3 (4)	3.3 (15)	-
Shielding	283 (567) t	5.7 (11.4)	52 (160)	52 (326)	-
Concrete Supports	3,364 t	67.3	4 (12)	47 (148)	-
Vacuum System	3 ea	2.4	1,320 (410)	558 (1,738)	-
Totals	-	235.9	-	2,437 (8,920)	122 (446)

Source: Tobin and Latkowski 1995.

I.4.2 Los Alamos National Laboratory

I.4.2.1 *Affected Environment*

The following sections describe the affected environment associated with the construction and operation of NIF at Los Alamos National Laboratory (LANL). Land use, air quality and acoustics, water resources, biotic resources, cultural and paleontological resources, socioeconomics, radiation and hazardous chemicals, and waste management are described.

I.4.2.1.1 Location and Land Use

The 11,300-ha (28,000-acre) LANL site is situated on Pajarito Plateau, which consists of a series of finger-like mesas separated by deep east-to-west oriented canyons cut by intermittent streams. Mesa tops range in elevation from approximately 2,400 m (7,800 ft) mean sea level (MSL) on the flanks of the Jemez Mountains to the west to about 1,900 m (6,200 ft) MSL at their eastern termination above the Rio Grande Valley to the east (LANL 1994).

The land surrounding LANL is largely undeveloped, with large tracts of land north, west, and south of the site being held by the Santa Fe National Forest, Bureau of Land Management, Bandelier National Monument, and Los Alamos County. San Ildefonso Pueblo borders LANL to the east (LANL 1994) (figure I.4.2.1.1–1).

Most LANL developments are confined to mesa tops, and most functions are concentrated in eight development areas, each of which is composed of various technical areas (TAs). Most of the land at LANL is very difficult to develop given the significant physical constraints. For example, over half the area consists of slopes that exceed 20 percent (LANL 1990a). Most land provides isolation for security and safety and is held in reserve for future use (LANL 1994).

The proposed NIF location at LANL is within TA-58 (figure I.3.4.2.1–2), which is part of the "Core Area and Two-Mile Mesa North" development area of LANL. The temporary construction laydown area would be located within the location designated for NIF. This development area houses approximately 57 percent of the LANL population and encompasses about 4 percent of the total LANL area. TA-58 is an undeveloped TA west of TA-3, the central hub of administration and support activities. TA-58 is characterized by gradual to moderate forested slopes. Several dirt and gravel roads cross the area. Initial surveys of the proposed TA-58 greenfield site indicate that there are no solid waste management unit locations at the site (ICF Kaiser and LANL 1994). Current access to TA-58 is provided by the existing canyon crossing from TA-3.

The topography of LANL affords spectacular views of the surrounding landscape of forested mountains, deep canyons, and the Rio Grande Valley. The mountain scenery, unusual geology, and archaeological heritage create a diverse visual environment. The scenery contrasts greatly with the functional industrial facilities of LANL. A majority of LANL's parking lots, security gates, and service and storage yards are visible to employees and visitors using public roads (DOE 1995c).

LANL is underlain by soil types varying in texture from clay and clay loam to gravel. Because of the topographic relief of the Pajarito Plateau, rock outcrops occur on greater than 50 percent of the site area. Soils on the mesas in the TA-58 area can vary widely in thickness and are typically thinnest near the edges of the mesas, where bedrock is often exposed. The walls of the canyons often consist of steep rock outcrops and patches of shallow undeveloped soils. Soils near the center of the mesa are more likely to be deeper and more stable, indicating less erosion than soils near the edges of the mesa (LANL 1993). The soils at LANL are acceptable for standard construction techniques, and none have been designated prime farmland or soil of statewide importance for New Mexico.

I.4.2.1.2 Air Quality and Acoustics

This discussion of existing air quality and acoustics includes a review of meteorology and climatology, and ambient air quality characteristics near LANL.

I.4.2.1.2.1 *Meteorology and Climatology*

LANL and the surrounding region have a semiarid, temperate mountain climate. The annual average temperature at LANL is 8.8 °C (47.8 °F); average daily temperatures range from -2.0 °C (28.5 °F) in January to 20.0 °C (68.0 °F) in July. The average annual precipitation at LANL is 47.5 cm (18.7 in) (Bowen 1992). Prevailing winds at LANL are from

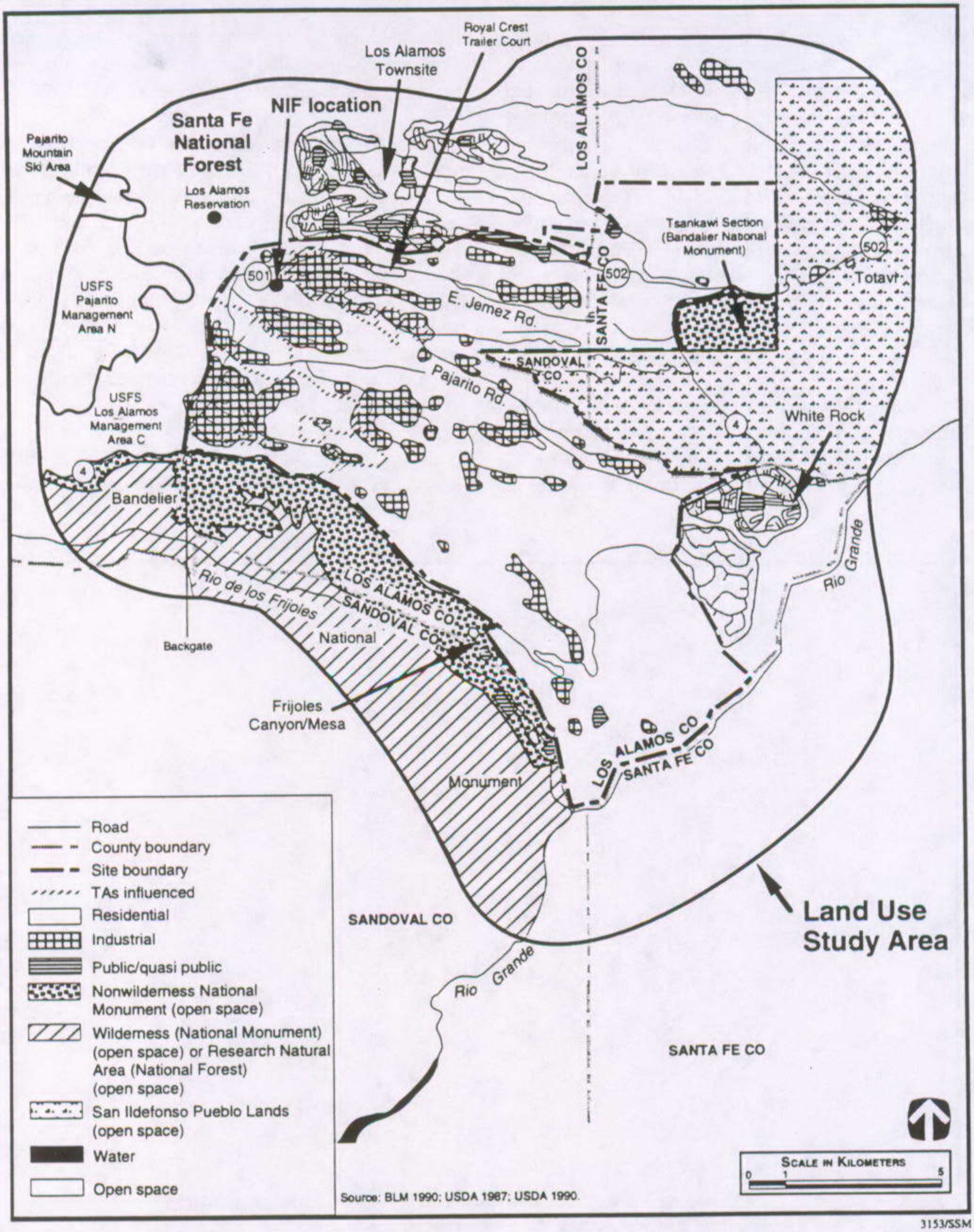

FIGURE I.4.2.1.1–1.—*Generalized Land Use at Los Alamos National Laboratory and Vicinity.*

the south during the day and from the west-northwest at night. The annual average wind speed is 2.8 m/s (6.3 mph) (Bowen 1989). The 1994 annual wind rose for LANL is shown in figure I.4.2.1.2.1–1. From 1990 to 1994, unstable atmospheric conditions occurred approximately 33 percent of the time, neutral conditions occurred about 36 percent of the time, and stable conditions occurred the remaining 31 percent of the time (Kreiner 1995). Atmospheric dispersion improves as the wind speed increases and as atmospheric conditions become more unstable.

I.4.2.1.2.2 *Ambient Air Quality*

The State of New Mexico is responsible for air pollution control and attainment of air quality standards in Los Alamos County. In addition to NAAQS for criteria pollutants, LANL is subject to ambient air quality standards adopted by New Mexico. Applicable NAAQS and New Mexico state ambient air quality standards are presented in table I.4.2.1.2.2–1.

LANL is located within the Upper Rio Grande Valley Intrastate AQCR 157. None of the areas within LANL and its surrounding counties are designated as nonattainment areas for any of the NAAQS (40 CFR 81.332). The nearest nonattainment area, for carbon monoxide and total suspended particulates, is in Bernalillo County, about 65 km (40 mi) south. In general, pollutant emission increases in an area designated nonattainment for a specific pollutant are subject to more stringent permitting requirements than if the area is designated attainment.

The New Mexico Environment Department monitor closest to LANL is adjacent to the Bandelier National

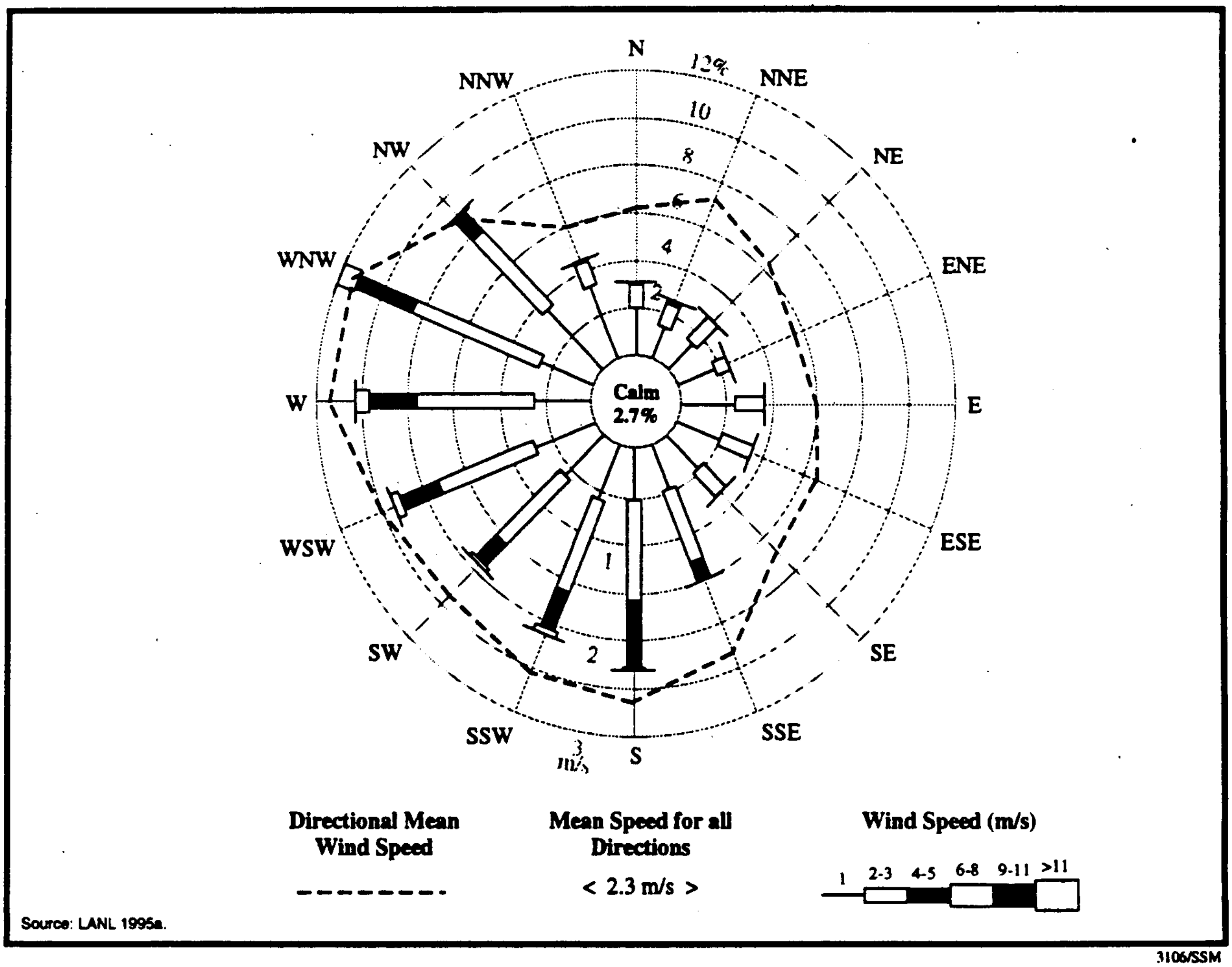

FIGURE I.4.2.1.2.1–1.—*Wind Distribution at Los Alamos National Laboratory, 1994.*

Monument at the southern LANL site boundary, approximately 8 km (5 mi) south-southeast of the proposed NIF location. In addition, LANL maintains eight onsite and nine offsite particulate monitors that measure airborne beryllium concentrations. The most recently published monitoring data show no violations of the NAAQS (see table I.4.2.1.2.2–1).

One Prevention of Significant Deterioration (PSD) Class I Area, the Bandelier National Monument's Wilderness Area, borders LANL to the south. To date, LANL has not been subject to PSD requirements (LANL 1990b; LANL 1994).

The primary emission sources of criteria pollutants at LANL are the steam plants, powerplant, beryllium operations, asphalt plant, burning of explosive wastes, and experimental detonation of conventional explosives (LANL 1994). Other emission sources include fugitive particulates from waste-burial activities, industrial processes, vehicles, and construction activities. Emission estimates for these sources are presented in section I.4.2.2.2.

Table I.4.2.1.2.2–1 presents the baseline ambient air concentrations for criteria pollutants for 1992 to 1993. The baseline concentrations are in compliance with applicable regulations and guidelines.

I.4.2.1.2.3 *Acoustic Conditions*

Major noise emission sources within LANL include various industrial facilities, equipment, and machines. At the site boundary, away from most of the industrial facilities at LANL, noise emitted from the site is barely distinguishable from background noise levels. However, some noise from detonation of explosives can be heard at residences adjacent to the site.

Background noise levels of 31 to 35 dBA have been measured near the Bandelier National Monument entrance and State Route 4 (Vigil 1995) and 38 to 51 dBA at White Rock (Burns 1995). The higher background noise levels at White Rock result from a greater amount of traffic (DOE 1995c).

Peak noise sources at LANL include explosive experiments at several TAs. An onsite peak noise level of 140 to 148 dBA has been measured 230 m (750 ft) from a 9-kg (20-lb) trinitrotoluene (TNT) test. Offsite peak noise levels measured from a 70-kg (150-lb) TNT test were 71 dBA at the site boundary and 60 to 70 dBA at permanent residences (DOE 1995c).

The acoustic environment along the LANL boundary is typical of a rural location, with residual noise levels of 35 to 50 dBA (EPA 1974). Near highways, traffic contributes to ambient noise levels, especially during peak hours, resulting in significantly higher noise levels than at remote locations.

The State of New Mexico has not established specific numerical environmental noise standards applicable to LANL. The Los Alamos County Code, Chapter 8.28.060(d), prohibits propagated noise levels in residential areas above 65 dBA between 7:00 a.m. and 9:00 p.m. and above 53 dBA at other times. Noise between 65 and 75 dBA for more than 10 minutes in a given hour is allowed between 7:00 a.m. and 9:00 p.m. Permits can be requested for temporary activities that exceed these standards (DOE 1995c).

I.4.2.1.3 Water Resources

Proposed new facilities for NIF would be located at the mesa top between Twomile Canyon and one of its tributaries (figure I.3.4.2.1–2). Streamflow in Twomile Canyon and its tributaries is ephemeral. Most runoff results from summer thunderstorms, and occasionally from intermittent springs (LANL 1993).

Groundwater in the LANL area occurs in three modes: (1) water in shallow alluvium in canyons, (2) perched groundwater, and (3) the main aquifer of the Los Alamos area. The main aquifer is the only aquifer in the area capable of serving as a municipal water supply. The main aquifer is separated from the alluvial and perched groundwater by about 110 to 190 m (350 to 620 ft) of tuff and volcanic sediments with low moisture content (LANL 1994).

The water supply for LANL comes from three DOE-owned well fields. Some surface water is used for boiler makeup and lawn watering, but this source accounts for only about 1 percent of the total water use. Average annual production for the entire system is about 5,600 MLY (1,480 MGY), of which about one third (1,900 MLY [502 MGY]) is used at

TABLE I.4.2.1.2.2–1.—***Comparison of Baseline Ambient Air Concentrations with Most Stringent Applicable Regulations and Guidelines at Los Alamos National Laboratory***

Pollutant	Averaging Time	Most Stringent Regulation or Guideline (mg/m^3)	Baseline Concentration[a] (mg/m^3)
Criteria Pollutant			
Carbon monoxide	8 hours	7,689[b]	115
	1 hour	11,578[b]	630
Lead	Calendar quarter	1.5[c]	ND[d]
Nitrogen dioxide	Annual	73[b]	3.8[e]
	24 hours	145[b]	ND[d]
Ozone	1 hour	235[c]	139[e]
Particulate matter 10 microns or smaller	Annual	50[c]	8[e]
	24 hours	150[c]	21[e]
Sulfur dioxide	Annual	40[b]	1.3[f]
	24 hours	202[b]	ND[d]
	3 hours	1,300[c]	ND[d]
	1 hour	NS[g]	23[f]
Mandated by State			
Hydrogen sulfide	1 hour	11[b]	ND[d]
Soiling index	-	0.4[h]	ND[d]
Total reduced sulfur	30 minutes	3[b]	ND[d]
Total suspended particulates	Annual	60[b]	8
	30 days	90[b]	<21
	7 days	110[b]	<21
	24 hours	150[b]	21

[a] For short-term standards, baseline concentration is second highest concentration for year for Federal standards and for 1-hour hydrogen sulfide state standard; highest concentration for other short-term standards.

[b] State standard.

[c] Federal standard (40 CFR 50).

[d] ND - No data available.

[e] 1993 New Mexico Environment Department (NMED) data at Bandelier.

[f] 1992 LANL data at TA-3.

[g] NS - No Federal or state standard exists.

[h] Units of cohs/1,000 linear ft of air.

Source: LANL 1994; Lazaro et al. 1996; NMEIB 1995; NMEIB 1996.

LANL. The annual consumption, without the proposed NIF, is expected to increase to 2,300 MLY (608 MGY) in the year 2005. Most water consumption is for industrial use (LANL 1990a; Purtymun et al. 1994; Richardson 1995c).

Most recent water quality monitoring data available for drinking water at LANL indicate that all parameters regulated under the *Safe Drinking Water Act* were in compliance with the maximum contaminant levels established by the regulation (LANL 1994).

I.4.2.1.4 Biotic Resources

LANL is located at the transition between the Arizona/New Mexico Plateau and Southern Rockies ecoregions (Omernik 1986). The predominant habitat in the western portion of LANL (including the proposed NIF area) is the ponderosa pine community (2,100 to 2,300 m [6,900 to 7,500 ft] elevation range). This community is dominated by ponderosa pine, with Douglas fir, Gambel oak, mountain muhly, and little bluestem also being common. The pinyon-juniper community (1,900 to 2,100 m [6,200 to 6,900 ft] elevation range) also occurs in the area. This habitat consists of stands of pinyon pine and one-seeded juniper, as well as grasses such as blue grama and galleta (DOE 1995c). NIF site is located west of a developed area of LANL (figure I.3.4.2.1–2).

Reptiles common to the LANL area include the collared lizard, eastern fence lizard, and whiptail lizard (DOE 1995c). Bird species that nest in the northwestern portion of LANL include the American robin, black-headed grosbeak, chipping sparrow, common raven, Hammond's flycatcher, lesser goldfinch, Steller's jay, white-breasted nuthatch, and western tanager (Travis 1992). LANL has traditionally been a wintering area for elk and mule deer. However, these two species have recently been using LANL on a year-round basis (DOE 1995c). This use has prompted concerns about increases in vehicular accidents with elk and deer at LANL (Kirk 1995, as cited in DOE 1995c). A herd of elk is resident at Two-Mile Mesa, and signs of black bear have been observed in Operational Unit 1111 (which includes TA-58). Raccoons, coyotes, porcupines, and skunks frequent the area (LANL 1993). Smaller mammal species include the Mexican woodrat, deer mouse, Abert's squirrel, and Nuttall's cottontail.

Wetlands at LANL are limited to the canyons, where riverine intermittent wetlands exist in most of the canyons and palustrine emergent and/or scrub-shrub wetlands exist in sections of Pueblo, Los Alamos, Sandia, Pajarito, and Ancho canyons. No wetlands exist in the immediate area proposed for NIF.

Aquatic habitats on LANL are primarily limited to springs and intermittent streams that flow through the 14 major canyons that pass throughout LANL. Releases of treated industrial and sanitary wastewaters allow portions of the intermittent streams in Los Alamos, Sandia, and Mortandad canyons to maintain more permanent flows. No aquatic habitats exist on the immediate NIF location area.

A list of the Federal and state rare, threatened, and endangered species that could exist at LANL is provided in Lazaro et al. (1996). Habitats that could attract several of the species (for example, Mexican spotted owl, northern goshawk, loggerhead shrike, gray vireo, and spotted bat) are present within Operational Unit 1111 (within which the proposed NIF location occurs) (LANL 1993). However, no designated critical habitats for Federal-listed species exist at LANL.

I.4.2.1.5 Cultural and Paleontological Resources

More than 1,300 prehistoric sites have been recorded on LANL; however, no archaeological sites or historic structures are recorded for the proposed NIF location in TA-58. Preliminary assessment of the proposed NIF location indicates that it is unlikely to contain archaeological remains; a field survey will be conducted to verify this assessment (ICF Kaiser Engineers and LANL 1994). Paleontological remains are unlikely to exist on the proposed NIF location because the Pajarito Plateau, composed of Pleistocene volcanic tuffs and the Bandelier Formation, does not contain fossiliferous deposits. No Native American cultural resources have been identified in the proposed NIF location by the six potentially affected tribes.

I.4.2.1.6 Socioeconomics

Socioeconomic characteristics described for LANL include regional economy, population and housing, public finance and public service infrastructure, and local transportation. Regional economic statistics are based on a regional economic study area that encompasses seven counties around LANL as defined by the Bureau of Economic Analysis. The economic study area is a broad labor and product market-based region linked by trade among economic sectors within the region. Statistics for population and housing, public finance, and public service infrastructure are based on the ROI, a three-county area in which more than 90 percent of all LANL employees reside. The ROI includes the counties of Los Alamos (with 48.3 percent of LANL employees), Rio Arriba (20.8 percent), and Santa Fe (19.0 percent). Counties included in the economic study region and counties included in the ROI are listed in Lazaro et al. (1996). Assumptions, assessment methodologies, and supporting data for each TA are also presented in Lazaro et al. (1996).

I.4.2.1.6.1 *Regional Economy*

The regional economic study area for LANL includes the Santa Fe Metropolitan Statistical Area. Between 1988 and 1995, employment in the economic study region was projected to increase from 66,800 to 75,900. BEA (1990) projects a compounded average annual growth rate of 1.26 percent from 1995 to 2003 (8,018 jobs). In 1995, LANL employed approximately 6,200 persons, accounting for 10.8 percent of employment in the regional economic study area. The distribution of LANL employees by place of residence in the ROI are presented in Lazaro et al. (1996).

I.4.2.1.6.2 *Population and Housing*

The ROI has experienced steady population growth between 1980 and 1990, with an average annual increase of about 2 percent, bringing the 1990 total to about 150,000 persons. Population growth has been strongest in Santa Fe County (approximately 30 percent between 1980 and 1990). By the year 2000, population in the ROI is expected to grow to approximately 169,900 persons (BEA 1995; U.S. Department of Commerce 1994).

Between 1980 and 1990 the number of housing units in the ROI increased by over 37 percent, from 46,006 units to 63,386 units (see table I.4.2.1.6.2–1). Housing in Los Alamos County increased from 6,585 units in 1980 to 7,565 units in 1990 (15 percent). Housing in Rio Arriba County increased from 11,107 units in 1980 to 14,357 units in 1990 (29 percent). Housing in Santa Fe County increased from 28,314 units to 41,464 units in 1990 (46 percent). The number of housing units in the ROI is expected to increase about 27 percent between 1990 and 2000 (BEA, 1995; U.S. Department of Commerce, 1994; ULI 1995).

The number of vacant owner units in the ROI has increased from approximately 3,100 units in 1980 to about 5,000 in 1990. It is estimated that in the year 2000 there will be approximately 7,000 vacant owner units if current construction and economic trends continue in the ROI.

In 1980 there were approximately 4,400 vacant housing units in the ROI. The number of vacant housing units increased to about 7,000 in 1990. It is estimated that by 2000 there will be approximately 9,000 vacant housing units if current construction and economic trends continue in the ROI.

TABLE I.4.2.1.6.2–1.—*Population and Housing Data for the Los Alamos National Laboratory Area*

Category	1980	1990	1996	1997	1998	1999	2000	2001	2002	2003
Estimated ROI population	122,400	149,687	163,467	165,051	166,650	168,267	169,900	171,237	172,586	173,946
Estimated total housing units	46,006	63,386	73,814	75,552	77,290	79,028	80,766	82,504	84,242	85,980
Estimated vacant owner units	3,144	5,020	6,372	6,561	6,750	6,939	7,128	7,317	7,506	7,695
Estimated vacant renter units	1,214	1,825	1,965	2,025	2,085	2,144	2,204	2,263	2,323	2,383
Estimated total vacant units in ROI[a]	4,385	6,845	8,337	8,586	8,835	9,038	9,332	9,581	9,829	10,078

[a] Vacancy rate - 11 percent.
Source: Historical data from U.S. Department of Commerce 1994; projections by Halliburton-NUS 1995.

I.4.2.1.6.3 *Public Finance and Public Services Infrastructure*

Public financial characteristics of the local jurisdictions in the ROI that would most likely be affected by construction and operation of NIF at LANL are summarized in this section. The data reflect total revenues and expenditures of each jurisdiction's general fund; special revenue funds; and, as applicable, debt service, capital project, and expenditure trust funds. Major revenue and expenditure categories and total revenues less expenditures for counties and cities are presented in table I.4.2.1.6.3–1. Table I.4.2.1.6.3–2 summarizes levels of service for education, community services, and health care.

TABLE I.4.2.1.6.3–1.—*Public Finance—Los Alamos National Laboratory Area*

Revenues and Expenditures[a]	Los Alamos County	Rio Arriba County	Santa Fe County	Santa Fe City	Espanola
Local sources (percent)	56	80	88	82	11
State sources (percent)	44	20	12	17	89
Federal sources (percent)	0	0	0	0	0
Total revenues (dollars)	19,825,220	10,662,842	29,528,335	16,175,431	6,679,263
General government (percent)	26	36	25	44	24
Public safety, health and community services (percent)	74	59	65	51	57
Debt service (percent)	0	4	9	5	7
Other (percent)	0	1	1	0	12
Total expenditures (dollars)	16,085,523	9,280,844	27,221,324	6,454,442	7,015,513
End-of-year fund balance (dollars)	7,190,875	5,570,366	17,676,743	61,911,387	2,851,826

[a] If reporting body did not distinguish between state and Federal revenue sources, the total for all intergovernmental revenue was combined and reported under the "State sources" heading.

Source: City of Espanola 1995; city of Santa Fe 1995; Los Alamos County 1995; Rio Arriba County 1995; Santa Fe County 1995.

TABLE I.4.2.1.6.3–2.—*Public Services—Los Alamos National Laboratory Area*

Part I: Education

County/School District	Enrollment	Pupil-Teacher Ratio	Per Pupil Expenditure[a] ($)
Los Alamos County	3,472	15.0:1	6,231
Rio Arriba County	6,807	18.0:1	4,375
Santa Fe County	14,152	18.8:1	3,415

[a] Expenditure per pupil was based on total operating expenditures for each school district and used 40-day membership attendance numbers for the number of students.

Part II: Level of Service per 1,000 Population

County/Jurisdiction	Police Protection	Fire Protection	General Government	Physicians
Los Alamos County	2.3	6.2	26.7	2.6
Rio Arriba County	0.5	NA[a]	6.8	0.8
Santa Fe County	0.6	3.8	3.5	3.2
Santa Fe City	2.0	1.6	17.5	NA
Espanola	1.3	1.2	6.8	NA

[a] Rio Arriba County Fire Department is entirely volunteers and numbers are not available.

Source: Los Alamos County 1995; New Mexico Public Schools 1994; American Medical Association 1994; city of Espanola Police Department 1995; Rio Arriba County Sheriff's Department 1995; city of Santa Fe Police Department 1995; Santa Fe County Sheriff's Department 1995; Rio Arriba County Payroll Department 1995; city of Santa Fe 1995; city of Espanola 1995; Los Alamos County Police and Sheriff's Department 1995.

I.4.2.1.6.4– *Local Transportation*

Vehicular access to LANL is provided by Pajarito Road; East Jemez Road; U.S. Route 84; and New Mexico Routes 4, 501, and 502 (DOE 1993a). Table I.4.2.1.6.4–1 shows the average daily traffic volumes for the site access roads at LANL. No major road improvements are scheduled for those segments providing immediate access to LANL (DOE 1993a)

Estimated traffic along segments providing access to LANL is projected to contribute to differing service level conditions in accordance with population growth. New Mexico State Route 4 (NMSR 4) would generally support congestion-free traffic flow. NMSRs 501 and 502 would support stable flow. NMSR 501 (between NMSR 4 East and NMSR 502), NMSR 502 (from NMSR 501 at Los Alamos to NMSR 40), and NMSR 502 (between NMSR 4 and NMSR 30) have all reached "level of service C" during the peak commuting hour. This level of service supports stable traffic flow but is approaching congested levels. Along these roadways, a motorist's speed and ability to maneuver could be restricted during the peak hour.

Although there is no public bus service that serves Los Alamos County, a nonprofit bus service provides regular scheduled runs between White Rock, LANL, and the Los Alamos townsite. The closest railroad to LANL is the Atchison, Topeka, and Santa Fe Railroad (DOE 1993a) (Montoya 1995).

The LANL ROI is served by the Albuquerque International Airport, which provides jet passenger service from both national and local carriers. The

TABLE I.4.2.1.6.4–1.—*Baseline Traffic on Los Alamos National Laboratory Access Roads*

Route	From	To	1995 ADT	1995 PHV	1995 LOS	2000 ADT	2000 PHV	2000 LOS
NMSR 4	NMSR 126	NMSR 501 N at Los Alamos W Gate	723	72	A	790	79	A
NMSR 4	NMSR 501 N at Los Alamos W Gate	NMSR 502	3,013	301	A	3,294	329	A
NMSR 501	NMSR 4 East	NMSR 502 at Los Alamos	9,327	933	C	10,197	1,020	C
NMSR 502	NMSR 510 at Los Alamos	NMSR 4	8,941	894	C	9,776	978	C
NMSR 502	NMSR 4	NMSR 30	12,267	1,227	C	13,412	1,324	C

Note: ADT - average daily traffic; PHV - peak hour volume; LOS - level of service; NMSR - New Mexico State Road.

Source: DOE 1993a.

Santa Fe Municipal Airport and Los Alamos Airport serve local air traffic (DOE 1993a; DOT 1992).

I.4.2.1.6.5 *Environmental Justice*

Environmental justice concerns the potential for high and adverse environmental or human health impacts to disproportionately affect minority or low-income populations. In this project-specific analysis (PSA), environmental justice is evaluated for impacts within the site region, defined as an 80-km (50-mi) radius around the site, and for the local area. Lazaro et al. (1996) presents the demographic analysis of minority and low-income population distributions on a regional and local basis.

In the LANL site region in 1990, 14 percent of the population was low income and 52 percent was minority. This value represents a lower percentage of the population that is low income, but a slightly higher percent that is minority, than the New Mexico state averages (21 percent low income and 49 percent minority). Within that area, census tracts closer to the LANL site tend not to have significantly higher or lower proportions of minority or low-income populations than tracts farther from the site.

I.4.2.1.7 Radiation and Hazardous Chemicals

I.4.2.1.7.1 *Radiation Environment*

LANL's radiological activities include testing of weapons for the Nation's nuclear arsenal, space nuclear systems, controlled thermonuclear fusion, and nuclear safeguards. A detailed discussion of the radiation environment, including background, radiological releases, and doses to members of the public is presented in *Environmental Surveillance at Los Alamos During 1992* (LANL 1994). The concentrations of radioactivity in various environmental media (air, water, soil) in the site region are also presented in that report.

Calculated radiological doses were used to estimate the potential health impacts to the public and onsite workers at LANL from any releases of radioactivity. The annual doses to individuals, the surrounding population (within 80 km [50 mi]), and workers are summarized in table I.4.2.1.7.1–1; corresponding health risks are also presented in the table. These values are in addition to those from natural background, consumer products, and medical sources, which total about 405 mrem. Background radiation doses are unrelated to LANL operations. Regulatory limits that specify the maximum effective dose equivalent to individual members of the public and occupational workers are also presented in table I.4.2.1.7.1–1.

The doses to the public presented in table I.4.2.1.7.1–1 are within regulatory limits (DOE 1990) and are small in comparison with background radiation. The onsite worker doses are all within regulatory limits, with the exception of the maximally exposed worker dose received by one worker.

I.4.2.1.7.2 *Hazardous Chemical Environment*

The background chemical environment important to human health has been discussed in section I.4.1.1.7.2. The inventories of hazardous materials stored at LANL are presented in table I.4.2.1.7.2–1. The potential for health impacts varies from facility to facility and from worker to worker, and available information is not sufficient to allow a meaningful estimation and summation of these impacts. However, workers are protected from hazards specific to the workplace through appropriate training, protective equipment, monitoring, and management controls. LANL workers are also protected by adherence to OSHA and EPA occupational standards that limit atmospheric and drinking water concentrations of potentially hazardous chemicals. Appropriate monitoring, which reflects the frequency and amounts of chemicals utilized in the operation processes, ensures that these standards are not exceeded.

I.4.2.1.8 Waste Management

The current waste management practices at LANL are outlined in table I.4.2.1.8–1. Wastes managed at LANL from research activities include spent nuclear fuel, TRU, low-level, mixed, hazardous, and nonhazardous wastes.

I.4.2.1.8.1 *Low-Level Waste*

Both liquid and solid LLW are generated and managed at LANL. Liquid LLW is generated from many areas throughout the site. LANL has two onsite liquid LLW treatment facilities, one of which uses ion-exchange technology. A new Radioactive Liquid Waste Treatment Facility is planned for LANL. Con-

TABLE I.4.2.1.7.1–1.—*Annual Radiation Doses to the General Public and Onsite Workers from Normal Operations at Los Alamos National Laboratory*

Receptor	Atmospheric Releases: Regulatory Limit[a]	Atmospheric Releases: Calculated	Liquid Releases: Regulatory Limit[a]	Liquid Releases: Calculated[b]	Total: Regulatory Limit[a]	Total: Calculated	Total: Risk[c]
Individual Dose							
Average exposed individual[d] (mrem)	10	6.3×10^{-3}	4	0[e]	100	6.3×10^{-3}	3.2×10^{-9}
Maximally exposed individual (mrem)	10	7.9	4	0.8	100	8.7	4.4×10^{-6}
Population Dose							
Population within 80 km (person-rem)	f	1.4	f	0[g]	f	1.4	7.0×10^{-4}
Worker Dose[h]							
Average worker (mrem)	NA	NA	NA	NA	5,000	34	1.4×10^{-5}
Maximally exposed worker (mrem)	NA	NA	NA	NA	5,000	7,000[i]	2.8×10^{-3}
Total workers[j] (person-rem)	NA	NA	NA	NA	None	194	7.7×10^{-2}

[a] The regulatory limits for individuals are given in DOE Order 5400.5. The 10 mrem/yr limit from airbome emissions is required by the *Clean Air Act*, the 4 mrem/yr limit is required by the *Safe Drinking Water Act*, and the total dose of 100 mrem/yr is the limit from all pathways combined. The occupational limit for workers is 5,000 mrem (10 CFR 835).
[b] The calculated dose values given in the column under Liquid Releases conservatively includes all water pathways, not just the drinking water pathway.
[c] Based on a risk factor of 5×10^{-7}/mrem for individuals, 5×10^{-4} /person-rem for population, and 4×10^{-7}/mrem for workers (ICRP 1991).
[d] Obtained by dividing the population dose by the number of people living within 80 km (50 mi) of the site.
[e] Estimated for a population of approximately 224,000.
[f] No regulatory limits exist for population doses; however, a 100 person-rem value for the population is found in proposed 10 CFR834 (58 FR 16268).
[g] Although the maximally exposed individual receives a dose, no population groups are exposed to any liquid pathways.
[h] Worker doses were estimated on the basis of readings from monitoring devices called thermoluminescent dosimeters.
[i] Only one worker exceeded the worker dose regulatory limit.
[j] The number of badged workers in 1992 was approximately 5,700.
Note: NA - not applicable.
Source: LANL 1994.

TABLE I.4.2.1.7.2–1.—*Maximum Daily Quantities of National Ignition Facility-Related Hazardous Materials Stored at Los Alamos National Laboratory*

Hazardous Material	Quantity
Acetone	22,300 L
Alumina	123,957 kg
Copper	18,067 kg
Ethanol	>22,300 L
Hydrofluoric acid	4,268 L
Lead	12,555 kg
Mercury	1,545 kg
Sodium hydroxide	>223,000 kg

Source: Richardson 1995a.

struction is expected to be complete in the year 2009. LANL also has an evaporation lagoon for the disposal of tritium-contaminated aqueous wastes at TA-53. The primary user of this facility is the Los Alamos Meson Physics Facility.

Solid LLW is generated from many areas throughout LANL and is disposed of onsite at TA-54, Area G. Solid LLW waste, such as paper, plastic, glassware, and rags, is separated into compactivel and noncompactivel materials by the waste generators. A 181-t (200-ton) compactor currently in the permitting stage will be used in the future to compact solid waste before it is placed in the landfill. Noncompactible LLW items, such as large equipment and much

TABLE I.4.2.1.8–1.—*Current Waste Management at Los Alamos National Laboratory*

Category	1993 Generation (m^3)	Treatment Method	Treatment Capacity (m^3/yr)	Storage Method	Storage Capacity[a] (m^3)	Disposal Method	Disposal Capacity (m^3)
Low-Level							
Liquid	21,400	Chemical treatment and ion-exchange; solidification; volume reduction (vial crusher)	9,000 (45 m^3/hr)	Chemical and ion-exchange plant TA-50 chemical plant TA-21	663	Treated effluent is discharged to the environment. Residual sludge is solidified and disposed of at TA-54 Area G as a solid LLW	See solid LLW
Solid	2,500	Compaction	76	TA-54 in area G	Variable[b]	In-situ compaction. Currently solid LLW goes to TA-54, Area G for burial	24 to 28 ha
Mixed Low-Level							
Liquid	0	Neutralization, precipitation, oxidation, thermal treatment, deactivation, and solidification; volume reduction; liquid scintillation cocktail vials	None	RCRA-permitted bldgs. (not built yet); interim status container storage areas	583	Incinerator at Diversified Scientific Services, Incorporated in Kingston, TN	NA
Solid	44.9	None	None	TA-54, Area L, or Area G	1,864	None-NTS is planned when permitted, and planned Mixed Waste Disposal Facility	NA
Hazardous							
Liquid	273	Thermal treatment; treatment tanks-neutralize, precipitate and evaporate	Varies depending on the waste stream	Thermal treatment: TA-14, -15, -16, -36 and -39. Storage: TA-5 storage and treatment TA-54, area L	502	Offsite	NA
Solid	668.56[a]	Thermal treatment; flashpad	Varies depending on the waste stream	See above	See above	See above	See above
Nonhazardous (Sanitary)							
Liquid	692,827[c]	Filter, settle, stripping	1,060,063	NA	NA	Permitted discharge sanitary tile fields	2,271,240 l/day
Solid	8,180 t	None	None	NA	NA	Onsite county landfill and landfill Area J, TA-54	NA

[a] Consists of 84.079 t (92.68 tons) *Resource Conservation and Recovery Act* regulated, 460.368 t (507.46 tons) state regulated, and 124.11 t (136.81 tons) *Toxic Substances Control Act* regulated.

[b] Solid LLW is stored temporarily to optimize disposal operations.

[c] 1991 data.

Note: NA - not applicable.

Source: Andrews and Tobin 1995; Bowers 1995.

of the D&D wastes, generally are wrapped in plastic and delivered to the burial site in covered or enclosed vehicles. A portion of the existing landfill has been contaminated by a chemical plume from the hazardous chemical disposal site. This contamination will partially restrict development of the landfill area. An expansion of disposal sites is planned and is currently being reviewed through the *National Environmental Policy Act* (NEPA) process.

I.4.2.1.8.2 *Mixed Low-Level Waste*

Mixed LLW includes solvents, pyrophoric substances, spray cans, scintillation vials, uranium-contaminated lithium hydride, miscellaneous reagent chemicals, vacuum pump oil contaminated with mercury, gas cylinders, and other contaminated material. It is stored onsite at TA-54 in Areas L and G. Currently LANL does not dispose of mixed LLW. The *Federal Facility Compliance Act* of 1992 requires LANL to develop a site treatment plan that will cover all mixed LLW at LANL. For mixed waste with identified treatment technologies, the plan must provide a schedule for submitting permit applications, entering into contracts, initiating construction, conducting system testing, starting operations, and processing mixed wastes. For mixed waste without an identified treatment technology, the plan must include a schedule for identifying and developing technologies, identifying the funding requirements for R&D, submitting treatability study exemptions, and submitting R&D permit applications.

A Hazardous Waste Treatment Facility planned for LANL is designed to treat hazardous and mixed waste streams that are not amenable to offsite treatment. Not all of the technologies to be included in the Hazardous Waste Treatment Facility have been chosen, but the facility will be able to treat reactive metals, plating wastes, acids, bases, ignitable liquids, spent solvents, and decontamination debris. An environmental restoration high-energy plasma technology is being tested as a technique for total destruction of mixed LLW. Another facility that will have the capability to treat mixed waste will be the Mixed Waste Disposal Facility. The treatment facilities will include a plant for treating leachate wastewater, a thermal desorption plant, a plant for stabilizing metals, and a landfill. Some mixed LLW packages are planned to be transported by commercial carriers in closed vans to NTS for burial after NTS is permitted. This procedure will allow LANL to stay in compliance with the *Federal Facility Compliance Act* of 1992.

I.4.2.1.8.3 *Hazardous Waste*

LANL received a permit for treatment, storage, and disposal of hazardous waste under RCRA in November of 1989 and under the Hazardous and Solid Waste Amendments of 1984 provisions from EPA on March 8, 1990. All hazardous waste treatment, storage, and disposal facilities at LANL are either fully permitted or are operating under interim status while other waste management facilities are being developed. Small volumes of almost all wastes listed under 40 CFR 261 are generated as a result of a wide variety of ongoing research. LANL does no landfilling of RCRA-hazardous waste onsite, but contracts with certified transporters to deliver hazardous waste to commercial RCRA-permitted treatment and disposal facilities offsite.

I.4.2.1.8.4 *Nonhazardous Waste*

Nonhazardous wastes are generated routinely and include general facility refuse such as paper, cardboard, glass, wood, plastics, scrap, metal containers, dirt and rubble. Nonhazardous wastes are segregated and recycled whenever possible. Trash is accumulated onsite in dumpsters, which are transported to the county sanitary landfill by commercial firms. The Los Alamos County Landfill is located on property owned by DOE and is operated under a special use permit.

I.4.2.2 *Environmental Impacts*

The following sections describe the potential environmental impacts for land use and visual resources, air quality and noise, water resources, ecological resources, cultural and paleontological resources, and socioeconomics from constructing and operating NIF at LANL. In addition, impacts associated with radiation and hazardous chemicals and waste management are described.

I.4.2.2.1 Land Use and Visual Resources

I.4.2.2.1.1 *Land Use*

Impacts to land use at LANL from NIF would be limited to land cleared and leveled for the Laser and Target Area Building, Optics Assembly Area, General Assembly Area, and office space associated with NIF. The proposed location for NIF (figure I.3.4.2.1–2) consists principally of second-growth woodlands located in TA-58. NIF would require the clearing of an estimated 4 ha (10 acres) of land for buildings, walkways, building access, temporary construction laydown area, and buffer space. The 4 ha (10 acres) would account for approximately 1 percent of the land currently available for development within LANL (Richardson 1995b). However, 4 ha (10 acres) represents an extremely small proportion of LANL's total land area of 111 km^2 (43 mi^2). The project would be located in an area designated as an experimental science land-use zone in LANL's Site Development Plan (LANL 1990a).

With appropriate erosion and sediment control measures, soil impacts during construction of NIF would be short term and minor. Seismic risks would be taken into account during construction and operation of NIF.

I.4.2.2.1.2 *Visual Resources*

New buildings for NIF would be located in the eastern portion of TA-58, in the middle of a young mixed forest of pinyon and Ponderosa pine with typical heights of about 23 m (75 ft) that rises above and to the west of the developed portion of TA-03. In addition to minor and short-term impacts associated with construction activities (fugitive dust, equipment exhaust, etc.), negative visual impacts would occur in the immediate vicinity of the new buildings in the eastern portion of TA-58. The visual character of the woodland would be altered by the presence of large structures, particularly the Laser and Target Area Building, which is expected to exceed 37 m (120 ft) in height. Because of the proximity of the NIF location to highly developed TA-3 and the LANL core area, longer-range views (greater than 1 km [0.5 mi] from the source) would not be adversely affected by NIF.

I.4.2.2.2 Air Quality and Acoustics

I.4.2.2.2.1 *Air Quality*

Construction Emissions. Estimated construction emissions, including emissions from site clearing and emissions associated with building construction, are listed in table I.4.2.2.2.1–1. The construction emission estimates are based on characteristics of the proposed LANL location and on construction vehicle exhaust and fugitive emissions.

Site clearing, which would continue for about two weeks, would produce the greatest amount of fugitive dust PM_{10} emissions compared with other phases of construction (which would occur over four years) and operation. The ISCST2, Version 93109 (EPA 1992a-b) was used to determine the impact of site-clearing activities on ambient air quality (see section I.4.1.2.2.1). The data selected for modeling air quality were 1994 surface meteorological data from the LANL site (LANL 1995a). The surface wind speeds and directions are summarized in an annual wind rose (see figure I.4.2.1.2.1–1). In addition, seasonal average morning mixing height data for Albuquerque (Holzworth 1972) were used throughout the corresponding months (LANL 1995a). Detailed emission inventories associated with site clearing and facility construction, meteorological data used, air quality model assumptions, and model input parameters are presented in Lazaro et al. (1996).

TABLE I.4.2.2.2.1–1.—*Estimated National Ignition Facility Construction Emissions for the Los Alamos National Laboratory Location*

Pollutant	Total Emissions (t/yr)[a]
Particulate matter 10 microns or smaller	8.16[b]
Volatile organic compounds	0.44
Carbon monoxide	1.23
Nitrogen dioxide	3.76
Sulfur dioxide	0.43
Lead	Negligible

[a] Metric tons (1,000 kg) per year.

[b] Includes 2.18 t/yr (2.4 ton/yr) of fugitive emissions for site clearing, using water-spray control that would occur during an approximate 16-day period in the first year and 5.62 t/yr (6.2 ton/yr) of facility construction emissions that would occur for the remainder of the year.

Source: Lazaro et al. 1996.

The national 24-hour particulate matter standard is 150 μg/m^3 (see table I.4.2.1.2.2–1). The 24-hour average particulate matter background concentration representative of the LANL site was 21 μg/m^3 (table I.4.2.1.2.2–1). With conventional dust control (that is, 50 percent control for excavation and 60 percent control for traffic on unpaved roads), maximum 24-hour average PM_{10} concentrations of 94 μg/m^3 over background are predicted at the public access road (West Jemez Road, which runs north of NIF location at the closest distance of 460 m [1,500 ft]). The maximum PM_{10} concentration of 115 μg/m^3, including background concentration, would be below the 24-hour NAAQS of 150 μg/m^3 for PM_{10}. Site clearing at LANL would be expected to last for approximately one-half month, so ambient air quality impacts associated with site clearing would be minor, local, and temporary.

Emissions During Operations. Air pollutant emissions from operation of NIF at LANL would be primarily due to fuel combustion and cleaning of the debris shields. Emissions of solvent VOCs (ethanol) from debris shield cleaning are estimated at approximately 0.5 t/yr (0.55 ton/yr) (LLNL 1995b). Other potential air pollutant emission sources not considered significant would be target destruction during operation under either the Conceptual Design or Enhanced options, exhaust emissions from vehicles used for freight shipments and employee commuting, and emissions from welding operations at the Fabrication Facility.

Table I.4.2.2.2.1–2 lists the estimated LANL annual air pollutant emissions on the basis of the anticipated NIF annual energy requirements provided in table I.4.1.2.2.1–3, adjusted to recognize that at LANL only three new support buildings (area of 4,645 m^2 [50,000 ft^2]) would be required out of the total complement of support buildings (area of 26,722 m^2 [287,643 ft^2]) as indicated in table I.3.4–1. Published emission factors (EPA 1993) were used in the calculations. Emissions of VOCs from solvent cleaning are included. For comparative purposes, table I.4.2.2.2.1–2 includes the LANL 1990 sitewide emissions. More detailed information on emission estimates is provided in Lazaro et al. (1996).

As indicated in table I.4.2.2.2.1–2, estimated air pollutant emissions from NIF operation at LANL are well below 1 t/yr (1.1 ton/yr), except for nitrogen dioxide, which is below 2 t/yr (2.2 ton/yr). Air pollutant emissions from NIF operations are less than 10 percent of LANL 1990 emissions except for VOC, which is approximately 20 percent of 1990 emissions. Existing ambient concentrations for these pollutants (see section I.4.2.1.2.2, table I.4.2.1.2.2–1) are well below the ambient air quality standards for all pollutants. On the basis of this information, it can be concluded that NIF operation would have no adverse impact on air quality and would not contribute to violation of ambient air quality standards.

Under New Mexico Air Quality regulations, a permit would be required before installation of NIF external

TABLE I.4.2.2.2.1–2.—*Annual Emission Increases with National Ignition Facility Operation at Los Alamos National Laboratory*

Pollutant	1990 Emissions[a] (t/yr)	Projected NIF Emissions[b] (t/yr)	1990 Emissions Plus NIF (t/yr)	NIF percent of 1990 Emissions
Particulate matter 10 microns or smaller	2.56[c]	0.18	2.74	6.8
Volatile organic compounds	2.89[d]	0.56	3.45	20
Carbon monoxide	21.58	0.46	22.04	2.2
Nitrogen dioxide	53.88	1.91	55.79	3.55
Sulfur dioxide	0.70	0.03	0.73	5
Lead	0.03	Negligible	0.03	Negligible

[a] Only pollutants with 1990 emissions of 11.35 kilograms/year (kg/yr) (25 lb/yr) or more are reported here.
[b] Emissions based onsite estimated natural gas external combustion, diesel internal combustion, and VOC solvent cleaning (0.5 t/yr [0.55 ton/yr]) and emission factors (EPA 1995c; Lazaro et al. 1996).
[c] Reported as particulate matter and assumed equivalent to particulate matter (PM_{10}).
[d] Reported as nonmethane hydrocarbons and assumed equivalent to VOC.
Source: EPA 1993; LANL 1994.

combustion units (boilers) if the boilers were subject to New Source Performance Standards (New Mexico Environment Improvement Board/Air Quality Control Regulations 702) (NMEIB/AQCR 702) (NMEIB 1994). Gas-fired boilers with rated heat input greater than 105,600 MJ/hr (100 million British thermal units [Btu/hr]), but not over 264,000 MJ/hr (250 million Btu/hr), are limited to New Source Performance Standards nitrogen oxide emissions ranging from 43 to 86 ng/J (depending on the heat release rate, which is a function of the furnace volume [40 CFR 60.44b]). There are no New Source Performance Standards emission limits for gas-fired boilers with a rated heat input at or less than 105,600 MJ/hr (40 CFR 60.40c).

Emissions of VOC at the stated annual rate of about 0.5 t/yr (0.55 ton/yr) would not have a significant impact on local air quality and would not require any additional controls (NMEIB/AQCR 702, Part 2). Additional regulatory information is presented in section I.5.2.1.

I.4.2.2.2.2 *Acoustics*

During the clearing phase of construction for NIF at the LANL site, noise from construction equipment would increase the average outdoor sound level by 6 dB at the location of the nearest public residence. That point corresponds to the location of the maximally exposed individual 1,670 m (5,480 ft) north-northeast of the proposed NIF location. The average outdoor sound level at this location would be expected to increase from 40 to 46 dBA when the clearing equipment was operating. The CNR rank, adjusted for the estimated preexisting background level and for temporal and conceptual characteristics of the sound, would be expected to be "C." Noise with CNR ranks of "A" through "D" is generally considered to be acceptable, with "A" being the least annoying. At a rank of "C," sporadic complaints from the public are expected. However, the possibility of complaints might be lessened if it were explained to the public beforehand that the noise would occur over a period of only about two weeks, and only during daylight hours.

The average outdoor daytime sound level at the nearest laboratory building at LANL would be expected to increase by 14 dB, from 40 dBA to 54 dBA. The adjusted CNR rank for the resulting sound is "D." This sound level would occur outside the laboratory buildings. Unless windows and doors were open, the increase in sound level would not be expected to interfere with any activities that were not sensitive to sound at the level of normal speech.

The average daytime sound level at the nearest Los Alamos townsite residential area, about 1.6 km (1 mi) northwest of the construction site, would be expected to increase by 4 dB, from 45 to 49 dBA. The adjusted CNR rank for the increased level is "B."

These estimates are based on the assumptions given in Lazaro et al. (1996). It is possible that actual noise levels might be either slightly higher or lower than these estimates.

I.4.2.2.3 Water Resources

Construction of NIF at LANL would be expected to have minor to negligible effects on water quality. Utility upgrades under LANL's long-range utilities development plan are expected to meet future projected water requirements and wastewater treatment needs, including those for NIF.

During construction, about 2.95 MLY (0.80 MGY) of water would be required for NIF (LLNL 1995b). NIF operations would require about 152 MLY (40 MGY) of raw water. About 18 MLY (4.7 MGY) of that total would be for domestic use (table I.4.2.2.3–1).

TABLE I.4.2.2.3–1.—*Water and Wastewater Utility Capacity at Los Alamos National Laboratory*

Utility System	Current Usage[a,b]	NIF Requirement[c]	Projected Usage, Including NIF[a]	Current Capacity[a]
Water supply (MLY)	5,519	152	5,671	6,800
Wastewater treatment (MLY)	693	18	711	829

[a] LANL 1990a; LANL 1995b; Richardson 1995c.
[b] DOE 1993b.
[c] LLNL 1995a.

Sanitary wastewater generated by operation of NIF is estimated to total about 18 MLY (4.7 MGY). Consolidation of LANL's existing sewer system was completed in 1992, bringing all treatment systems into compliance with Federal and state regulations. Wastewater treatment capacity in the new consolidated facility is sufficient to meet NIF requirements.

Because the canyons south and north of the NIF location are more than 20 m (65 ft) deep, the 100-year floodplain is contained within the canyons (Dunham 1995). No floodplain map for the 500-year flood is available, but because of the depth of the canyons, flooding of the NIF location from the 500-year flood is unlikely.

I.4.2.2.4 Biotic Resources

I.4.2.2.4.1 *Terrestrial Resources*

NIF (including the temporary construction laydown area) would be constructed within a mix of ponderosa pine and pinyon pine-juniper habitats and would eliminate up to 4.0 ha (9.9 acres) of these habitats. The general types of impacts that could result from NIF construction at LANL would be similar to those discussed for LLNL (e.g., destruction or displacement of wildlife within construction areas) (section I.4.1.2.4). However, the ponderosa pine and pinyon-juniper habitats that would be affected at LANL are of a higher quality than is the disturbed grassland at LLNL. Construction of NIF at LANL would extend the influence of an urbanized/industrial area into more natural habitat and increase fragmentation of the wooded habitat. Operation of NIF is not expected to have significant adverse impacts on terrestrial resources. Fencing around NIF may have a localized affect on the movement of the elk herd and localized disturbance of wildlife could occur from the increased level of human activity.

I.4.2.2.4.2 *Wetlands and Aquatic Resources*

The proposed NIF location at LANL does not contain, nor is it located near, wetlands or surface water resources. Therefore, construction and operation of NIF at LANL would not be expected to adversely affect such resources.

I.4.2.2.4.3 *Rare, Threatened, and Endangered Species*

No significant adverse impacts to rare, threatened, or endangered species from construction or operation of NIF at LANL would be expected. Several of the listed species that exist at LANL could exist in the area proposed for NIF (section I.4.2.1.4.3). Construction of NIF facilities could result in a minor loss of habitat that could be utilized by some species (e.g., New Mexican jumping mouse, northern goshawk, gray vireo, southwestern willow flycatcher, spotted bat, and occult little brown bat). However, no habitat designated as critical would be affected. Lights associated with the NIF project could affect the availability of prey base for the Mexican spotted owl (Risberg 1995).

I.4.2.2.5 Cultural and Paleontological Resources

Construction and operation of the proposed NIF at LANL would have no effect on archaeological sites or historic structures listed on or eligible for NRHP because these resources are absent in the affected area. The proposed NIF would have no effect on important paleontological remains or Native American cultural resources.

I.4.2.2.6 Socioeconomics

Locating NIF at LANL would have a minor impact on socioeconomic conditions in the economic study region and in the ROI described in section I.4.2.1.6. Because NIF partnership includes representatives from government, industry, and the academic sector throughout the United States, procurement and investment required for NIF would be dispersed over a number of different regions, damping the concentration of economic effects of the program in the LANL area.

The following sections describe the effects of constructing and operating NIF on the host region's economy and employment, and on population, housing, public finances and services, and local transportation in the ROI.

I.4.2.2.6.1 *Regional Economic Impacts*

Slight changes in employment and economic activity levels in the economic study region would occur from local spending of employee wages, procurement of goods and services (including construction materials), and other local investments associated with constructing and operating NIF. In addition to creating new jobs (direct) at the site, indirect job opportunities, such as community-support services, would also be created in the economic study region as a result of NIF construction and operation. The total new jobs created (direct and indirect) would contribute slightly to unemployment reduction, income increases, and economic output in the regional economy during construction and operation of NIF (table I.4.2.2.6.1–1). Constructing NIF at LANL would result in a peak of approximately 270 direct jobs in 1998. This construction-related procurement would indirectly create nearly 860 jobs in the economic study area. Employment for operation would begin phasing in as construction neared completion. Direct employment related to operations is projected at 330, with nearly 270 indirect jobs created throughout the economic study region. As a result of construction and operation of NIF, the baseline compounded average annual growth rate from 1995 to 2003 would increase by 0.03 percentage points.

Peak earnings associated with the 270 direct jobs created in 1998 are projected at approximately 15.3 million dollars. Construction-related procurement would indirectly create more than 16 million dollars in regional earnings. Direct earnings related to operations are projected to reach nearly 14 million dollars, with 5.5 million dollars in indirect earnings added to the regional economy.

I.4.2.2.6.2 *Population and Housing*

Construction. Population in-migration resulting from the NIF construction phase demands would begin in 1996 and peak in 1998, with a projected cumulative total of 2,200 people moving into the ROI (table I.4.2.2.6.1–1) over the three-year period. This population increase would result in demand for an additional 800 housing units in the ROI. Baseline projections of the LANL ROI housing market from 1996 (NIF construction start date) through 1998 indicate that nearly 8,800 housing units would be available. The introduction of 2,200 new workers and their families could affect the housing market in the ROI. Additional housing demand could absorb approximately 800 homes or 9 percent of the 8,800 vacant housing units in the LANL region. Such a high demand for housing could stimulate new housing starts and affect housing costs in the region. However, most of this housing demand would be temporary and would primarily affect the renter segment of the ROI housing market.

Operations. Population in-migration resulting from the NIF operation phase demands could result in an additional 610 people moving into the ROI. While this demand for housing would be longer term relative to construction, no perceptible strain on the market is expected, assuming that the general conditions associated with the housing market continue.

I.4.2.2.6.3 *Public Finance*

Construction. Given the population and economic growth associated with NIF during the construction phase, fiscal balances (revenues and expenditures) are expected to increase for all jurisdictions within the ROI. Short-term public impacts would peak during 1998 and would then decline as construction neared completion in 2002. Since the largest percentage of socioeconomic impacts are expected to occur in Los Alamos County (assuming current residential patterns), that county would experience the largest fiscal impact in the ROI (table I.4.2.2.6.1–1).

Operations. The increase in population and economic growth as a result of NIF operations would increase fiscal balances for all counties within the ROI, with greatest impact in Los Alamos County. Fiscal impacts would remain relatively stable throughout the operational period.

I.4.2.2.6.4 *Public Services*

By 1998, the county of Los Alamos would need to hire 13 additional teachers and two additional doctors to maintain its current level of service. By 2003, when operations would start, the county would need only four additional teachers over the baseline conditions to maintain the current level of service.

I.4.2.2.6.5 *Local Transportation*

In 1995, LANL employed approximately 6,200 persons (DOE 1993a). Direct employment generated by NIF at LANL for the life cycle of the project (1996 to 2033) would range from a minimum of 28 new jobs in 1996 to a maximum of 270 new jobs in 1998.

TABLE I.4.2.2.6.1-1.—*Potential Socioeconomic Impacts in the Los Alamos National Laboratory Area*

Parameters	NIF Alternative Change Over Reference Baseline		Reference Baseline	
	Peak Construction 1998[a]	Operations 2003[b]	1996 to 2002[a]	2003[b]
Regional Employment				
Direct jobs	270	330		
Indirect jobs	860	270		
Total jobs	1,130	600	1,760 additional jobs projected annually	2,250 additional jobs projected
Regional Aggregate Earnings[c]				
Direct earnings	15.29	13.81		
Indirect earnings	16.27	5.48		
Total earnings	31.56	19.29		
Regional Population Migration				
ROI in-migrating population	2,200	610	1,700 additional people annually	1,360 additional people
Regional Housing Demand				
Number of housing units in the ROI	800	220	9,080 vacant housing units (annual average)	10,080 vacant housing units
Local Transportation				
Number of trips generated at site per day	518	630		
Public Finance				
Percent change over 1995 fund balance	4.40	0.71	NA[d]	NA
Public Services (LOS)				
Change in service demand (Los Alamos County)				
Police	2	1	48[d]	50
Fire	5	2	130[d]	136
General	28	8	566[d]	585
Physicians	2	0	55[d]	56
Teachers	13	4	260[d]	268

[a] Construction period would be 1996 to 2002, with peak construction projected to occur in 1998.
[b] Operating period would be 2003 to 2033, with impacts throughout the period projected to remain stable.
[c] Regional earnings are in millions of constant 1994 dollars.
[d] Projected 1998 fund balance for Public Finance, and projected 1998 level of service (LOS) for Public Services.

Note: LOS - level of service.

Source: Model results.

The peak number of direct jobs created by NIF at LANL would be approximately 270 in 1998. These direct jobs could generate up to 518 new daily trips on LANL access roads (table I.4.2.2.6.5–1). Depending on where the new workforce resided, congestion on NMSR 4 from NMSR 126 to NMSR 501 could increase in Los Alamos County. The level of service on NMSRs 501 and 502 near LANL are currently approaching congested levels during peak periods; new trips generated from NIF construction and operation could aggravate congestion on these roads (table I.4.2.2.6.5–1).

A peak of approximately 860 indirect jobs in 1998 could impact traffic flow within the region, depending on where these jobs were located. If all indirect employment was concentrated in either Los Alamos or Santa Fe, increased congestion could occur on that city's roads. However, if indirect jobs were dispersed throughout the region, the regional road system would likely be able to handle the additional trips generated from the operation of NIF.

I.4.2.2.6.6 *Environmental Justice*

For the population in the region within 80 km (50 mi) of LANL, minorities are in a higher proportion and low-income populations are in lower proportion to other populations than in New Mexico as a whole (section I.4.2.1.6.5). Socioeconomic impacts within this region would be beneficial. Health impacts from radiological doses in this region would not be expected to result in any cancer fatalities. Because these two impacts would not be highly adverse, no environmental justice issues for regional impacts have been identified.

Neither minority nor low-income populations are clustered disproportionately in the local vicinity of the LANL site (section I.4.2.1.6.5). Thus, the local area impacts from construction and operation of NIF would not disproportionately affect either minority or low-income populations at this site. Consequently, no environmental justice issues related to local area impacts from the construction and operation of NIF have been identified.

I.4.2.2.7 Radiation and Hazardous Chemicals

This section describes potential radiological and hazardous chemical impacts resulting from normal operations and postulated accidents at NIF at LANL. Methods, data, and assumptions used in estimating impacts are presented in Lazaro et al. (1996).

I.4.2.2.7.1 *Normal Operations*

The general public surrounding the LANL site and workers at LANL may be exposed to small quantities of radionuclides released and radiation emitted from routine NIF operations; however, these levels of radioactive releases and radiation emissions would be expected to be well within regulatory limits. No impacts from hazardous chemicals should occur, because only minute quantities of hazardous VOCs would be expected to be emitted during routine NIF operations. Impacts from routine transportation of tritium targets would also not be expected, because there would be no detectable levels of radiation outside the packages carrying the low-energy beta-emitting tritium targets.

Table I.4.2.2.7.1–1 summarizes the potential impacts of radiation exposures resulting from the Conceptual Design and the Enhanced options of NIF operations at LANL.

TABLE I.4.2.2.7.1–1.—*Potential Radiological Impacts from Normal Operations of the National Ignition Facility at Los Alamos National Laboratory*

Receptor	Conceptual Design Option	Enhanced Option
Maximally Exposed Individual		
Dose (mrem/yr)	0.003	0.009
Percent of natural background	$7x10^{-4}$	0.002
30-year fatal cancer probability	$4x10^{-8}$	$1x10^{-7}$
Population Within 80 Km		
Dose (person-rem/yr)	0.02	0.06
Percent of natural background	$2x10^{-5}$	$6x10^{-5}$
30-year fatal cancers	0	0
Workers Onsite		
Dose (person-rem/yr)		
Non-NIF workers	0.02	0.05
NIF workers	10	10
30-year fatal cancers	0	0

Source: Model results.

TABLE I.4.2.2.6.5–1.—*Future Traffic Impacts from National Ignition Facility Project on Los Alamos National Laboratory Access Roads*

Route	From	To	Estimated 1995 AADT	Estimated Background and Peak Project Year AADT (1998)	Estimated Percent Change in AADT Between 1995 and Peak Construction Year (%)	Estimated 1995 LOS	Estimated Background and Peak Construction Year LOS (1998)
NMSR 4	NMSR 126	NMSR 501 N at Los Alamos W Gate	723	750	4	A	A
NMSR 4	NMSR 501 N at Los Alamos W Gate	NMSR 502	3,103	3,125	1	B	B
NMSR 501	NMSR 502 at Los Alamos	NMSR 502 at Los Alamos	9,327	9,675	4	D	D
NMSR 502	NMSR 501 at Los Alamos	NMSR 4	8,941	9,272	4	D	D
NMSR 502	NMSR 4	NMSR 30	12,267	12,721	4	D	D

Note: AADT - annual average daily trips; LOS - level of service.

Source: DOE 1993a.

Impacts to the Public. For the Enhanced Option, the estimated radiation dose to a maximally exposed member of the public located about 1.6 km (1 mi) north-northeast of NIF would be 0.01 mrem/yr, which would be much less than the dose limit of 100 mrem/yr resulting from all pathways combined (DOE 1990). The likelihood of the maximally exposed individual contracting a fatal cancer would be 1 in 10 million for the entire operational life of NIF (dose/yr x 30 yr x fatal cancer risk factor of $5x10^{-4}$/rem). The estimated radiation dose to the surrounding public is 0.06 person-rem/yr; no cancer fatalities would be expected to occur in the public for the entire NIF operations at LANL. For the Conceptual Design Option, estimated radiation impacts are about one-third the impacts from the Enhanced Option. No adverse health effects would result.

Impacts to Workers. In addition to potential exposure to radionuclides, the general LANL workers outside NIF could be exposed to direct radiation resulting from high-yield experiments at NIF. For the Enhanced Option, the estimated radiation dose to these non-NIF workers at LANL is 0.05 person-rem/yr. No cancer fatalities would be expected to occur to workers for the entire NIF operations at LANL. For the Conceptual Design Option, estimated radiation impacts are about one-third the impacts from the Baseline Option, posing an extremely low risk of adverse health effects.

Potential radiation exposures inside NIF would be kept as low as reasonably achievable through facility design and administrative controls. The design objective of NIF would be to keep the individual radiation worker dose to less than 500 mrem/yr. On average, it is estimated that a NIF worker would receive a dose of approximately 30 mrem/yr.

I.4.2.2.7.2 *Postulated Accidents*

Radionuclides and hazardous chemicals could be released by accidents postulated at NIF and during the transport of tritium targets. Tables I.4.2.2.7.2–1 and I.4.2.2.7.2–2 summarize potential impacts to the public and workers from postulated facility and transportation accidents. A description of each accident scenario evaluated is provided in Lazaro et al. (1996).

Radiological Impacts

Impacts to the Public. The public could be exposed to radionuclides released from a postulated accident at NIF. The bounding accident assumes an earthquake would occur at the time of a maximum-yield experiment, with an accidental release frequency of $2x10^{-8}$/yr. For the Enhanced Option, the estimated radiation dose to the maximally exposed member of the public is 0.1 rem. The likelihood that the maximally exposed individual would contract a fatal cancer from this exposure is 1 in 16,000. The estimated radiation dose to the surrounding public is 490 person-rem. No cancer fatalities would be expected to occur in the public following such an accident at NIF. For the Conceptual Design Option, estimated radiation impacts are about half the impacts calculated for the Enhanced Option. No adverse health effects would be expected.

TABLE I.4.2.2.7.2–1.—*Potential Radiological Impacts from Postulated Bounding Accident Involving the National Ignition Facility at Los Alamos National Laboratory*

Receptor	Conceptual Design Option	Enhanced Option
Maximally Exposed Individual		
Dose (rem)	0.08	0.1
Fatal cancer probability	$4x10^{-5}$	$7x10^{-5}$
Risk (cancer fatalities/yr)	$8x10^{-13}$	$1x10^{-12}$
Population Within 80 Km		
Dose (person-rem)	290	490
Fatal cancers	0	0
Risk (cancer fatalities/yr)	$3x10^{-9}$	$5x10^{-9}$
Workers Onsite		
Dose (person-rem)	14	23
Fatal cancers	0	0
Risk (cancer fatalities/yr)	$1x10^{-10}$	$2x10^{-10}$

Source: Model results.

Table I.4.2.2.7.2–1 also indicates that the risk of radiation-caused cancer fatalities from the postulated accident at LANL would be essentially zero, considering the extremely low probability of the accident occurring during NIF operations. The risk would be the product of the estimated radiation dose, fatal

TABLE I.4.2.2.7.2–2.—*Potential Radiological Risks and Consequences of Transporting Tritium Targets from Manufacturing Facilities to Los Alamos National Laboratory*

Manufacturing Facility	Conceptual Design Option	Enhanced Option
General Atomics		
Dose risk (person-rem/yr)	2.2×10^{-6}	1.7×10^{-5}
Fatality risk (cancer fatalities/yr)	1×10^{-9}	9×10^{-9}
Nonradiological accidents[a] (fatalities/yr)	2×10^{-3}	4×10^{-3}
Nonradiological vehicular emissions (fatalities/yr)	8×10^{-4}	2×10^{-3}
Lawrence Livermore National Laboratory		
Dose risk (person-rem/yr)	2.2×10^{-6}	1.7×10^{-5}
Fatality risk (cancer fatalities/yr)	1×10^{-9}	9×10^{-9}
Nonradiological accidents[a] (fatalities/yr)	2×10^{-3}	4×10^{-3}
Nonradiological vehicular emissions (fatalities/yr)	4×10^{-4}	9×10^{-4}
Savannah River		
Dose risk (person-rem/yr)	2.4×10^{-6}	1.9×10^{-5}
Fatality risk (cancer fatalities/yr)	1×10^{-9}	1×10^{-8}
Nonradiological accidents[a] (fatalities/yr)	2×10^{-3}	4×10^{-3}
Nonradiological vehicular emissions (fatalities/yr)	2×10^{-4}	4×10^{-4}
University of Rochester		
Dose risk (person-rem/yr)	2.6×10^{-6}	2.0×10^{-5}
Fatality risk (cancer fatalities/yr)	1×10^{-9}	1×10^{-8}
Nonradiological accidents[a] (fatalities/yr)	2×10^{-3}	4×10^{-3}
Nonradiological vehicular emissions (fatalities/yr)	2×10^{-4}	4×10^{-4}
Maximum Consequence Accident		
Population[b,c]		
Dose (person-rem)	0.33	3.3
Fatal cancers	2×10^{-4}	2×10^{-3}
Maximally Exposed Individual[b,d]		
Dose (rem)	1.2×10^{-4}	1.2×10^{-3}
Fatal cancer probability	6×10^{-8}	6×10^{-7}

[a] Collective population fatalities causes were calculated for 145 shipments (Conceptual Design Option) and 335 shipments (Enhanced Option). For example, a reported value of 4×10^{-3} fatalities suggests that no fatalities are expected for the proposed action. However, one single fatality out of the entire affected population might be expected over the course of 250 years if the same number of shipments were to continue for that length of time.

[b] The most severe accidents assumed that 100 percent of the target tritium was released in an oxide form during an accident. Accident consequence results were determined using the RISKIND computer program which is described in Yuan et al. 1993. Stable weather conditions (Pasquill Stability Class F) with a wind speed of 1 m/s (2.2 mph) were assumed.

[c] The maximum consequences would result from an accident occurring in an urban environment. The population was assumed to extend at a uniform density of 3,861 persons/km^2 (10,000 persons/mi^2) to a radius of 80 km (50 mi) from the accident site. The population exposure pathways for urban environments included inhalation and resuspended inhalation. Urban environments were not assumed to produce food for local use or export, hence no ingestion dose was included.

[d] The maximally exposed individual was assumed to be at the location of maximum exposure. The location of the maximally exposed individual was assumed to be 380 m (1,247 ft) from the accident under stable weather conditions. Individual exposure pathways include acute inhalation during passage of the plume. No ingestion dose was considered.

Note: The transportation risk assessment assumed 100 percent of the tritium targets would be manufactured and transported to NIF from each site. In practice, tritium targets would be produced and transported from more than one manufacturer.
The transportation risk assessment was performed for offsite transportation only. Transportation risks from onsite transport of tritium targets were assumed to be negligible compared with risks from offsite transportation.

Source: Model results.

cancer risk factor of $5x10^{-4}$/rem, and accident release frequency of $2x10^{-8}$/yr.

Impacts to Workers. For the Enhanced Option, the estimated radiation dose to all workers at LANL from the postulated accident is 23 person-rem. No cancer fatalities would be expected to occur to workers following the postulated accident. For the Conceptual Design Option, estimated radiation impacts are about half the impacts calculated for the Enhanced Option. No adverse health effects would be expected. The risk of radiation-caused cancer fatalities would essentially be zero, considering the extremely low potential for the postulated accident to occur. LANL has a comprehensive emergency plan, which would be expanded to incorporate NIF to ensure protection of workers in case of an accident or natural disaster.

Transportation Impacts. Radiological impacts associated with the transportation of tritium targets would result from a release of tritium into the environment following a transportation accident. Since tritium is a pure beta emitter with no associated gamma radiation, radiological risks associated with routine (incident-free) transportation operations are considered to be negligible. The potential radiological impacts of transporting tritium targets were calculated for truck and air travel. For this analysis, it was assumed that the tritium targets would be transported by truck from the manufacturing sites to the nearest major airport and then by cargo aircraft to Albuquerque International Airport. After arriving at Albuquerque, the targets would be transferred to a truck for shipment to NIF at LANL.

Table I.4.2.2.7.2–2 presents the risks associated with the transportation of tritium targets from each of the tritium manufacturing facilities to NIF at LANL. Radiological risk from transportation activities is defined as the product of the accident consequence (dose) and the probability of the accident occurring, and was calculated by considering a wide range of accidents, from high-probability, low-consequence events to low-probability, high-consequence events (see Lazarro et al. 1996). Latent cancer fatality risks were obtained by multiplying the dose risk by 0.0005 latent cancer fatalities per person-rem (ICRP 1991). Latent cancer fatality risks range from $1x10^{-9}$ to $1x10^{-8}$ per year for all cases.

Nonradiological impacts associated with the ground transport of tritium targets were calculated under both routine (incident-free) and accident conditions. Nonradiological population risks for routine operations were calculated by multiplying the distance traveled by truck in urban population density zones by a risk factor for latent mortality from pollutant inhalation (Rao et al. 1982). Nonradiological population risks resulting from vehicular accidents were calculated in a similar manner by multiplying the state-specific accident fatality rate by the distance traveled by truck in the state.

The maximally exposed individual and population doses were calculated for a transportation accident involving release of the entire tritium cargo (assumed to be five tritium targets). Radiological impacts from a potential maximum-consequence accident were assessed for a general population located in a zone of urban population density. Maximally exposed individuals are assumed to be exposed unshielded as the plume passed at a distance resulting in the largest dose to the individual. Radiological consequences were assessed using worst-case weather conditions (Pasquill Stability Class F) for both the collective population and the maximally exposed individual. For assessment purposes, it was assumed that the entire tritium cargo was released to the environment in oxide form. The estimated number of latent cancer fatalities from the maximum-severity transportation accident was calculated by multiplying the population committed effective dose equivalent by 0.0005 latent cancer fatalities per person-rem (ICRP 1991). Table I.4.2.2.7.2–2 summarizes the impacts resulting from a maximum-consequence accident during the transport of tritium targets.

Hazardous Chemical Impacts. A number of possible chemical accidents were studied in terms of their potential impacts on workers and the public outside the LANL site boundaries. The range of accidents considered (including an aircraft crash) and the four possible accidents likely to have the greatest impacts were studied in detail (see Lazaro et al. 1996). These four accidents are as follows:

- A mercury release from the ignitron switches
- A combined alumina/silica release from the target chamber

- A carbonyl fluoride release from the optics treatment area

- A hydrogen fluoride release from the optics treatment area

These accidents would occur within the NIF Laser and Target Area Building, and people at nearby buildings and members of the public would be potentially at risk for inhalation effects. The nearest location of members of the public would be 1.6 km (1.0 mi) north-northeast of the proposed NIF.

A modeling study was conducted for each of the four release scenarios. More details, including predicted concentrations, are provided in Lazaro et al. (1996). The modeling study applied a dispersion model to each of the releases and used a health criterion representative of acute impacts from an exposure that might happen once in a lifetime. The health criterion (ERPG-2 level) was the concentration below which, if exposure occurred for an hour, the exposed individual could still avoid irreversible health effects by taking emergency action. The results of the modeling yield the following conclusions:

- The threat zone from each of the four accidents would not extend to the boundary with the public under either typical or extreme meteorological conditions

- Nearby buildings and personnel outside would be at risk if any of the four accidents occurred. The assumptions were made that the release would not be inhibited by walls of NIF Laser and Target Area Building and that the wind would take the plume away from the building. The distances beyond which concentrations would fall below the ERPG-2 level for each of the accidents are as follows:

  - Mercury scenario—237 m (778 ft) for both the Conceptual Design and Enhanced options

  - Alumina/silica scenario—171 m (561 ft) for the Conceptual Design Option and 231 m (758 ft) for the Enhanced Option

  - Carbonyl fluoride scenario—70 m (230 ft) for both the Conceptual Design and Enhanced options

  - Hydrogen fluoride release—101 m (331 ft) for both the Conceptual Design and Enhanced options

The personnel in nearby buildings would likely be protected because the release (typically lasting 15 minutes) would pass by the buildings with little infiltration. Personnel outside in the immediate vicinity of the NIF building may be affected.

I.4.2.2.8 Waste Management Impacts

This section evaluates wastes that would be generated by NIF that might affect the current waste management practices of LANL during construction, operation, and decommissioning of NIF if it were to be located at LANL.

I.4.2.2.8.1 *Waste Generation and Management During Construction and Operation*

All construction wastes would be nonhazardous and would be handled under conventional construction regulations. Site capacity is adequate to handle these wastes, or arrangements would be made with offsite disposal facilities if necessary.

Table I.4.1.2.8.1–2 (section I.4.1.2.8.1) describes the quantities of wastes generated during operations by category for both the Conceptual Design and Enhanced options (Bowers and Crawford 1995). The following discussions describe current practices and the proposed disposition of NIF operational wastes shown in table I.4.1.2.8.1–2 for LANL.

During operation, various low-level, mixed, hazardous, and nonhazardous wastes would be handled at NIF. The quantities of these wastes and their proposed management at LANL are discussed below. Technologies that might be employed to minimize waste streams are also discussed. Waste handling methods would be the same for both the Conceptual Design and Enhanced options. Waste quantities would be somewhat higher for the Enhanced Option; however, no changes in waste handling would be necessary.

Aqueous LLW would be treated at TA-50 (radioactive Liquid Waste Treatment Facility) if the tritium concentration was low enough in the TA-53 lagoon or would be treated using equipment and techniques developed by LANL's Tritium Systems and Engineering Group (Richardson 1995d). Molecular sieves would be disposed of at TA-54, Area G. Personal protective equipment and cleaned wipes would be reused, as is common practice at other laboratories. Solid LLW would be disposed of at TA-54, Area G. High-efficiency particulate air filters are currently sampled and characterized at LANL by the Chemical Science and Technology Division, which has a program to dispose of high-efficiency particulate air filters at TA-54. Solid LLW material that is discarded is an approved waste for disposal at TA-54.

Solid mixed wastes generated by NIF would be stored at Area G of TA-54 in inspectable arrays until characterization and selection of an appropriate disposal facility (for example, Hazardous Waste Treatment Facility or NTS). The tritiated vacuum pump oil could be stabilized. Liquid mixed waste would be treated onsite or stabilized.

Hazardous Waste. Disposal of capacitors and general chemicals would be handled as outlined in section I.4.2.1.8.3.

Nonhazardous Waste. Nonhazardous wastes generated by NIF would be handled similarly to current procedures at LANL (section I.4.2.1.8.4). The incremental waste generated by NIF would not be expected to significantly affect the volume of wastes that would be disposed of at the Los Alamos County Landfill located on property owned by DOE (Richardson 1995e).

Potential Waste Minimization During Operations. During operations, waste minimization would be handled as described in section I.4.1.2.8 for LLNL.

Existing Waste Management Capabilities at LANL. The estimated waste that would be generated by NIF is listed in table I.4.1.2.8.1–2. Table I.4.2.2.8.1–1 compares the NIF waste generation rate to the annual handling/treatment capacity at LANL. Table I.4.2.2.8.1–2 details the impacts that NIF would have on existing storage capacities at LANL.

I.4.2.2.8.2 *Waste Management at Los Alamos National Laboratory During National Ignition Facility Decommissioning*

LANL proposes that decommissioning NIF after the projected 30 years of operation would follow the procedures for handling the laser, target area, and associated equipment as described in section I.4.1.2.8 for LLNL.

TABLE I.4.2.2.8.1–1.—*Comparison of National Ignition Facility Waste to Annual Treatment Capacity at Los Alamos National Laboratory* [Page 1 of 2]

Category	Ratio of NIF Waste Generation to Annual Treatment Capacity[a]	Treatment Capacity (m^3/yr)	Is Existing or Planned Treatment/Disposal Capacity Adequate
Low-Level			
Liquid			
Conceptual design total	2.8×10^{-2}	9,000 (45 m^3/hr)	Yes
Enhanced total	7.4×10^{-2}	9,000 (45 m^3/hr)	Yes
Solid			
Conceptual design total	1.7×10^{-2}	76	Yes
Enhanced total	3.8×10^{-2}	76	Yes
Mixed			
Liquid			
Conceptual design total	NA[b]	None	Yes
Enhanced total	NA	None	Yes

TABLE I.4.2.2.8.1–1.—*Comparison of National Ignition Facility Waste to Annual Treatment Capacity at Los Alamos National Laboratory* [Page 2 of 2]

Category	Ratio of NIF Waste Generation to Annual Treatment Capacity[a]	Treatment Capacity (m^3/yr)	Is Existing or Planned Treatment/Disposal Capacity Adequate
Low-Level			
Liquid			
Solid			
Conceptual design total	NA	None	Yes
Enhanced total	NA	None	Yes
Hazardous			
Liquid			
Conceptual design total	Variable[c]	Variable	Variable
Enhanced total	Variable	Variable	Variable
Solid			
Conceptual design total	Variable	Variable	Variable
Enhanced total	Variable	Variable	Variable

[a] The following values for the densities of the materials were assumed: molecular sieves: density of diatomaceous earth (0.27 g/cm^3); personal protective equipment and wipes: density of paper (0.4 g/cm^3); pre and high-efficiency particulate air filters: density of charcoal (1.8 g/cm^3); paper capacitors: density of paper (0.4 g/cm^3); hardware from the chamber: density of 50 percent aluminum and 50 percent stainless steel (5.3 g/cm^3).

[b] NA - not applicable.

[c] Depending on waste stream.

Source: Calculated from tables I.4.1.2.8.1–2 and I.4.2.1.8–1.

TABLE I.4.2.2.8.1–2.—*Impact of Estimated National Ignition Facility-Generated Waste on Waste Storage at Los Alamos National Laboratory*

Category	NIF-Generated Waste/Year (m^3)		Years to Fill Storage with NIF Flow Alone[a]		Is Existing Storage Capacity Adequate	
	Solid[b]	Liquid[b]	Solid	Liquid	Solid	Liquid
Low-Level						
Conceptual design total	2.98	0.60	Variable	600	Variable	Yes
Enhanced total	7.25	1.56	Variable	200	Variable	Yes
Mixed						
Conceptual design total	0.34	2.00	5,500	300	Yes	Yes
Enhanced total	0.88	4.98	2,000	100	Yes	Yes
Hazardous[c]						
Conceptual design total	8.0	2.30	63	200	Yes	Yes
Enhanced total	8.0	4.60	63	100	Yes	Yes

[a] The following values for the densities of the materials were assumed: molecular sieves: density of diatomaceous earth (0.27 g/cm^3); personal protective equipment and wipes: density of paper (0.4 g/cm^3); pre- and high-efficiency particulate air filters: density of charcoal (1.8 g/cm^3); paper capacitors: density of paper (0.4 g/cm^3); hardware from the chamber: density of 50 percent aluminum and 50 percent stainless steel (5.3 g/cm^3).

[b] The total amount of the low-level waste was found by adding the values in the column "Cleaned" of table I.4.1.2.8.1–2 to the column "Low-Level" of the same table. The density of the debris shield was assumed to be the density of iron (7.87g/cm^3). The density of the low-level liquid waste was assumed equal to 1.0 g/cm^3. The amount of the "cleaned" personal protective equipment and wipes/general cleaning was added to solid low-level radioactive waste.

[c] The values for the hazardous waste were calculated by adding the hazardous waste from the Laser and Target Area Building and the Optics Assembly Area.

Source: Calculated from tables I.4.1.2.8.1–2 and I.4.2.1.8–1.

I.4.3 Nevada Test Site

I.4.3.1 *Affected Environment*

The following sections describe the affected environment associated with the construction and operation of NIF at Area 22 of Nevada Test Site (NTS). Land use, air quality and acoustics, water resources, biotic resources, cultural and paleontological resources, socioeconomics, radiation and hazardous chemicals, and waste management are described.

I.4.3.1.1 Location and Land Use

The 350,000-ha (867,000-acre) NTS site is located east of U.S. Route 95 in Nye County, Nevada. All of the land within NTS is owned by the Federal Government and is administered, managed, and controlled by DOE. NTS is also entirely bordered by Federal land—the land to the west, north, and east consists of the Nellis Air Force Range, and Federal land to the south is administered by the Bureau of Land Management. There is no prime farmland at NTS. Offsite agricultural activity occurs on the southern side of U.S. Route 95 and consists of a cattle allotment granted by the Bureau of Land Management (DOE 1995c). Figure I.4.3.1.1–1 shows generalized land uses at NTS and vicinity.

NTS is divided into three major regions consisting of 26 areas. The northern region is the underground nuclear weapons test area. The southwestern region (Area 25) provides support primarily for DOE's proposed high-level waste repository at the Yucca Mountain Project Site. The southeastern region is the nonnuclear explosives test area and the primary administrative and support area of NTS. Mercury Base Camp, in the southeastern region is the main base camp for worker housing and administrative operations for the site (DOE 1995c).

The proposed location for NIF is in Area 22, which is an undeveloped area approximately 3.2 km (2.0 mi) southwest of the Mercury Base Camp (figure I.3.4.3.1–2). New buildings required for NIF would be constructed in Area 22, while most other NIF requirements would be met through conversion of existing facilities located within the Mercury Base Camp. General maintenance would use two existing buildings in Area 6, approximately 52 km (32 mi) from the proposed NIF location. The temporary construction laydown area would be located within the location designated for NIF.

NTS is in the southern Great Basin Region of the Basin and Range Physiographic Province, which is characterized by a series of north-south trending mountain ranges separated by broad alluvial valleys. The higher elevations on NTS are on Pahute Mesa, about 2,205 m (7,235 ft), and Rainer Mesa, about 2,345 m (7,649 ft) above sea level. The lowest elevations are in Frenchman Flat and Jackass Flats, both at approximately 910 m (3,000 ft) above sea level (DOE 1995d).

The visible facilities of NTS are scattered within this setting. Public viewpoints of NTS are located in the Amargosa Valley and Mercury Valley along U.S. Route 95. At the principal view point in the Mercury Valley, the main base camp at Mercury is well defined at night by facility lighting (DOE 1995c).

Limited soil studies have been performed at NTS. Studies in adjacent areas have classified soils into three major types: shallow soils developed in the uplands and mountains; soils on valley fill and nearly level to moderately sloping outwash plains, alluvial fans, and fan aprons; and playas and soils on nearly level flats and basins. Possible erosion hazards range from slight to severe, while the shrink-swell potential ranges from low to high for these soils. The potential for wind erosion and shrink-swell increases into the playas and basins. The soils at NTS are considered acceptable for standard construction techniques. There is no prime farmland at NTS (DOE 1995c).

I.4.3.1.2 Air Quality and Acoustics

This discussion of existing air quality and acoustics includes a review of the meteorology, climatology, and atmospheric dispersion characteristics near NTS.

I.4.3.1.2.1 *Meteorology and Climatology*

The climate at NTS and in the surrounding region is characterized by limited precipitation, low humidity, and large diurnal temperature ranges. The lower elevations are characterized by hot summers and mild winters. As elevation increases on the site, precipitation increases and temperature decreases (DOE 1986). The annual average temperature at Desert Rock, NV, near the proposed NIF location at NTS is

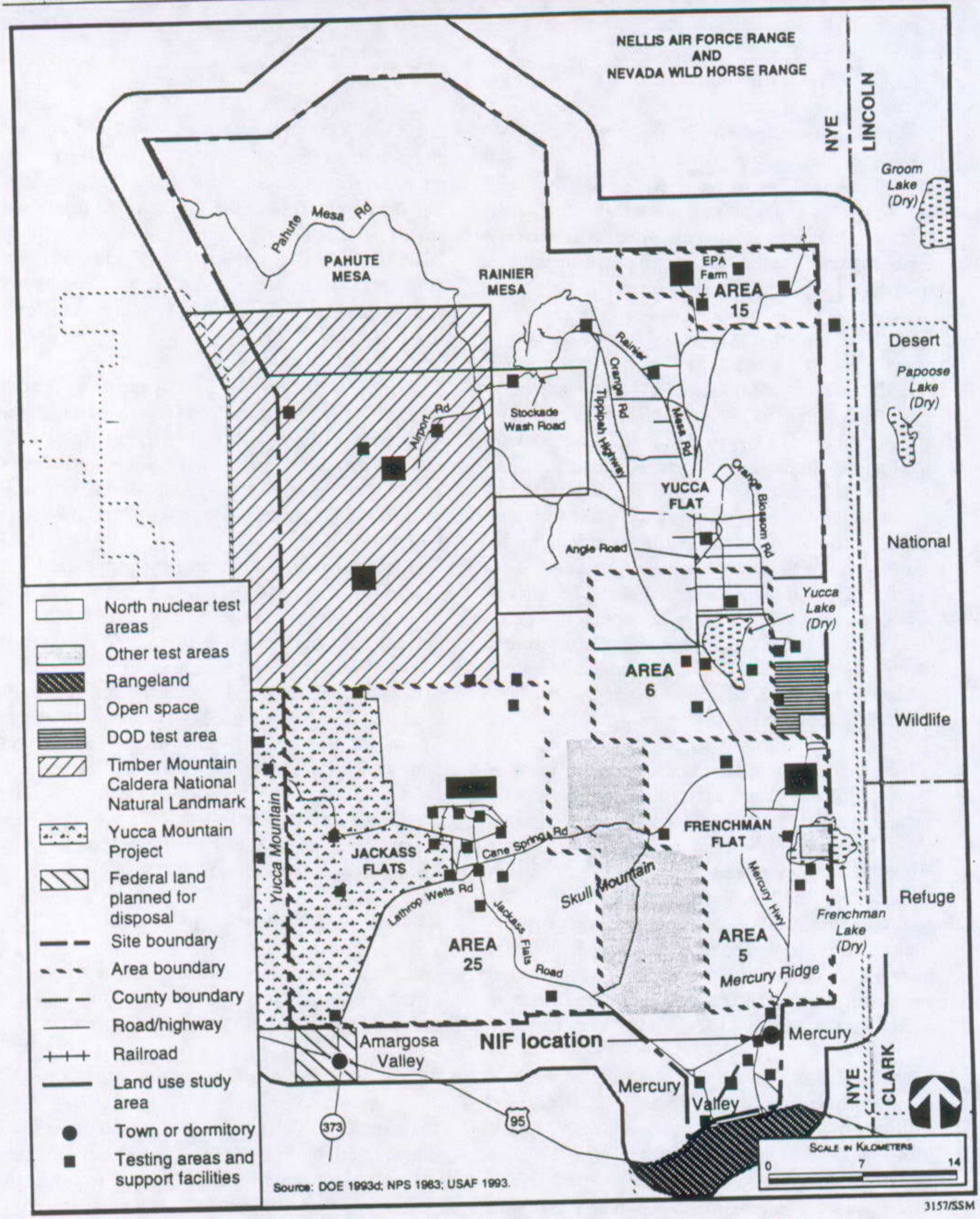

FIGURE I.4.3.1.1–1.—*Generalized Land Use at Nevada Test Site and Vicinity.*

16.5 °C (62 °F); average daily temperatures range from 6.5 °C (44 °F) in January to a maximum of 29.0 °C (84 °F) in July. The average annual precipitation is 17.1 cm (6.72 in). The prevailing winds are from the south-southwest during the day and east-northeast at night at an annual average wind speed of 15 km/hr (kph) (9.2 mph) (White 1995a). The 5-year wind rose for NTS (based on measurements at Desert Rock Air Strip) is shown in figure I.4.3.1.2.1–1. During 1987 to 1991, unstable atmospheric conditions occurred approximately 22 percent of the time, neutral conditions about 38 percent of the time, and stable conditions the remaining 40 percent (EPA 1995b). In general, atmospheric dispersion improves as the wind speed increases and as atmospheric conditions become more unstable.

The limited precipitation and warm temperatures characteristic of the region create an arid climate that limits the growth of ground-covering vegetation, resulting in large areas of exposed soil that are potential sources of windborne particulate matter (dust). Atmospheric particulate matter concentrations are reduced if the exposed soil is wetted or if the particulate matter is "washed out" of the atmosphere by precipitation. However, the area's precipitation and temperature seldom provide these beneficial mechanisms. This condition increases the particulate matter background concentration and increases the likelihood that the area's PM_{10} and total suspended particulates (TSP) ambient air concentrations will approach or exceed regulatory standards.

I.4.3.1.2.2 *Ambient Air Quality*

The State of Nevada is responsible for air pollution control and attainment of air quality standards in Nye County. Federal air quality standards exist for the criteria air pollutants ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, PM_{10}, and lead

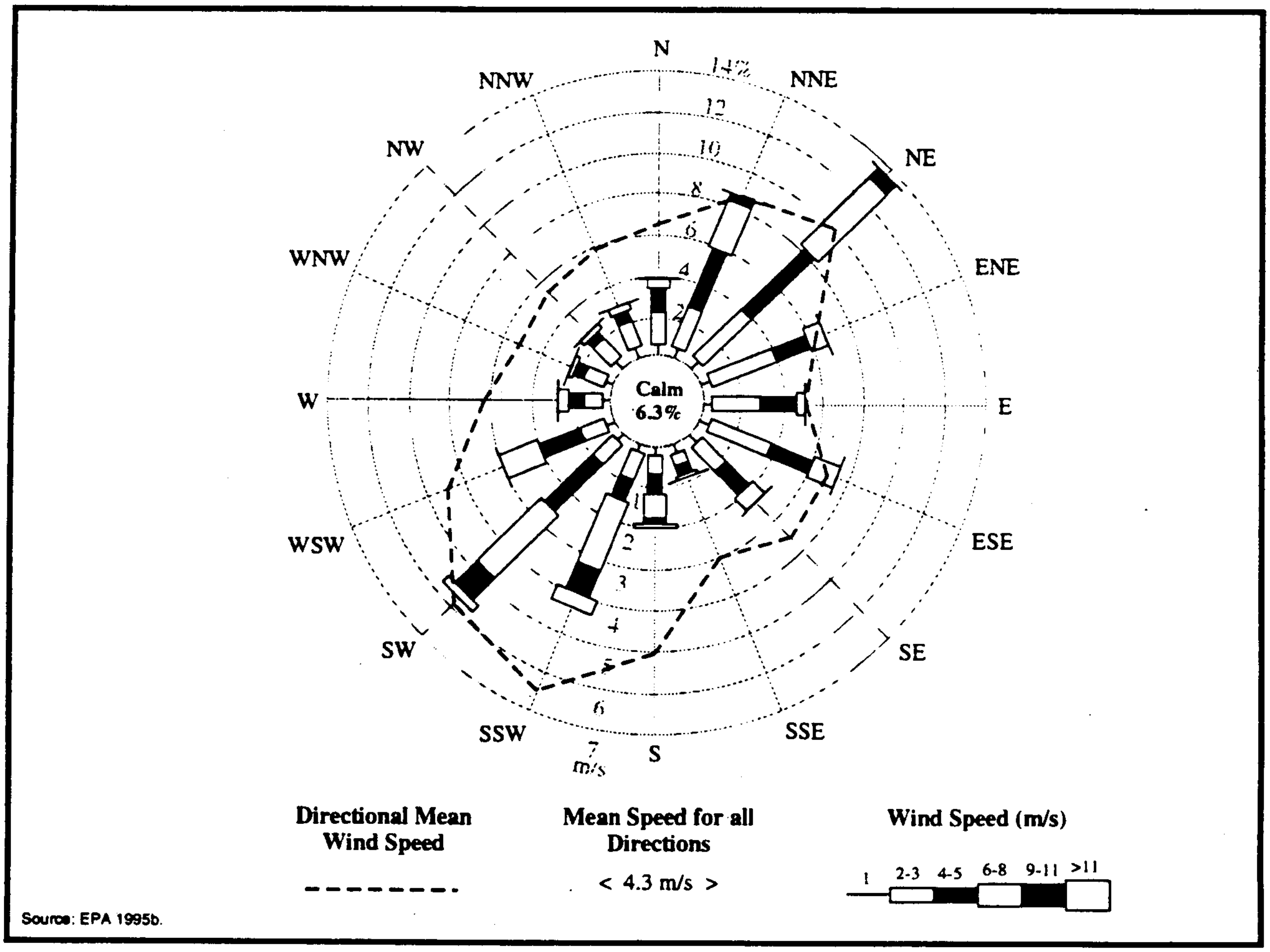

FIGURE I.4.3.1.2.1–1.—*Wind Distribution at Nevada Test Site, 1987-1991.*

(40 CFR 50). Nevada has also established state ambient air quality standards for these pollutants, as well as for hydrogen sulfide and visibility. The state and national ambient air quality standards for criteria pollutants are the same for Nye County (NBAQ 1988-1992). Applicable NAAQS and Nevada State ambient air quality standards are presented in table I.4.3.1.2.2–1.

Nye County, located in the Nevada Interstate AQCR 147, is in attainment or unclassified with regard to the NAAQS (40 CFR 81.329). In general, pollutant emission increases in an area designated nonattainment for a specific pollutant are subject to more stringent permitting requirements than if the area is designated attainment or unclassified.

The monitoring data available for NTS are very limited. Carbon monoxide data were collected for one month at three NTS sites in 1990. Onsite monitoring data have also been collected for PM_{10} and sulfur dioxide. The closest state-operated air monitoring station, located in the North Las Vegas area (AQCR 13) about 105 km (65 mi) southeast of NTS, is not representative of NTS. Table I.4.3.1.2.2–1 shows that, except for the 24-hour PM_{10}, baseline concentrations are in compliance with applicable national and Nevada ambient air quality standards. The PM_{10} is exceeded because of moderate background concentrations attributable to the desert terrain and contributions from operations at the site (DOE 1995c).

The area surrounding NIF location at NTS contains two PSD Class I areas: the Grand Canyon National Park, approximately 193 km (120 mi) to the east-southeast in Arizona, and Sequoia National Park, approximately 169 km (105 mi) to the west in California.

The primary criteria pollutant emission sources at NTS include particulates from construction, unpaved roads, and other ground surface disturbances; various pollutants from operation of fuel-burning equipment, incineration, and open burning; and VOCs from fuel

TABLE I.4.3.1.2.2–1.—*Comparison of Baseline Ambient Air Concentrations with Most Stringent Applicable Regulations and Guidelines at Nevada Test Site*

Pollutant	Averaging Time	Most Stringent Regulation or Guideline (μg/m^3)	Baseline Concentration (μg/m^3)
Criteria Pollutant			
Carbon monoxide	8 hours	10,000[a,b]	2,300
	1 hour	40,000[a,b]	2,700
Lead	Calendar quarter	1.5[a,b]	ND[c]
Nitrogen dioxide	Annual	100[a,b]	ND
Ozone	1 hour	235[a,b]	ND
Particulate matter	Annual	50	8.4
	24 hours	150[a,b]	172.6[d]
Sulfur dioxide	Annual	80[a,b]	6.9
	24 hours	365[a,b]	117
	3 hours	1,300[a,b]	660.6
Mandated by State			
Hydrogen sulfide	1 hour	112[c]	ND
Visibility	-	e	ND

[a] Federal standard (40 CFR 50).
[b] State standard.
[c] ND - No data available.
[d] Exceeds most stringent regulation or guideline.
[e] In sufficient amount to reduce the prevailing visibility to less than 48 km (30 mi) when humidity is less than 70 percent.
Source: NSEC 1995; DOE 1995c.

storage facilities (DOE 1995c). Emission estimates for these sources are listed in section I.4.3.2.2.

I.4.3.1.2.3 *Acoustic Conditions*

Major sources of noise within NTS include various industrial facilities, equipment, and machines, and aircraft operations. No noise survey data for NTS are available. At the site boundary, away from most of the industrial facilities at NTS, noise emitted from the site is barely distinguishable from background noise levels.

The acoustic environment along the NTS boundary can be classified as either uninhabited desert or small rural communities and is assumed to be that of a rural location with residual noise levels of 35 to 50 dBA (EPA 1974). Near highways, traffic contributes to ambient noise levels, especially during peak hours, resulting in significantly higher noise levels than at remote locations. Except for the prohibition of nuisance noise, neither the State of Nevada nor its local governments have established specific numerical environmental noise standards applicable to NTS (DOE 1995c).

I.4.3.1.3 Water Resources

No perennial streams exist in the proposed NIF location at NTS (figure I.3.4.3.1–2). Rainfall quickly evaporates or infiltrates the normally dry soil; flows in stream channels occur only after significant precipitation events. Flowing water in the normally dry channels, if it occurs, also evaporates or seeps into permeable sand and gravel channel beds (DOE 1995d). During extreme storm events, sheet flooding may occur. The 500-year floodplain has not been delineated for the proposed NTS Area 22 location for NIF. Preliminary calculations indicate that the broad, flat plain that includes the proposed NIF location may experience a sheet flow reaching a depth of 0.09 m (0.3 ft) during a 500-year flood event (White 1995f).

Groundwater beneath the eastern portion of NTS, which includes the proposed NIF location, is part of the Ash Meadows groundwater sub-basin. Three primary aquifers are present within this subbasin: the Lower Carbonate (the deepest), the Volcanic, and the Valley-Fill (the shallowest). Other aquifers are present to a limited extent under the area, but their water-yielding potential has not been thoroughly investigated. The Lower Carbonate, the regional aquifer, has a saturated thickness ranging from about 100 to 1,000 m (328 to 3,280 ft). The groundwater in this aquifer flows in a south-southwest direction toward Ash Meadows. The Volcanic and Valley-Fill aquifers range in thickness from 0 to about 600 m (0 to 1,970 ft) and are confined within local drainage basins. The depth to the groundwater table is about 220 m (722 ft) beneath valleys in the southern part of NTS (DOE 1995c-d). NTS water supply system consists of 17 wells, 11 of which are currently active (White 1995b).

I.4.3.1.4 Biotic Resources

NTS occurs within the Southern Basin and Range Ecoregion (Omernik 1986). The site is in a transition area between the Mojave and Great Basin deserts and, thus, contains species characteristic of both deserts. Less than one percent of the 350,000 ha (867,000 acres) of NTS is developed; thus, natural plant communities are found across most of NTS. The areas designated for use for NIF are within the creosote bush community (one of nine major plant communities occurring at NTS). Introduced plants such as red brome, cheatgrass, and Russian thistle are common in some areas (DOE 1995c).

Common wildlife species at NTS include the side-blotched lizard, western shovel-nosed snake, black-throated sparrow, red-tailed hawk, Merriam's kangaroo rat, and Great Basin pocket mouse. Raptors common to NTS include the turkey vulture and rough-legged hawk. Carnivores that exist at NTS include the long-tailed weasel and bobcat, and big-game species include the pronghorn antelope and mule deer. Hunting is not permitted on NTS.

Wetlands are associated with the playas and springs on NTS. However, no potential wetlands exist in the area designated for NIF. Natural aquatic resources at NTS are limited to two playas and a few natural springs. In addition, sewage lagoons and ponds are associated with existing NTS facilities, and man-made water reservoirs are located throughout NTS. The water reservoirs support introduced bluegill, goldfish, and golden shiners. None of the aquatic resources exist in the area designated for NIF.

A list of Federal and state rare, threatened, and endangered species that could potentially exist at NTS is provided in Lazaro et al. (1996). The desert tortoise is the only Federal-listed (threatened) species known to inhabit NTS, and no designated critical habitats for Federal-listed species exist at NTS. Habitats that could attract several of the species (e.g., chuckwalla, desert tortoise, and loggerhead shrike) are present. The distribution of the desert tortoise includes the southern third of NTS, which includes the location designated for NIF (figure I.4.3.1.4–1). Urbanization, roadways, habitat fragmentation, grazing, wildfires, disease, and other perturbations have caused decreases in desert tortoise populations (Bury et al. 1994; Corn 1994). The occurrence of the desert tortoise on NTS is $\leq 17/km^2$ ($44/mi^2$). They occur mostly in the lowland desert community dominated by creosote bush and burro bush (Bury et al. 1994).

I.4.3.1.5 Cultural and Paleontological Resources

An intensive archaeological field survey (employing 15-m [50-ft] transects) was conducted at the proposed NIF location and access road on NTS during August 1995 (Jones 1995). The survey documented an isolated artifact (stone flake) that does not meet eligibility criteria for NRHP and is not considered significant (Hattori 1995). Paleontological remains are unlikely to occur on the proposed NIF location on the basis of its geologic setting, which lacks fossiliferous deposits. No Native American cultural resources have been identified in the proposed NIF location in the course of consultation with potentially affected tribes.

I.4.3.1.6 Socioeconomics

Socioeconomic characteristics summarized here for the NTS area include the regional economy, population and housing, public finance and public service infrastructure, and local transportation. Regional economic statistics are based on a regional economic study area that encompasses 11 counties around NTS as defined by BEA. The economic study area is a broad labor and product market-based region linked by trade among economic sectors within the region. Statistics for population, housing, public finance, and public service infrastructure are based on the ROI, a two-county area in which 97 percent of all NTS employees reside. These counties are Clark County (containing 82 percent of NTS employees) and Nye County (15 percent). Lazaro et al. (1996) lists counties and cities included in the economic study region and the counties included in the ROI. Assumptions, assessment methodologies, and supporting data for each TA are also presented in Lazaro et al. (1996).

I.4.3.1.6.1 *Regional Economy*

The regional economic study area for NTS includes the Las Vegas Metropolitan Statistical Area (Clark County). Employment in the economic study region was projected to increase from 412,300 in 1988 to 496,700 in 1995. BEA projects a compounded average annual rate of growth of 1.9 percent from 1995 to 2003 (79,522 jobs) (BEA 1990).

In 1995, NTS employed about 8,600 persons (DOE 1995), accounting for 2.0 percent of employment in the regional economic study area. The distribution of NTS employees by place of residence in the ROI is presented in Lazaro et al. (1996).

I.4.3.1.6.2 *Population and Housing*

The ROI has experienced significant population growth between 1980 and 1990, with an average annual increase of about 4.5 percent, bringing the 1990 total to approximately 683,000 persons. Population growth has been strongest in Clark County. By the year 2000, population in the ROI is projected to grow to approximately 860,000 (U.S. Department of Commerce 1994; BEA 1990).

Between 1980 and 1990, the number of housing units in the ROI increased from 194,899 to 325,261, an increase of 67 percent (see table I.4.3.1.6.2–1). Housing in Clark County increased from approximately 190,607 units in 1980 to 317,188 units in 1990. Housing in Nye County increased from 4,292 units in 1980 to approximately 8,073 units in 1990. Assuming a continuation of current construction and economic trends, the number of housing units in the ROI is projected to increase to approximately 455,000 units by the year 2000.

The number of vacant owner units in the ROI has increased from approximately 11,000 in 1980 to about 17,000 in 1990. It is estimated that in the year

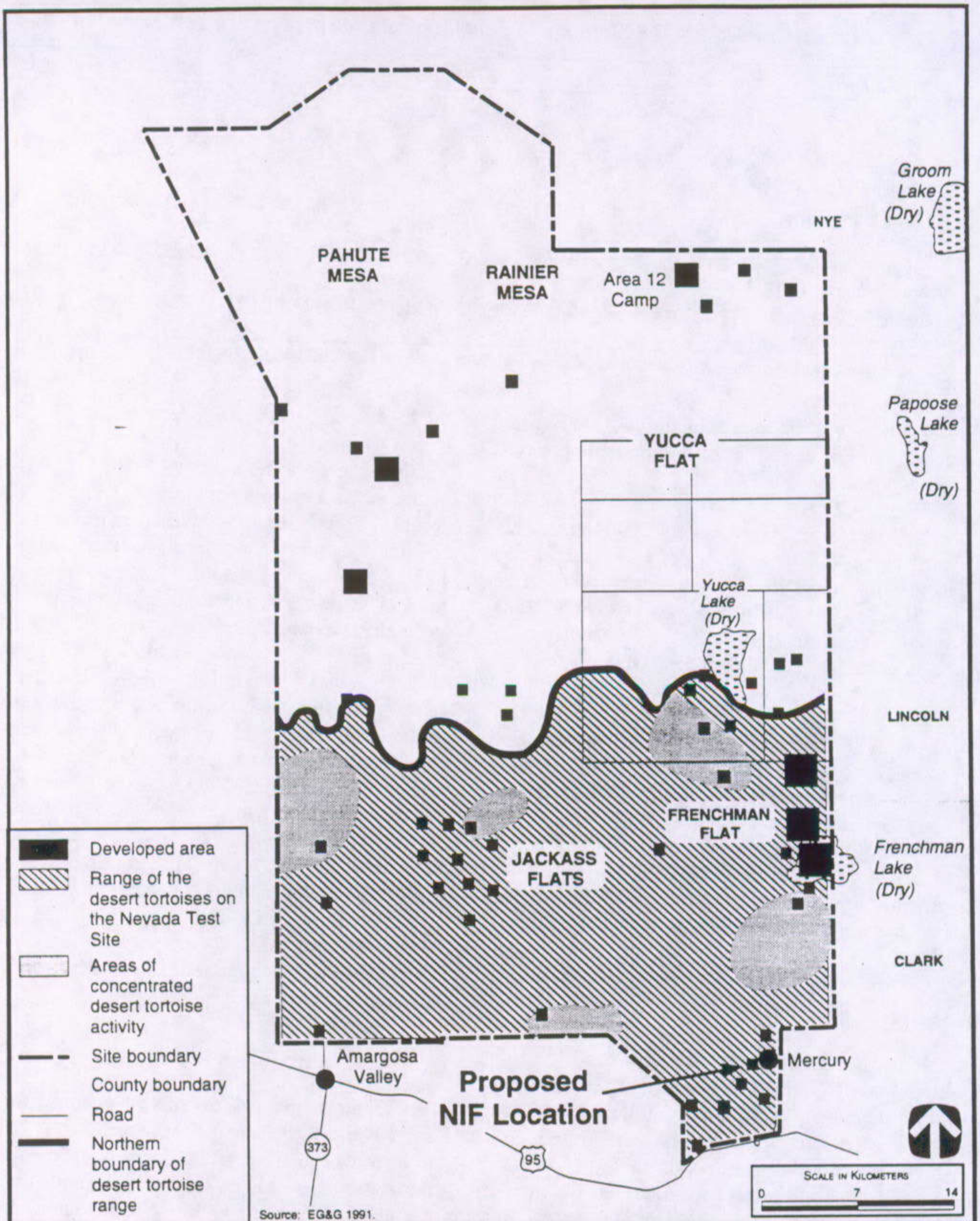

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FIGURE I.4.3.1.4–1.—*Distribution of the Desert Tortoise at Nevada Test Site.*

TABLE I.4.3.1.6.2–1.—*Population and Housing Data for the Nevada Test Site Area*

Category	1980	1990	1996	1997	1998	1999	2000	2001	2002	2003
Estimated ROI population	472,135	683,040	798,044	812,625	827,527	842,675	858,100	870,949	883,990	897,227
Estimated total housing units	194,899	325,261	403,478	416,514	429,551	442,587	455,623	468,659	481,695	494,732
Estimated vacant owner units	10,806	16,954	21,319	22,047	22,774	23,502	24,229	24,957	25,684	26,412
Estimated vacant renter units	7,319	15,022	18,968	19,625	20,283	20,940	21,598	22,255	22,913	23,571
Estimated total vacant units in ROI	18,125	31,976	40,287	41,672	43,057	44,442	45,827	47,212	48,597	49,982

Source: Historical data from U.S. Department of Commerce 1994; projections by Halliburton-NUS 1995.

2000 there will be approximately 24,000 vacant owner units if current construction and economic trends continue in the ROI.

In 1980 there were approximately 7,000 vacant rental units in the ROI. The number of vacant rental units increased to about 15,000 in 1990. It is estimated that in the year 2000 there will be approximately 22,000 vacant rental units if current construction and economic trends continue in the ROI.

Between 1993 and 1994, within the Las Vegas Metropolitan Statistical Area, single-family development experienced a sharp increase of about 30 percent in new housing units. Multifamily housing construction increased by 44 percent between 1993 and 1994. The number of new housing units sold increased as well, rising 11 percent over 1993 levels. In spite of the growing supply of houses in the Las Vegas market, new housing prices continue to climb (ULI 1995).

I.4.3.1.6.3 *Public Finance and Public Services Infrastructure*

Public financial characteristics of the local jurisdictions in the ROI that are most likely to be affected by construction and operation of NIF at NTS are summarized in this section. The data reflect total revenues and expenditures of each jurisdiction's general fund, special revenue funds, and, as applicable, debt service, capital project, and expenditure trust funds. Major revenue and expenditure categories and total revenues less expenditures for counties and cities are presented in table I.4.3.1.6.3–1.

Table I.4.3.1.6.3–2 summarizes public service levels for education, community services, and health care.

I.4.3.1.6.4 *Local Transportation*

Vehicular access to NTS is provided by U.S. 95 to the south, with access to the northeast provided by State Route 373. State Route 160 provides site access from the south and east. Road segments providing access to NTS experience little traffic congestion outside of the Las Vegas metropolitan area. Although traffic is generally heavier on U.S. 95 than on State Route 373, both roads are projected to remain at level of service A (DOE 1995a). Table I.4.3.1.6.4–1 lists the site access roads at NTS and the average daily traffic volumes for each route. No major road improvements are scheduled for road segments providing immediate access to NTS (DOE 1995c). Although no public transportation system serves NTS, a contract bus service for workers is available at a nominal cost (DOE 1995c). The major railroad in the ROI is the Union Pacific Railroad located approximately 80 km (50 mi) east of NTS near the city of Las Vegas. McCarran International Airport in the city of Las Vegas provides jet passenger service from both national and local carriers.

I.4.3.1.6.5 *Environmental Justice*

Environmental justice concerns the potential for high and adverse environmental or human health impacts to disproportionately affect minority or low-income populations. In this PSA, environmental justice is evaluated for impacts within the site region, defined as the area within an 80-km (50-mi) radius around the site, and for the local area. Lazaro et al. (1996) presents the demographic analysis of minority and low-income population distributions on a regional and local basis.

TABLE I.4.3.1.6.3–1.—*Public Finance—Nevada Test Site Area*

Revenues and Expenditures[a]	Clark County	City of Henderson	City of Las Vegas	City of North Las Vegas	Nye County
Local sources (percent)	63	39	46	44	53
State sources (percent)	37	61	54	56	47
Federal sources (percent)	0	0	0	0	0
Total revenues (dollars)	295,686,362	44,838,156	165,281,174	33,422,607	12,348,383
General government (percent)	22	25	19	15	37
Public safety, health, and community services (percent)	66	75	80	85	63
Debt service (percent)	0	0	0	0	0
Other (percent)	11	0	0	0	0
Total expenditures (dollars)	241,422,802	42,164,384	155,307,893	33,027,839	12,511,908
End-of-year fund balance (dollars)	77,826,604	1,140,575	13,712,536	3,656,142	1,374,364

[a] If reporting body did not distinguish between state and Federal revenue sources, the total for all intergovernmental revenue was combined and reported under "state sources."

Source: City of Henderson 1995; Nye County 1994; city of North Las Vegas 1994; city of Las Vegas 1994.

TABLE I.4.3.1.6.3–2.—*Public Services—Nevada Test Site Area*

Part I: Education

County/School District	Enrollment	Pupil-Teacher Ratio	Per Pupil Expenditure ($)
Clark County School District	145,327	16.6:1[a]	3,478[b]
Nye County School District	4,467	NA	3,662

[a] Pupil-teacher ratio for Clark County includes administrative personnel.

[b] Expenditure per pupil for Clark County is based on total expenditure.

Note: NA - not available.

Part II: Level of Service per 1,000 Population

County/Jurisdiction	Police Protection	Fire Protection	General Government	Physicians
Clark County	1.2	0.5	5.1	1.4
City of Henderson	0.8	0.8	6.4	NA
City of Las Vegas	4.5	1.2	7.0	NA
City of North Las Vegas	2.4	0.8	9.2	NA
Nye County	5.3	NA[a]	19.1	0.4

[a] Fire protection services are provided by cities in the county, and departments are predominantly volunteer.

Source: Clark County School District 1994; city of North Las Vegas 1994; city of Las Vegas 1994; Clark County 1994; Federal Bureau of Investigation 1993; American Medical Association 1994; city of Henderson Fire Department 1995; city of Henderson Personnel Department 1995; city of Las Vegas Human Resources Department 1995; Nye County School District 1995; Nye County Sheriff's Department 1995; Nye County Personnel Department 1995; city of Tonopah Fire Department 1995; Clark County Personnel Department 1995.

TABLE I.4.3.1.6.4–1.—*Baseline Traffic on Nevada Test Site Access Roads*

NTS Access Road	1993 Average Daily Traffic
U.S. 95 (6.1 km north of Mercury Interchange)	2,715
U.S. 95 (In Searchlight, 0.16 km south of SR-164)	6,115
SR 160 (In Pahrump Valley, 61 m south of SR 372 to Ash Meadows)	10,600
SR 160 (Pahrump Valley at Clark/Nye County line)	2,970
SR 160 (145 m south of U.S. 95)	655
U.S. 95/6 (In Tonopah, 0.3 km north of U.S. 6 north of St. Patrick Street)	7,635
SR 160 (In Pahrump Valley, 0.16 km north of SR 372 to Ash Meadows)	6,670

Source: Nevada Department of Transportation 1993.

In the NTS site region in 1990, 10 percent of the population was low income and 14 percent was minority, compared with the Nevada state average of 10 percent low income and 21 percent minority. Within the area, census tracts closer to the NTS site tend not to have significantly higher or lower proportions of minority or low-income populations than tracts farther from the site.

I.4.3.1.7 Radiation and Hazardous Chemicals

I.4.3.1.7.1 *Radiation Environment*

Both aboveground and underground tests of nuclear weapons and test devices have been conducted at NTS. In addition, weapons effects tests have been conducted on military communications, electronics, satellites, sensors, and other materials. In October 1992, underground nuclear testing was halted. The site maintains the capability of resuming testing if directed by the President. A detailed discussion of the radiation environment, including background, radiological releases, and doses to members of the public, is presented in *U.S. Department of Energy Nevada Operations Office Annual Site Environment Report–1993, Volume 1* (DOE 1994a). The concentrations of radioactivity in various environmental media (air, water, soil) in the site region are also presented in that reference.

Calculated radiological doses were used to estimate the potential health impacts to the public and onsite workers at NTS from any releases of radioactivity. The annual doses to individuals, to the surrounding population (within 80 km [50 mi]), and to workers are summarized in table I.4.3.1.7.1–1; corresponding health risks are also presented in this table. These doses are in addition to those from natural background, consumer products, and medical sources, which total about 378 mrem. Background radiation doses are unrelated to NTS operations. Regulatory limits that specify the maximum effective dose equivalent to individual members of the public and occupational workers are also presented in table I.4.3.1.7.1–1. The doses to the public listed in the table are within regulatory limits (DOE 1990) and are small in comparison to background radiation. The onsite worker doses are also within regulatory limits.

I.4.3.1.7.2 *Hazardous Chemical Environment*

The background chemical environment important to human health consists of the atmosphere, which may contain hazardous chemicals that can be inhaled; drinking water, which may contain hazardous chemicals that can be ingested; and other environmental media with which people may come in contact (for example, soil through contact or via the food pathway). Exposure pathways to NTS workers during normal operation may include inhaling the workplace atmosphere, drinking NTS potable water, and possibly other contact with hazardous materials associated with work assignments. The potential for health impacts varies from facility to facility and from worker to worker, and available information is not sufficient to allow a meaningful estimation and summation of these impacts. However, workers are protected from hazards specific to the workplace through appropriate training, protective equipment, monitoring, and management controls. NTS workers are also protected by adherence to OSHA and EPA occupational standards that limit atmospheric and drinking water concentrations of potentially hazardous chemicals. Appropriate monitoring, which reflects the frequency and amounts of chemicals used in NTS operation processes, ensures that these standards are not exceeded. The quantities of NIF-related hazardous materials purchased for use at NTS in 1994 are listed in table I.4.3.1.7.2–1.

TABLE I.4.3.1.7.1-1.—*Annual Radiation Doses to the General Public and Onsite Workers from Normal Operations at Nevada Test Site*

Receptor	Atmospheric Releases: Regulatory Limit[a]	Atmospheric Releases: Calculated	Liquid Releases: Regulatory Limit[a]	Liquid Releases: Calculated[b]	Total: Regulatory Limit[a]	Total: Calculated	Total: Risk[c]
Individual Dose							
Average exposed individual[d] (mrem)	10	5.5×10^{-4}	4	0.0	100	5.5×10^{-4}	2.8×10^{-10}
Maximally exposed individual (mrem)	10	4.8×10^{-3}	4	0.0	100	4.8×10^{-3}	2.4×10^{-9}
Population Dose[e]							
Population within 80 km (person-rem)	f	1.2×10^{-2}	f	0.0	f	1.2×10^{-2}	6.0×10^{-6}
Worker Dose[g]							
Average worker (mrem)	NA	NA	NA	NA	5,000	2.6	1.0×10^{-6}
Maximally exposed worker (mrem)	NA	NA	NA	NA	5,000	750	3.0×10^{-4}
Total workers (person-rem)[h]	NA	NA	NA	NA	None	2	8.0x1

[a] The regulatory limits for individuals are given in DOE Order 5400.5. The 10 mrem/yr limit from airborne emissions is re ired by the *Clean Air Act*, the 4 mrem/yr limit is required by the *Safe Drinking Water Act*, and the total dose of 100 mrem/yr is th imit from all pathways combined. The occupational limit for workers is 5,000 mrem (10 CFR 835).

[b] The calculated dose values given in the column under Liquid Releases conservatively includes all water pathways, not ju the drinking water pathway.

[c] Based on latent fatal cancer risk factors of 5×10^{-7}/mrem for individuals, 5×10^{-4} /person-rem for population, and 4×10^{-7}/mr n for workers (ICRP 1991).

[d] Obtained by dividing the population dose by the number of people living within 80 km (50 mi) of the site.

[e] Estimated for a population of approximately 21,750 people.

[f] No regulatory limits exist for population doses; however, a 100 person-rem value for the population is found in proposed 5 FR 16268 (10 CFR 834).

[g] Worker doses were estimated on the basis of readings from monitoring devices called thermoluminescent dosimeters.

[h] The number of badged workers in 1992 was approximately 780.

Note: NA - not applicable.

Source: Reynolds Electrical and Engineering Co., Inc. 1994.

TABLE I.4.3.1.7.2-1.—*Maximum Daily Quantities of National Ignition Facility-Related Hazardous Materials Purchased by and Stored at Nevada Test Site*

Hazardous Material	Quantity (kg)
Acetone	394
Ethanol (l)	80
Hydrofluoric acid	273
Sodium hydroxide	856

Source: White 1995c.

I.4.3.1.8 Waste Management

The current waste management practices at NTS are outlined in table I.4.3.1.8-1. Wastes generated by research activities at NTS include TRU wastes, LLW, mixed, hazardous, and nonhazardous wastes.

I.4.3.1.8.1 *Low-Level Waste*

LLW has been generated and disposed of in eight areas at NTS, but currently only Areas 3 and 5 are active for LLW treatment, storage, and disposal.

Bulk waste is disposed of in Area 3, and packaged classified and unclassified waste is disposed of in Area 5. Disposal of onsite waste began in 1971, and in 1978 operations expanded to receive wastes generated offsite. The offsite generators are currently revising their procedures to meet NTS waste acceptance criteria. Standard shallow land burial techniques have been employed for disposal.

I.4.3.1.8.2 *Mixed Low-Level Waste*

Mixed waste received from Rocky Flats Environmental Technology Site (formerly known as the Rocky Flats Plant) has been disposed of at NTS. This mixed waste disposal at NTS ceased in 1990, pending issuance by the State of Nevada of a RCRA Part B Permit for NTS. No mixed waste has been accepted from offsite generators for disposal since 1990. The existing mixed waste disposal unit, P03U, has interim status and may be used for disposal of DOE mixed waste generated in the State of Nevada. Environmental restoration could generate additional volumes of mixed wastes that would require some form of treatment. The Nevada Division of Environmental Protection provides RCRA oversight for NTS. A 1992 revised RCRA Part B Permit application to include a separate mixed waste storage and disposal unit at NTS, in accordance with the provisions of the *Federal Facility Compliance Act* of 1992, has been submitted to the state. The Site Treatment Plan was finalized with the state in March 1996. The Site Treatment Plan and Compliance Order do not contain provisions for accepting offsite wastes. Negotiations concerning waste streams that are not included will be dealt with on a case-by-case basis.

If a permit for the proposed mixed waste disposal units is denied, DOE/NV will have to deal with mixed waste generated at NTS in the same manner as at other DOE facilities across the country. The mixed waste will be properly characterized and managed, and a disposal location will have to be identified.

I.4.3.1.8.3 *Hazardous Waste*

Hazardous wastes result from ongoing operations that use solvents, lubricants, fuel, lead, metals, motor oil, and acids. Hazardous wastes are accumulated at satellite areas and shipped offsite to a commercial RCRA-permitted facility. Additional accumulation areas are planned, and new equipment is planned to prevent the possibility of cross contamination with radioactive wastes (creating mixed wastes) in handling these materials. Hazardous waste generation is decreasing as the result of an aggressive waste minimization program and will substantially decrease in the future due to the present moratorium on nuclear testing.

I.4.3.1.8.4 *Nonhazardous Waste*

Nonhazardous sanitary wastes are expected to be generated at the current rates for the next several years and then decline, assuming the present moratorium on underground weapons testing continues. Liquid nonhazardous wastes are disposed of in septic tanks, sumps, or in ponds; solid nonhazardous wastes are disposed of in landfills at various locations on the site. Recycling of paper, metals, glass, plastics, and cardboard has resulted in some decreases in waste quantities.

I.4.3.2 *Environmental Impacts*

The following sections describe the potential environmental impacts for land use and visual resources, air quality and noise, water resources, ecological resources, cultural and paleontological resources, and socioeconomics from constructing and operating NIF at NTS. In addition, impacts associated with radiation, hazardous chemicals, and waste management are described.

I.4.3.2.1 Land Use and Visual Resources

I.4.3.2.1.1 *Land Use*

Land-use impacts resulting from siting the NIF project at NTS would be limited to clearing and leveling of land for the Laser and Target Area Building, the Optics Assembly Area, the Optics Maintenance Area, Optics Storage Area, and Target Receiving and Inspection Area. Minor, short-term disturbance of the land containing NIF facilities could also result from installation of necessary water and wastewater systems. The proposed location for NIF would be in Area 22,

TABLE I.4.3.1.8–1.—*Current Waste Management at Nevada Test Site*

Category	1993 Generation (m^3)	Treatment Method	Treatment Capacity (m^3/yr)	Storage Method	Storage Capacity (m^3)	Disposal Method	Disposal Capacity (m^3)
Low-Level							
Liquid	Dependant on restoration activities	Not determined	NA	None	NA	None	None
Solid	178	None	NA	None	NA	Shallow burial	650,000
Mixed Low-Level							
Liquid	Included in solid	None	NA	NA	NA	None	None
Solid	None	None	None	Containers on asphalt pads	1,208	Pit	90,626
Hazardous							
Liquid	248	Contracted offsite	None	RCRA-permitted storage unit	See solid hazardous	Contracted offsite	NA
Solid	Approx 4 (878 kg hazardous) (2,400 kg explosives)	Contracted offsite	None	RCRA-permitted storage unit[a]	61.6	Contracted offsite	NA
Nonhazardous (Sanitary)	11,000	None for solid, septic fields for liquid	As required for liquid	None	None	Landfill (onsite)	Expandable as required; as of November 1994, 459,000 m^3 available
Nonhazardous (Other)	82,800	None for solid, septic fields for liquid	As required for liquid	None	None	Landfill (onsite)	Expandable as required

[a] Explosive waste is treated immediately after generation. Explosives are not stored at the Hazardous Waste Storage Unit.

Note: NA - not applicable.

Source: NTS 1996; White 1995g.

about 3.2 km (2 mi) southwest of the Mercury Base Camp in an isolated part of Nye County (figure I.3.4.3.1–2). An estimated 18 ha (45 acres) of land in Area 22 would be required for buildings, walkways, building access, temporary construction laydown area, and buffer space. However, the required acreage represents a small fraction of total land available on NTS for future development (White 1995d). The project would be located on a large tract of vacant land that has at least an additional 80 ha (200 acres) available for future expansion. No impacts to land use outside of Area 22 would be expected.

With appropriate erosion and sediment control measures, soil impacts during construction of NIF would be short term and minor. Seismic risks would be taken into account during construction and operation of NIF.

I.4.3.2.1.2 *Visual Resources*

Although structures erected for the NIF project would alter the visual landscape of the proposed location, no adverse visual impacts are expected. The proposed NIF location at NTS is remotely located in a part of Nevada that has a population density of less than 1.0 person/km^2 (2.6 persons/mi^2). The area is relatively flat, dominated by desert vegetation, and not visually diverse. NIF structures, particularly the Laser and Target Area Building, would be visible to persons using U.S. Highway 95, but the distance of the site from the highway (about 6.5 km [4 mi]) would lessen its visual domination of the horizon. Other manmade structures, such as the Mercury Base Camp and Desert Rock Air Strip, already exist in the vicinity of the proposed NIF site.

I.4.3.2.2 Air Quality and Acoustics

I.4.3.2.2.1 *Air Quality*

Construction Emissions. Estimated air pollutant emissions from site clearing and facility construction are listed in table I.4.3.2.2.1–1. The construction emission estimates are based on characteristics of the proposed NTS location for NIF and on construction vehicle exhaust and fugitive emissions.

Site clearing would continue for about 2.5 months, followed by facility construction for four years (LLNL 1995b). Site clearing would produce the greatest amount of fugitive dust PM_{10} emissions. The ISCST2, Version 93109 [EPA 1992a-b] was used to determine the impact of site-clearing activities on ambient air quality (see section I.4.1.2.2.1). The data selected for modeling air quality were surface meteorological data and twice-daily mixing height data from the nearby Desert Rock National Weather Service Station for 1987-91 (EPA 1995b). The surface wind speeds and directions are summarized in an annual wind rose (see figure I.4.3.1.2.1–1). Detailed emission inventories associated with site clearing and facility construction, meteorological data used, air quality model assumptions, and model input parameters are presented in Lazaro et al. (1996).

TABLE I.4.3.2.2.1–1.—*Estimated National Ignition Facility Construction Emissions for the Nevada Test Site Location*

Pollutant	Total Emissions (t/yr)[a]
Particulate matter	31.93[b] (35.20)
Volatile organic compounds	0.44 (0.49)
Carbon monoxide	1.23 (1.36)
Nitrogen dioxide	3.73 (4.11)
Sulfur dioxide	0.43 (0.47)
Lead	Negligible

[a] Metric tons (1,000 kg) per year.
[b] Includes 10.43 t/yr (11.50 ton/yr) of fugitive emissions for site clearing using water-spray control that would occur during an approximate 73-day period in the first year and 21.14 t/yr (23.30 ton/yr) of facility construction emissions that would occur for the remainder of the first year of construction.

Note: See Lazaro et al. (1996) for details.
Source: Lazaro et al. 1996.

Because of the arid conditions typical of the region, the 24-hour average PM_{10} background concentration representative of NTS site is 173 μg/m^3 (table I.4.3.1.2.2–1), which is already over the national and state standard of 150 μg/m^3 (see table I.4.3.1.2.2–1). Therefore, site clearing should be carried out so as to minimize additional impacts on ambient air quality. With conventional dust control (that is, 50 percent control for excavation and 60 percent control for traffic on unpaved roads), a maximum 24-hour average PM_{10} concentration of 2 μg/m^3 over background is predicted at the site boundary. This value is so small because the site boundary is approximately 4.5 km (2.8 mi) east of the proposed NIF location. Although the maximum PM_{10} concentration of 175 μg/m^3, including background concentration, would be above the 24-hour NAAQS, the impact on ambient air quality from site clearing alone would be insignificant. Site clearing at NTS would be expected to last for 2.5 months, so any associated air quality impacts would be local and temporary.

Emissions During Operations. Sources of air pollutant emissions from NIF operation at NTS would include fuel combustion and solvent cleaning of the debris shields. Emissions of solvent VOCs (ethanol) from debris shield cleaning would total approximately 0.5 t/yr (0.55 ton/yr) (LLNL 1995b). Other potential air pollutant emission sources that would not be considered significant would include the target destruction, under either the Conceptual Design or Enhanced options, emissions from vehicles used for freight shipments and employee commuting, and emissions from welding operations at the Fabrication Facility.

Table I.4.3.2.2.1–2 lists the estimated NTS annual air pollutant emissions on the basis of the anticipated NIF annual energy requirements provided in table I.4.1.2.2.1–3. These values were adjusted to recognize that at NTS, only four new support buildings (with a total area of 5,341 m^2 [57,492 ft^2]) would be required out of the total complement of support buildings (area of 26,722 m^2 [287,643 ft^2]). Also, fuel usage to meet these energy requirements would be specific to NTS. Liquid petroleum gas would be used rather than natural gas (White 1995e). Published emission factors (EPA 1995) were used in the calculations. Emissions of VOCs from solvent cleaning are included. For comparative purposes, table I.4.3.2.2.1–2 includes NTS 1992 sitewide emissions. More detailed information on emission estimates is provided in Lazaro et al. (1996).

As indicated in table I.4.3.2.2.1–2, estimated air pollutant emissions due to NIF operation at NTS are well below 1 t/yr (1.1 ton/yr) except for nitrogen dioxide, which is less than 3 t/yr (3.3 ton/yr). Estimated air pollutant emissions from NIF operations, are less than 1 percent of NTS 1992 emissions Existing ambient concentrations for these pollutants (see section I.4.3.1.2.2, table I.4.3.1.2.2–1) are well below the ambient air quality standards, except for PM_{10}. The predicted increase of 0.08 t/yr (0.09 ton/yr) in PM_{10} is equivalent to less than 1 percent of NTS 1992 emissions and is not expected to cause a measurable increase in the 24-hour and annual average ambient concentrations at the site boundary. On the basis of this information, it can be concluded that NIF operations would have no adverse impact on air quality and would not contribute to violation of the ambient air quality standards.

TABLE I.4.3.2.2.1–2.—***Annual Emission Increases with National Ignition Facility Operation at Nevada Test Site***

Pollutant	1992 Emissions[a] (t/yr)	Projected NIF Emissions[a] (t/yr)	1992 Emissions Plus NIF (t/yr)	NIF Percent of 1992 Emissions
Particulate matter	86.8[b]	0.08	86.9	0.09
Volatile organic compounds	ND	0.56	NA	NA
Carbon monoxide	ND	0.37	NA	NA
Nitrogen dioxide	ND	2.21	NA	NA
Sulfur dioxide	71.1	0.004	71.1	0.006
Lead	ND	Negligible	NA	NA

[a] 1992 emissions are the most current data available. Emissions are based on site-estimated liquid petroleum gas external combustion, diesel internal combustion, and VOC solvent cleaning (0.5 t/yr [0.55 ton/yr]) and emission factors (EPA 1995c; ANL 1995).

[b] Based on boiler and incinerator emissions.

Note: ND - no data available; NA - not applicable.

Source: EPA 1993; DOE 1995c.

NTS must comply with the Nevada State Air Pollution Control regulations. Construction activities at NTS would require an operating permit for any surface area disturbance of more than 2.02 ha (5 acres) of land (that is, clearing, excavating, and leveling the land) (Nevada Administrative Code [NAC] Section 445.365). Therefore, a construction permit would be required for NIF. Construction fugitive dust air pollutant emissions must be controlled by using the best practical methods to prevent particulate matter from becoming airborne (NAC Section 445B.365 [NSEC 1995]).

External combustion units (boilers) must have a state air pollution permit before construction (NAC Sections 445B.291, 445B.287). Liquid petroleum gas-fired boilers with rated heat input greater than 105,600 MJ/hr (100 million Btu/hr) but not over 264,000 MJ/hr (250 million Btu/hr) are limited to New Source Performance Standards (NSPS) nitrogen oxide emissions of from 43 to 86 ng/J, depending on the heat release rate, which is a function of the furnace volume (40 CFR 60.44b). There are no NSPS emission limits for liquid petroleum gas-fired boilers with a rated heat input at or less than 105,600 MJ/hr (40 CFR 60.40c).

Emissions of VOC at the stated annual rate of 0.5 t/yr (0.55 ton/yr) would not have a significant impact on local air quality and would not require any additional controls (NAC 445B.395). Additional air quality regulatory information is presented in section 5.2.

I.4.3.2.2.2 *Acoustics*

During the clearing phase of construction of NIF at NTS, there would be no increase in the average outdoor daytime sound level at the nearest private residence, 20 km (12.4 mi) south-southwest of the NIF site. The average outdoor daytime sound level at this point would remain at 28 dBA or less during hours the clearing equipment was operating. The CNR rank, adjusted for the estimated preexisting background level, would not be expected to change from its normal level.

The residual outdoor daytime sound level at the nearest laboratory building (the gate house/security office) is expected to increase by 12 dB, to 40 dBA. The existing average daytime sound level at this point is estimated to be 28 dBA. The adjusted CNR rank for the resulting sound is "C." These estimates are based on the assumptions given in Lazaro et al. (1996). It is possible that the actual noise levels might be higher or lower than those estimated.

I.4.3.2.3 Water Resources

About 2.95 MLY (0.78 MGY) of water would be required for NIF construction (LLNL 1995b). Water and wastewater utility requirements for NIF operations at NTS are shown in table I.4.3.2.3–1. The raw water supply required for NIF operations would total about 152 MLY (40 MGY), of which 18 MLY (4.7 MGY) would be for domestic use. NTS water supply system has adequate production and storage capacity to meet the needs of NIF. The water would be obtained from six existing wells on NTS. An underground water pipeline about 3.2-km (2-mi) long would have to be constructed to the NIF location. Sewage treatment and disposal facilities would also have to be constructed for the project. Adequate land area exists for such facilities (White 1995e). The foundations for NIF buildings would be above the depth of the 500-year flood and project facilities would be designed to withstand any flood. Materials that might cause water pollution would not be stored within reach of the 500-year flood.

TABLE I.4.3.2.3–1.—*Water and Wastewater Utility Capacity at Nevada Test Site*

Utility System	Current Usage	NIF Requirement	Projected Usage, Including NIF	Current Capacity
Water supply[a] (MLY)	2,400	152	2,552	14,800
Wastewater treatment (MLY)	0	18	18	0

[a] Represents pumping capacity for all the water supply wells for NTS water services area, which includes NIF location.
Source: White 1995e.

I.4.3.2.4 Biotic Resources

I.4.3.2.4.1 *Terrestrial Resources*

At NTS Area 22, NIF (including the temporary construction laydown area) would be constructed within undeveloped creosote bush habitat, eliminating up to 18.2 ha (45.0 acres) of that habitat. The general types of impacts that could result from NIF construction at NTS would be similar to those discussed for LLNL (section I.4.1.2.4–1). Areas disturbed by construction but not occupied by a building, parking lot, or access road would be of minimal value to wildlife because of the difficulty of reestablishing a vegetative cover in a desert environment (DOE 1995c). Additionally, introduced plants such as red brome, cheatgrass, and Russian thistle readily invade disturbed areas and delay revegetation by native plants.

I.4.3.2.4.2 *Wetlands and Aquatic Resources*

The proposed NIF location at NTS does not contain, nor is it located near, wetlands or surface water resources. Therefore, construction and operation of NIF at NTS would not be expected to adversely affect such resources.

I.4.3.2.4.3 *Rare, Threatened, and Endangered Species*

No habitat designated as critical to threatened or endangered species would be affected by construction of NIF. Construction and operation of NIF (including the 3.2-km [2-mi] underground water supply pipeline) at NTS Area 22 location could pose a threat to individual desert tortoises and their habitat. Vehicular traffic associated with NIF construction and operation would also be a threat to tortoises. The ferruginous hawk would be discouraged from using areas near NIF because of human disturbance, but the loggerhead shrike could use the fence that would surround NIF for perching and hunting sites (DOE 1995c).

I.4.3.2.5 Cultural and Paleontological Resources

Construction and operation of the proposed NIF at Area 22 would have no effect on archaeological sites or historic structures listed on or eligible for the NRHP, or on important paleontological remains or Native American cultural resources.

I.4.3.2.6 Socioeconomics

Locating NIF at NTS would have a minor impact on the economic study region and in the ROI described in section I.4.3.1.6 because the site is in a somewhat diverse regional economy with extensive inter- and intraregional, national, and global economic interactions and linkages. None of the average annual increases in any of the socioeconomic variables would constitute a major difference from the region-specific average annual increases expected without NIF. Also, because the NIF partnership includes representatives of government, industry, and the academic sector throughout the United States, procurement and investment would be dispersed over a number of different regions, thus dampening the concentration of economic effects of the program.

The following sections describe the effects of constructing and operating NIF on the host region's economy and employment, and on population, housing, public finances and services, and local transportation in the ROI.

I.4.3.2.6.1 *Regional Economic Impacts*

Slight changes in employment and economic activity levels in the economic study region would occur from local spending of employee wages, procurement of goods and services including construction materials, and other local investment associated with constructing and operating NIF. In addition to creating new jobs (direct) at the site, indirect job opportunities, such as community support services, would also be created in the economic study region as a result of these new direct jobs. The total new jobs created (direct and indirect) would contribute slightly to unemployment reduction and would increase income and economic output in the regional economy during construction and operation of NIF. Table I.4.3.2.6.1–1 presents the potential impacts to the regional economy if NIF is located at NTS.

Constructing NIF at NTS would result in a peak of approximately 280 direct jobs in 1998. This construction-related procurement would indirectly create 1,360 jobs in the economic study area.

TABLE I.4.3.2.6.1–1.—*Potential Socioeconomic Impacts in the Nevada Test Site Area*

Parameters	NIF Alternative Change Over Reference Baseline		Reference Baseline	
	Peak Construction 1998[a]	Operations 2003[b]	1996 to 2002[a]	2003[b]
Regional Employment				
Direct jobs	280	330		
Indirect jobs	1,360	290		
Total jobs	1,640	620	14,600 jobs projected annually	12,900 additional jobs projected
Regional Aggregate Earnings [c]				
Direct earnings	16.19	13.81		
Indirect earnings	27.22	6.29		
Total earnings	43.41	20.10		
Regional Population Migration				
ROI in-migrating population	2,340	440		13,300 additional people
Regional Housing Demand				
Number of housing units in the ROI	850	160	44,400 vacant housing units (annual average)	50,000 vacant housing units
Local Transportation				
Number of trips generated at site per day	538	630		
Public Finance	0.21	0.04	NA[d]	NA
Percent change over 1995 fund balance (Clark County)				
Public Services				
Change in service demand				
Police[e]	9	1	1,436[d]	7,839
Fire[e]	2	0	379[d]	909
General[e]	15	2	2,240[d]	2,349
Physicians[f]	3	1	1,455[d]	2,096
Teachers[f]	18	3	9,530[d]	13,725

[a] Construction period would be 1996 to 2002, with peak construction projected to occur in 1998.
[b] Operating period would be 2003 to 2033, with impacts throughout the period projected to remain stable.
[c] Regional earnings are millions of constant 1994 dollars.
[d] Projected 1998 fund balance for Public Finance, and projected 1998 level of service (LOS) for Public Services.
[e] Las Vegas.
[f] Clark County.
Note: NA - not applicable.
Source: Model results.

Employment for NIF operation would begin phasing in as construction neared completion. Direct employment related to operations is projected at 330, with nearly 290 indirect jobs created throughout the economic study region. As a result of constructing and operating NIF, the baseline compound average annual growth rate from 1995 to 2003 would increase by 0.01 percentage points.

Peak earnings associated with the 280 direct jobs created in 1998 are projected at approximately 16.2 million dollars. Construction-related procurement would indirectly create more than 27 million dollars in regional earnings. Direct earnings related to operations are projected to reach nearly 14 million dollars, with 6.3 million dollars in earnings added to the regional economy.

I.4.3.2.6.2 *Population and Housing*

Construction. Population in-migration resulting from NIF construction phase demands would peak in 1998 with a projected cumulative total of 2,340 people moving into the ROI (table I.4.3.2.6.1–1). This population increase would result in demand for an additional 850 housing units on the ROI. Baseline projections of the NTS ROI housing market from 1996 (NIF construction start date) through 1998 indicate that nearly 43,000 housing units will be available. The demand for approximately 850 vacant housing units in the ROI would use approximately 2 percent of the available housing stock in the ROI. NIF would generate little demand for new housing construction because of the number of vacant housing units within the ROI and the proximity of NTS to Las Vegas. Most of this housing demand would be temporary and would primarily affect the renter segment of the ROI housing market.

Operation. Population in-migration resulting from NIF operation phase demands could result in an additional 440 people moving into the ROI. While additional demand for housing would be longer term relative to construction, no perceptible strain on the market is expected, assuming that the general conditions associated with the housing market continue.

I.4.3.2.6.3 *Public Finance*

Construction. Given the projected population and economic growth associated with NIF during the construction phase, fiscal balances (revenues and expenditures) would be expected to increase for all the jurisdictions within the ROI. Short-term public finance impacts would peak during the year 1998 and would then decline as construction neared completion in 2002. Since the largest percentage of socioeconomic impacts are expected to occur in Clark County (assuming current residential patterns), that county would experience the greatest fiscal impacts in the ROI (table I.4.3.2.6.1–1).

Operation. The increase in population and economic growth as a result of NIF operations would increase fiscal balances for all counties within the ROI, with the greatest impact in Clark County. Fiscal impacts would remain relatively stable from the initial impact in 2003 throughout the duration of NIF operations.

I.4.3.2.6.4 *Public Services*

By the year 1998, Clark County would need to hire 9 additional police officers, and Nye County would need 18 additional teachers and 3 additional doctors to maintain its current level of service. By 2003, when operations would start, Nye County would need only three additional teachers and one additional doctor over the baseline conditions to maintain the current level of service.

I.4.3.2.6.5 *Local Transportation*

In 1995, NTS employed approximately 8,600 persons (DOE 1995c). Direct employment generated by NIF at NTS for the life cycle of the project (1996-2033) would range from a minimum of 21 new jobs in 1996 to a maximum of 280 new jobs in 1998. Peak direct employment would be approximately 280 workers in 1998. These direct jobs would generate additional trips on NTS access roads (table I.4.3.2.6.1–1); however, these additional trips should not significantly increase congestion of NTS local transportation network (table I.4.3.2.6.5–1).

A peak of nearly 1,360 indirect jobs in 1999 could be generated within the ROI if NIF was located at NTS. It is likely that the major share of these jobs would be located within Clark and Nye counties. The road network in Clark County and the city of Las Vegas is well developed and expanding and would be capable of handling the additional trips generated from operation of NIF. Because the indirect jobs would be

TABLE I.4.3.2.6.5–1.—*Future Traffic Impacts from National Ignition Facility Project on Nevada Test Site Access Roads*

Route	From	To	Estimated 1995 AADT	Estimated Background and Peak Project Year AADT (1998)	Estimated Percent Change in AADT[a] (%)	Estimated 1995 LOS	Estimated Background and Peak Construction Year LOS (1998)
U.S. 95	Indian Springs	Nye/Clark County border	4,200	4,700	12	A	A
U.S. 95	Indian Springs	SR 156	6,000	6,500	8	A	B
U.S. 95	4 miles north of Mercury	NA	3,100	3,600	16	A	A
U.S. 95	at Amargosa Valley	NA	2,200	2,300	5	A	A
SR 160	at U.S. 95 Interchange	NA	750	923	23	A	A
SR 160	at Pahrump	NA	825	968	17	A	A
SR 160	0.85 mile from Clark/Nye County	NA	3,600	3,840	7	A	A
SR 160	Nevada/ California State line	NA	775	835	8	A	A

[a] Between 1995 and Peak Construction Year.

Note: NA - not applicable; AADT - annual average daily trips; LOS - level of service; SR - State Route.

Source: Carpenter 1995; Nevada Department of Transportation 1993.

dispersed in both Clark and Nye counties, adverse impacts to the regional transportation network are unlikely.

I.4.3.2.6.6 *Environmental Justice*

For the region within 80 km (50 mi) of NTS, both minorities and low-income populations are in the same or lower proportion to other populations compared with the state of Nevada as a whole (section I.4.3.1.6.5). Thus, no environmental justice issues associated with regional impacts have been identified.

Neither minority nor low-income persons are clustered disproportionately in the local vicinity of NTS (section I.4.3.1.6.5). Thus, the local area impacts from construction and operation of NIF would not disproportionately affect either minority or low-income populations.

I.4.3.2.7 Radiation and Hazardous Chemicals

This section describes potential radiological and hazardous chemical impacts that could result from normal operations and postulated accidents at NIF at NTS. Methods, data, and assumptions used in estimating these impacts are presented in Lazaro et al. (1996).

I.4.3.2.7.1 *Normal Operations*

The general public surrounding, and workers at, NTS might be exposed to small quantities of radionuclides released and radiation emitted from routine NIF operations; however, the expected level of radioactive releases and radiation emissions would be well within regulatory limits. No impacts from hazardous chemicals should occur because only minute quantities of hazardous VOCs would be emitted during routine NIF operations. Impacts from routine transportation of tritium targets also would not be expected because there would be no detectable levels of radiation outside the package carrying the low-energy beta-emitting tritium targets.

Table I.4.3.2.7.1–1 summarizes the potential impacts of radiation exposures from operations consistent with the Conceptual Design Option and the Enhanced Option of NIF at NTS.

Impacts to the Public. For the Enhanced Option, the estimated radiation dose to a maximally exposed member of the public located about 20 km (12.5 mi) south-southeast of NIF is 4×10^{-4} mrem/yr, which is much less than the dose limit of 100 mrem/yr resulting from all pathways combined (DOE 1990). The likelihood of the maximally exposed individual contracting a fatal cancer is 1 in 170 million for the entire operational life of NIF (dose/yr x 30 yr x fatal cancer risk factor of 5×10^{-4}/rem). The estimated radiation dose to the surrounding public is 1×10^{-3} person-rem/yr; no cancer fatalities would be expected to occur in the public for the entire NIF operations at NTS. For the Conceptual Design Option, estimated radiation impacts are about one-third the impacts of the Enhanced Option. No adverse health effects would result.

Impacts to Workers. In addition to their potential exposure to radionuclides, the general NTS workers outside NIF could be exposed to direct radiation resulting from high-yield experiments at NIF. For the Enhanced Option, the estimated radiation dose to these non-NIF workers at NTS is 9×10^{-4} person-rem/yr. No cancer fatalities would be expected to occur in workers for the entire NIF operations at NTS. For the Conceptual Design Option, estimated radiation impacts are about one-third the impacts of the Enhanced Option and carry extremely low risk of adverse health effects.

TABLE I.4.3.2.7.1–1.—*Potential Radiological Impacts from Normal Operations of the National Ignition Facility at Nevada Test Site*

Receptor	Conceptual Design Option	Enhanced Option
Maximally Exposed Individual		
Dose (mrem/yr)	1×10^{-4}	4×10^{-4}
Percent of natural background	4×10^{-5}	1×10^{-4}
30-year fatal cancer probability	2×10^{-9}	6×10^{-9}
Population Within 80 Km		
Dose (person-rem/yr)	3×10^{-4}	1×10^{-3}
Percent of natural background	5×10^{-6}	2×10^{-5}
30-year fatal cancers	0	0
Workers Onsite		
Dose (person-rem/y)		
Non-NIF workers	3×10^{-4}	9×10^{-4}
NIF workers	10	10
30-year fatal cancers	0	0

Source: Model results.

Potential radiation exposures inside NIF would be kept as low as reasonably achievable through facility design and administrative controls. The design objective of NIF is to keep the individual radiation worker dose to less than 500 mrem/yr. On average, it is estimated that a NIF worker would receive approximately 30 mrem/yr.

I.4.3.2.7.2 *Postulated Accidents*

Radionuclides and hazardous chemicals could be released from accidents postulated at NIF and during the transportation of tritium targets. Tables I.4.3.2.7.2–1 and I.4.3.2.7.2–2 summarize potential radiological impacts to the public and workers from postulated facility and transportation accidents, respectively. A description of each accident scenario evaluated is provided in Lazaro et al. (1996).

Radiological Impacts

Impacts to the Public. The public could be exposed to radionuclides released from a postulated accident at NIF. The bounding accident assumed that an earthquake would occur at the time of a maximum-yield experiment, with an accidental release frequency of $2x10^{-8}$/yr. For the Enhanced Option, the estimated radiation dose to the maximally exposed member of the public is 0.05 rem. The likelihood of the maximally exposed individual contracting a fatal cancer from this exposure would be 1 in 5,000. The estimated radiation dose to the surrounding public would be 70 person-rem. No cancer fatalities would be expected to occur among members of the public following an accident at NIF. For the Conceptual Design Option, estimated radiation impacts are about one-half the impacts from the Enhanced Option. No adverse health effects would be expected to result.

Table I.4.3.2.7.2–1 also indicates that the risk of radiation-caused cancer fatalities from the postulated accident at NTS is essentially zero when the extremely low frequency of the accident occurring during NIF operations is taken into account. The risk is the product of the estimated radiation dose, a fatal cancer risk factor of $5x10^{-4}$, and an accident release frequency of $2x10^{-8}$/yr.

TABLE I.4.3.2.7.2–1.—*Potential Radiological Impacts from Postulated Bounding Accident Involving the National Ignition Facility at Nevada Test Site*

Receptor	Conceptual Design Option	Enhanced Option
Maximally Exposed Individual		
Dose (rem)	0.03	0.05
Fatal cancer probability	$2x10^{-5}$	$2x10^{-5}$
Risk (cancer fatalities/yr)	$3x10^{-13}$	$5x10^{-13}$
Population Within 80 Km		
Dose (person-rem)	41	70
Fatal cancers	0	0
Risk (cancer fatalities/yr)	$4x10^{-10}$	$7x10^{-10}$
Workers Onsite		
Dose (person-rem)	2	4
Fatal cancers	0	0
Risk (cancer fatalities/yr)	$2x10^{-11}$	$3x10^{-11}$

Source: Model results.

Impacts to Workers. For the Enhanced Option, the estimated radiation dose to all workers at NTS is 4 person-rem. No cancer fatalities would be expected to occur among workers following the postulated accident at NTS. For the Conceptual Design Option, estimated radiation impacts are about half the impacts of the Enhanced Option. No adverse health effects would be expected to result. The risk of radiation-caused cancer fatalities would essentially be zero considering the extremely low potential for the postulated accident to occur. NTS has a comprehensive emergency plan, which would be expanded to incorporate NIF, to ensure protection of workers in case of an accident or natural disaster.

Transportation Impacts. Radiological impacts associated with the transportation of tritium targets would result from a release of tritium into the environment following a transportation accident. Because tritium is a pure beta emitter with no associated gamma radiation, radiological risks associated with routine (incident-free) transportation operations would be considered negligible. The potential radiological impacts of transporting tritium targets were calculated for truck and air travel. Trucks were assumed to be used to transport the tritium targets from the manufacturing sites to the nearest major airport, with cargo aircraft then used to transport the targets to McCarran International Airport. After arriving at McCarran, the targets were assumed to be transferred to a truck for shipment to NIF at NTS.

Table I.4.3.2.7.2–2 summarizes the risks associated with the transportation of tritium targets from each of the tritium manufacturing facilities to NIF at NTS. Radiological risk from transportation activities is defined as the product of the accident consequence (dose) and the probability of the accident occurring, and was calculated by considering a wide range of accidents, from high-probability, low-consequence events to low-probability, high-consequence events (see Lazaro et al. 1996). Estimated latent cancer fatality risks were obtained by multiplying the dose risk by $5x10^{-4}$ latent cancer fatalities per person-rem (ICRP 1991). Estimated latent cancer fatality risks range from $6x10^{-10}$ to $9x10^{-9}$ per year for all cases.

Nonradiological impacts associated with the ground transport of tritium targets were calculated for both routine (incident-free) and accident conditions. Nonradiological population risks for routine operations were calculated by multiplying the distance traveled by truck in urban population density zones by a risk factor for latent mortality from pollutant inhalation (Rao et al. 1982). Nonradiological population risks resulting from vehicular accidents were calculated in

TABLE I.4.3.2.7.2–2.—*Potential Radiological Risks and Consequences of Transporting Tritium Targets from Manufacturing Facilities to Nevada Test Site*

Manufacturing Facility	Conceptual Design Option	Enhanced Option
General Atomics		
Dose risk (person-rem/yr)	$1.2x10^{-6}$	$9.5x10^{-6}$
Fatality risk (cancer fatalities/yr)	$6x10^{-10}$	$5x10^{-9}$
Nonradiological accidents[a] (fatalities/yr)	$1x10^{-3}$	$3x10^{-3}$
Nonradiological vehicular emissions (fatalities/yr)	$8x10^{-4}$	$2x10^{-3}$
Lawrence Livermore National Laboratory		
Dose risk (person-rem/yr)	$1.2x10^{-6}$	$9.3x10^{-6}$
Fatality risk (cancer fatalities/yr)	$6x10^{-10}$	$5x10^{-9}$
Nonradiological accidents[a] (fatalities/yr)	$1x10^{-3}$	$3x10^{-3}$
Nonradiological vehicular emissions (fatalities/yr)	$4x10^{-4}$	$1x10^{-3}$
Los Alamos		
Dose risk (person-rem/yr)	$2.4x10^{-6}$	$1.9x10^{-5}$
Fatality risk (cancer fatalities/yr)	$1x10^{-9}$	$9x10^{-9}$
Nonradiological accidents[a] (fatalities/yr)	$2x10^{-3}$	$6x10^{-3}$
Nonradiological vehicular emissions (fatalities/yr)	$2x10^{-4}$	$5x10^{-4}$
Savannah River		
Dose risk (person-rem/yr)	$2.0x10^{-6}$	$1.6x10^{-5}$
Fatality risk (cancer fatalities/yr)	$1x10^{-9}$	$8x10^{-9}$
Nonradiological accidents[a] (fatalities/yr)	$1x10^{-3}$	$3x10^{-3}$
Nonradiological vehicular emissions (fatalities/yr)	$2x10^{-4}$	$5x10^{-4}$
University of Rochester		
Dose risk (person-rem/yr)	$2.1x10^{-6}$	$1.6x10^{-5}$
Fatality risk (cancer fatalities/yr)	$1x10^{-9}$	$8x10^{-9}$
Nonradiological accidents[a] (fatalities/yr)	$9x10^{-4}$	$2x10^{-3}$
Nonradiological vehicular emissions (fatalities/yr)	$2x10^{-4}$	$5x10^{-4}$
Maximum Consequence Accident		
Population[b,c]		
Dose (person-rem)	0.33	3.3
Fatal cancers	$2x10^{-4}$	$2x10^{-3}$
Maximally Exposed Individual[b,d]		
Dose (rem)	$1.2x10^{-4}$	$1.2x10^{-3}$
Fatal cancer probability	$6x10^{-8}$	$6x10^{-7}$

[a] Collective population fatalities were calculated for 145 shipments (Conceptual Design Option) and 335 shipments (Enhanced Option). For example, a reported value of $4x10^{-3}$ fatalities suggests that no fatalities are expected for the proposed action. However, one single fatality out of the entire affected population might be expected over the course of 250 years if the same number of shipments were to continue for that length of time.

[b] The most severe accidents assumed that 100 percent of the target tritium was released in an oxide form during an accident. Accident consequence results were determined using the RISKIND computer program which is described in Yuan et al. 1993. Stable weather conditions (Pasquill Stability Class F) with a wind speed of 1 m/s (2.2 mph) were assumed.

[c] The maximum consequences would result from an accident occurring in an urban environment. The population was assumed to extend at a uniform density of 3,861 persons/km^2 (10,000 persons/mi^2) to a radius of 80 km (50 mi) from the accident site. The population exposure pathways for urban environments included inhalation and resuspended inhalation. Urban environments were not assumed to produce food for local use or export, hence no ingestion dose was included.

[d] The maximally exposed individual was assumed to be at the location of maximum exposure. The location of the maximally exposed individual was assumed to be 380 m (1,247 ft) from the accident under stable weather conditions. Individual exposure pathways included acute inhalation during passage of the plume. No ingestion dose was considered.

Note: The transportation risk assessment assumed 100 percent of the tritium targets would be manufactured and transported to NIF from each site. In practice, tritium targets would be produced and transported from more than one manufacturer. The transportation risk assessment was performed for offsite transportation only. Transportation risks from onsite transport of tritium targets were assumed to be negligible compared to risks from offsite transportation.

Source: Model results.

a similar manner by multiplying the state-specific accident fatality rate by the distance traveled by truck in the state.

The maximally exposed individual and population doses were calculated for a transportation accident involving the entire release of the tritium cargo (assumed to be five tritium targets). Radiological impacts resulting from a potential maximum-consequence accident were assessed for a general population located in an urban population density zone. Maximally exposed individuals were assumed to be exposed and unshielded as the plume passed at a distance, resulting in the largest dose to the individual. Radiological consequences were assessed for worst-case weather conditions (Pasquill Stability Class F) for both the collective population and the maximally exposed individual. For assessment purposes, it was assumed that the entire tritium cargo was released to the environment in oxide form. The estimated number of latent cancer fatalities from the maximum-severity transportation accident was calculated by multiplying the population-committed effective dose equivalent by $5x10^{-4}$ latent cancer fatalities per person-rem (ICRP 1991). Table I.4.3.2.7.2-2 summarizes the impacts of a maximum-consequence accident during transportation of tritium targets.

Hazardous Chemical Impacts. A number of possible chemical accidents (including one caused by an aircraft crash) were studied in terms of their potential impacts on workers and the public outside NTS boundaries (Lazaro et al. 1996). The five accidents likely to have the greatest impacts were studied in detail. Four of these five accidents would occur at NIF location, and the fifth accident would occur elsewhere on NTS. The four release scenarios occurring at NIF are as follows:

- A mercury release from the ignitron switches
- A combined alumina/silica release from the target chamber
- A carbonyl fluoride release from the optics treatment area
- A hydrogen fluoride release from the optics treatment area

All four accidents at NIF would occur far from workers in other buildings and very far from the public. The fifth accident is unique to NTS because of the presence of propane storage tanks for fuel on the site near NIF. The two largest tanks hold 28,400 L (7,500 gal) each and are positioned side by side. The worst-case scenario assumes that both tanks would simultaneously leak from a 5-cm (2-in) diameter hole 0.3 m (1 ft) from the tank bottom as a continuous release over one hour.

A modeling study was conducted for each of the five release scenarios. More details, including predicted concentrations, are provided in Lazaro et al. (1996). The modeling study applied a dispersion model to each of the releases and used a health criterion (ERPG-2 level) representative of acute impacts from an exposure that might happen once in a lifetime. The health criterion was the concentration below which, if exposure occurred for an hour, the exposed individual could still avoid irreversible health effects by taking emergency action. The results of the modeling yielded the following conclusions:

- The threat zone from each of the four accidents would not extend to the boundary with the public under either typical or extreme meteorological conditions
- Personnel in other buildings on the site are so far away that they would not be affected. The assumptions made for the four accidents in the NIF Laser and Target Area Building were that the release would not be inhibited by the walls of the NIF building and that the wind would take the plume away from the building. The distances beyond which concentrations would fall below the ERPG-2 level for each of the five accidents are as follows:
  - Mercury scenario—239 m (784 ft) for both the Conceptual Design and Enhanced options.
  - Alumina/silica scenario—231 m (758 ft) for the Conceptual Design Option and 171 m (561 ft) for the Enhanced Option.

–Carbonyl fluoride scenario—75 m (246 ft) for both the Conceptual Design and Enhanced options.

–Hydrogen fluoride release—101 m (331 ft) for both the Conceptual Design and Enhanced options.

–Propane release—755 m (2,477 ft) for both the Conceptual Design and Enhanced options.

Personnel in NIF Laser and Target Area Building and those outside in the immediate vicinity might be affected.

I.4.3.2.8 Waste Management Impacts

This section describes the proposed management of wastes generated during construction, normal operation, and the ultimate decommissioning of NIF if it were located at NTS.

I.4.3.2.8.1 *Waste Generation and Management During Construction and Operation*

During construction, waste management would be performed as described in section I.4.1.2.8 for LLNL. No water permits would be needed for withdrawal of groundwater for activities occurring on NTS. A RCRA Part B Permit would be required for the construction of hazardous and mixed waste management facilities, and a state-issued permit would be required for the construction of nonhazardous waste landfills. All construction activity would be performed in compliance with requirements identified in DOE O 47001.1. NTS has adequate capacity to handle (or contract for offsite disposal of) this waste stream.

Table I.4.1.2.8.1–2 (section I.4.1.2.8.1) describes the quantities of various low-level, mixed, hazardous, and nonhazardous wastes that would be generated during NIF operation for both the Conceptual Design Option and Enhanced Option. The following paragraphs describe how the wastes shown in that table would be managed if NIF were located at NTS.

Successive sections cover how developing technologies might be applied to minimize waste streams. Waste handling methods would be the same for both the Conceptual Design and Enhanced options. While, as shown in various tables, total estimated waste quantities are somewhat higher for the Enhanced Option, no changes in handling methods would be necessary.

Low-Level Waste. Solid LLW produced during NIF operations would be disposed of onsite. NTS currently disposes of solid LLW onsite, in compliance with NVO-325 waste acceptance criteria.

Waste that does not meet the waste acceptance criteria requirements of NVO-325 may not be disposed of at NTS. The waste must be certified to meet the requirements whether that creates the need for further treatment or characterization or whatever the area of deficiency by which the waste or the management program governing the waste was deemed unacceptable. There is and has been waste that has been unapproved or disapproved. DOE's Nevada Operations Office conducts an audit on the program managing the waste and is the approval authority for all waste streams to be disposed of on NTS.

Aqueous LLW would be treated onsite to eliminate free liquids. Currently, there are no existing facilities at NTS for the treatment of liquid radioactive waste. However, there are plans to develop this capability at NTS in the near future (FY 1997) (see next section on mixed liquid waste).

Mixed Waste. Current plans are to permit mixed solid waste disposal units on NTS for mixed waste generated both on and offsite that meets RCRA land disposal requirements. A permit application has been submitted to the State of Nevada, and it is estimated that the units will be available in fiscal year 1997, well before NIF operations would begin. NTS currently has the capability, under interim status, to dispose of mixed waste generated onsite at the Area 5 Radioactive Waste Management Site. The current remaining capacity for mixed waste disposal at NTS is over 90,000 m^3 (117,000 yd^3) and will be much greater (approximately 250,000 m^3 [325,000 yd^3]), assuming that approval and construction of permitted mixed waste disposal units takes place as anticipated. The small amount of mixed waste generated at NIF would not significantly affect mixed waste operations. In the event the mixed waste was generated before development of acceptable NTS disposal capacity, the waste could be stored, pending approval by the State of Nevada, at a storage pad onsite at the Area 5 Radioactive Waste Management Site or could be sent to a mixed waste disposal site out of state.

Low-level mixed liquid waste would be treated to eliminate free liquids before disposal at NTS. Free liquids are not allowed for disposal, per requirements identified in the NTS Waste Acceptance Criteria, NVO-325. As with solid mixed waste, the requirements identified in the RCRA land disposal restrictions would also be met. No facilities currently exist at NTS for the treatment of liquid mixed waste; however, there are plans to develop such capability in the near future. The liquid waste treatment system, which is designed to treat large volumes of liquid waste (both radioactive and mixed) is expected to be available in fiscal year 1997. This system would use evaporation as the primary treatment method for the anticipated waste. A second mixed waste treatment facility, which is still in the preliminary planning stages, is also expected to be operational in fiscal year 1997. This facility will use stabilization as the primary method of treatment and might be more appropriate for the liquid mixed waste from NIF. This facility should be online by the time any waste would be generated by NIF operations. Therefore, upon approval of a permit modification, this planned facility would be available for the treatment of NIF liquid mixed waste.

If necessary, NIF liquid mixed waste could be stored onsite at the Area 5 Radioactive Waste Management Site until a treatment facility was available. This waste would be stored on a mixed-waste storage pad that is planned for construction in the near future. If the mixed waste storage pad were not available at the time of generation, the waste could be stored on the TRU pad with approval from the State of Nevada. The TRU pad is currently used for the storage of mixed waste (Ortego and Johnston 1995). The waste containers are protected from the environment in a covered building. Monitoring already exists and could be modified to detect hazards specific to NIF waste.

The mixed aqueous waste from the debris shield cleaning would be neutralized, stabilized, and disposed of at NTS as an approved waste stream.

Hazardous Waste. NTS has a well-established system for management of large quantities of hazardous waste. Both liquid and solid hazardous wastes are sent offsite to permitted treatment, storage, or disposal facilities located outside Nevada. Hazardous waste generated at NTS is accumulated and stored at the RCRA-permitted hazardous waste storage unit located near the Area 5 Radioactive Waste Management Site. NTS generates approximately 300,000 L (79,250 gal) of hazardous waste annually, based on fiscal year 1994 volumes. The addition of an estimated 8.0 m^3 (280 ft^3) of solid and 4,500 L (1,190 gal) of liquid hazardous waste from NIF could be handled by the existing waste management system and would not cause a significant adverse impact. A subcontractor typically removes waste from the hazardous waste storage unit on a monthly basis under an existing approved EPA identification number for NTS. There are no plans to construct a hazardous waste disposal unit at NTS. Precious metals, such as silver and mercury, and used oils are sent to approved recycling and recovery centers. Most hazardous waste from NIF would be shipped to an approved commercial RCRA treatment, storage, and disposal facility.

Nonhazardous Waste. Sanitary wastewater would be treated at a new sewage lagoon system dedicated to NIF. There are a number of these sewage lagoons in existence at NTS because this is the customary method for managing this type of waste. Resources would be available to construct this system for NIF.

The development of a storm drain would depend on the siting for NIF. Because of the vast availability of usable land at NTS, it is unlikely that extensive storm drain development would be necessary. Siting of the facility and its subsequent design would allow for alluvial flood protection. There are no public structures in the vicinity of NTS that would require the diversion of flood waters. The only potentially affected structures would be the other DOE facilities in the vicinity of NIF.

Disposal of nonhazardous solid waste would be handled by onsite DOE/NV contractors. NTS maintains the capability to dispose of nonhazardous solid waste at onsite disposal units. Landfills are available for sanitary waste, construction debris, and hydrocarbon-contaminated soil. The onsite contractor maintains a collection schedule for the removal of nonhazardous waste and can be called for supplementary pickups as needed.

Possible Waste Minimization During Operation. Waste minimization would be handled as described in section I.4.1.2.8 for LLNL. A pollution prevention opportunity assessment will be conducted on proposed NIF operations to optimize their efficiency and minimize waste generation.

Existing Waste Management Capabilities at Nevada Test Site. Based on the estimated waste generation by NIF (table I.4.3.2.8.1–1) and on information on current waste handling practices at NTS, comparison tables were developed that indicate the capability of the existing NTS facilities to undertake the various waste managements tasks associated with NIF.

For reference, table I.4.3.1.8–1 shows the current waste management capacity at NTS. Table I.4.3.2.8.1–1 shows the impact of estimates for NIF on waste storage at NTS. Table I.4.3.2.8.1–2 is a comparison of NIF waste-generation rate to the annual handling/treatment capacity at NTS. There are currently no treatment capabilities on NTS applicable to the waste that would be generated at NIF.

I.4.3.2.8.2 *Waste Management at Nevada Test Site During National Ignition Facility Decommissioning*

NTS proposes that decommissioning NIF after 30 years of operation includes removal of the laser and associated equipment from the laser building (Ortego 1995). The D&D activities would not add a significant burden to operations at NTS. This type of activity is common throughout the DOE complex at

TABLE I.4.3.2.8.1–1.—***Impact of Estimated National Ignition Facility-Generated Waste on Waste Storage at Nevada Test Site***

Category	NIF-Generated Waste/Year[a] (m^3)		Years to Fill with NIF Flow Alone		Is Existing or Planned Storage Capacity Adequate	
	Solid	Liquid	Solid	Liquid	Solid	Liquid
Low-Level						
Conceptual Design total	2.98	0.60	Unknown	Unknown	Yes[b]	Yes[b]
Enhanced total	7.25	1.56	Unknown	Unknown	Yes[b]	Yes[b]
Mixed						
Conceptual Design total	0.34	2.00	3.3×10^3	0.57	Yes	Yes[c]
Enhanced total	0.88	4.98	1.3×10^3	0.22	Yes	Yes
Hazardous[d]						
Conceptual Design total	8.0	2.30	13[e]	45.2	Yes[f]	Yes[f]
Enhanced total	8.0	4.60	13[e]	22.6	Yes[f]	Yes[f]

[a] The total amount of the low-level waste was found by adding the values in the column "Cleaned" of table I.4.1.2.8.1–2 to the column "Low-Level" of the same table. The mass of the debris shield was translated into volume by assuming the density of iron (7.87 g/cm^3). The density of the low-level liquid waste was assumed equal to 1.0 g/cm^3.

[b] The storage capacity is unknown; however, the capacity is easily larger than 1,600 L/yr (426 gal/yr). Storage could be accomplished with 208-L (55-gal) drums at numerous locations.

[c] Planned.

[d] The values for the hazardous waste were found by adding the hazardous waste from the Laser and Target Area Building and the Optics Assembly Area.

[e] The following values for the densities of the materials were assumed: molecular sieves: density of diatomaceous earth (0.27 g/cm^3); personal protective equipment and wipes: density of paper (0.4 g/cm^3); pre- and high-efficiency particulate air filters: density of charcoal (1.8 g/cm^3); paper capacitors: density of paper (0.4 g/cm^3); hardware from the chamber: density of 50 percent aluminum and 50 percent stainless steel (5.3 g/cm^3).

[f] Shipped offsite.

Source: Calculated from tables I.4.1.2.8–2 and I.4.3.1.8–1.

TABLE I.4.3.2.8.1–2.—*Comparison of National Ignition Facility Waste to Annual Treatment Capacity at Nevada Test Site*

Category	Ratio of NIF Waste Generation to Annual Treatment Capacity	Treatment Capacity (m^3/yr)	Is Existing or Planned Treatment/Disposal Capacity Adequate
Low-Level			
Liquid			
Conceptual design total	NA	NA	Yes[a]
Enhanced total	NA		Yes[a]
Solid			
Conceptual design total	NA	NA	Yes[a]
Enhanced total	NA		Yes[a]
Mixed			
Liquid			
Conceptual design total	NA	NA	Yes[a]
Enhanced total	NA		
Solid			
Conceptual design total	NA	None	Yes[a]
Enhanced total	NA		
Hazardous			
Liquid			
Conceptual design total	NA	None	Yes[b]
Enhanced total	NA		
Solid			
Conceptual design total	NA	None	Yes[b c]
Enhanced total	NA	None	Yes[b,c]

[a] Planned.
[b] Explosives waste only treatment capacity.
[c] Shipped offsite.
Note: NA - not applicable.
Source: Calculated from tables I.4.1.2.8–2 and I.4.3.1.8–1.

the present time. Experienced waste-handling and radiation safety personnel working at NTS would be employed for decommissioning.

A wide variety of decommissioning projects similar to those required for NIF are currently under way at NTS. All radiation-related work practices at NTS comply with the three primary requirements and guidance documents for radiation safety: 10 CFR 835, Radiation Control Manual, and DOE N 441.1. A fully implemented program has been established with complex guidelines and procedures, which forms a site-specific Radiation Safety and Control Manual. As low as reasonably achievable programs have been established and are implemented based on the above-noted program documents. All work that would present the potential for exposure or contamination would receive special consideration and planning, including, but not limited to, dry-run practices, condition monitoring experiments, and personal protective equipment upgrade analysis. Decontamination systems designed specifically for equipment in NIF would be established to optimize efficiency and reduce the amount of waste residuals from the decontamination process. A wide variety of radiation safety and decontamination resources and experience exist at NTS. These resources would be made available, as necessary, for the development and implementation of NIF systems. Existing equipment, such as anticontamination clothing and personal protective equipment, would be available for use at NIF. This type of reusable equipment would be decontaminated onsite at the laundering and cleaning facilities available at NTS. Residual materials from the decontamination process would be disposed of at NTS.

The following sections discuss specifics of decommissioning of NIF laser and associated components, followed by a discussion of decommissioning of equipment in the target area. The major activated/contaminated components would be located in the target area, so this facility would pose the most complex operation.

Decommissioning of National Ignition Facility Laser by Nevada Test Site. The decommissioning of the NIF laser would be handled similar to the manner described in section I.4.1.2.8 for LLNL. Mercury wastes from the ignitron switches would be sent to a permitted mercury recycling center, as is the current practice for other mercury wastes. The mixed waste from the capacitors would have to meet the requirements of NVO-325 before disposal on NTS at the Area 5 Radioactive Waste Management Site, as indicated in the discussion above on mixed wastes.

If the mixed waste from capacitors did not meet the physical requirements mandated under NVO-325, the waste might be treated to meet these requirements. If the characterization information on the capacitor mixed waste was deemed unacceptable, the characterization documentation must be redone and/or improved to meet the requirements. If the quality assurance on the capacitor mixed waste was inadequate, the management of the waste would have to be improved to meet the requirements. If the generators did not wish to achieve compliance with the requirements of NVO-325 they might wish to pursue other locations for disposal of the waste.

There should be no reason the mixed waste from the capacitors would not meet the waste acceptance criteria of NVO-325 as long as the waste was managed, treated and/or characterized properly, in compliance with the applicable requirements.

Decommissioning of National Ignition Facility Target Area. The decommissioning of the NIF target area would be handled similar to the manner described in section I.4.1.2.8 for LLNL. DOE/NV and associated contractors have experience dealing with tritium contamination in virtually all phases of operations. Routine carbon dioxide cleaning during operations of NIF would be the primary process for reducing the total amount of contamination on components at the end of life of NIF. NTS waste management operations have disposed of millions of curies of tritium during the history of Radioactive Waste Management Site operations, especially in Area 5. This disposal site, as well as operational sites throughout NTS, is equipped with tritium monitoring and detection systems. The Analytical Services Laboratory at NTS (in Area 23) can perform a variety of analyses for tritium and can carry out personnel decontamination.

Radioactive and mixed waste could be disposed of at NTS, assuming it could be managed and processed in accordance with NVO-325. Large structures that could not easily be containerized could be disposed of at the Area 3 Radioactive Waste Management Site, which is used for the disposal of bulk LLW containers.

NIF would be decommissioned according to standard engineering practices. The project would be handled in a manner similar to construction projects, per the requirements of DOE O 430.1. This planning would optimize all phases of decommissioning and provide the most efficient method for completing the work. Efficient work would lead to a reduction in time for exposure of workers, which would in turn reduce the overall exposure projections.

I.4.4 North Las Vegas Facility

I.4.4.1 *Affected Environment*

The following sections describe the affected environment associated with the construction and operation of NIF at the North Las Vegas Facility (NLVF). Land use, air quality and acoustics, water resources, biotic resources, cultural and paleontological resources, socioeconomics, radiation and hazardous chemicals, and waste management are described.

I.4.4.1.1 Location and Land Use

NLVF is located in the city of North Las Vegas, west of Losee Road, north of Carey Avenue, east of Commerce Street, and south of Brooks Avenue (figure I.3.4.4.1–2). The 32-ha (80-acre) NLVF is zoned general industrial and is bordered on the north, south, and east by general industrial zoning. The western border of the site is adjacent to Commerce Street, which separates the property from fully developed, single-family residential-zoned property. Figure I.4.4.1.1–1 shows the generalized land use in the vicinity of NLVF. NLVF is divided into three distinct areas: the A, B, and C complexes. The A complex covers 8 ha (20 acres) and housed support for the LLNL nuclear test program. The B complex covers 8 ha (20 acres) just south of A complex and housed support for the LANL nuclear test program. The C complex, located west of A and B complexes, covers 15.5 ha (38.3 acres) and housed a computer center and administrative and engineering support functions (DOE 1995h). The open space in C complex would be the primary location for NIF and for the temporary construction laydown area. Existing facilities in C complex and A complex would also be used (figure I.3.4.4.1–2).

The entire NLVF is built on cleared, previously disturbed land, and most of it is covered by buildings, pavement, concrete, or landscaping, except for the open space in C complex. That open space is void of most vegetation. The soils on NLVF range from relatively thick layers of cemented to noncemented soils, and from stiff to very stiff silty and sandy clay, and clay with interbedded medium-dense to dense clayey and silty sand.

I.4.4.1.2 Air Quality and Acoustics

This discussion of existing air quality and acoustics includes a review of the meteorology, climatology, and ambient air quality characteristics near NLVF.

I.4.4.1.2.1 *Meteorology and Climatology*

The climate at NLVF and the surrounding region has four well-defined seasons. Summers display desert conditions, with maximum temperatures usually near 38 °C (100 °F). Winters are mild, with daytime temperatures near 15.5 °C (60 °F). Rainy days average less than one in June to three per month in the winter. Severe thunderstorms occasionally occur in the summer. The spring and fall are generally considered the most ideal seasons, although sharp temperature changes can occur during these months. The annual average temperature at NLVF is 19.1 °C (66.3 °F); average daily temperatures range from 6.9 °C (44.5 °F) in January to 32.1 °C (89.8 °F) in July. The average annual precipitation is 10.6 cm (4.19 in). The prevailing winds are from the southwest at an annual average speed of 15.2 kph (9.3 mph) (Gale Research 1992). The 5-year wind rose for NLVF (based on measurements at McCarran International Airport in Las Vegas) is shown in figure I.4.4.1.2.1–1. From 1987 to 1991, unstable conditions occurred approximately 28 percent of the time, neutral conditions about 37 percent of the time, and stable conditions the remaining 35 percent of the time (NOAA 1995b). In general, atmospheric dispersion improves as the wind speed increases and as the atmospheric conditions become more unstable.

The limited precipitation and warm temperatures create an arid climate that limits the growth of ground-covering vegetation. This condition results in large areas of exposed soil that are potential sources of windborne particulate matter (dust). Ambient particulate matter concentrations are reduced if the exposed soil is wetted or if the airborne particulate matter is "washed out" of the atmosphere by precipitation. However, the area's precipitation and temperature seldom provide these beneficial mechanisms. This situation worsens the particulate matter background concentration and increases the likelihood of the area's PM_{10} and TSP ambient air concentrations approaching or exceeding regulatory standards.

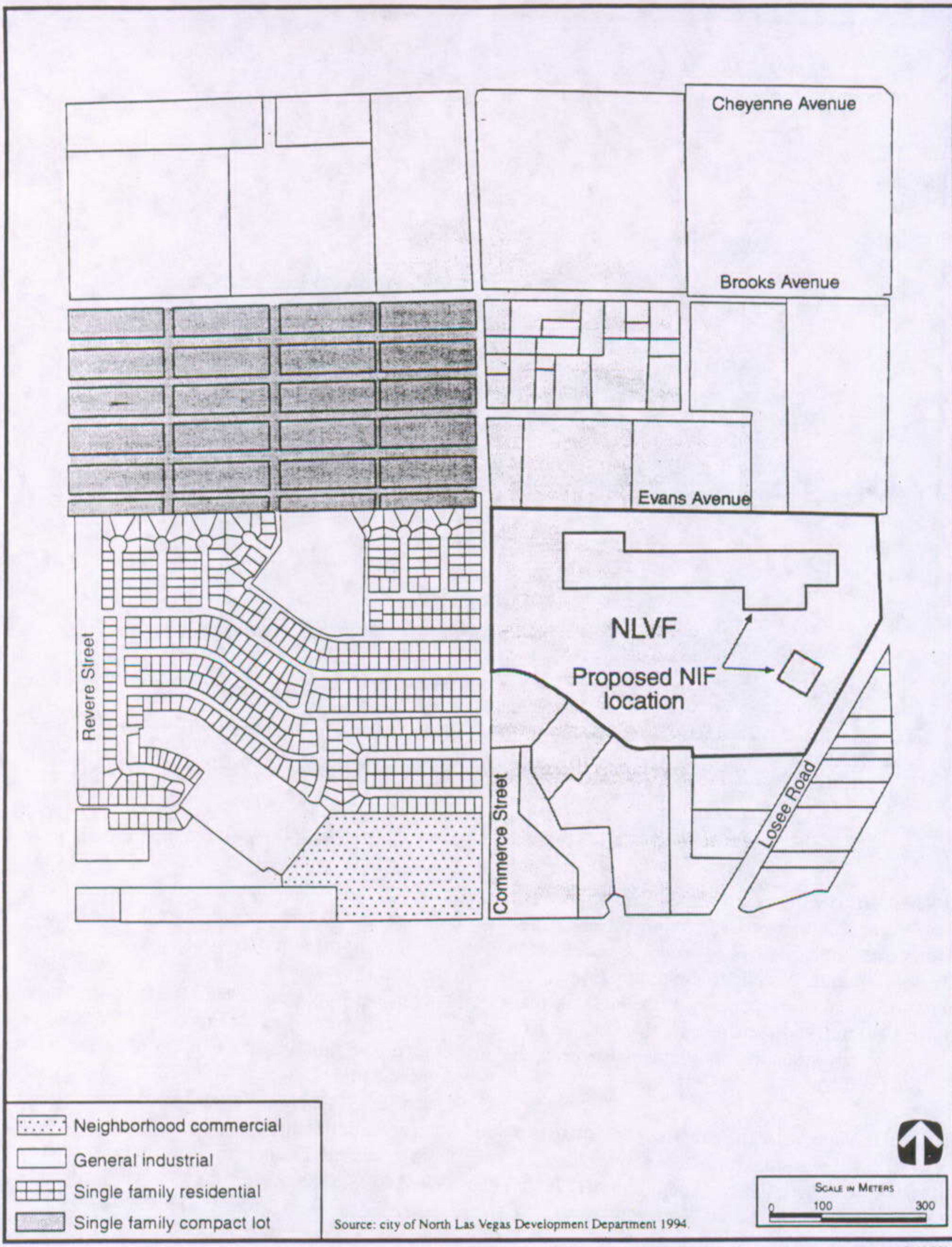

FIGURE I.4.4.1.1–1.—*Generalized Land Use at North Las Vegas Facility and Vicinity.*

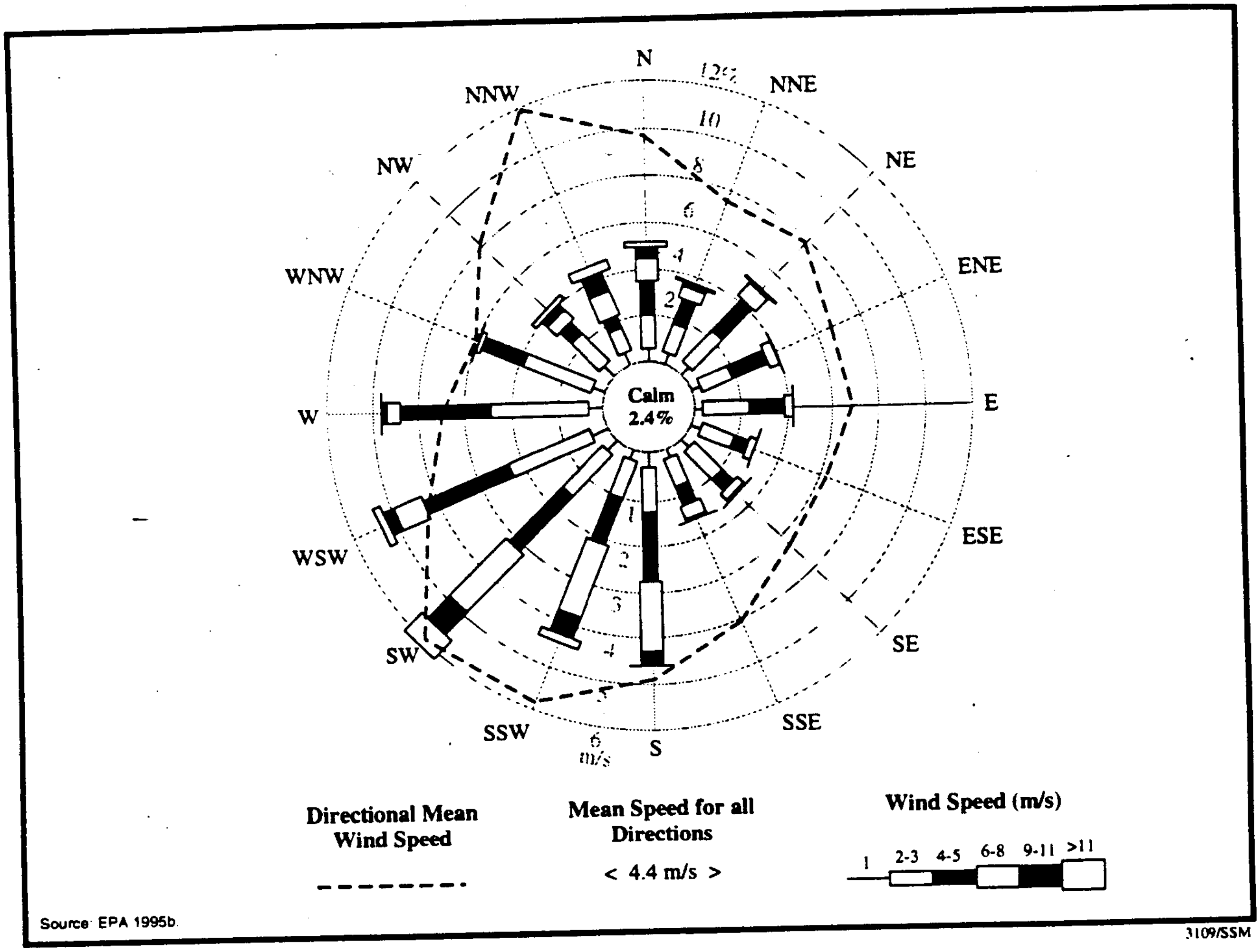

FIGURE I.4.4.1.2.1-1.—*Wind Distribution at North Las Vegas Facility, 1987-1991.*

I.4.4.1.2.2 *Ambient Air Quality*

The Clark County Health District is responsible for air pollution control and attainment of air quality standards in Clark County. In addition to NAAQS for criteria pollutants, NLVF is subject to ambient air quality standards adopted by the Clark County Health District. Applicable NAAQS and Clark County ambient air quality standards are presented in table I.4.4.1.2.2-1.

The NLVF site is in the Las Vegas Intrastate AQCR 13, which includes only Clark County. Portions of Clark County, including the NLVF site, are classified as nonattainment areas for the NAAQS for carbon monoxide, PM_{10}, and TSP (40 CFR 81.339). In general, pollutant emission increases in an area designated as nonattainment for a specific pollutant are subject to more stringent permitting requirements than if the area is designated as attainment.

The Clark County Health District operates a network of air monitoring stations in Clark County. The monitor closest to NLVF is at the McDaniel Post Office at 1414 East Lake Mead Drive, approximately 1.9 km (1.2 mi) east of the proposed NIF location. Data for this and other monitors near NLVF are provided in Lazaro et al. (1996). Table I.4.4.1.2.2-1 lists the 1994 baseline ambient air concentrations for criteria pollutants and other pollutants at NLVF. All of the baseline concentrations are in compliance with NAAQS. The emissions of criteria pollutants at NLVF are discussed in section I.4.4.2.2.

The area surrounding NLVF contains two PSD Class I areas: Grand Canyon National Park, approximately 110 km (65 mi) to the east in Arizona, and

TABLE I.4.4.1.2.2–1.—***Comparison of Baseline Ambient Air Concentrations with Most Stringent Applicable Regulations and Guidelines at North Las Vegas Facility***

Pollutant	Averaging Time	Most Stringent Regulation or Guideline ($\mu g/m^3$)	1994 Baseline Concentration[a] ($\mu g/m^3$)
Criteria Pollutant			
Carbon monoxide	8 hours	10,000[b,c,d]	8,635
	1 hour	40,000[b,c,d]	13,456
Lead	Calendar quarter	1.5[b,c,d]	ND[e]
Nitrogen dioxide	Annual	100[c,d]	53
Ozone	1 hour	235[b,c,d]	192
Particulate matter 10 microns or smaller	Annual	50[b,c,d]	47
	24 hours	150[b,c,d]	114
Sulfur dioxide	Annual	60[c,d]	ND
	24 hours	260[c,d]	ND
	3 hours	1,300[b,c,d]	ND
Mandated by State			
Hydrogen sulfide	1 hour	112[c]	ND
Visibility	-	f	ND

[a] For short-term standards, baseline concentration is the highest concentration for the year.
[b] Federal standard (40 CFR 50).
[c] State standard.
[d] County standard.
[e] ND - No data available.
[f] In sufficient amount to reduce the prevailing visibility to less than 48 km (30 mi) when the humidity is less than 70 percent.
Source: DBHCC 1993; Lazaro et al. 1996; NAC 1995; Taipale 1995.

Joshua Tree National Monument, approximately 250 km (155 mi) to the south-southwest in California.

I.4.4.1.2.3 *Acoustic Conditions*

Major noise emission sources within NLVF include motor vehicles and various industrial facilities and equipment. The site is bordered by highways along the eastern and western NLVF boundaries. Near highways, traffic contributes to ambient noise levels, especially during peak hours. The adjacent main land uses in the vicinity of NLVF are light industrial to the north, east, and south, and urban residential to the west. The acoustic environment along the NLVF boundary is generally assumed to be that of an urban location, with typical average daytime sound noise levels of 55 to 65 dBA (EPA 1974).

I.4.4.1.3 Water Resources

NLVF is located in the Las Vegas Valley, which is a desert between sharp, rugged mountain ranges on a gently sloping alluvial fan piedmont. At the lowest point of the alluvial fan is the Las Vegas Wash, which drains an area of 2,280 km^2 (880 mi^2) toward Lake Mead. Stormwater from NLVF is discharged into local flood control systems (DOE 1995h).

The depth to groundwater at NLVF varies seasonally from 5 to 45 m (17 to 150 ft). Groundwater is the source of water supply for the city of North Las Vegas, which in turn provides water to NLVF. The nearest water well to NLVF is about 0.40 km (0.25 mi) south (DOE 1995h). Current water usage by NLVF is about 69.4 MLY (18.3 MGY) (Lazaroff 1995a). Industrial wastewater and sanitary sewage from NLVF are discharged into the city of North Las Vegas sewer system, which is connected to the city of

Las Vegas treatment plant. The treated wastewater is discharged into Lake Mead under an NPDES permit issued by the Nevada Division of Environmental Protection (DOE 1995h). NLVF discharges an average of 54.8 MLY (14.5 MGY) of wastewater. Wastewater quality has historically met the permit requirement established by the city to protect the treatment processes and ultimately the water quality of Lake Mead (DOE 1995h). The proposed NIF location at NLVF is outside the 500-year floodplain of the local drainage (FEMA 1993).

I.4.4.1.4 Biotic Resources

NLVF is in the Southern Basin and Range Ecoregion (Omernik 1986). NLVF was built on cleared, previously disturbed land that is now mostly covered by buildings, pavement, or landscaping. Exceptions include about 4.5 ha (11 acres) of undeveloped land at the western end of the facility (designated area for NIF), the open area west of Building C-3, and the stormwater detention basin south of Building C-1. No undisturbed native vegetation remains on the site (DOE 1995h). No wetlands or natural aquatic habitats occur at NLVF.

Because NLVF is located in an urbanized area and contains little vegetation, few native wildlife species are present. No surveys for onsite biota have been conducted. However, species adapted to urban habitats (e.g., small mammals such as house mouse and Norway rat; and ubiquitous bird species such as American robin, European starling, house finch, house sparrow, and rock dove) would be expected to exist at NLVF.

Because NLVF is located within urban Las Vegas on previously disturbed land within a fenced site, no threatened, endangered, or rare species are expected to exist there. No designated critical habitats for Federal-listed species exist at NLVF. The facility is within the range of the federal-threatened desert tortoise, but urbanized areas of Clark County are not considered tortoise habitat (DOE 1995h). No desert tortoises were found during an offsite survey of undeveloped land near the western boundary of NLVF (Knowles and Gulash 1989).

I.4.4.1.5 Cultural and Paleontological Resources

Although prehistoric and historic remains (sites 26CK1185 and 26CK1527) are located within 1.6 km (1 mi) of the proposed NIF location, no archaeological remains (prehistoric or historic) are likely to be present at that location because of the heavy past disturbance of the surface and near-surface sediment (DOE 1995h; Jones 1995). Lower-lying deposits that are relatively undisturbed are too ancient to contain archaeological remains. No historic structures occur in the proposed NIF location. No Native American cultural resources have been identified at NLVF in the course of past consultation with potentially affected tribal organizations.

I.4.4.1.6 Socioeconomics

Socioeconomic characteristics described for NLVF area include the regional economy, population and housing, public finance and public service infrastructure, and local transportation. Regional economic statistics are based on a regional economic study area that encompasses 11 counties around NLVF as defined by the Bureau of Economic Analysis. The economic study area is a broad labor and product market-based region linked by trade among economic sectors within the region. Statistics for population, housing, public finance, and public service infrastructure are based on the ROI, a two-county area in which 95 percent of NLVF employees reside. Lazaro et al. (1996) lists counties included in the economic study region and counties included in the ROI. Assumptions, assessment methodologies, and supporting data for each TA are also presented in Lazaro et al. (1996).

I.4.4.1.6.1 *Regional Economy*

The regional economic study area for NLVF includes the Las Vegas Metropolitan Statistical Area (Clark County). Employment in the economic study region is projected to increase from 412,300 in 1988 to 496,700 in 1995. BEA projects the compounded annual rate of growth at 19 percent from 1995 to 2018 (79,522 jobs) (BEA 1990).

In 1995, NLVF employed approximately 1,000 people, accounting for less than 1 percent of employment in the regional economic study area. The distribution of NLVF employees by place of residence in the ROI is presented in Lazaro et al. (1996).

I.4.4.1.6.2 *Population and Housing*

The ROI experienced significant population growth between 1980 and 1990, with an average annual increase of about 4.5 percent, bringing the 1990 total to approximately 683,000 persons. Population growth has been strongest in Clark County. By the year 2000, population in the ROI is projected to grow to approximately 860,000 persons (BEA 1990; U.S. Department of Commerce 1994).

Between 1980 and 1990, the number of housing units in the ROI increased from 194,899 to 325,261, an increase of 67 percent (see table I.4.4.1.6.2–1). Housing in Clark County increased from approximately 190,607 units in 1980 to 317,188 in 1990. Housing in Nye County increased from 4,292 units in 1980 to approximately 8,073 in 1990. Assuming a continuation of current construction and economic trends, the number of housing units in the ROI is projected to increase to approximately 455,000 by the year 2000.

The number of vacant owner units in the ROI has increased from approximately 11,000 units in 1980 to 17,000 in 1990. It is estimated that in the year 2000 there will be approximately 25,000 vacant owner units if current construction and economic trends continue in the ROI.

In 1980 there were approximately 7,000 vacant rental units in the ROI. The number of vacant rental units increased to about 15,000 in 1990. It is estimated that in the year 2000 there will be approximately 22,000 vacant rental units if current construction and economic trends continue in the ROI.

Between 1993 and 1994, the Las Vegas Metropolitan Statistical Area experienced a sharp increase of about 30 percent in new single-family housing units. Multifamily housing construction increased by 44 percent between 1993 and 1994. The number of new housing units sold increased as well, rising 11 percent over 1993 levels. In spite of the growing supply of houses in the Las Vegas market, new housing prices continue to climb (ULI 1995).

I.4.4.1.6.3 *Public Finance and Public Services Infrastructure*

Public financial characteristics of the local jurisdictions in the ROI that are most likely to be affected by construction and operation of NIF at NLVF are summarized in this section. The data reflect total revenues and expenditures of each jurisdiction's general fund, special revenue funds, and, as applicable, debt service, capital project, and expenditure trust funds. Major revenue and expenditure categories and revenues less expenditures for counties and cities are presented in table I.4.4.1.6.3–1. Table I.4.4.1.6.3–2 summarizes public service levels for community services, health care, and education.

I.4.4.1.6.4 *Local Transportation*

The existing roadway network in the vicinity of NLVF includes Losee Road, Carey Avenue, Cheyenne Avenue, Interstate 15, Commerce Street, Brooks Avenue, and Lake Mead Boulevard. Direct access to NLVF is via Brooks Avenue, Carey Avenue, Commerce Street, Losee Road, and North 5th Street (Omni-Means 1990).

Losee Road is generally a north-south oriented roadway adjacent to the eastern boundary of NLVF. It currently begins at a signalized intersection with Lake

TABLE I.4.4.1.6.2–1.—*Population and Housing Data for the North Las Vegas Facility Area*

Category	1980	1990	1996	1997	1998	1999	2000	2001	2002	2003
Estimated ROI population	472,135	683,040	798,044	812,625	827,527	842,675	858,100	870,949	883,990	897,227
Estimated total housing units	194,899	325,261	403,478	416,514	429,551	442,587	455,623	468,659	481,695	494,732
Estimated vacant owner units	10,806	16,954	21,319	22,047	22,774	23,502	24,229	24,957	25,684	26,412
Estimated vacant renter units	7,319	15,022	18,968	19,625	20,283	25,940	21,598	22,255	22,913	23,571
Estimated total vacant units in ROI	18,125	31,976	40,287	41,672	43,057	44,442	45,827	47,212	48,597	49,982

Source: Historical data from the U.S. Department of Commerce 1994; projections by Halliburton-NUS 1995.

TABLE I.4.4.1.6.3–1.—*Public Finance—North Las Vegas Facility Area*

Revenues and Expenditures[a]	Clark County	City of Henderson	City of Las Vegas	City of North Las Vegas	Nye County
Local sources (percent)	63	39	46	44	53
State sources (percent)	37	61	54	56	47
Federal sources (percent)	0	0	0	0	0
Total revenues (dollars)	295,686,362	44,838,156	165,281,174	33,422,607	12,348,383
General government (percent)	22	25	19	15	37
Public safety, health, and community services (percent)	66	75	80	85	63
Debt service (percent)	0	0	0	0	0
Other (percent)	11	0	0	0	0
Total expenditures (dollars)	241,422,802	42,164,384	155,307,893	33,027,839	12,511,908
End-of-year fund balance (dollars)	77,826,604	1,140,575	13,712,536	3,656,142	1,374,364

[a] If reporting body did not distinguish between state and Federal revenue sources, the total for all intergovernmental revenue was combined and reported under "state sources."

Source: City of Henderson 1995; Nye County 1994; city of North Las Vegas 1994; city of Las Vegas 1994.

TABLE I.4.4.1.6.3–2.—*Public Services—North Las Vegas Facility Area*

Part I: Education

County/School District	Enrollment	Pupil-Teacher Ratio	Per Pupil Expenditure ($)
Clark County School District	145,327	16.6:1[a]	3,478[b]
Nye County School District	4,467	NA	3,662

[a] Pupil-teacher ratio for Clark County includes administrative personnel.

[b] Expenditure per pupil for Clark County is based on total expenditures.

Note: NA - not available.

Part II: Level of Service per 1,000 Population

County/Jurisdiction	Police Protection	Fire Protection	General Government	Physicians
Clark County	1.2	0.5	5.1	1.4
City of Henderson	0.8	0.8	6.4	NA
City of Las Vegas	4.5	1.2	7.0	NA
City of North Las Vegas	2.4	0.8	9.2	NA
Nye County	5.3	NA[a]	19.1	0.4

[a] Fire protection services are provided by cities in the county, and departments are predominantly volunteer.

Note: NA - not applicable.

Source: Clark County School District 1994; city of North Las Vegas 1994; city of Las Vegas 1994; Clark County 1994; Federal Bureau of Investigation 1993; American Medical Association 1994; city of Henderson Fire Department 1995; city of Henderson Personnel Department 1995; city of Las Vegas Human Resources Department 1995; Nye County School District 1995; Nye County Sheriff's Department 1995; Nye County Personnel Department 1995; city of Tonapah Fire Department 1995; Clark County Personnel Department 1995.

Mead Boulevard and continues north, intersecting Carey Avenue at a four-way-stop intersection and Cheyenne Avenue at a signalized intersection. Both the Atlas Gate and the South Gate provide access to Losee Road (Omni-Means 1990).

Cheyenne Avenue is an east-west roadway to the north of the project site. Except for the first 300 m (1,000 ft) west of Losee Road, Cheyenne Avenue is a two-lane roadway. Carey Avenue is a four-lane roadway that provides east-west circulation south of the project site. It includes a grade-separated crossing of Interstate 15 but does not provide access to the freeway. Lake Mead Boulevard is another important east-west road south of NLVF. It is a four-lane roadway from its interchange with Interstate 15 west to H Street. Interstate 15 is a four-lane limited access interstate freeway oriented north-south through the area. In the vicinity of the project, access is provided to Interstate 15 at interchanges with Lake Mead Boulevard and Cheyenne Avenue. Commerce Street is a two-lane street running north-south along the western edge of NLVF. It begins at Cheyenne Avenue and terminates just north of Lake Mead Boulevard. Another short portion acts as a continuation of Losee Road south of Lake Mead Boulevard for a few blocks. Brooks Avenue is a minor two-lane street running east-west between Losee Road and Martin Luther King Boulevard north of the site (Omni-Means 1990). Table I.4.4.1.6.4–1 provides 1990 levels of service for roads around NLVF.

Road improvements within the NLVF vicinity include repaving of Carey Avenue, resurfacing of Cheyenne Street, and future improvements of the Interstate 15 and Cheyenne Avenue interchange. The major transportation project in the region is the "spaghetti bowl" expansion at the Interstate 15 and U.S. 95 interchange. The first phase of this project is scheduled to begin within the next 12 months (Burke 1995).

The primary railroad in the region is the Union Pacific Railroad, which is located approximately 1.6 km (1 mi) east of NLVF. McCarran International Airport in the city of Las Vegas provides jet passenger service from both national and local carriers.

I.4.4.1.6.5 *Environmental Justice*

Environmental justice concerns the potential for high and adverse environmental or human health impacts to disproportionately affect minority or low-income populations. In this PSA, environmental justice is evaluated for impacts within the site region, defined as the area within an 80-km (50-mi) radius around the site, and for the local area. Lazaro et al. (1996) presents the demographic analysis of minority and low-income population distributions on a regional and local basis.

In the NLVF site region in 1990, 10 percent of the population was low income and 25 percent was minority. These values represent an equal percentage of low-income and a higher percentage of minority persons than the Nevada state average (10 percent low income and 21 percent minority). Within the area, census tracts closer to the NLVF site tend to have significantly higher proportions of minority, but not low-income, populations than tracts farther from the site.

TABLE I.4.4.1.6.4–1.—*Baseline Traffic on North Las Vegas Facility Access Roads*

Route	From	To	Estimated 1995 AADT	Estimated 1995 LOS
Carey Ave	300 ft east of M.L. King Blvd	NA	7,730	A
Carey Ave	300 ft east of M.L. King Blvd	NA	8,400	A
Lake Mead Blvd	East of Interstate 15	NA	38,000	C
Cheyenne Ave	0.5 mi west of M.L. King Blvd	NA	19,000	A
Cheyenne Ave	200 ft east of Rancho Rd	NA	20,000	A
Losee Ave	50 ft south of Miller Rd	NA	12,000	D
Losee Ave	Between the two Crestline Loop Roads	NA	10,000	D
Losee Ave	200 ft south of Sharp Circle	NA	10,500	E

Note: AADT - annual average daily trips; LOS - level of service; NA - not applicable.
Source: DOE 1993a.

I.4.4.1.7 Radiation and Hazardous Chemicals

I.4.4.1.7.1 *Radiation Environment*

NLVF provides calibration services using specialized radiation fields for a variety of instrument test packages in support of DOE Nevada Operations. A detailed discussion of the radiation environment, including background, radiological releases, and doses to members of the public, is presented in *U.S. Department of Energy Nevada Operations Office Annual Site Environment Report–1993, Volume 1* (1994). The concentrations of radioactivity in various environmental media (air, water, soil) in the site region are also presented in this reference.

Calculated radiological doses were used to estimate the potential health impacts to the public and onsite workers at NLVF from any releases of radioactivity. The annual doses to the workers are summarized in table I.4.4.1.7.1–1; corresponding health risks are also presented in the table (also see Lazaro et al. 1996). These doses are in addition to those from natural background, consumer products, and medical sources, which total about 360 mrem/yr. The onsite worker doses are within regulatory limits. Background radiation doses are unrelated to NLVF operations. Regulatory limits that specify the maximum effective dose equivalent to individual members of the public and occupational workers are also presented in table I.4.4.1.7.1–1.

I.4.4.1.7.2 *Hazardous Chemical Environment*

The background chemical environment important to human health consists of the atmosphere, which may contain hazardous chemicals that can be inhaled; drinking water, which may contain hazardous chemicals that can be ingested; and other environmental media with which people may come in contact (e.g., soil through contact or via the food pathway). Exposure pathways to NLVF workers during normal operation may include inhaling the workplace atmosphere, drinking NLVF potable water, and possible other contact with hazardous materials associated with work assignments. The potential for health impacts varies from facility to facility and from worker to worker, and available information is not sufficient to allow a meaningful estimation and summation of these impacts. However, workers are protected from hazards specific to the workplace through appropriate training, protective equipment, monitoring, and management controls. NLVF workers are also protected by adherence to OSHA and EPA occupational standards that limit atmospheric and drinking water concentrations of potentially hazardous chemicals. Appropriate monitoring, which reflects the frequency and amounts of chemicals utilized in the operation processes, ensures that these standards are not exceeded. The maximum daily quantities of NIF-related hazardous materials stored at NLVF are presented in table I.4.4.1.7.2–1. NLVF stores and uses few hazardous materials in amounts greater than the threshold planning quantities that require reporting under the Federal regulations at 40 CFR 370–Hazardous Chemical Reporting: Community Right-to-Know (DOE 1995h).

TABLE I.4.4.1.7.2–1.—*Maximum Daily Quantities of National Ignition Facility-Related Hazardous Materials Stored at North Las Vegas Facility*

Hazardous Material	Quantity
Acetone	37.8 L
Alumina	2,063 kg
Ammonia	275 kg
Ammonium hydroxide	37.84 L
Boron	20 kg
Copper	<4.5 kg
Ethanol	1,514 L
Hydrofluoric acid	208 L
Lead	<5.6 kg
Mercury	6,333 kg
Methylene chloride	18.9 L
Stainless steel	<1.1 kg
Tetraethylorthosilicate	378.4 L

Source: Lazaroff 1995b.

I.4.4.1.8 Waste Management

The current waste management practices at NLVF are outlined in table I.4.4.1.8–1. Wastes managed at NLVF from research activities include hazardous and nonhazardous wastes. The NIF project is expected to generate low-level, mixed, hazardous, and nonhazardous wastes during operation.

TABLE I.4.4.1.7.1–1.—***Annual Radiation Doses to the General Public and Onsite Workers from Normal Operations at North Las Vegas Facility***

Receptor	Atmospheric Releases: Regulatory Limit[a]	Atmospheric Releases: Calculated	Liquid Releases: Regulatory Limit[a]	Liquid Releases: Calculated[b]	Total: Regulatory Limit[a]	Total: Calculated	Total: Risk[c]
Individual Dose							
Average exposed individual (mrem)	10	0.0[d]	4	0.0	100	0.0	0.0
Maximally exposed individual (mrem)	10	0.0[d]	4	0.0	100	0.0	0.0
Population Dose							
Population within 80 km (person-rem)	e	0.0[d]	e	0.0	e	0.0	0.0
Worker Dose[f]							
Average worker (mrem)	NA	NA	NA	NA	5,000	82	3.3×10^{-5}
Maximally exposed worker (mrem)	NA	NA	NA	NA	5,000	440	1.8×10^{-4}
Total workers (person-rem)[g]	NA	NA	NA	NA	None	0.57	2.3×10^{-4}

[a] The regulatory limits for individuals are given in DOE Order 5400.5. The 10 mrem/yr limit from airborne emissions is required by the *Clean Air Act*; the 4 mrem/yr limit is required by the *Safe Drinking Water Act*, and the total dose of 100 mrem/yr is the limit from all pathways combined. The occupational limit for workers is 5,000 mrem (10 CFR 835)

[b] The calculated dose values given in the column under Liquid Releases conservatively includes all water pathways, not just the drinking water pathway.

[c] Based on latent fatal cancer risk factors of 5×10^{-7}/mrem for individuals, 5×10^{-4} /person-rem for population, and 4×10^{-7}/mrem for workers (ICRP 1991).

[d] Two very small atmospheric releases occurred on July 12 and August 14, 1995. The dose to any offsite individual is expected to be a fraction of a mrem (monitoring data is not yet available from all stations).

[e] No regulatory limits exist for population doses; however, a 100 person-rem value for the population is found in the proposed 10 CFR 834 (58 FR 16268).

[f] Worker doses were estimated on the basis of readings from monitoring devices called thermoluminescent dosimeters.

[g] The number of badged workers in 1994 was approximately seven.

Note: NA - not applicable.

Source: White 1995g.

I.4.4.1.8.1 *Hazardous Waste*

NLVF generated about 17,920 kg (39,500 lb) of hazardous wastes in 1992. All hazardous wastes are treated, stored, or disposed of offsite at EPA-permitted facilities. Spills or releases of hazardous materials have historically been minor and were promptly cleaned up upon discovery.

A Waste Minimization and Pollution Prevention Awareness Implementation Plan submitted to DOE/NV on December 20, 1991, is in place for NLVF. A formalized system of waste minimization was developed through the implementation of EG&G/EM Policy No. 31-70, *Waste Minimization and Pollution Prevention;* and Standard Operating Procedure 31-006.A, *Hazardous Waste Minimization Plan*. Hazardous waste generation from various processes has already been reduced through product substitution or by permanently discontinuing the hazardous waste generating process.

There are no underground storage tanks for hazardous or petroleum substances at NLVF. All aboveground tanks are protected against accidental releases by use of either secondary containment or a double-walled tank with continuous leak detection. There are no hazardous waste treatment, storage, or disposal facilities requiring state or Federal permits at NLVF (DOE 1995h).

TABLE I.4.4.1.8–1.—*Current Waste Management at North Las Vegas Facility*

Category	1994 Generation (m^3)	Treatment Method	Treatment Capacity (m^3/yr)	Storage Method	Storage Capacity (m^3)	Disposal Method	Disposal Capacity (m^3)
Low-Level							
Liquid	None	None	None	None	None	None[a]	NA
Solid	None	None	None	None	None	None	NA
Mixed Low-Level							
Liquid	None	None	None	None	None	None	NA
Solid	None	None	None	None	None	None	NA
Hazardous							
Liquid	~8.24	None	None	90-day accumulation pad	None	Out of state disposal or treatment facilities	NA
Solid	~3.47	None	None	90-day accumulation pad	None	Out of state disposal or treatment facilities	NA
Nonhazardous Waste (Sanitary)	Unknown	None	None	None	None	City of Las Vegas disposal facility	NA
Nonhazardous Waste (Other)	Unknown	None	None	Bulk waste collection bins	As required	Scheduled pickup by city contractor (landfill)	NA

[a] Radioactive low-level or mixed low-level waste would be transported to NTS for disposal, if any were generated.

Note: NA - not applicable.

Source: Andrews and Tobin 1995; Bowers 1995.

I.4.4.1.8.2 *Nonhazardous Waste*

Policies and procedures are in place at NLVF that promote recycling and resource recovery. In 1992, a total of 9 t (9.9 tons) of office paper, 227 t (250 tons) of scrap metals, and 425 laser printer cartridges from NLVF were recycled.

Physical and administrative measures implemented at NLVF minimize or prevent the introduction of pollutants into stormwater. Stormwater from the NLVF site is discharged by concentrated conveyance or sheet flow onto Losee Road. Industrial wastewater and sanitary sewage from NLVF are discharged into city of North Las Vegas sewer lines, which are connected to the city of Las Vegas publicly owned treatment works. The publicly owned treatment works discharges treated wastewater directly into Lake Mead under an NPDES permit issued by the Nevada Division of Environmental Protection. NLVF discharges an average of 147,303 L (38,888 gal) of wastewater per day into the publicly owned treatment works, with a peak maximum of 369,318 L (97,000 gal) of wastewater per day. Approximately 32 to 35 percent of the wastewater originates from industrial processes; the remaining 65 percent is predominantly sanitary wastes. Wastewater quality historically has been in compliance with permit conditions established by the city of North Las Vegas to protect the publicly owned treatment works treatment processes and ultimately the water quality in Lake Mead (DOE 1995h).

I.4.4.2 *Environmental Impacts*

The following sections describe the potential environmental impacts for land use and visual resources, air quality and noise, water resources, ecological resources, cultural and paleontological resources, and socioeconomics for constructing and operating NIF at NLVF. In addition, impacts associated with radiation, hazardous chemicals, and waste management are described.

I.4.4.2.1 Land Use and Visual Resources

I.4.4.2.1.1 *Land Use*

Other than temporary impacts associated with construction activities, the principal impact of NIF on land use at NLVF would be the conversion of limited open space. NLVF occupies 32 ha (80 acres) (figure I.3.4.4.1–2), and although NIF (including the temporary construction laydown area) would only require about 3.2 ha (8 acres) of open space, that area represents approximately 10 percent of NLVF's total land area and 56 percent of NLVF's developable land (Lazaroff 1995c). However, the impact of this conversion would be reduced somewhat by the existence of other areas on the site (F-4, F-5, F-6) that remain open for future development. Potential onsite impacts to land use could also result from required waste and water system upgrades, but the presence of NIF should not preclude future land uses or development in the city of North Las Vegas or Clark County.

With appropriate erosion and sediment control measures, soil impacts during construction of NIF would be short term and minor. Seismic risks would be taken into account during construction and operation of NIF.

I.4.4.2.1.2 *Visual Resources*

With the exception of short-term minor impacts associated with construction (fugitive dust, equipment exhaust, etc.), NIF-related impacts to visual resources in and around NLVF would be limited to an intrusion on the visual landscape by the Laser and Target Area Building. The structure would exceed 37 m (120 ft) in height and would be visible above the horizon to most viewers in the residential areas located just beyond the western and southeastern boundaries of NLVF. However, visual impacts would be negligible because of a general lack of competing or unique visual landscape features for the residential area viewers. For onsite viewers, NIF would be located in an area that is characterized by industrial-type structure forms, little or no variety in vegetation, and virtually no visual diversity.

I.4.4.2.2 Air Quality and Acoustics

I.4.4.2.2.1 *Air Quality*

Construction Emissions. Estimated construction emissions of air pollutants, including those from site clearing and those associated with facility construction, are listed in table I.4.4.2.2.1–1. These emission estimates are based on characteristics of the proposed NLVF location and on projected construction vehicle exhaust and fugitive emissions. Site clearing would occur for about two weeks, followed by facility construction for four years (LLNL 1995b).

The site-clearing phase of construction would produce the greatest amount of fugitive dust PM_{10} emissions of the construction process. The ISCST2, Version 93109 (EPA 1992a-b) was used to determine the impact of site-clearing activities on ambient air quality (see section I.4.1.2.2.1). The data selected for modeling air quality were surface meteorological data from nearby Las Vegas McCarran International Airport and twice-daily mixing height data from the Desert Rock National Weather Service Station for 1987-91 (EPA 1995b). The surface wind speeds and directions are summarized in an annual wind rose (see figure I.4.4.1.2.1–1). Detailed emission inventories associated with site clearing and facility construction, meteorological data used, air quality model assumptions, and model input parameters are presented in Lazaro et al. (1996).

The 24-hour average PM_{10} background concentration representative of the NLVF site is 114 $\mu g/m^3$, which is very close to the national and state standard of 150 $\mu g/m^3$ (table I.4.4.1.2.2–1). This condition is due to arid soil conditions typical of the region. Accordingly, site clearing should be carried out so as to minimize impact on ambient air quality.

With conventional dust control (such as 50 percent control for excavation and 60 percent control for traffic on unpaved roads), maximum 24-hour average PM_{10} concentrations of 156 $\mu g/m^3$ over background are predicted at the site boundary (10 m [32 ft] north of the proposed NIF location). These levels would be above the NAAQS and State Ambient Air Quality Standard for PM_{10}, resulting in significant short-term impacts to air quality at the site boundary during the two weeks of site clearing. Operation with additional dust-control measures that involve continuous water spraying or use of a chemical dust suppressant would reduce dust emissions from excavation by 75 percent and from traffic on unpaved roads by 90 percent. These measures would bring maximum 24-hour average concentrations down to 69 μg/m^3 over background concentration. A maximum concentration of 183 μg/m^3, including background concentration, would still be higher than the national and state standards for PM_{10}. Thus, other approaches (such as reduction of activity or use of intensified dust control measures) should be implemented to comply with the national and state standards for PM_{10}. For example, by reducing the workload by half (which would increase the site-clearing period to one month), the maximum PM_{10} concentration over background is predicted to be 35 μg/m^3. Including background concentration, the cumulative concentration would be 149 μg/m^3, which would comply with the NAAQS for PM_{10}. Site clearing at NLVF would be expected to last for less than one month, so air quality impacts associated with site clearing would be local and temporary, assuming that proper mitigation measures were employed.

TABLE I.4.4.2.2.1–1.—*Estimated National Ignition Facility Construction Emissions for the North Las Vegas Facility Location*

Pollutant	Total Emissions (t/yr)[a]
Particulate matter 10 microns or smaller	6.89[b]
Volatile organic compound	0.44
Carbon monoxide	1.23
Nitrogen dioxide	3.76
Sulfur dioxide	0.43
Lead	Negligible

[a] Metric tons (1,000 kg) per year.

[b] Includes 1.91 t/yr (2.11 ton/yr) of fugitive emissions for site clearing using water-spray control that would occur during an approximate 13-day period in the first year and 4.63 t/yr (5.10 ton/yr) of facility construction emissions that would occur for the remainder of the first year of construction.

Source: Lazaro et al. 1996.

Emissions During Operations. Sources of air pollutant emissions from operation of NIF at NLVF are expected to be primarily fuel combustion and cleaning of the debris shields. Emissions of VOCs (ethanol) from debris shield cleaning are estimated to total about 0.5 t/yr (0.55 ton/yr) (LLNL 1995b). Other potential air pollutant emission sources not considered significant are target destruction under either the direct drive or indirect drive options, emissions from vehicles used for freight shipments and employee commuting, and emissions from welding operations at the Fabrication Facility.

As indicated in table I.4.4.2.2.1–2, air pollutant emissions due to NIF operation are projected to be well below 1 t/yr (1.1 ton/yr) except for nitrogen dioxide, which is projected at approximately 2 t/yr (2.2 ton/yr). Estimated air pollutant emissions from NIF operations would constitute significant increases over 1990 emission levels, ranging from an increase of 27 percent for PM_{10} to 241 percent for carbon monoxide. However, existing ambient concentrations for these pollutants (see section I.4.4.1.2.2, table I.4.4.1.2.2–1) are well below the ambient air quality standards, and it can be concluded that NIF operation would have no adverse impact on air quality and would not contribute to a violation of the ambient air quality standards.

Table I.4.4.2.2.1–2 includes the estimated NLVF annual air pollutant emissions based on the anticipated NIF annual energy requirements provided in table I.4.1.2.2.1–3, adjusted to recognize that at NLVF, only four new support buildings (total area of 13,006 m^2 [140,000 ft^2]) would be required out of the total complement of support buildings (area of 26,722 m^2 [287,643 ft^2]).

Published emission factors (EPA 1995b) were used in the calculations. Emissions of VOCs resulting from shield cleaning with solvents are included. For comparative purposes, table I.4.4.2.2.1–2 also includes NLVF 1990 sitewide emissions. More detailed information on emission estimates is provided in Lazaro et al. (1996).

NLVF must comply with the Clark County Air Pollution Control regulations (APCR) (DBHCC 1995). Abatement of visible fugitive dust emissions would be required for construction activities at NLVF. Construction activities specifically addressed include general site; haul roads; and material handling, storage, and transport (APCR, section 41).

External combustion units (boilers) would have to comply with BACT for carbon monoxide and nitrogen oxide for nonmajor sources (APCR, sec-

TABLE I.4.4.2.2.1-2.—***Annual Emission Increases with National Ignition Facility Operation at North Las Vegas Facility***

Pollutant	1990 Emissions (t/yr)	Projected NIF Emissions[a] (t/yr)	1990 Emissions Plus NIF (t/yr)	NIF Percent of 1990 Emissions
Particulate matter	0.78	0.21	0.99	27
Volatile organic compound	3.45	0.57	4.02	17
Carbon monoxide	0.23	0.56	0.79	241
Nitrogen oxide	1.07	2.28	3.35	213
Sulfur dioxide	0.07	0.04	0.11	50
Lead	Negligible	Negligible	Negligible	Negligible

[a] Emissions based on site-estimated natural gas external combustion, diesel internal combustion, and VOC solvent cleaning (0.5 t/yr [0.55 ton/yr]) and emission factors (EPA 1995c; Lazaro et al. 1996).

Source: DOE 1995h; EPA 1993.

tions 12.2.10.1, 12.2.11.1). In addition, emission offset credits might be required at more than twice the potential to emit for these boiler emissions (APCR, section 12.2.11.4). Gas-fired boilers with rated heat input greater than 105,600 MJ/hr (100 million Btu/hr) but not over 264,000 MJ/hr (250 million Btu/hr) are limited to NSPS nitrogen oxide emissions from 43 to 86 ng/J, depending on the heat release rate, which is a function of the furnace volume (40 CFR 60.44b). There are no NSPS emission limits for gas-fired boilers with a rated heat input at or less than 105,600 MJ/hr (40 CFR 60.40c).

Emissions of VOCs at the stated annual rate of 0.5 t/yr (0.55 ton/yr) might require additional controls, depending on the type of solvent used (APCR, section 60.1.1). Additional regulatory information is presented in section I.5.2.

I.4.4.2.2.2 *Acoustics*

During the clearing phase of NIF construction at NLVF, equipment noise would cause an increase of 8 dB in the average outdoor sound level at the nearest residence, which is in a neighborhood on the western side of Commerce Avenue, west of the site. Because of traffic noise from the street that runs along the east side of this residential area, the average daytime sound level is already high, thus reducing the effect of the added noise.

The point modeled was 210 m (690 ft) west of the facility. The results show that the average sound level at this point is expected to increase from 66 dBA to 74 dBA during hours that the clearing equipment is operating. The CNR rank, adjusted for the estimated preexisting background level, is expected to be "A." (Noise with CNR ranks "A" through "D" is generally considered to be acceptable, with "A" essentially leading to no impacts.) At the level of "D," the Modified CNR method predicts sporadic complaints from the public. The likelihood of such complaints can be lessened if the public is notified in advance that the noise will occur only over a period of approximately a month and only during daylight hours.

Because the residential area is so close to the construction area, the average daytime sound level would vary with changes in the locations of the various pieces of construction equipment as they moved about in the course of site clearing.

To illustrate the effect of equipment movement, a second point, also at the edge of the residential area, was modeled. This second point was 134 m (440 ft) south of the first residential point and immediately across Commerce Avenue from the construction site. The results showed that the average outdoor daytime sound level is expected to increase 17 dB, from 66 dBA to 83 dBA, for the same deployment of equipment. The adjusted CNR rank for this level is "C," which is not expected to elicit more than sporadic complaints.

The average outdoor daytime sound level at the nearest laboratory building at NLVF is expected to increase by 10 dB, from 60 dBA to 70 dBA. The adjusted CNR rank for the resulting sound is "A." This level would occur outside the laboratory buildings; unless windows and doors were open, the increase in sound level would not be expected to interfere with any activities that were not sensitive to sound at the level of normal speech. These are estimates based on the assumptions given in Lazaro et al. (1996).

I.4.4.2.3 Water Resources

Construction of NIF at NLVF would be expected to have minor to negligible effects on water quality in the area. Current water and wastewater utility capacities would be adequate to meet the additional requirements for NIF.

About 2.95 MLY (0.78 MGY) of water would be required for construction (LLNL 1995b). Water and wastewater utility requirements for NIF operations at NLVF are shown in table I.4.4.2.3–1. The total raw water supply required for NIF operation would be about 152 MLY (40 MGY), of which 18.0 MLY (4.7 MGY) would be for domestic use. This water requirement for NIF operation would be equivalent to an increase of 220 percent over the current NLVF usage of 69.4 MLY (18.3 MGY) (DOE 1995h; Lazaroff 1995a). The NIF sanitary wastewater volume is estimated to be 18.0 MLY (4.7 MGY). Water supply and sanitary wastewater treatment are provided by the city of North Las Vegas (DOE 1994b). Current water and wastewater utility capacity would be adequate to meet the additional requirement for NIF.

The proposed NIF location at NLVF has minimal flooding potential because it is outside the 500-year floodplain of the local drainage (FEMA 1983).

I.4.4.2.4 Biotic Resources

I.4.4.2.4.1 *Terrestrial Resources*

An environmental assessment (DOE 1995h) conducted for the Nevada Support Facility (that would be located in the same general area proposed for NIF at NLVF) concluded that no significant impacts to ecological resources would occur from construction and operation of that facility. That conclusion would also be applicable to NIF if it should be located at NLVF.

The general types of impacts that could result from NIF construction at NLVF would be similar to those discussed for LLNL (section I.4.1.2.4). Construction of NIF (including the temporary construction laydown area) at NLVF would occur within a 3.2-ha (7.9-acre) area of disturbed soil with scattered grasses and forbs that occurs within the 4.5 ha (11 acres) of undeveloped land at the western end of NLVF. This area is of negligible value to wildlife. Landscaping around the new NIF buildings could add a minor amount of lawn with scattered shrubs and trees that could provide habitat for wildlife species adapted to suburban or industrial conditions.

I.4.4.2.4.2 *Wetlands and Aquatic Resources*

The proposed NIF location at NLVF does not contain, nor is it located near, wetlands or surface water resources. Therefore, construction and operation of NIF at NLVF would not be expected to adversely affect such resources.

I.4.4.2.4.3 *Rare, Threatened, and Endangered Species*

Although NLVF is located within the range of the desert tortoise (federally threatened), it is not

TABLE I.4.4.2.3–1.—*Water and Wastewater Utility Capacity at North Las Vegas Facility*

Utility System	Current Usage	NIF Requirement	Projected Usage, Including NIF	Current Capacity
Water supply (MLY)	69.4	152	221	2,993
Wastewater treatment (MLY)	54.8	17.9	73	402

Source: DOE 1995h; Lazaroff 1995a.

expected that tortoises would exist at the proposed location for NIF. That location is within a fenced area and does not contain adequate cover habitat required for tortoises. Therefore, no impacts to desert tortoises would be expected at NLVF. Impacts to other listed species would not be expected because NLVF does not contain suitable habitat for listed species whose ranges encompass the facility.

I.4.4.2.5 Cultural and Paleontological Resources

Construction and operation of the proposed NIF would have no effect on archaeological sites or historic structures that are listed on or eligible for NRHP, important paleontological remains, or Native American cultural resources.

I.4.4.2.6 Socioeconomics

Construction and operation of NIF at NLVF would have a minor impact on socioeconomic conditions in the economic study region and in the ROI described in section I.4.4.1.6, because NLVF would be located in a somewhat diverse regional economy with extensive inter- and intraregional, national, and global economic interactions and linkages. None of the average annual increases in any of the socioeconomic variables would constitute a major difference from the region-specific base line average annual increases. Also, because the NIF partnership includes representatives from government, industry, and the academic sector throughout the United States, NIF-related procurement and investment would be dispersed over a number of different regions, dampening the concentration of economic effects of the program.

The following sections describe the effects on the host region's economy and employment, and on population, housing, public finances, public services infrastructure, and local transportation in the ROI.

I.4.4.2.6.1 *Regional Economic Impacts*

Slight changes in employment and economic activity levels in the economic study region would occur from local spending of employee wages, procurement of goods and services (including construction materials), and other local investment associated with constructing and operating NIF. In addition to creating new jobs (direct) at the site, the project would create indirect job opportunities, such as community support services, in the economic study area. The total new jobs created (direct and indirect) would contribute to unemployment reduction and increased income and economic output in the regional economy during construction and operation of NIF. Table I.4.4.2.6.1–1 presents the potential impacts to the regional economy if NIF were located at NLVF.

Constructing NIF at NLVF would result in a peak of approximately 280 direct jobs in 1998. This construction-related procurement would indirectly create nearly 1,360 jobs in the economic study region. Employment for operation would begin phasing in as construction neared completion. Direct employment related to operations is projected at 330, with more than 290 indirect jobs created throughout the economic study region. As a result of constructing and operating NIF, the baseline compounded annual growth rate from 1995 to 2003 would increase by 0.01 percentage points.

Peak earnings associated with the 280 direct jobs created in 1998 are projected at approximately 16.7 million dollars. Construction-related procurement would indirectly create more than 27 million dollars in regional earnings.

I.4.4.2.6.2 *Population and Housing*

Construction. Population in-migration resulting from NIF construction phase demands would peak in 1998, with a projected cumulative total of 2,340 people moving into the ROI (table I.4.4.2.6.1–1). This population increase would result in demand for an additional 850 housing units in the ROI. Baseline projections of the NLVF ROI housing market from 1996 (NIF construction start date) through 1998 indicate that nearly 43,000 housing units would be available. It has been estimated that more than 50,000 vacant housing units would be available in the ROI in 1998 and 1999. The NIF-related demand for approximately 850 housing units in the ROI would absorb approximately 2 percent of the available housing stock in the ROI. The NIF project would generate little demand for new housing construction because of the number of vacant housing units within the ROI and the proximity of NLVF to Las Vegas. Most of the housing demand would be temporary and would primarily affect the renter segment of the ROI housing market.

TABLE I.4.4.2.6.1–1.—*Potential Socioeconomic Impacts in the North Las Vegas Facility Area*

Parameters	NIF Alternative Change Over Reference Baseline		Reference Baseline	
	Peak Construction 1998[a]	Operations 2003[b]	1996 to 2002[a]	2003[b]
Regional Employment				
Direct jobs	280	330		
Indirect jobs	1,360	290		
Total jobs	1,640	620	14,600 jobs projected annually	12,900 additional jobs
Regional Aggregate Earnings[c]				
Direct earnings	16.19	13.81		
Indirect earnings	27.22	6.29		
Total earnings	43.41	20.10		
Regional Population Migration				
ROI in-migrating population	2,340	440		13,300 additional people
Regional Housing Demand				
Number of housing units in the ROI	850	160	44,000 vacant housing units (annual average)	50,000 vacant housing units
Local Transportation				
Number of trips generated at site per day	538	630		
Public Finance	0.21	0.04	NA[d]	NA
Percent change over 1995 fund balance (Clark County)				
Public Services (LOS)				
Change in service demand				
Police[e]	9	1	1,436[d]	7,839
Fire[e]	2	0	379[d]	909
General[e]	15	2	2,240[d]	2,349
Physicians[f]	3	1	1,455[d]	2,096
Teachers[f]	18	3	9,530[d]	13,725

[a] Construction period would be 1996 to 2002, with peak construction projected to occur in 1998.
[b] Operating period would be 2003 to 2033, with impacts throughout the period projected to remain stable.
[c] Regional earnings are millions of constant 1994 dollars.
[d] Projected 1998 fund balance for Public Finance, and projected 1998 level of service (LOS) for Public Services.
[e] Las Vegas.
[f] Clark County.
Source: Model results.

Operations. Population in-migration resulting from NIF operation phase demands could result in an additional 440 people moving into the ROI. While this demand for housing would be longer term relative to construction, no perceptible strain on the market is expected, assuming that the general conditions associated with the housing market continue.

I.4.4.2.6.3 *Public Finance*

Construction. Given the anticipated population and economic growth associated with NIF during the construction phase, fiscal balances (revenues and expenditures) are expected to increase for all jurisdictions within the ROI. Short-term public finance impacts would peak during 1998 and would then decline as construction neared completion in 2002. Since the largest percentage socioeconomic impacts are expected to occur in Clark County (assuming current residential patterns), the county would experience the greatest fiscal impacts in the ROI (table I.4.4.2.6.1–1).

Operations. The increase in population and economic growth as a result of NIF operations would increase both revenues and expenditures for all counties within the ROI, with the greatest impact in Clark County. Fiscal impacts would remain stable from the initial impact in 2003 through the duration of NIF operations.

I.4.4.2.6.4 *Public Services*

By the year 1998, Clark County would need to hire nine additional police officers, and Nye County would need 18 additional teachers and 3 additional doctors to maintain its current level of service. By 2003, when operations would start, Nye County would need only 3 additional teachers and 1 additional doctor over the baseline conditions to maintain the current level of service.

I.4.4.2.6.5 *Local Transportation*

In 1995, NLVF employed approximately 1,000 persons. Direct employment generated by the NIF project at NLVF for the life cycle of the project (1996-2033) would range from a minimum of 21 new jobs in 1996 to a maximum of 280 new jobs in 1998. Peak direct employment would total approximately 280 workers in 1998. These direct jobs would generate additional trips on NLVF access roads (table I.4.4.2.6.5–1); however, these additional trips should not significantly increase congestion to the NLVF transportation network (table I.4.4.2.6.5–1).

A peak of nearly 1,360 indirect jobs in 1999 could be generated within the ROI if NIF were located at NLVF. It is likely that the major share of these jobs would be located within Clark County. The road network associated with Clark County and the city of Las Vegas is well developed and expanding, and it would be capable of handling the additional trips generated from the operation of NIF. Because the indirect jobs would be dispersed across Clark County, adverse impacts to the regional transportation network are unlikely.

I.4.4.2.6.6 *Environmental Justice*

For the population in the region within 80 km (50 mi) of NLVF, minorities are in a higher proportion and low-income populations are in an equal proportion to other populations relative to Nevada as a whole (section I.4.4.1.6.5). Thus, minorities—but not low-income populations—could experience disproportionate regional socioeconomic impacts, which would be beneficial. The regional health impact of radiological doses to the population over the lifetime of NIF might result in one cancer fatality. This impact would occur to the population within the region, which is disproportionately minority. Thus, an environmental justice issue exists with the construction and operation of NIF at this site.

Minorities, but not low-income persons, are clustered disproportionately in the local vicinity of the NLVF site (section I.4.4.1.6.5). Thus, the local area impacts from the construction and operation of NIF could disproportionately affect minorities but not low-income populations. None of these local area environmental or health impacts have been judged to be highly adverse or significant.

I.4.4.2.7 Radiation and Hazardous Chemicals

This section describes potential radiological and hazardous chemical impacts resulting from normal operations and postulated accidents at NIF at NLVF. Methods, data, and assumptions used in estimating impacts are presented in Lazaro et al. (1996).

TABLE I.4.4.2.6.5–1.—*Future Traffic Impacts from National Ignition Facility Project on North Las Vegas Facility Access Roads*

Route	From	To	Estimated 1995 AADT	Estimated Background and Peak Project Year AADT (1998)	Estimated Percent Change in AADT Between 1995 and Peak Construction Year (%)	Estimated 1995 LOS	Estimated Background and Peak Construction Year LOS (1998)
Carey Ave	300 ft east of M.L. King Blvd	NA	7,730	8,290	7	A	A
Carey Ave	300 ft east of M.L. King Blvd	NA	8,400	9,000	7	A	A
Lake Mead Blvd	East of Interstate 15	NA	38,000	41,600	9	C	C
Cheyenne Ave	0.5 mi west of M.L. King Blvd	NA	19,000	20,150	6	A	A
Cheyenne Ave	200 ft east of Rancho Rd	NA	20,000	21,500	8	A	A
Losee Ave	50 ft south of Miller Rd	NA	12,000	12,950	8	D	D
Losee Ave	Between the two Crestline Loop Roads	NA	10,000	10,500	5	D	D
Losee Ave	200 ft south of Sharp Circle	NA	10,500	11,300	8	E	E

Note: AADT - annual average daily trips; LOS - level of service; NA - not applicable.
Source: Nevada Department of Transportation 1993.

I.4.4.2.7.1 *Normal Operations*

The general public around NLVF and workers at NLVF might be exposed to small quantities of radionuclides released and radiation emitted from routine NIF operations; however, the expected level of radioactive releases and radiation emissions is well within regulatory limits. No impacts from hazardous chemicals should occur because only minute quantities of hazardous VOCs are expected to be emitted during routine NIF operations. Impacts from routine transportation of tritium targets are also not expected because there would be no detectable levels of radiation outside the packages carrying the low-energy, beta-emitting tritium targets. Table I.4.4.2.7.1–1 summarizes the potential impacts of radiation exposures from the Conceptual Design Option and the Enhanced Option for NIF operations at NLVF.

Impacts to the Public. For the Enhanced Option, the radiation dose to a maximally exposed member of the public located about 210 m (689 ft) west of NIF is estimated to be 0.6 mrem/yr, which is much less than the dose limit of 100 mrem/yr resulting from all pathways combined (DOE 1990). The likelihood of the maximally exposed individual contracting a fatal cancer is 1 in 130,000 for the entire operational life of NIF (dose/yr x 30 yr x fatal cancer risk factor of $5x10^{-4}$/rem). The radiation dose to the surrounding public is estimated at 0.6 person-rem/yr; no cancer fatalities would be expected to occur in the public for the entire NIF operations at NLVF. For the Conceptual Design Option, it is estimated that radiation impacts would be one-third the impacts of the Enhanced Option. No adverse health effects would result.

Impacts to Workers. In addition to the potential for their exposure to radionuclides, the general NLVF workers outside NIF could be exposed to direct radiation resulting from high-yield experiments at NIF. For the Enhanced Option, the estimated radiation dose to these non-NIF workers at NLVF is 0.07 person-rem/yr. No cancer fatalities would be expected to occur among workers for the entire NIF operations at NLVF. For the Conceptual Design Option, estimated radiation impacts are about one-third of those of the Enhanced Option, and the risk of adverse health effects would be extremely low.

TABLE I.4.4.2.7.1–1.—*Potential Radiological Impacts from Normal Operations of the National Ignition Facility at North Las Vegas Facility*

Receptor	Conceptual Design Option	Enhanced Option
Maximally Exposed Individual		
Dose (mrem/yr)	0.2	0.6
Percent of natural background	0.06	0.2
30-year fatal cancer probability	$2x10^{-6}$	$8x10^{-6}$
Population Within 80 Km		
Dose (person-rem/yr)	0.2	0.6
Percent of natural background	$7x10^{-5}$	$2x10^{-4}$
30-year fatal cancers	0	0
Workers Onsite		
Dose (person-rem/yr)		
Non-NIF workers	0.02	0.07
NIF workers	10	10
30-year fatal cancers	0	0

Source: Model results.

Potential radiation exposures inside NIF would be kept as low as reasonably achievable through facility design and administrative controls. The design objective of NIF is to keep the individual radiation worker dose to less than 500 mrem/yr. It is estimated that on average, a NIF worker would receive approximately 30 mrem/yr. No adverse health effects are anticipated to workers inside NIF at this exposure level.

I.4.4.2.7.2 *Postulated Accidents*

Radionuclides and hazardous chemicals could be released from accidents at NIF and during the transportation of tritium targets. Tables I.4.4.2.7.2–1 and I.4.4.2.7.2–2 summarize potential impacts to the public and workers from postulated facility and transportation accidents. A description of each accident scenario evaluated is provided in Lazaro et al. (1996).

TABLE I.4.4.2.7.2–1.—*Potential Radiological Impacts from Postulated Bounding Accident Involving the National Ignition Facility at North Las Vegas Facility*

Receptor	Conceptual Design Option	Enhanced Option
Maximally Exposed Individual		
Dose (rem)	6	10
Fatal cancer probability	$3x10^{-3}$	$5x10^{-3}$
Risk (cancer fatalities/yr)	$6x10^{-11}$	$1x10^{-10}$
Population Within 80 Km		
Dose (person-rem)	3,000	4,900
Fatal cancers	1	2
Risk (cancer fatalities/yr)	$3x10^{-8}$	$5x10^{-8}$
Workers Onsite		
Dose (person-rem)	30	50
Fatal cancers	0	0
Risk (cancer fatalities/yr)	$2x10^{-10}$	$4x10^{-10}$

Source: Model results.

Radiological Impacts

Impacts to the Public. The public could be exposed to radionuclides released from a postulated accident at NIF. The bounding accident assumes that an earthquake would occur at the time of a maximum-yield experiment, with an accidental release frequency of $2x10^{-8}$/yr. For the Enhanced Option, the estimated radiation dose to the maximally exposed member of the public is 10 rem. The likelihood of the maximally exposed individual contracting a fatal cancer from this exposure would be 1 in 200. The estimated radiation dose to the surrounding public from the postulated accident is 4,900 person-rem. At this dose level, two cancer fatalities would be expected to occur in the public.

However, as indicated in table I.4.4.2.7.2–1, the actual risk of radiation-caused cancer fatalities from the postulated accident is essentially zero when the extremely low frequency of the accident occurring during NIF operations is taken into account. The risk is the product of the estimated radiation dose, fatal cancer factor of $5x10^{-4}$/rem, and accident release frequency of $2x10^{-8}$/yr. For the Conceptual Design Option, it is estimated that radiation impacts would be about half the impacts from the Enhanced Option. One cancer fatality would be expected to result within the surrounding population if the accident did occur.

Impacts to Workers. For the Enhanced Option, the estimated radiation dose to all workers at NLVF is 50 person-rem from the postulated accident. No cancer fatalities would be expected to occur among workers following the accident. For the Conceptual Design Option, the estimated radiation impacts are about half the impacts from the Enhanced Option. No adverse health effects would be expected. The risk of radiation-caused cancer fatalities would essentially be zero, considering the extremely low potential for the postulated accident to occur. NLVF has a comprehensive emergency plan, which would be expanded to incorporate NIF to ensure protection of workers in case of an accident or natural disaster.

Transportation Impacts. Radiological impacts associated with the transportation of tritium targets would result from a release of tritium into the environment following a transportation accident. Since tritium is a pure beta emitter with no associated gamma radiation, radiological risks associated with routine (incident-free) transportation operations would be considered negligible. The potential radiological impacts of transporting tritium targets were calculated for truck and air travel. The targets were assumed to be transported by truck from the manufacturing sites to the nearest major airport and then by cargo aircraft to McCarran International Airport in Las Vegas. It was further assumed that after arriving at the Las Vegas airport, the targets would be transferred to a truck for shipment to NLVF.

Table I.4.4.2.7.2–2 summarizes the risks associated with the transportation of tritium targets from each of the tritium manufacturing facilities to NIF at NLVF. Radiological risk from transportation activities is defined as the product of the accident consequence (dose) and the probability of the accident occurring, and was calculated by considering a wide range of accidents, from high-probability, low-consequence events to low-probability, high-consequence events (see ANL 1995). Latent cancer fatality risks were obtained by multiplying the dose risk by 0.0005 latent cancer fatalities per person-rem (ICRP 1991). Latent cancer fatality risks are estimated to range from $6x10^{-10}$ to $9x10^{-9}$ per year for all cases.

TABLE I.4.4.2.7.2–2.—*Potential Radiological Risks and Consequences of Transporting Tritium Targets from Manufacturing Facilities to North Las Vegas Facility*

Manufacturing Facility	Conceptual Design Option	Enhanced Option
General Atomics		
Dose risk (person-rem/yr)	1.2×10^{-6}	9.4×10^{-6}
Fatality risk (cancer fatalities/yr)	6×10^{-10}	5×10^{-9}
Nonradiological accidents[a] (fatalities/yr)	8×10^{-4}	2×10^{-3}
Nonradiological vehicular emissions (fatalities/yr)	8×10^{-4}	2×10^{-3}
Lawrence Livermore National Laboratory		
Dose risk (person-rem/yr)	1.2×10^{-6}	9.3×10^{-6}
Fatality risk (cancer fatalities/yr)	6×10^{-10}	5×10^{-9}
Nonradiological accidents[a] (fatalities/yr)	9×10^{-4}	2×10^{-3}
Nonradiological vehicular emissions (fatalities/yr)	4×10^{-4}	1×10^{-3}
Los Alamos		
Dose risk (person-rem/yr)	2.4×10^{-6}	1.9×10^{-5}
Fatality risk (cancer fatalities/yr)	1×10^{-9}	9×10^{-9}
Nonradiological accidents[a] (fatalities/yr)	2×10^{-3}	5×10^{-3}
Nonradiological vehicular emissions (fatalities/yr)	2×10^{-4}	5×10^{-4}
Savannah River		
Dose risk (person-rem/yr)	2.0×10^{-6}	1.6×10^{-5}
Fatality risk (cancer fatalities/yr)	1×10^{-9}	8×10^{-9}
Nonradiological accidents[a] (fatalities/yr)	8×10^{-4}	2×10^{-3}
Nonradiological vehicular emissions (fatalities/yr)	2×10^{-4}	5×10^{-4}
University of Rochester		
Dose risk (person-rem/yr)	2.1×10^{-6}	1.6×10^{-5}
Fatality risk (cancer fatalities/yr)	1×10^{-9}	8×10^{-9}
Nonradiological accidents[a] (fatalities/yr)	6×10^{-4}	1×10^{-3}
Nonradiological vehicular emissions (fatalities/yr)	2×10^{-4}	5×10^{-4}
Maximum Consequence Accident		
Population[b,c]		
Dose (person-rem)	0.33	3.3
Fatal cancers	2×10^{-4}	2×10^{-3}
Maximally Exposed Individual[b,d]		
Dose (rem)	1.2×10^{-4}	1.2×10^{-3}
Fatal cancer probability	6×10^{-8}	6×10^{-7}

[a] Collective population fatalities were calculated for 145 shipments (Conceptual Design Option) and 335 shipments (Enhanced Option). For example, a reported value of 4×10^{-3} fatalities suggests that no fatalities are expected for the proposed action. However, one single fatality out of the entire affected population might be expected over the course of 250 years if the same number of shipments were to continue for that length of time.

[b] The most severe accidents assumed that 100 percent of the target tritium would be released in an oxide form during an accident. Accident consequence results were determined using the RISKIND computer program which is described in Yuan et al. 1993. Stable weather conditions (Pasquill Stability Class F) with a wind speed of 1 m/s (2.2 mph) were assumed.

[c] The maximum consequences would result from an accident occurring in an urban environment. The population was assumed to extend at a uniform density of 3,861 persons/km^2 (10,000 persons/mi^2) to a radius of 80 km (50 mi) from the accident site. The population exposure pathways for urban environments include inhalation and resuspended inhalation. Urban environments were not assumed to produce food for local use or export, hence no ingestion dose was included.

[d] The maximally exposed individual was assumed to be at the location of maximum exposure. The location of the maximally exposed individual was assumed to be 380 m (1,247 ft) from the accident under stable weather conditions. Individual exposure pathways included acute inhalation during passage of the plume. No ingestion dose was considered.

Note: The transportation risk assessment assumes 100 percent of the tritium targets would be manufactured and transported to NIF from each site. In practice, tritium targets would be produced and transported from more than one manufacturer. The transportation risk assessment was performed for offsite transportation only. Transportation risks from onsite transport of tritium targets were assumed to be negligible compared to risks from offsite transportation.

Source: Model results.

radiological population risks for routine operations were calculated by multiplying the distance traveled by truck in zones of urban population density by a risk factor for latent mortality from pollutant inhalation (Rao et al. 1982). Nonradiological population risks resulting from vehicular accidents were calculated in a similar manner by multiplying the state-specific accident fatality rate by the distance traveled by truck in the state.

The maximally exposed individual and population doses were calculated for a transportation accident involving the entire release of the tritium cargo (assumed to be five tritium targets). Radiological impacts resulting from a potential maximum-consequence accident were assessed for a general population in an urban population density zone. Maximally exposed individuals were assumed to be exposed unshielded as the plume passed at a distance resulting in the largest dose to the individual. Radiological consequences were assessed using worst-case weather conditions (Pasquill Stability Class F) for both the collective population and the maximally exposed individual. For assessment purposes, it was assumed that the entire tritium cargo was released to the environment in oxide form. The estimated number of latent cancer fatalities from the maximum-severity transportation accident was calculated by multiplying the population committed effective dose equivalent by 0.0005 latent cancer fatalities per person-rem (ICRP 1991). Table I.4.4.2.7.2–2 summarizes the impacts of a maximum-consequence accident during transportation of tritium targets.

Hazardous Chemical Impacts. A number of possible chemical accidents were studied in terms of their potential impacts on workers and the public outside the NLVF site boundaries (Lazaro et al. 1996). The four possible accidents likely to have the greatest impacts were studied in detail. The accidents considered (including an aircraft crash) and the four selected for more detailed study are discussed in Lazaro et al. (1996). The four accident scenarios considered in detail were as follows:

- A mercury release from the ignitron switches
- A combined alumina/silica release from the target chamber
- A carbonyl fluoride release from the optics treatment area
- A hydrogen fluoride release from the optics treatment area

The nearest site boundary (to a residential area) is 210 m (689 ft) west of the proposed NIF location. Potential impacts at that area and at the nearest onsite buildings are of principal interest.

A modeling study was conducted for each of the four release scenarios. More details, including predicted concentrations, are provided in Lazaro et al. (1996). The modeling study applied a dispersion model to each of the releases and used a health criterion representative of acute impacts from an exposure that might happen once in a lifetime. The health criterion (ERPG-2 level) was the concentration below which, if exposure occurred for an hour, the exposed individual could still avoid irreversible health effects by taking emergency action. The results of the modeling yielded the following conclusions:

- The threat zone from each of the four accidents would not extend to the boundary with the public under either typical or extreme meteorological conditions except for the mercury release. The nearest members of the public would be 210 m (689 ft) west of the facility, and the maximum threat zone for the mercury release would be 239 m (784 ft). Houses there are more than 19 m (62 ft) from the street, so people in those houses should be protected. However, people outdoors and within the 239-m (784-ft) threat zone could be adversely affected by inhalation of released mercury.
- Nearby buildings and personnel outside would be at risk if any of the four accidents occurred. The assumption was made that the release would not be inhibited by walls of the NIF Laser and Target Area Building and that the wind would take the plume away from the building. The distances beyond which concentrations would fall below the ERPG-2 level for each of the accidents are as follows:

- Mercury scenario—237 m (778 ft) for both the Conceptual Design and Enhanced options

- Alumina/silica scenario—171 m (561 ft) for the Conceptual Design Option and 231 m (758 ft) for the Enhanced Option

- Carbonyl fluoride scenario—75 m (246 ft) for both the Conceptual Design and Enhanced options

- Hydrogen fluoride release—101 m (331 ft) for both the Conceptual Design and Enhanced options

The personnel in nearby buildings would likely be protected because the release (typically lasting 15 minutes) would pass by the buildings with little infiltration. Personnel in the NIF Laser and Target Area Building and those outdoors in the immediate vicinity might be affected.

I.4.4.2.8 Waste Management Impacts

This section evaluates wastes generated by NIF that might impact current waste management at NLVF during construction, normal operation, and the ultimate decommissioning of NIF if it were located at NLVF.

I.4.4.2.8.1 *Waste Generation and Management During Construction and Operation*

Waste management during construction would be performed as described in section I.4.1.2.8 for LLNL. All construction activities would be performed in compliance with requirements identified in DOE Order 430.1. Table I.4.1.2.8.1–2 (section I.4.1.2.8.1) describes the quantities of wastes generated by category for both the Conceptual Design Option and Enhanced Option. NLVF has no onsite capacity to treat or dispose of low-level, mixed, or hazardous wastes.

During operation, various low-level, mixed, hazardous, and nonhazardous wastes would be generated at NIF. The quantities of these waste streams and their proposed management at NLVF are discussed below. Successive sections cover how developing technologies might be applied to minimize waste streams and, finally, the disposition of wastes from decommissioning.

Waste handling methods would be the same under both the Conceptual Design Option and the Enhanced Option. While total waste quantities would be somewhat higher for the Enhanced Option, no changes in handling methods would be necessary.

Low-Level Waste. Solid LLW would be disposed of at NTS. Hardware from the NIF chamber is an example of the type of solid LLW that would be discarded. Aqueous LLW would be treated at NTS to eliminate free liquids. Currently, no facilities exist at NLVF or at NTS for treatment of liquid radioactive waste. However, as discussed below, there are plans to develop this capability at NTS in the near future.

Mixed Waste. Current plans are to permit mixed solid waste disposal units at NTS for mixed waste generated both on and offsite that meets RCRA land disposal requirements. A permit application has been submitted to the State of Nevada, and it is estimated that the units will be available in fiscal year 1997, well before NIF would begin operations. NTS currently has the capability, under interim status, to dispose of mixed waste generated onsite at the Area 5 Radioactive Waste Management Site. This availability could conceivably be extended, if approved by the State of Nevada, to mixed waste generated at NLVF as well. The current remaining capacity for mixed waste disposal at NTS is over 90,000 m^3 (117,700 yd^3) and will be much greater (about 250,000 m^3 [327,000 yd^3]), assuming that approval and construction of permitted mixed waste disposal units takes place as anticipated. The small amount of mixed waste generated at NIF would not significantly affect mixed waste operations. In the event the mixed waste were generated before the development of acceptable NTS disposal capacity, the waste could be stored pending approval by the State of Nevada at a storage pad at the Area 5 Radioactive Waste Management Site or sent to a mixed waste disposal site out of state.

Mixed liquid waste would be treated to eliminate free liquids before disposal at NTS. Free liquids are not allowed for disposal, and must be stabilized according to the requirements stipulated in the NTS Waste Acceptance Criteria, NVO-325. As with solid mixed waste, the requirements identified in the RCRA for the land disposal restrictions would also be met. Currently, no facilities exist at NLVF or NTS for treatment of liquid mixed waste; however, there are plans to develop this capability in the near future. The liquid waste treatment system, which is designed to treat large volumes of liquid waste (both radioactive and mixed) is expected to be available in fiscal year 1997. This system would use evaporation as the primary treatment method for the anticipated waste. A second NTS mixed waste treatment facility that is still in the preliminary planning stages is also expected to be operational in fiscal year 1997. This facility will use stabilization as the primary method of treatment and might be more appropriate for the liquid mixed waste from NIF. This facility should be online by the time any waste could be generated by NIF operations. Therefore, upon approval of a permit modification, this planned facility would be available for the treatment of NIF liquid mixed waste. If necessary, the NIF liquid mixed waste could be stored at the NTS Area 5 Radioactive Waste Management Site until a treatment facility was available. The mixed aqueous waste from debris shield cleaning would be neutralized, stabilized, and transported to NTS for disposal as an approved waste stream.

Hazardous Waste. Most hazardous waste would be shipped to an approved commercial RCRA treatment, storage, and disposal facility. Scheduled pickup and removal of hazardous waste is now done by a subcontractor. The subcontractor can be called for nonscheduled removal, if necessary.

Nonhazardous Waste. Sanitary wastewater would be handled with the existing facility sewage removal outlets connected to the city of Las Vegas wastewater treatment system. NLVF operates under an NPDES permit. The addition of an estimated 18 MLY (5 MGY) of nonhazardous liquid waste from NIF operations would not have major effects on the existing removal system at the facility or on the Las Vegas treatment system.

All facilities within NLVF are, or will soon be, provided with adequate stormwater runoff protection. The development of enhanced stormwater drainage channels is planned for fiscal year 1995 at NLVF to divert runoff flow to city flood protection channels. The primary channels diverting flow from NLVF run along the road east and adjacent to the site. These primary diversion channels feed into a large storm drain channel near NLVF and are designed to protect Interstate 15, which is located approximately 200 m (656 ft) to the east. A soil stabilization project is also planned for undeveloped land within NLVF. The existing storm drain network is capable of handling the expected floodwaters from a storm occurring on or near NLVF. The design-basis-flood-level local rainfall, based on a low-hazard-use building at this location, would not be considered a significant risk because of the low probability of flooding. NLVF encompasses 33 ha (80 acres) and is not located within a 100-year floodplain.

Disposal of solid nonhazardous wastes would be handled through the city of North Las Vegas waste removal contractor. That contractor operates a transfer location less than 1 km (0.6 mi) northwest of NLVF. Waste from this transfer station is taken to a landfill outside the city limits. The transfer station handles a large portion of the waste from the city of Las Vegas, and the estimated volume of 6,000 m^3 (8,000 yd^3) per year from NIF would not have a significant impact on the transfer station operations. Waste would be regularly removed in bulk waste collection bins provided by the city contractor. At times of unusually heavy generation of nonhazardous solid waste, the city contractor could be called for supplementary pickups.

Possible Waste Minimization During Operation. Waste minimization for NIF operations at NLVF would be handled as described in section I.4.1.2.8 for LLNL. The operation process would be subjected to a pollution prevention opportunity assessment to optimize efficiency and minimize waste generation.

Existing Waste Management Capabilities at NLVF. On the basis of the anticipated waste volume generation by NIF (table I.4.1.2.8.1–2) and on information on current waste handling practices at NLVF, comparison tables were developed that indicate the capability of the existing NLVF facilities to undertake the various waste managements tasks associated with NIF. Table I.4.4.2.8.1–1 shows the estimated impacts of the NIF operations on waste storage at NLVF and compares the NIF waste generation rate to the annual handling/treatment capacity at NLVF.

The management of NIF wastes at NLVF would represent a significant extension of current practices

TABLE I.4.4.2.8.1–1.—*Comparison of the National Ignition Facility Waste to Annual Treatment Capacity at North Las Vegas Facility*

Category	Amount of NIF-Generated Waste/Year[a] (m^3)	Ratio of NIF Waste Generation to Annual Treatment Capacity	Treatment Capacity (m^3/yr)	Is the Treatment Capacity Adequate	Is Existing or Planned Storage/ Disposal Capacity Adequate
Low-Level					
Liquid (m^3)					
Conceptual design total	0.60	NA	None	No	Yes[b]
Enhanced total	1.56	NA	None	No	Yes[b]
Solid (m^3)					
Conceptual design total	2.98	NA	None	No	Yes[b]
Enhanced total	7.25	NA	None	No	Yes[b]
Mixed					
Liquid (m^3)					
Conceptual design total	2.0	NA	None	No	Yes[b]
Enhanced total	4.98	NA	None	No	Yes[b]
Solid (m^3)					
Conceptual design total	0.34	NA	None	No	Yes[b]
Enhanced total	0.88	NA	None	No	Yes[b]
Hazardous[c]					
Liquid (m^3)					
Conceptual design total	2.30	NA	None	No	Yes[d]
Enhanced total	4.60	NA	None	No	Yes[d]
Solid (m^3)					
Conceptual design total	8.0	NA	None	No	Yes[d]
Enhanced total	8.0	NA	None	No	Yes[d]

[a] The total amount of the low-level waste was found by adding the values in the column "Cleaned" of table I.4.1.2.8–2 to the column "Low-Level" of the same table. The mass of the debris shield was assumed to be the density of iron (7.87 g/cm^3). The density of the low-level liquid was assumed equal to 1.0 g/cm^3. The amount of the "cleaned" personal protective equipment and wipes/general cleaning was added to solid low-level radioactive waste.

[b] Shipped offsite to NTS.

[c] The hazardous waste values are the sum of the values for the Laser and Target Area Building and the Optics Assembly Area.

[d] Shipped offsite to RCRA treatment, storage, and disposal facility.

Note: NA - not applicable.

Source: Calculated from table I.4.1.2.8.1–2 and Ortego 1995.

or capability. Thus, the impact of NIF waste on waste management operations at NLVF would be significant. Maximum efforts would have to be made to ensure compliance with regulatory requirements. Treatment processes for mixed and hazardous wastes would be investigated and coordinated with the State of Nevada in order to obtain appropriate permits. Radioactive and mixed waste would be managed in accordance with NVO-325 requirements and disposed of at NTS.

I.4.4.2.8.2 *Waste Management at North Las Vegas Facility During National Ignition Facility Decommissioning*

The procedures proposed by NLVF for decommissioning NIF after 30 years of operation are summarized here. The general approach is that at the end of the life of the NIF Laser Facility, the laser and associated equipment would be removed from the laser building. D&D activities for NIF would not add a significant burden to operations at NLVF. This type of activity is common throughout the DOE complex at the present time. Experienced waste handling and radiation safety personnel working at NTS would be used for decommissioning NIF. A wide variety of decommissioning projects are currently in progress at NTS.

All radiation-related work practices at NTS comply with the three primary requirements and guidance documents for radiation safety: 10 CFR 835, Radiation Control Manual, and DOE N 441.1. A fully implemented program has been established with complete procedures and guidance from a site-specific Radiation Safety and Control Manual. As low as reasonably achievable programs have been established and are implemented on the basis of the above-noted program documents. All work that would present the potential for exposure or contamination would receive special consideration and planning, including (but not limited to) dry-run practices, condition monitoring experiments, and personal protective equipment upgrade analysis. Decontamination systems would be established specifically for equipment in NIF to optimize efficiency and reduce the amount of waste residuals from the decontamination process. A wide variety of radiation safety and decontamination resources and experience exist at NTS. These resources would be made available, as necessary, for the development and implementation of NIF systems. Existing equipment, such as anticontamination clothing and personal protective equipment, would be available for use at NIF. This type of reusable equipment would be decontaminated onsite at the laundering and cleaning facilities available at NTS. Residual materials from the decontamination process would be disposed of at NTS.

The following sections discuss decommissioning of the NIF laser and associated components, followed by a discussion of decommissioning of equipment in the target area. The major activated/contaminated components would be located in the target area, so this facility would be the most complex operation.

Decommissioning of the NIF Laser by NLVF. The decommissioning of the NIF laser would be handled as described in section I.4.1.2.8 for LLNL. Mercury wastes from the ignitron switches would be sent to a permitted mercury recycling center, as is the current practice. The mixed waste from the capacitors would have to meet the requirements of NVO-325 before disposal on the NTS at the Area 5 Radioactive Waste Management Site.

Decommissioning of the NIF Target Area. The decommissioning of the NIF target area would be handled similar to the manner described in section I.4.1.2.8 for LLNL. DOE/NV and associated contractors have experience dealing with tritium contamination in virtually all phases of operations. Routine carbon dioxide cleaning during operations of NIF is indicated as the primary process for reducing the total amount of contamination on components at the end-of-life of NIF. Waste management operations at NTS have included disposal of millions of curies of tritium, especially as part of Area 5 Radioactive Waste Management Site operations. The disposal site, and operational sites throughout NTS, are equipped for tritium monitoring and detection. The Analytical Services Laboratory at NTS (in Area 23) can perform a variety of analyses for tritium, including personnel contamination determinations.

Radioactive and mixed waste could be disposed of at NTS assuming it could be managed and processed in accordance with NVO-325. Large structures that could not easily be containerized could be disposed of at the Area 3 Radioactive Waste Management Site, which is used for the disposal of bulk LLW containers.

NIF would be decommissioned according to standard engineering practices. The project would be handled similarly to construction projects per requirements of DOE O 430.1. This planning would optimize all phases of decommissioning and provide the most efficient method for completing the work. Efficient work would lead to a reduction in time for exposure of workers, which would in turn reduce the overall exposure projections.

I.4.5 Sandia National Laboratories

I.4.5.1 *Affected Environment*

The following sections describe the affected environment associated with the construction and operation of NIF at Sandia National Laboratories (SNL). Land use, air quality and acoustics, water resources, biotic resources, cultural and paleontological resources, socioeconomics, radiation and hazardous chemicals, and waste management are described.

I.4.5.1.1 Location and Land Use

The 1,150-ha (2,842-acre) SNL site is located east of Albuquerque, New Mexico, within the boundaries of the 21,044-ha (52,000-acre) Kirtland Air Force Base military reservation. The land north of SNL, with the exception of a few vacant parcels, is part of the urbanized city of Albuquerque. Areas to the west and south, by agreements with the State of New Mexico and the Isleta Pueblo, serve as buffer zones for certain test operations. Figure I.4.5.1.1–1 shows SNL Technical Areas and surrounding Kirtland Air Force Base land use.

The proposed NIF location at SNL is in an undeveloped area in Technical Area II, north of R Street, east of 9th Avenue and south of East Ordnance Road (figure I.3.4.5.1-2). The temporary construction laydown area would be located within the location designated for NIF. Areas east of the proposed NIF location in Technical Area II have been used for testing explosive components, and the immediate vicinity of NIF location was until recently part of an extensive operational safety zone. With the completion of the Explosives Component Facility in 1995, Technical Area II will be increasingly used for laboratory service functions (SNL 1995a). To the south of the proposed NIF location is Technical Area IV, which consists of several Inertial Confinement Fusion (ICF) and pulsed-power research facilities. In the area immediately north is located an SNL facilities storage yard, and to the west is a DOE arms control treaty verification rail and truck terminal mock-up. Approximately 2.4 km (1.5 mi) to the west is the runway for Kirtland Air Force Base, which is also shared with commercial planes landing at Albuquerque International Airport. A residential development at Kirtland Air Force Base containing approximately 100 housing units is located approximately 1.5 km (0.9 mi) north of the proposed NIF location. Well-drained, gravelly soils dominate the area. No soils at SNL are classified as prime farmland.

I.4.5.1.2 Air Quality and Acoustics

This discussion of existing air quality and acoustics includes a review of the meteorology, climatology, and ambient air quality characteristics near SNL.

I.4.5.1.2.1 *Meteorology and Climatology*

The climate at SNL and the surrounding region is arid continental with abundant sunshine, low humidity, scant precipitation, and a wide seasonal range of temperatures. The annual average temperature at SNL is 13.4 °C (56.2 °F); average daily temperatures range from 1.6 °C (34 8 °F) in January to 26.0 °C (78.8 °F) in July. The average annual precipitation at SNL is 20.6 cm (8.12 in). Prevailing winds much of the year are from the southeast; however, prevailing winter and spring winds are from the north and south, respectively. The annual average wind speed is 14.5 kph (9.0 mph) (NOAA 1990). Figure I.4.5.1.2–1 shows the 5-year wind rose for SNL based on measurements at Albuquerque International Airport. During the years 1987 to 1991, unstable atmospheric conditions occurred approximately 27 percent of the time, neutral conditions about 36 percent of the time, and stable conditions the remaining 37 percent of the time (EPA 1995b). In general, atmospheric dispersion improves as the wind speed increases and as the atmospheric conditions become more unstable.

The limited precipitation and warm temperatures of the area create an arid climate that limits the growth of ground-covering vegetation, resulting in the presence of large areas of exposed soil that are a potential source of windborne particulate matter (dust). These particulate matter concentrations are reduced if the exposed soil is wetted or if the dust is "washed out" of the atmosphere by precipitation. However, the area's precipitation and temperature seldom provide these beneficial mechanisms. This condition worsens the background particulate matter concentrations and increases the likelihood of the area's particulate matter (PM_{10}) and TSP ambient air concentration approaching or exceeding regulatory standards.

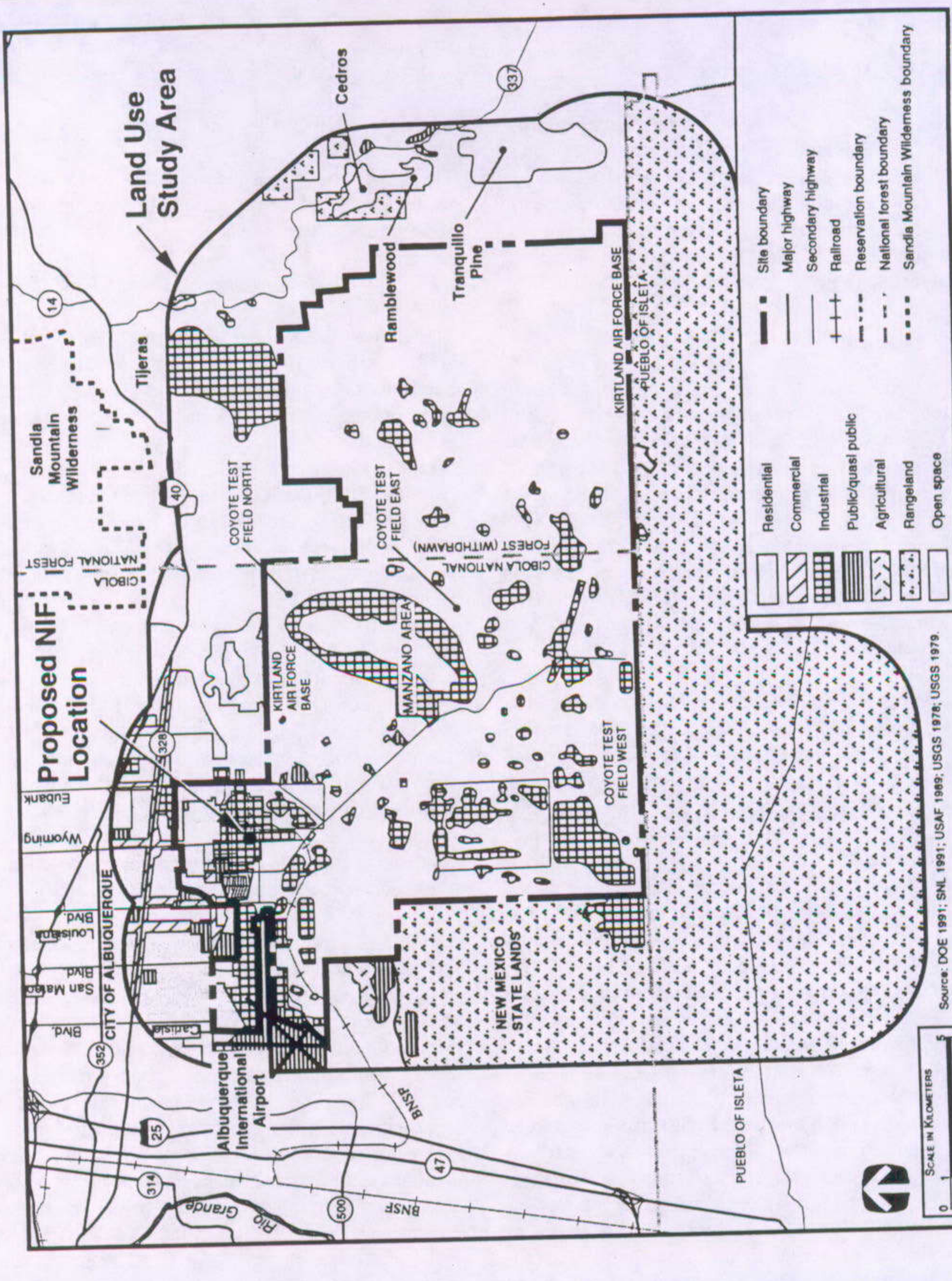

FIGURE I.4.5.1.1-1.—*Generalized Land Use at Sandia National Laboratories and Vicinity.*

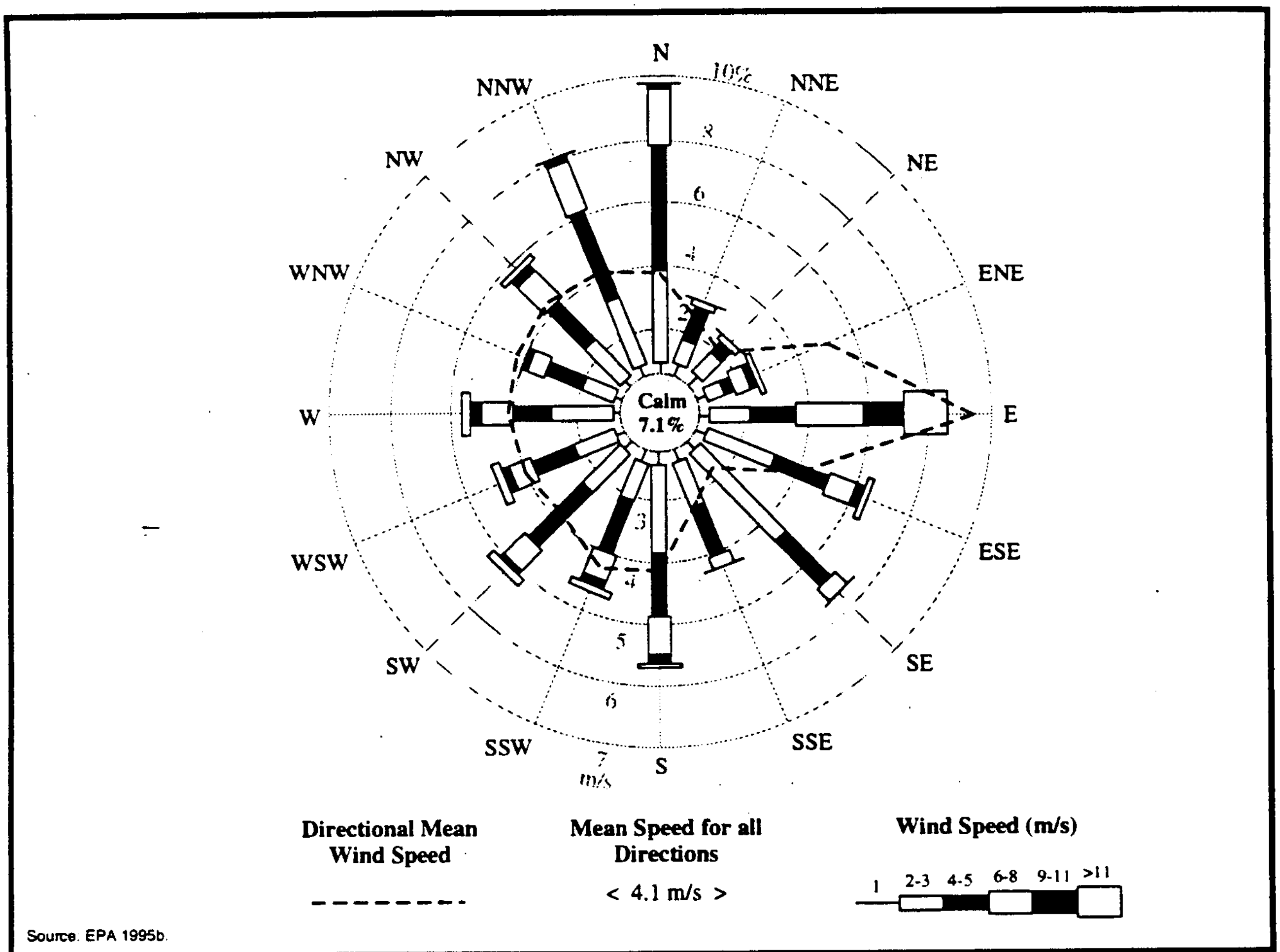

FIGURE I.4.5.1.2–2.—*Wind Distribution at Sandia National Laboratories, 1987-1991.*

I.4.5.1.2.2 *Ambient Air Quality*

The Albuquerque-Bernalillo County Air Quality Control Board is responsible for air pollution control and attainment of air quality standards in the city of Albuquerque and Bernalillo County. In addition to being subject to NAAQS for criteria pollutants, SNL is subject to ambient air quality standards adopted by the Albuquerque-Bernalillo County Air Quality Control Board. Applicable NAAQS and Albuquerque-Bernalillo County ambient air quality standards are listed in table I.4.5.1.2.2–1.

SNL is located within the Albuquerque-Mid Rio Grande New Mexico Intrastate AQCR 152. Portions of the AQCR are designated as nonattainment for carbon monoxide and TSP (40 CFR 81.332). In general, pollutant emission increases in an area designated as nonattainment for a specific pollutant are subject to more stringent permitting requirements than if the area is designated as attainment.

The New Mexico Environment Department operates a network of air quality monitors in the Albuquerque area. The state monitor closest to SNL is at the city water tank on Mesilla (Site ID 2ZE), approximately 8 km (5 mi) north-northwest of the proposed NIF location. Data for this and other monitors near SNL are shown in Lazaro et al. (1996). Table I.4.5.1.2.2–1 presents the 1993 baseline ambient air concentrations for criteria pollutants and other pollutants at SNL. All of the baseline concentrations are in compliance with the NAAQS. The 1-hour photochemical oxidant concentration exceeds the county standard, which is common in urban areas.

The nearest PSD Class I Area is the Bandelier National Monument Wilderness Area, which is

TABLE I.4.5.1.2.2–1.—*Comparison of Baseline Ambient Air Concentrations with Most Stringent Applicable Regulations and Guidelines at Sandia National Laboratories*

Pollutant	Averaging Time	Most Stringent Regulation or Guideline (μg/m³)	1993 Baseline Concentration[a] (μg/m³)
Criteria Pollutant			
Carbon monoxide	Annual	4,600[b]	1,600
	8 hours	10,000[c]	4,900
	1 hour	15,000[b]	10,000
Lead	Calendar quarter	1.5[d]	0.066
	30 days	3[b]	0.84
Nitrogen dioxide	Annual	100[d]	30
	24 hours	117[b]	77
Ozone	1 hour	235[d]	190
Particulate matter	Annual	50[d]	15.92
	24 hours	150[d]	66
Sulfur dioxide	Annual	11[b]	0.8
	24 hours	92[b]	5
	3 hours	1,300[d]	22
Mandated by County or State			
Arsenic, copper and zinc	30 days	10[b]	ND[e]
Asbestos	30 days	0.01[d]	ND
Beryllium	30 days	0.01[b,c]	ND
Heavy metals	30 days	10[d]	0.066[f]
Hydrogen sulfide	1 hour	4[b]	ND
Non-methane hydrocarbons	3 hours (6 a.m.-9 a.m.)	100[b]	ND
	3 hours	120[c]	ND
Photochemical oxidants	1 hour	20[b]	190[g,h]
Soiling index	Annual	0.3[b,i]	ND
Total reduced sulfur	30 minutes	4[b,c]	ND
Total suspended particulates	Annual	60[b,c]	ND
	30 days	90[c]	ND
	7 days	110[c]	ND
	24 hours	150[b,c]	ND

[a] For short-term standards, baseline concentration is second highest concentration for the year, for national standards and for 1-hour carbon monoxide and 3-hour nonmethane hydrocarbon county standards; baseline concentration is highest concentration for other short-term standards.

[b] County standard.

[c] State standard.

[d] Federal standard (40 CFR 50).

[e] ND - No data available.

[f] Heavy metals value assumed to be same as for lead.

[g] Photochemical oxidants value assumed to be same as ozone.

[h] Value exceeds the most stringent regulation or guideline.

[i] Units of cohs per 1,000 linear feet of air.

Source: ABCAQCB 1973; NMEIB 1981; NMAQB 1994.

located about 70 km (45 mi) north-northeast of SNL (NMAQB 1994).

The primary emission sources of criteria pollutants at SNL are the steam plant, paint shops, toxic machine shop, process development laboratory, and diesel generator plant at Technical Area I, and the explosive testing at Technical Area II (DOE 1988). Other emission sources include fugitive particulates from waste-burial activities, other processes, vehicles, and construction activities.

I.4.5.1.2.3 *Acoustic Conditions*

SNL is within Kirtland Air Force Base, which borders the Albuquerque International Airport. Commercial and military aircraft operations are the dominant source of noise at SNL because of the presence of the major east/west runway of the International Airport to the west of the northern portion of the SNL site. Military aircraft from Kirtland Air Force Base share the International Airport runways with commercial aircraft. Aircraft operations are a periodic noise source, and maximum levels are associated with aircraft takeoffs and landings (DOE 1993b). Other noise emission sources within SNL include motor vehicles and various industrial facilities and equipment.

Studies have recorded intermittent noise levels of 54 to 102 dBA for the northern portion of SNL near Technical Areas I, II, and IV east of the International Airport east/west runway. Daytime noise levels in Technical Area III, in the southern portion of SNL remote from the runway, have been measured at 64 to 72 dBA, with an average of 66 dBA (DOE 1993b). These noise levels contribute to the ambient background noise in these areas.

I.4.5.1.3 Water Resources

The major surface water feature in the area is the Rio Grande, which flows north to south through Albuquerque and lies about 10 km (6 mi) west of SNL. There are no perennial streams on the SNL site. The two primary surface channels at SNL are Tijeras Arroyo and Arroyo del Coyote. Tijeras Arroyo is directly southeast of Technical Area II and has a drainage area of about 208 km^2 (80 mi^2) above the confluence with Arroyo del Coyote. Arroyo del Coyote has a drainage area of about 70 km^2 (27 mi^2). Both arroyos flow intermittently during heavy summer thundershowers (SNL 1994). Technical Area II has no stormsewer system. Storm runoff drains into Tijeras Arroyo, which flows west to the Rio Grande. Except for the southeast corner, Technical Area II (including the proposed NIF location) is outside the 100- and 500-year floodplains of Tijeras Arroyo (figure I.4.5.1.3–1).

A fault complex separates the regional aquifer system into a deeper zone west of the fault and a shallower zone to the east. The depth to groundwater at SNL varies from 15 to 30 m (49 to 98 ft) east of the fault and 120 to 150 m (394 to 492 ft) west of the fault. Most SNL facilities, including Technical Area II where NIF would be located, are located west of the fault system.

The water supply for SNL is provided by Kirtland Air Force Base and the city of Albuquerque. Kirtland Air Force Base draws water from a system of wells, with a backup from the city of Albuquerque. In 1990, Kirtland Air Force Base pumped an average of over 5,840 MLY (1,533 MGY) of water from its production wells. SNL uses about 1,387 MLY (365 MGY) of water, of which 70 percent is provided by Kirtland Air Force Base and the rest by the city of Albuquerque (SNL 1995a; IT Corporation 1992).

SNL contains over 24 km (15 mi) of sewer lines interconnected with those of Kirtland Air Force Base. During 1993, SNL had four general wastewater streams discharging to the Albuquerque wastewater treatment plant and three industrial wastewater streams that required pretreatment before discharging to the sewer system (SNL 1994).

I.4.5.1.4 Biotic Resources

SNL is located in the Arizona, Livermore Plateau Ecoregion (Omernik 1986). Most of the undeveloped spaces located at and near the area designated for NIF support grassland vegetation. Common plant species include galleta, sand dropseed, ring muhly, and Indian ricegrass. Grassland vegetation dominates in Technical Area II, with arroyo banks occurring along the southeastern margin of that area. The arroyo banks generally contain a drought-adapted grassland community, dominated by species such as club

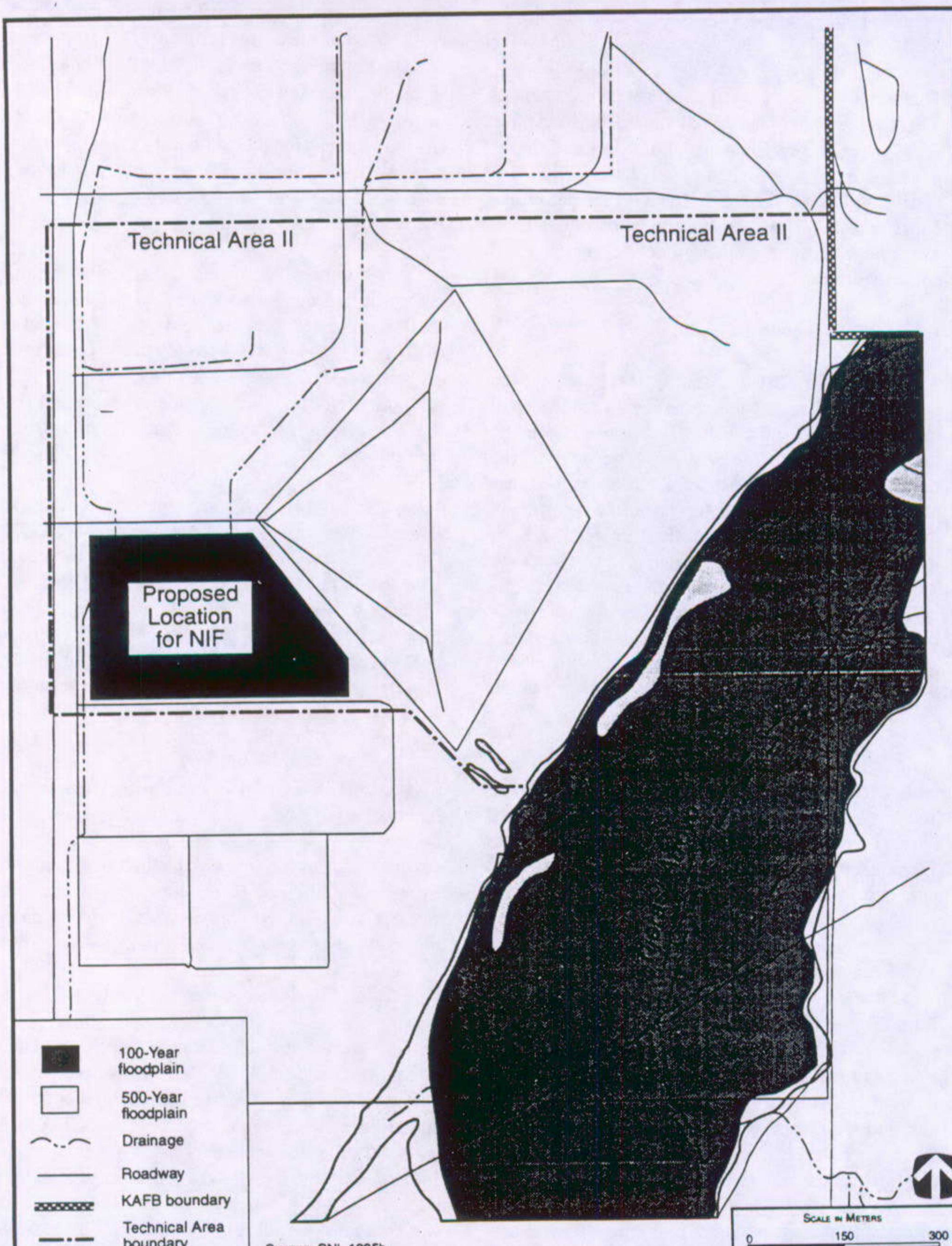

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FIGURE I.4.5.1.3–1.—*Floodplain Map for Technical Area-II at Sandia National Laboratories.*

cholla, prickly pear, soapweed yucca, and four-wing saltbush (IT Corporation 1992).

The size and diversity of the wildlife populations at SNL are limited by lack of available water (IT Corporation 1992). Amphibians and reptiles that could occur in Technical Area II include the western spadefoot toad, plains spadefoot toad, Woodhouse's toad, Great Plains toad, many-lined skink, Great Plains skink, whiptail lizard, side-blotched lizard, short-horned lizard, bullsnake, and coachwhip. The western diamondback rattlesnake and western rattlesnake also occur in grassland communities of the area (IT Corporation 1992).

Raptors that may use grassland habitats of SNL for hunting include northern harrier, red-tailed hawk, Swainson's hawk, ferruginous hawk, American kestrel, prairie falcon, barn owl, long-eared owl, great horned owl, burrowing owl, and turkey vultures. Other common grassland birds that may nest in the area include scaled quail, mourning dove, greater roadrunner, horned lark, American crow, northern mockingbird, crissal thrasher, loggerhead shrike, lark sparrow, black-throated sparrow, western meadowlark, brown-headed cowbird, and house finch (IT Corporation 1992).

Common mammals in the grassland areas include desert cottontail, black-tailed jackrabbit, spotted ground squirrel, Gunnison's prairie dog, Botta's pocket gopher, silky pocket mouse, Ord's kangaroo rat, banner-tailed kangaroo rat, Merriam's kangaroo rat, western harvest mouse, deer mouse, white-footed mouse, and northern grasshopper mouse. Coyote, kit fox, long-tailed weasel, badger, striped skunk, and bobcat are among the predatory mammals within the grassland habitats. Mule deer infrequently make use of such habitats (IT Corporation 1992).

No National Wetland Inventory maps have been prepared for SNL. If wetlands do exist on SNL, they would be in the area of the springs and intermittent drainages associated with the canyons and arroyos of Kirtland Air Force Base. These areas do not occur within the area designated for NIF.

Aquatic resources of SNL include intermittent stream channels within Arroyo del Coyote and Tijeras Arroyo. Several springs exist on Kirtland Air Force Base, including Sol de Mete Spring, Coyote Springs, and G Spring, associated with canyons and arroyos. There are also drainage ditches, Lake Christian (a 0.8-ha [2.0-acre] permanent pond in the southern portion of Kirtland Air Force Base), and golf course ponds. None of these resources occur within the area designated for NIF.

A list of Federal and state rare, threatened, and endangered species that could potentially exist at SNL is provided in Lazaro et al. (1996). Habitats that could attract several of the species (such as loggerhead shrike and New Mexico jumping mouse) are present. However, no designated critical habitats for Federal-listed species exist at SNL.

I.4.5.1.5 Cultural and Paleontological Resources

No prehistoric or historic archaeological sites or structures exist on the proposed NIF location in Technical Area II. An intensive pedestrian field survey (employing 6- to 12-m [20- to 50-ft] transects) was conducted during August 1990; no artifacts or features were encountered on or near the proposed NIF location (Hoagland 1990). The SNL Sitewide Hydrogeologic Characterization Project reports that no important paleontological remains have been recovered from deposits on SNL, including the alluvial and colluvial sediments that exist on the proposed NIF location (Wheeler 1995a). Consultation with the Isleta Pueblo indicates that no Native American cultural resources exist within the boundaries of SNL, including the proposed NIF location (Wheeler 1995a).

I.4.5.1.6 Socioeconomics

Socioeconomic characteristics described here for the SNL area include the regional economy, population and housing, public finance and public service infrastructure, and local transportation. Regional economic statistics are based on a regional economic study area that encompasses nine counties around SNL, as defined by the BEA. The economic study area is a broad labor and product market-based region linked by trade among economic sectors within the region. Statistics for population and housing, public finance, and infrastructure are based on the ROI, a three-county area in which more than 95 percent of SNL employees reside. The three counties are Bernalillo (containing 88.0 percent of the workforce), Sandoval (4.5 percent), and Valencia (4.5 percent). The counties and cities included in the economic study region and the counties included in the ROI are listed in Lazaro et al. (1996). Assumptions, assessment methodologies. and supporting data are also presented in Lazaro et al. (1996).

I.4.5.1.6.1 *Regional Economy*

The economic study area for SNL includes the Albuquerque Metropolitan Statistical Area (Bernalillo County) and eight surrounding counties. Between 1988 and 1995, employment in the economic study region was projected to increase from 291,600 to 331,500. BEA (1990) projects a compounded average annual growth rate of 1.3 percent from 1995 to 2003 (34,646 jobs).

In 1995, SNL employed approximately 8,500 persons, accounting for 2.8 percent of employment in the regional economic study area. In 1995, employment at SNL dropped to 7,543. Data on historical and projected employment at SNL and the distribution of employees by place of residence in the ROI are presented in Lazaro et al. (1996).

I.4.5.1.6.2 *Population and Housing*

The ROI experienced steady population growth between 1980 and 1990, with an average annual increase of about 3.2 percent, bringing the 1990 total to about 605,000 persons. Population growth has been strongest in Sandoval County (84 percent between 1980 and 1990). By the year 2000, population in the ROI is expected to grow to approximately 672,000 persons (U.S. Department of Commerce 1994; BEA 1990).

Between 1980 and 1990, the number of housing units in the ROI increased by over 22 percent, from 196,765 to 241,683 units (see table I.4.5.1.6.2–1). Housing in Bernalillo County increased from 162,126 units in 1980 to 201,235 in 1990 (24 percent). Housing in Sandoval County increased from 12,286 units in 1980 to 23,667 in 1990 (93 percent), and housing in Valencia County decreased from 22,352 units in 1980 to 16,781 in 1990 (minus 25 percent). The number of housing units in the ROI is expected to increase about 19 percent between 1990 and 2000 (U.S. Department of Commerce 1994; BEA 1990; ULI 1995).

The number of vacant owner units in the ROI increased from about 11,000 units in 1980 to about 13,000 in 1990. It is estimated that by the year 2000 there will be approximately 16,000 vacant owner units if current construction and economic trends continue in the ROI.

In 1980 there were approximately 5.000 vacant rental units in the ROI. The number of vacant units increased to about 7,000 by 1990. It is estimated that by the year 2000 there will be approximately 9,000 vacant rental units if current construction and economic trends continue in the ROI.

In 1994, the residential market within the ROI continued a four-year upward trend, both in terms of

TABLE I.4.5.1.6.2–1.—*Population and Housing Data for the Sandia National Laboratories Area*

	1980	1990	1996	1997	1998	1999	2000	2001	2002	2003
Estimated ROI population	458,430	605,088	642,577	649,734	656,973	664,295	671,700	677,689	683,733	689,833
Estimated total housing units	196,765	241,683	268,634	273,126	277,617	282,109	286,601	291,093	295,585	300,076
Estimated vacant owner units	11,123	13,053	14,372	14,592	14,811	15,031	15,251	15,471	15,691	15,910
Estimated vacant renter units	5,028	7,011	8,040	8,212	8,383	8,555	8,726	8,897	9,069	9,240
Estimated total vacant housing units in ROI[a]	16,151	20,064	22,412	22,803	23,194	23,586	23,977	24,386	24,760	25,151

[a] Vacancy rate - 8 percent.
Source: Historical data from U.S. Department of Commerce (1994); projections by Haliburton-NUS (1995).

construction activity and sales of existing houses. Construction of single-family houses increased by 20 percent. Single-family development continued to be concentrated in the northwest and northeast Albuquerque submarkets, as well as in the city of Rio Rancho. The northwest and northeast submarkets contain more upscale housing, with more affordable housing in the city of Rio Rancho. After four years of declining vacancy rates, the region appears poised for a surge in new construction. Multifamily permits have increased sharply since 1993, and several residential projects are planned. In light of current economic conditions in the Albuquerque housing market, residential construction activity is expected to continue at a brisk pace (ULI 1995).

I.4.5.1.6.3 *Public Finance and Public Services Infrastructure*

Public financial characteristics of the local jurisdictions in the ROI that are most likely to be affected by NIF at SNL are presented in this section. The data reflect total revenues and expenditures of each jurisdiction's general fund, special revenue funds, and, as applicable, debt service, capital project, and expenditure trust funds. Major revenue and expenditure categories and total revenues less expenditures for counties and cities are presented in table I.4.5.1.6.3–1. Table I.4.5.1.6.3–2 summarizes public service levels for education, community service, and health care.

I.4.5.1.6.4 *Local Transportation*

Vehicular access to SNL is provided by Broadway Boulevard, Eubank Boulevard, Louisiana Boulevard, Wyoming Boulevard, and Gibson Boulevard in Albuquerque. Interstate 40 and Interstate 25 provide regional access to SNL. Table I.4.5.1.6.4–1 shows the site access roads at SNL and the average daily traffic volumes for each route.

There currently are two major road improvement projects within the SNL vicinity. These projects are (1) the Eubank Road and Interstate 40 interchange overpass project and (2) the Four Hills Road, Tramway Boulevard, and Interstate 40 interchange project. Future road improvement projects that will begin before 2000 include the Juan Tabo Road and Interstate 40 interchange project, the Wyoming Boulevard and Interstate 40 interchange project, and the Gibson Street reconstruction project (Fegan 1995).

Traffic along road segments providing access to SNL is projected to contribute to differing service level conditions in accordance with population growth. Eubank, Gibson, Louisiana, Wyoming, and, to a lesser extent, Broadway would typically experience traffic congestion, with volumes approaching or exceeding the design capacity of each roadway. Along these roadways, a motorist's speed and ability to maneuver would be restricted, and potential disruptions to traffic flow could be caused by accidents

TABLE I.4.5.1.6.3–1.—*Public Finance—Sandia National Laboratories Area*

Revenues and Expenditures[a]	Bernalillo County	City of Albuquerque	Valencia County	Sandoval County
Local sources (percent)	70	55	NA	85
State sources (percent)	30	45	NA	15
Federal sources (percent)	0	0	NA	0
Total revenues (dollars)	65,106,243	236,936,897	NA	6,218,259
General government (percent)	53	18	NA	51
Public safety, health, and community services (percent)	47	82	NA	49
Debt service (percent)	0	0	NA	0
Other (percent)	0	0	NA	0
Total expenditures (dollars)	61,559,532	202,472,160	NA	4,442,071
End-of-year fund balance (dollars)	30,597,329	17,108,146	NA	3,052,034

[a] If reporting body did not distinguish between state and Federal revenue sources, the total for all intergovernmental revenue was combined and reported under "state sources."

Source: Bernalillo County 1994; city of Albuquerque 1994; Sandoval County 1993.

TABLE I.4.5.1.6.3–2.—*Public Services—Sandia National Laboratories Area*

Part I: Education

County/School District	Enrollment	Pupil-Teacher Ratio	Per Pupil Expenditure[a] ($)
Bernalillo County[b]	89,131	19.2:1	3,733
Sandoval County	5,841	19.3:1	4,039
Valencia County	10,854	21.7:1	3,421

[a] Expenditure per pupil was based on total operating expenditures for each school district and used 40-day membership attendance numbers for the number of students.

[b] Albuquerque school district.

Part II: Level of Service per 1,000 Population

County/Jurisdiction	Police Protection	Fire Protection	General Government	Physicians
Bernalillo County	0.1	0.2	2.4	3.8
City of Albuquerque	2.6	1.3	17.7	NA
Sandoval County	0.3	NA[a]	NA	1.1
Valencia County	0.4	NA	4.1	0.5

[a] Fire protection services provided by volunteer firefighters.

Source: New Mexico Public Schools 1994; city of Albuquerque 1994; Federal Bureau of Investigation 1993; American Medical Association 1994.

or maintenance activities, resulting in considerable congestion (DOE 1993a).

Major planned improvements to roads that provide access to SNL include future construction of a limited-access, six-lane freeway from Interstate 40 on the west to Interstate 25 on the north. Construction of additional capacity for Interstate 40 east may include one lane in each direction from Tramway Boulevard to the intersection between Interstate 25 and Interstate 40 (the Big I). A transportation corridor study of a potential roadway from Tramway, Eubank, and Juan Tabo along the Tijeras Arroyo (to intersect with Interstate 25 between Rio Bravo and the Pajarito Study Corridor and provide access to Kirtland Air Force Base and Mesa Del Sol) is being pursued. The study is expected to determine the number of lanes and functional classification for the facility (Middle Rio Grande Council of Governments 1995). Public transportation within the ROI is provided by Sun Tran. The Albuquerque Aviation Department owns and operates the Albuquerque International Airport, which provides jet service from both national and local carriers.

I.4.5.1.6.5 *Environmental Justice*

Environmental justice concerns the potential for high and adverse environmental or human health impacts to disproportionately affect minority or low-income

TABLE I.4.5.1.6.4–1.—*Baseline Traffic on Sandia National Laboratories Access Roads*

Route	From	To	1995 ADT	1995 PHV	1995 LOS	2000 ADT	2000 PHV	2000 LOS
Broadway Blvd.	Gibson Blvd.	NMSR 47	13,006	1,301	C	15,306	1,531	D
Eubank Blvd.	I-40 in Albuquerque	Gibson Blvd.	19,232	1,923	E	54,387	54,387	F
Gibson Blvd.	I-25 in Albuquerque	Louisiana Blvd.	46,213	4,621	F	39,406	39,406	F
Louisiana Blvd.	Gibson Blvd.	I-40 in Albuquerque	33,484	3,348	F	46,652	46,652	F
Wyoming Blvd.	I-40 in Albuquerque	Kathryn Ave.	39,641	3,964	F	22,634	22,634	E

Note: ADT - average daily traffic; PHV - peak hour volume; LOS - level of service.

Source: DOE 1993a.

populations. In this PSA, environmental justice is evaluated for impacts within the site region, defined as the area within an 80-km (50-mi) radius around the site, and within the local area. Lazaro et al. (1996) presents the demographic analysis of minority and low income population distributions on a regional and local basis.

In the SNL site region in 1990, 15 percent of the population was low income and 45 percent was minority. These values are lower percentages of both low-income and minority persons than the New Mexico state averages (21 percent low income and 49 percent minority). Within the area, census tracts closer to the SNL site tend not to have significantly higher or lower proportions of minority or low-income populations than tracts farther from the site.

I.4.5.1.7 Radiation and Hazardous Chemicals

I.4.5.1.7.1 *Radiation Environment*

A detailed discussion of the radiation environment at SNL, including background, radiological releases, and doses to members of the public, is presented in 1993 *Site Environmental Report*, Sandia National Laboratories (SNL 1994). The concentrations of radioactivity in various environmental media (air, water, soil) in the site region are also presented in that reference.

Calculated radiological doses were used to estimate the potential health impacts to the public and onsite workers at SNL from any releases of radioactivity. The annual doses to individuals, the surrounding population (within 80 km [50 mi]), and workers are summarized in table I.4.5.1.7.1–1; corresponding health risks are also presented in this table. These doses are in addition to those from natural background, consumer products, and medical sources, which total about 399 mrem.

Background radiation doses are unrelated to SNL operations. Regulatory limits that specify the maximum effective dose equivalent to individual members of the public and occupational workers are also presented in table I.4.5.1.7.1–1.

The doses to the public are within regulatory limits (DOE 1990) and are small in comparison to background radiation. The onsite worker doses are also within regulatory limits.

I.4.5.1.7.2 *Hazardous Chemical Environment*

The background chemical environment important to human health consists of the atmosphere, which may contain hazardous chemicals that can be inhaled; drinking water, which may contain hazardous chemicals that can be ingested; and other environmental media with which people may come in contact (e.g., soil through contact or the food pathway). Exposure pathways to SNL workers during normal operation may include inhaling the workplace atmosphere, drinking SNL potable water, and possible other contact with hazardous materials associated with work assignments.

The existing inventory of hazardous chemicals at SNL of the types that may be used by NIF is listed in table I.4.5.1.7.2–1. The potential for health impacts from these chemicals varies from facility to facility and from worker to worker, and available information is not sufficient to permit a meaningful estimation and summation of these impacts. However, workers are protected from hazards specific to the workplace through appropriate training, protective equipment, monitoring, and management controls.

TABLE I.4.5.1.7.2–1.—*1994 Inventory of National Ignition Facility-Related Hazardous Materials Stored at Sandia National Laboratories*

Hazardous Material	Quantity
Acetone	7,069 L
Aluminum	27,092 kg
Ammonium hydroxide	3,046 L
Boron	62 kg
Copper	3,867 kg
Ethanol	3,820 L
Hydrofluoric acid	5,546 L
Lead	81,524 kg
Mercury	850 kg
Methylene chloride	1,409 L
Stainless steel	2,141 kg
Tetraethylorthosilicate	355 L

Source: Atencio 1995.

TABLE I.4.5.1.7.1–1.—***Annual Radiation Doses to the General Public and Onsite Workers from Normal Operations at Sandia National Laboratories***

Receptor	Atmospheric Releases: Regulatory Limit[a]	Atmospheric Releases: Calculated	Liquid Releases: Regulatory Limit[a]	Liquid Releases: Calculated[b]	Total: Regulatory Limit[a]	Total: Calculated	Total: Risk[c]
Individual Dose							
Average exposed individual[d] (mrem)	10	$4.7x10^{-5}$	4	0.0	100	$4.7x10^{-5}$	$2.4x10^{-11}$
Maximally exposed individual (mrem)	10	$1.6x10^{-3}$	4	0.0	100	$1.6x10^{-3}$	$8.0x10^{-10}$
Population Dose[e]							
Population within 80 km (person-rem)	f	$2.7x10^{-2}$	f	0.0	f	$2.7x10^{-2}$	$1.4x10^{-4}$
Worker Dose[g]							
Average worker (mrem)	NA	NA	NA	NA	5,000	3.2	$1.3x10^{-6}$
Maximally exposed worker (mrem)	NA	NA	NA	NA	5,000	1,000	$4.0x10^{-4}$
Total workers[h] (person-rem)	NA	NA	NA	NA	None	11	$4.4x10^{-3}$

[a] The regulatory limits for individuals are given in DOE Order 5400.5. The 10 mrem/yr limit from airborne emissions is required by the *Clean Air Act*, the 4 mrem/yr limit is required by the *Safe Drinking Water Act*, and the total dose of 100 mrem/yr is the limit from all pathways combined. The occupational limit for workers is 5,000 mrem (10 CFR 835).

[b] The calculated dose values given in the Liquid Releases column conservatively include all water pathways, not just the drinking water pathway.

[c] Based on latent fatal cancer risk factors of $5x10^{-7}$/mrem for individuals, $5x10^{-4}$/person-rem for population, and $4x10^{-7}$/mrem for workers (ICRP 1991).

[d] Obtained by dividing the population dose by the number of people living within 80 km (50 mi) of the site.

[e] Dose for the population in an 80-km (50-mi) radius surrounding SNL, including the population on Kirtland Air Force Base; estimated for a population of approximately 578,313 people.

[f] No regulatory limits exist for population doses; however, a 100 person-rem value for the population is found in proposed 58 FR 16268 (10 CFR 834).

[g] Worker doses were estimated on the basis of readings from monitoring devices called thermoluminescent dosimeters.

[h] The number of badged workers in 1992 was approximately 3,420.

Note: NA - not applicable.

Source: SNL 1994.

SNL workers are also protected by adherence to OSHA and EPA occupational standards that limit atmospheric and drinking water concentrations of potentially hazardous chemicals. Appropriate monitoring, which reflects the frequency and amounts of chemicals utilized in the operation processes, ensures that these standards are not exceeded.

The chemical pollutant levels from SNL operations to which the public is exposed meet all applicable permit, regulatory, and DOE operational requirements. A review of the SNL annual environmental and accident reports indicates that there have been no significant adverse impacts to workers, the public, or the environment from hazardous chemicals.

I.4.5.1.8 Waste Management

The current waste management practices at SNL are outlined in table I.4.5.1.8–1. Wastes generated at SNL from research activities include low-level, mixed, hazardous, and nonhazardous wastes. NIF is expected to generate these same categories of wastes during operation.

I.4.5.1.8.1 *Low-Level Waste*

LLW at SNL is generated in both technical and remote test areas as a result of R&D activities. Most of LLW consists of contaminated equipment and combustible decontamination materials and cleanup

TABLE I.4.5.1.8–1.—*Current Waste Management at Sandia National Laboratories* [Page 1 of 2]

Category	1994 Generation Rate (m^3)	Treatment Method	Treatment Capacity (m^3/yr)	Storage Method	Storage Capacity (m^3)	Disposal Method	Disposal Capacity (m^3)
Low-Level							
Liquid	0.9	Included in mixed low-level	NA	Staged at generator sites or in containers at Technical Area III aboveground storage site and other facilities	Included in mixed low-level	NA	NA
Solid	53	Included in mixed low-level	NA	Staged at generator sites or in containers at Technical Area III aboveground storage site and other facilities	Included in mixed low-level	None; pending offsite shipment to NTS	NA
Mixed Low-Level							
Liquid	0.0	Neutralization, solidification; specific preferred treatment option for each treatability group per Site Treatment Plan for mixed waste	Data not available	Technical Area III	Included in solid	NA	NA
Solid	2.0	Compaction; specific preferred treatment option for each treatability group per Site Treatment Plan for mixed waste	Data not available	Staged at generator sites or in containers at Technical Area III aboveground storage site and other facilities	3,080	Offsite commercial facilities; some waste streams have no disposal options identified	NA

TABLE I.4.5.1.8–1.—*Current Waste Management at Sandia National Laboratories* [Page 2 of 2]

Category	1994 Generation Rate (m^3)	Treatment Method	Treatment Capacity (m^3/yr)	Storage Method	Storage Capacity (m^3)	Disposal Method	Disposal Capacity (m^3)
Hazardous							
Liquid	138	Neutralization or thermal treatment (open burn)	Data for neutralization not available at this time	RCRA-permitted Hazardous Waste Management Facility	Included in solid	Offsite	NA
Solid	553 t[a,b]	Thermal treatment	9.1 kg/campaign	RCRA-permitted Hazardous Waste Management Facility	Data not available at this time	Offsite	NA
Nonhazardous (Sanitary)							
Liquid	1,459,906	Offsite	NA	None	NA	Offsite-NPDES outfall to municipal facilities	NA
Solid	4,250 t[b]	Segregation and recycling	NA	None	NA	Offsite sanitary landfill	NA
Nonhazardous (Other)							
Liquid	Included in sanitary	Included in sanitary	NA	None	NA	Included in sanitary	NA
Solid	Included in sanitary	Included in sanitary	NA	None	NA	Onsite classified waste landfill for classified waste; off site for other nonhazardous wastes	NA

[a] Includes 86 t of RCRA-regulated and 466 t of non-RCRA-regulated wastes.
[b] This waste is not tracked by volume and the weight of material is too variable to reliably convert.
Note: NA - not applicable.
Source: SNL 1995d.

debris. All generated LLW is temporarily stored at generator sites or aboveground in transportation containers at the location of the closed Technical Area III LLW disposal site. All LLW packages currently onsite are being stored, pending approval for transport by commercial carriers to NTS for burial.

I.4.5.1.8.2 *Mixed Low-Level Waste*

Mixed wastes managed at SNL include radioactively contaminated oils and solvents and radioactively contaminated or activated lead or other heavy metals. Other mixed wastes may be generated as a result of weapons tests. The 557-m^2 (6,000-ft^2) Radioactive and Mixed Waste Management Facility will have a centralized packaging and storage function for LLW and mixed waste. Mixed waste will be stored at the facility until a decision has been made on an acceptable waste disposal site. Waste processing at the Radioactive and Mixed Waste Management Facility will include activities required to comply with the waste acceptance criteria and Federal regulations. SNL is aiding DOE in developing a compliance agreement to be negotiated with EPA Region VI Field Office. DOE and SNL are assessing their responsibilities as outlined in the FFCA and may enter into similar agreements with the State of New Mexico.

I.4.5.1.8.3 *Hazardous Waste*

Hazardous wastes are generated at SNL by the numerous R&D activities conducted throughout the Laboratory. The Hazardous Waste Management Facility can store 265,000 L (70,000 gal) of liquid and solid hazardous wastes at one time. There are no active onsite disposal facilities for hazardous/toxic wastes at SNL. All RCRA-regulated wastes are packaged, manifested, and shipped offsite by DOT-registered carriers for disposal at RCRA-permitted treatment and disposal facilities.

I.4.5.1.8.4 *Nonhazardous Waste*

SNL contains over 24 km (15 mi) of sewer lines interconnected with those of Kirtland Air Force Base. Pretreated industrial wastewater effluent and sanitary sewage are discharged to the city of Albuquerque sewer system in compliance with NPDES permit discharge limits. Solid sanitary waste is collected and taken to the municipal solid waste landfills of the city of Albuquerque and the city of Rio Rancho.

At SNL, waste minimization and pollution prevention programs have been implemented with programmatic controls such as source reduction, inventory control, product substitution, and waste exchange programs.

I.4.5.2 ***Environmental Impacts***

The following sections describe the potential environmental impacts for land use and visual resources, air quality and noise, water resources, ecological resources, cultural and paleontological resources, and socioeconomics for constructing and operating NIF at SNL. In addition, impacts associated with radiation, hazardous chemicals, and waste management are described.

I.4.5.2.1 Land Use and Visual Resources

I.4.5.2.1.1 *Land Use*

Impacts to land use at and around SNL from NIF would be limited to the clearing of land, minor and temporary disruptions from construction activities at contiguous land parcels south of the proposed location, and a slight increase in vehicular traffic. The proposed location for NIF at SNL (figure I.3.4.5.1–2) is a large parcel of flat, vacant land on the southern end of Technical Area II between East Ordnance Road and R Boulevard, and a small plot of land for construction staging on the northern edge of Technical Area IV just south of R Boulevard. NIF would require the clearing of an estimated 10.5 ha (25.9 acres) of land for buildings, walkways, building access, temporary construction laydown area, and buffer space. Such acreage would account for approximately 7 percent of the land currently available for development at SNL (Wheeler 1995b). NIF would be located in an area dedicated to similar land uses (SNL 1995a). No impacts to land use in Bernalillo County, the city of Albuquerque, or nearby communities would be expected.

With appropriate erosion and sediment control measures, soil impacts during construction of NIF would be short term and minor. Seismic risk would be taken into account during construction and operation of NIF.

I.4.5.2.1.2 *Visual Resources*

Other than short-term construction effects (from fugitive dust, equipment exhaust, etc.), no impacts to visual resources would result from siting and operation of the proposed facilities. NIF would be located in an area that is flat, has little variety in vegetation, and has virtually no visual diversity. Structures erected for NIF would be consistent with the industrial-type building form that can be found on contiguous and nearby parcels of land. Although the Laser and Target Area Building would exceed 37 m (120 ft) in height, it would not appreciably alter the visual character of Technical Area II and its environs. The visual impact of NIF would be further reduced by its remoteness from public access roads.

I.4.5.2.2 Air Quality and Acoustics

I.4.5.2.2.1 *Air Quality*

Construction Emissions. Estimated emissions from site-clearing and construction of the facilities are listed in table I.4.5.2.2.1–1. The estimates are based on characteristics of the proposed SNL location and on construction vehicle exhaust and fugitive emissions. Site clearing would occur over a period of about 5 weeks, and would produce the greatest amount of fugitive dust (PM_{10}) emissions during the construction process. ISCST2, Version 93109 [EPA 1992a-b] was used to determine the impact of site-clearing activities on ambient air quality (see section I.4.1.2.2.1). The data selected for modeling air quality were surface meteorological data and twice-daily mixing height data from nearby Albuquerque International Airport for 1987 to 1991 (EPA 1995b). The surface wind speeds and directions are summarized in an annual wind rose (see figure I.4.5.1.2–1). Detailed emission inventories associated with site clearing and facility construction; meteorological data used; and air quality model, assumptions, and input parameters are presented in Lazaro et al. (1996).

The national 24-hour PM_{10} standard is 150 $\mu g/m^3$; the 24-hour average PM_{10} background concentration representative of the SNL site is 40 $\mu g/m^3$ (table I.4.5.1.2.2–1). With conventional dust control (i.e., 50-percent control for excavation and 60-percent control for traffic on unpaved roads), maximum 24-hour average PM_{10} concentrations of 12 $\mu g/m^3$ over background are predicted at the closest site boundary (1.0 km [0.6 mi] north-northeast of NIF location).

TABLE I.4.5.2.2.1–1.—*Estimated National Ignition Facility Construction Emissions for the Sandia National Laboratories Location*

Pollutant	Total Emissions (t/yr)[a]
Particulate matter volatile organic compound	18.33[b]
Volatile organic compound	0.44
Carbon monoxide	1.23
Nitrogen dioxide	3.76
Sulfur dioxide	0.43
Lead	Negligible

[a] Metric tons (1,000 kg) per year.
[b] Includes 5.26 t/yr of fugitive emissions for site clearing using water-spray control that would occur during an approximate 39-day period in the first year and 12.7 t/yr of facility construction emissions that would occur for the remainder of the year.
Source: Lazaro et al. 1996.

Maximum PM_{10} concentrations of 52 $\mu g/m^3$, including background concentration, are considerably below the 24-hour NAAQS of 150 $\mu g/m^3$ for PM_{10}. Site clearing at SNL would be expected to last for about a month, so ambient air quality impacts associated with site clearing would be negligible, local, and temporary. Additional regulatory information is presented in section I.5.2.

Emissions During Operations. Air pollutant emissions from operation of NIF at SNL are expected to be primarily from fuel combustion and cleaning of debris shields. Emissions of solvent VOCs (ethanol) from debris shield cleaning are expected to total about 0.5 t/yr (0.55 tons/yr) (LLNL 1995b). Other potential air pollutant emission sources not considered significant are target destruction under either the direct-drive or enhanced indirect-drive options, emissions from vehicles used for freight shipments and employee commuting, and emissions from welding operations at the Fabrication Facility.

Table I.4.5.2.2.1–2 lists the estimated SNL annual air pollutant emissions based on the anticipated NIF annual energy requirements provided in table I.4.1.2.2.1–3, adjusted to recognize that at SNL, six new support buildings (with a total area of 9,988 m^2 [107,513 ft^2]) would be required out of the total complement of support buildings area of 26,722 m^2 [287,643 ft^2]).

Published emission factors (EPA 1993) were used in the calculations. Emissions of VOCs from solvent cleaning are included. For comparative purposes, table I.4.5.2.2.1–2 includes SNL 1993 site-wide emissions. More detailed information on emission estimates is provided in Lazaro et al. (1996). As indicated in table I.4.5.2.2.1–2, estimated air pollutant emissions due to NIF operation at SNL are well below 1 t/yr (1.1 tons/yr) except for nitrogen dioxide, which is about 2 t/yr (2.2 tons/yr). Estimated air pollutant emissions from NIF operations would constitute increases over SNL 1993 emission levels, ranging from an increase of 5.3 percent for PM_{10} to 227 percent for carbon monoxide. Existing ambient concentrations for these pollutants (see section I.4.5.1.2.2, table I.4.5.1.2.2–1) are well below the ambient air quality standards except for the Albuquerque County 8-hour standard for carbon monoxide. The additional emission of 0.52 t/yr (0.57 ton/yr) carbon monoxide from NIF operations might pose a problem in attainment of this standard.

SNL must comply with the Albuquerque-Bernalillo County Air Quality Control Board (1995) regulations. Construction activities would require a permit because 0.30 ha (0.74 acre) of land surface would be disturbed. As part of the permit, SNL would have to specify mitigation measures that would prevent the escape from the site of airborne particulate matter that would have more than 10 percent opacity relative to the surrounding background.

Installation of NIF external combustion units (boilers) would require a county permit before construction (Regulation No. 22). Gas-fired boilers with rated heat input greater than 105,600 MJ/hr (100 million Btu/hr) but not over 264,000 MJ/hr (250 million Btu/hr) are limited to New Source Performance Standard nitrogen oxides (NOx) emissions from 43 to 86 ng/J, depending on the heat release rate, which is a function of the furnace volume (40 CFR 60.44b). There are no New Source Performance Standard emission limits for gas-fired boilers with a rated heat input at or less than 105,600 MJ/hr (40 CFR 60.40c). VOC emissions without

TABLE I.4.5.2.2.1–2.—*Annual Emission Increases with National Ignition Facility Operation at Sandia National Laboratories*

Pollutant	1993 Emissions[a] (t/yr)	Projected National Ignition Facility Emissions[b] (t/yr)	1993 Emissions with National Ignition Facility (t/yr)	NIF Percent of 1993 Emissions
Particulate matter [c]	3.76	0.20	3.96	5.3
Volatile organic compound[d]	1.65	0.57	2.22	34
Carbon monoxide	0.23	0.52	0.75	227
Nitrogen dioxide	1.07	2.15	3.22	201
Sulfur dioxide	0.07	0.04	0.11	50
Lead	NA	Negligible	NA	Negligible

[a] Based on steam plant and stand-by steam plant emissions (see Lazaro et al. 1996 for details).

[b] Emissions based on site estimated natural gas external combustion, diesel internal combustion, and VOC solvent cleaning (0.5 t/yr [0.55 ton/yr]) (see table I.4.1.2.2–1) and emission factors (EPA 1995c; Lazaro et al. 1996).

[c] Reported as total suspended particulate, assumed equivalent to particulate matter less than or equal to 10 micrometers.

[d] Reported as total organic hydrocarbons for steam plant and hydrocarbons for stand-by steam generators, assumed equivalent to VOCs.

Note: NA - not available.

Source: EPA 1993; SNL 1994.

controls would be limited to less than 45.4 kg (100 lb) in any single 24-hour day or 4.54 kg/hr (10 lb/hr) (Regulation No. 11.07). Additional regulatory information is presented in section I.5.2.

I.4.5.2.2.2 *Acoustics*

During site clearing for NIF at the SNL site, noise from construction equipment would increase the average daytime outdoor sound level by 1 dB at the location of the nearest residence. The point modeled is 1,864 m (6,116 ft) north-northwest of NIF. The average sound level at this point would be expected to increase from 64 dBA to 65 dBA during hours that clearing equipment would be operating. The CNR rank, adjusted for the estimated preexisting background level and for temporal and conceptual characteristics of the sound, is expected to be "A." Noise with CNR ranks "A" through "D" is generally considered to be acceptable, with "A" representing essentially no impacts. At the "A" level, the Modified CNR method predicts no complaints from the public. The noise would occur only over a period of approximately one month and only during daylight hours.

The average outdoor daytime sound level at the nearest laboratory building would not be expected to increase. The existing average daytime sound level at this point is estimated to be 64 dBA. The adjusted CNR rank for the resulting sound is "A."

The average daytime sound level at the residential area approximately 1.6 km (1 mi) west of the construction site would not be expected to increase. The existing average daytime sound level at this point is estimated to be 63 dBA. The adjusted CNR rank for the resulting sound is "A." This sound level is not expected to result in complaints from residents in the area.

These noise level estimates are based on the assumptions given in Lazaro et al. (1996). It is possible that actual noise levels could be lower or higher than the estimates.

I.4.5.2.3 Water Resources

About 2.95 MLY (0.78 MGY) of water would be required for NIF construction (LLNL 1995b). Water requirements for NIF operations (152 MLY [40 MGY]) would increase the water use at SNL by 11 percent. Wastewater discharge would be expected to increase by about 18 MLY (4.7 MGY), which is less than 2 percent of the current wastewater volume of 1,280 MLY (336 MGY) (Wheeler 1995c). Agreement with Kirtland Air Force Base and the city of Albuquerque would have to be reached to obtain additional water supply and to discharge additional wastewater.

The proposed location for NIF has minimal flooding potential because it is outside the 500-year floodplain of Tijeras Arroyo (figure I.4.5.1.3–1) (SNL 1995b).

I.4.5.2.4 Biotic Resources

I.4.5.2.4.1 *Terrestrial Resources*

NIF (including the temporary construction laydown area) at SNL would be constructed within 10.5 ha (25.9 acres) of previously disturbed grassland habitat. The general types of impacts that could result from NIF construction at SNL would be similar to those discussed for LLNL (section I.4.1.2.4).

I.4.5.2.4.2 *Wetlands and Aquatic Resources*

The proposed NIF location at SNL does not contain, nor is it located near, any wetlands or surface water resources. Therefore, construction and operation of NIF at SNL would not be expected to adversely affect such resources.

I.4.5.2.4.3 *Rare, Threatened, and Endangered Species*

The only impacts to rare, threatened, or endangered species that might occur from construction of NIF at SNL would be displacement or avoidance of the NIF location because of human presence and noise. No impacts from operation of NIF would be anticipated.

I.4.5.2.5 Cultural and Paleontological Resources

Construction and operation of the proposed NIF would have no effect on archaeological sites or historic structures that are listed on or eligible for the NRHP, important paleontological remains, or Native American cultural resources.

I.4.5.2.6 Socioeconomics

Construction and operation of NIF at SNL would have a minor impact on the socioeconomic conditions in the economic study region and ROI described in section I.4.5.1.6. This is because the SNL is located in a somewhat diverse regional economy with extensive inter- and intraregional, national, and global economic interactions and linkages. Also, because the NIF partnership includes representatives of government, industry, and the academic sector throughout the United States, procurement and investment would be dispersed over a number of different regions, dampening the concentration of economic effects of the program.

The following sections describe the effects of construction and operation of NIF on the host region's economy and employment, and on population, housing, public finances, public services, and local transportation in the ROI.

I.4.5.2.6.1 *Regional Economic Impacts*

Slight changes in employment and economic activity levels in the economic study region would occur from local spending of employee wages, procurement of goods and services including construction materials, and other local investment associated with constructing and operating NIF. In addition to creating new jobs (direct) at the site, indirect job opportunities, such as community support services, would also be created in the economic study area as a result of these new direct jobs. The total new jobs created (direct and indirect) would contribute slightly to unemployment reduction and increased income and economic output in the regional economy during construction and operation of NIF. Table I.4.5.2.6.1–1 summarizes the potential impacts to the regional economy if NIF were located at SNL. Construction of NIF at SNL would result in a peak of more than 280 direct jobs in 1998. This construction-related procurement would indirectly create more than 1,490 jobs in the economic study area. Employment for operation would begin phasing in as construction neared completion. Direct employment related to operations is estimated at 330, with more than 340 indirect jobs created throughout the economic study area. As a result of constructing and operating NIF, the baseline compounded average annual growth rate from 1995 to 2003 would increase by 0.02 percentage points.

Peak earnings associated with the 280 direct jobs created in 1998 are projected at approximately 16.4 million dollars. Construction-related procurement would indirectly create more than 24 million dollars in regional earnings. Direct earnings related to operations are projected to reach nearly 14 million dollars, with 7.3 million dollars in indirect earnings added to the regional economy.

I.4.5.2.6.2 *Population and Housing*

Construction. Population in-migration resulting from NIF construction phase demands would peak in 1998 with a projected cumulative total of 3,065 people moving into the ROI (table I.4.5.2.6.1–1).

This population increase would result in demand for an additional 1,120 housing units in the ROI. Baseline projections of the SNL ROI housing market from 1996 (NIF construction start date) through 1998 indicate that nearly 54,000 housing units would be available. NIF-related demand for approximately 1,120 housing units in 1998 in the ROI would absorb approximately 5 percent of the vacant housing supply in the ROI. NIF would generate little demand for new housing construction because of the number of vacant housing units within the SNL region and the proximity of SNL to many communities in the Middle Rio Grande Valley that could provide both temporary and permanent housing for in-migrating workers. Most of this housing demand would be temporary and would primarily affect the renter segment of the ROI housing market.

Operations. Population in-migration resulting from NIF operation phase demands could result in an additional 660 people moving into the ROI. While the demand for housing would be longer term relative to construction, no perceptible strain on the market is expected, assuming that the general conditions associated with the housing market continue.

I.4.5.2.6.3 *Public Finance*

Construction. Given the anticipated population and economic growth associated with NIF during the construction phase, fiscal balances (revenues and expenditures) would be expected to increase for all the

TABLE I.4.5.2.6.1-1.—*Potential Socioeconomic Impacts in the Sandia National Laboratories Area*

Parameters	NIF Alternative Change Over Reference Baseline		Reference Baseline	
	Peak Construction 1998[a]	Operations 2003[b]	1996 to 2002[a]	2003[b]
Regional Employment				
Direct jobs	280	330		
Indirect jobs	1,490	340		
Total jobs	1,770	670	6,870 additional jobs projected annually	6,895 additional jobs projected
Regional Aggregate Earnings[c]				
Direct earnings	16.44	13.81		
Indirect earnings	24.38	7.30		
Total earnings	40.82	21.11		
Regional Population Migration				
ROI in-migrating population	3,065	660		6,100 people
Regional Housing Demand				
Number of housing units in the ROI	1,120	240	23,600 vacant housing units (average annual)	25,200 vacant housing units
Local Transportation				
Number of trips generated at site per day	538	630		
Public Finance				
Percent change over 1995 fund balance (Bernalillo County)	0.06	0.01	NA	NA
Public Services				
Change in service demand				
Police[d]	7	2	1,131[e]	1,226
Fire[d]	3	1	548[e]	594
General[d]	37	11	7,592[e]	8,226
Physicians[f]	10	2	2,079[e]	2,253
Teachers[f]	24	5	4,895[e]	5,303

[a] Construction period would be 1996 to 2002, with peak construction projected to occur in 1998.
[b] Operating period would be 2003 to 2033, with impacts throughout the period projected to remain stable.
[c] Regional earnings are millions of constant 1994 dollars.
[d] Albuquerque.
[e] Projected 1998 fund balances for Public Finances, and projected 1998 level of service (LOS) for public services.
[f] Bernalillo County.
Source: Model results.

jurisdictions within the ROI. Short-term fiscal impacts would peak during 1998 and would then decline as construction neared completion in 2002. Since the largest percentage of socioeconomic impacts are expected to occur in Bernalillo County and the city of Albuquerque (assuming current residential patterns), these jurisdictions would experience the greatest fiscal impacts in the ROI (table I.4.5.2.6.1–1).

Operations. The increase in population and economic growth as a result of NIF operations would increase fiscal balances for all counties within the ROI, with the greatest impact in Bernalillo County and the city of Albuquerque. Fiscal impacts are projected to remain stable from the initial impact in 2003 through the duration of NIF operations.

I.4.5.2.6.4 *Public Services*

By 1998, Albuquerque would require 24 additional teachers and 10 additional doctors to maintain its current level of service. By 2003, when operations would start, 5 additional teachers and 2 additional doctors would be required over baseline conditions to maintain the current level of service.

I.4.5.2.6.5 *Local Transportation*

In 1995, SNL employed approximately 8,500 persons. Direct employment generated by NIF at SNL for the life of the project (1996-2033) would range from a minimum of 21 new jobs in 2001 to a maximum of 280 new jobs in 1998. The 280 direct jobs in 1998 could generate up to 538 new trips daily on SNL access roads (table I.4.5.2.6.1–1). Many roads near SNL have reached capacity and experience some congestion. Any additional trips generated by NIF would have the potential to aggravate the existing congestion on SNL access roads, particularly on Eubank, Gibson, Wyoming, and Louisiana Boulevards (table I.4.5.2.6.5–1).

A peak of approximately 1,490 new indirect jobs in 1998 could affect traffic flow within the Albuquerque region, depending on where these jobs are located. However, if the new indirect jobs associated with operation of NIF were sufficiently dispersed, the road network in the Albuquerque metropolitan area would likely be able to handle additional traffic generated by indirect jobs associated with NIF.

TABLE I.4.5.2.6.5–1.—*Future Traffic Impacts from National Ignition Facility Project on Sandia National Laboratories Access Roads*

Route	From	To	Estimated 1995 AADT	Estimated Background and Peak Project Year AADT (1998)	Estimated Percent Change in AADT[a] (%)	Estimated 1995 LOS	Estimated Background and Peak Construction Year LOS (1998)
Broadway Blvd	Gibson Blvd	NMSR 47	13,006	13,650	5	A	A
Eubank Blvd	I-40 in Albuquerque	Gibson Blvd	19,232	19,700	2	B	B
Gibson Blvd	I-25 in Albuquerque	Louisiana Blvd	46,213	47,400	3	E	E
Louisiana Blvd	Gibson Blvd	I-40 in Albuquerque	33,484	34,300	2	C	D
Wyoming Blvd	I-40 in Albuquerque	Kathryn Ave	39,641	40,600	2	D	D

[a] Between 1995 and Peak Construction Year.

Note: AADT - annual average daily trips; LOS - level of service; NMSR - New Mexico state route.

Source: DOE 1993a.

I.4.5.2.6.6 *Environmental Justice*

For the region within 80 km (50 mi) of SNL, both minorities and low-income populations constitute smaller proportions of the population than in New Mexico as a whole (section I.4.5.1.6.5). Thus, no environmental justice issues associated with regional impacts have been identified.

Neither minorities nor low-income persons are clustered disproportionately in the local vicinity of the SNL site (section I.4.5.1.6.5). Thus, local area impacts from the construction and operation of NIF would not disproportionately affect either minority or low-income populations.

I.4.5.2.7 Radiation and Hazardous Chemicals

This section describes potential radiological and hazardous chemical impacts resulting from normal operations and postulated accidents at NIF at SNL. Methods, data, and assumptions used in estimating impacts are presented in Lazaro et al. (1996).

I.4.5.2.7.1 *Normal Operations*

The general public surrounding the SNL site and workers at SNL might be exposed to small quantities of radionuclides released and radiation emitted from routine NIF operations; however, the expected levels of radioactive releases and radiation emissions are well within regulatory limits. No impacts from hazardous chemicals should occur because only minute quantities of hazardous VOCs are expected to be emitted during routine NIF operations. No impacts are expected from routine transportation of tritium targets because there would be no detectable levels of radiation outside the packages carrying the targets. Table I.4.5.2.7.1–1 summarizes the potential impacts of radiation exposures for the Conceptual Design Option and the Enhanced Option for NIF operations at SNL.

Impacts to the Public. For the Enhanced Option, the estimated radiation dose to a maximally exposed member of the public located about 1.9 km (1.2 mi) north of NIF is 0.004 mrem/yr, which is much less than the dose limit of 100 mrem/yr resulting from all pathways combined (DOE 1990). The likelihood of the maximally exposed individual contracting a fatal cancer is 1 in 17 million for the entire operational life of NIF (dose/yr x 30 yr x fatal cancer risk factor of 5×10^{-4}/rem). The estimated radiation dose to the surrounding public is 0.2 person-rem/yr; no cancer fatalities would be expected to occur in the public for the entire NIF operations at SNL.

TABLE I.4.5.2.7.1–1.—***Potential Radiological Impacts from Normal Operations of the National Ignition Facility at Sandia National Laboratories***

Receptor	Conceptual Design Option	Enhanced Option
Maximally Exposed Individual		
Dose (mrem/yr)	0.001	0.004
Percent of natural background	3×10^{-4}	0.001
30-year fatal cancer probability	2×10^{-8}	6×10^{-8}
Population Within 80 Km		
Dose (person-rem/yr)	0.07	0.2
Percent of natural background	3×10^{-5}	9×10^{-5}
30-year fatal cancers	0	0
Workers Onsite		
Dose (person-rem/yr)		
Non-NIF workers	0.02	0.08
NIF workers	10	10
30-year fatal cancers	0	0

Source: Model results.

For the Conceptual Design Option, radiation impacts are estimated to be about one-third of those for the Enhanced Option. No health effects would result.

Impacts to Workers. In addition to potential exposure to radionuclides, the general SNL workers outside NIF could be exposed to direct radiation resulting from high-yield experiments at NIF. For the Enhanced Option, the estimated radiation dose to these non-NIF workers at SNL is 0.08 person-rem/yr. No cancer fatalities would be expected to occur in workers for the entire NIF operations at SNL. For the Conceptual Design Option, radiation impacts are estimated to be about one-third the impacts from the Enhanced Option but still carry no risk of adverse health effects.

Potential radiation exposures inside NIF would be kept as low as reasonably achievable through facility design and administrative controls. The design objective of NIF is to keep the individual radiation worker dose to less than 500 mrem/yr. On average, it is estimated that a NIF worker would receive approximately 30 mrem/yr. No adverse health effects to workers inside NIF would be expected at this exposure level.

I.4.5.2.7.2 *Postulated Accidents*

Radionuclides and hazardous chemicals could be released from accidents postulated at NIF and during the transportation of tritium targets. Tables I.4.5.2.7.2–1 and I.4.5.2.7.2–2 summarize estimated impacts to the public and workers from postulated accidents. A description of each accident scenario evaluated is provided in Lazaro et al. (1996).

TABLE I.4.5.2.7.2–1.—*Potential Radiological Impacts Resulting from Postulated Bounding Accident Involving the National Ignition Facility at Sandia National Laboratories*

Receptor	Conceptual Design Option	Enhanced Option
Maximally Exposed Individual		
Dose (rem)	0.07	0.1
Fatal cancer probability	$4x10^{-5}$	$6x10^{-5}$
Risk (cancer fatalities/yr)	$7x10^{-13}$	$1x10^{-12}$
Population Within 80 Km		
Dose (person-rem)	1,100	1,800
Fatal cancers	0	1
Risk (cancer fatalities/yr)	$1x10^{-8}$	$2x10^{-8}$
Workers Onsite		
Dose (person-rem)	20	33
Fatal cancers	0	0
Risk (cancer fatalities/yr)	$2x10^{-10}$	$3x10^{-10}$

Source: Model results.

<u>Radiological Impacts</u>

Impacts to the Public. The public could be exposed to radionuclides released from a postulated accident at NIF. The bounding accident assumes that an earthquake would occur at the time of a maximum-yield experiment with an accidental release frequency of $2x10^{-8}$/yr. For the Enhanced Option, the estimated radiation dose to the maximally exposed member of the public is 0.1 rem. The likelihood of the maximally exposed individual contracting a fatal cancer from this exposure would be 1 in 17,000. The estimated radiation dose to the surrounding public is 1,800 person-rem. At this level of dose, one cancer fatality would be expected within the surrounding population if the accident were to occur. However, as indicated in table I.4.5.2.7.2–1, the actual risk of radiation-caused cancer fatalities from the postulated accident at SNL is essentially zero when the extremely low probability of the accident occurring during NIF operations is taken into account. The risk is the product of the estimated radiation dose, fatal cancer risk factor of $5x10^{-4}$/rem, and accident release frequency of $2x10^{-8}$/yr.

For the Conceptual Design Option, estimated radiation impacts would be about one-half the impacts from the Enhanced Option. No cancer fatalities would be expected to occur in the public if the postulated accident occurred at NIF.

Impacts to Workers. For the Enhanced Option, the estimated radiation dose to all workers at SNL is 33 person-rem. No cancer fatalities would be expected to occur among workers following the postulated accident at SNL. For the Conceptual Design Option, the estimated radiation impacts are about half the impacts from the Enhanced Option. No adverse health effects would be expected to result. The risk of radiation-caused cancer fatalities among workers would essentially be zero considering the extremely low potential for the postulated accident to actually occur. SNL has a comprehensive emergency plan, which would be expanded to incorporate NIF to ensure protection of workers in case of an accident or natural disaster.

<u>Transportation Impacts</u>. Radiological impacts associated with the transportation of tritium targets would result from a release of tritium into the environment following a transportation accident. Because tritium is a low-energy beta emitter with no associated gamma rays, there would be no radiological risks associated with incident-free (routine) transportation operations. The potential radiological impacts of transporting tritium targets were calculated for truck and air travel. It was assumed that trucks would be used to transport the tritium targets from the manufacturing sites to the nearest major airport and that cargo aircraft would be used to

TABLE I.4.5.2.7.2-2.—*Potential Radiological Risks and Consequences of Transporting Tritium Targets from Manufacturing Facilities to Sandia National Laboratories*

Manufacturing Facility	Conceptual Design Option	Enhanced Option
General Atomics		
Dose risk (person-rem/yr)	1.1×10^{-6}	8.9×10^{-6}
Fatality risk (cancer fatalities/yr)	6×10^{-10}	4×10^{-9}
Nonradiological accidents[a] (fatalities/yr)	5×10^{-4}	1×10^{-3}
Nonradiological vehicular emissions (fatalities/yr)	8×10^{-4}	2×10^{-3}
Lawrence Livermore National Laboratory		
Dose risk (person-rem/yr)	1.2×10^{-6}	9.4×10^{-6}
Fatality risk (cancer fatalities/yr)	6×10^{-10}	5×10^{-9}
Nonradiological accidents[a] (fatalities/yr)	6×10^{-4}	1×10^{-3}
Nonradiological vehicular emissions (fatalities/yr)	4×10^{-4}	9×10^{-4}
Los Alamos		
Dose risk (person-rem/yr)	1.5×10^{-6}	1.2×10^{-5}
Fatality risk (cancer fatalities/yr)	8×10^{-10}	6×10^{-9}
Nonradiological accidents[a] (fatalities/yr)	2×10^{-3}	4×10^{-3}
Nonradiological vehicular emissions (fatalities/yr)	2×10^{-3}	4×10^{-3}
Savannah River		
Dose risk (person-rem/yr)	1.4×10^{-6}	1.1×10^{-5}
Fatality risk (cancer fatalities/yr)	7×10^{-10}	6×10^{-9}
Nonradiological accidents[a] (fatalities/yr)	5×10^{-4}	1×10^{-3}
Nonradiological vehicular emissions (fatalities/yr)	2×10^{-4}	5×10^{-4}
University of Rochester		
Dose risk (person-rem/yr)	1.6×10^{-6}	1.2×10^{-5}
Fatality risk (cancer fatalities/yr)	8×10^{-10}	6×10^{-9}
Nonradiological accidents[a] (fatalities/yr)	3×10^{-4}	7×10^{-4}
Nonradiological vehicular emissions (fatalities/yr)	2×10^{-4}	5×10^{-4}
Maximum Consequence Accident		
Population[b,c]		
Dose (person-rem)	0.33	3.3
Fatal cancers	2×10^{-4}	2×10^{-3}
Maximally Exposed Individual[b,d]		
Dose (rem)	1.2×10^{-4}	1.2×10^{-3}
Fatal cancer probability	6×10^{-8}	6×10^{-7}

[a] Collective population fatalities were calculated for 145 shipments (Conceptual Design Option) and 335 shipments (Enhanced Option). For example, a reported value of 4×10^{-3} fatalities suggests that no fatalities are expected for the proposed action. However, one single fatality out of the entire affected population might be expected over the course of 250 years if the same number of shipments were to continue for that length of time.

[b] The most severe accidents assumed that 100 percent of the target tritium would be released in an oxide form during an accident. Accident consequence results were determined using the RISKIND computer program which is described in Yuan et al. 1993. Stable weather conditions (Pasquill Stability Class F) with a wind speed of 1 m/s (2.2 mph) were assumed.

[c] The maximum consequences would result from an accident occurring in an urban environment. The population was assumed to extend at a uniform density of 3,861 persons/km^2 (10,000 persons/mi^2) to a radius of 80 km (50 mi) from the accident site. The population exposure pathways for urban environments included inhalation and resuspended inhalation. Urban environments were not assumed to produce food for local use or export, hence no ingestion dose was included.

[d] The maximally exposed individual was assumed to be at the location of maximum exposure. The location of the maximally exposed individual was assumed to be 380 m (1,247 ft) from the accident under stable weather conditions. Individual exposure pathways included acute inhalation during passage of the plume. No ingestion dose was considered.

Note: The transportation risk assessment assumed that 100 percent of the tritium targets would be manufactured and transported to NIF from each site. In practice, tritium targets would be produced and transported from more than one manufacturer. The transportation risk assessment was performed for offsite transportation only. Transportation risks from onsite transport of tritium targets were assumed to be negligible compared to risks from offsite transportation.

Source: Model results.

transport the tritium targets to Albuquerque International Airport. After arriving at the Albuquerque airport, the targets would be transferred to a truck for shipment to NIF at SNL.

Table I.4.5.2.7.2–2 summarizes the risks associated with the transportation of tritium targets from each of the tritium manufacturing facilities to NIF at SNL. Radiological risk from transportation activities is defined as the product of the accident consequence (dose) and the probability of the accident occurring, and was calculated by considering a wide range of accidents, from high-probability, low-consequence events to low-probability, high-consequence events (see Lazaro et al. 1996). Latent cancer fatality risks were obtained by multiplying the dose risk by 0.0005 latent cancer fatalities per person-rem (ICRP 1991). Estimated latent cancer fatality risks range from $6x10^{-10}$ to $6x10^{-9}$ per year for all cases.

Nonradiological impacts associated with the ground transport of tritium targets were calculated for both routine (incident-free) and accident conditions. Nonradiological population risks for routine operations were calculated by multiplying the distance traveled by truck in urban population density zones by a risk factor for latent mortality from pollutant inhalation (Rao et al. 1982). Nonradiological population risks resulting from vehicular accidents were calculated in a similar manner by multiplying the state-specific accident fatality rate by the distance traveled by truck in the state.

The maximally exposed individual and population doses were calculated for a transportation accident involving the release of the entire tritium cargo (assumed to be five tritium targets). Radiological impacts resulting from a potential maximum-consequence accident were assessed for a general population located in an urban population density zone. The maximally exposed individual was assumed to be exposed unshielded as the plume passed at a distance resulting in the largest dose to the individual. Radiological consequences were assessed for worse-case weather conditions (Pasquill Stability Class F) for both the collective population and the maximally exposed individual. For assessment purposes, it was assumed that the entire tritium cargo would be released to the environment in oxide form. The estimated number of latent cancer fatalities from the maximum-severity transportation accident was calculated by multiplying the population committed effective dose equivalent by 0.0005 latent cancer fatalities per person-rem (ICRP 1991). Table I.4.5.2.7.2–2 summarizes the impacts of a maximum-consequence accident during transportation of tritium targets.

Hazardous Chemical Impacts. A number of chemical accidents (including one caused by an aircraft crash) were considered in evaluating potential impacts on members of the public or nearby workers at NIF (Lazaro et al. 1996). The four accidents likely to have the greatest impacts were selected for more detailed study. These four accident scenarios are as follows:

- A mercury release from the ignitron switches
- A combined alumina/silica release from the target chamber
- A carbonyl fluoride release from the optics treatment area
- A hydrogen fluoride release from the optics treatment area

A modeling study was conducted for each of the four release scenarios. More details, including predicted concentrations, are provided in Lazaro et al. (1996). The modeling study applied a dispersion model to each of the releases and used a health criterion representative of acute impacts from an exposure that might happen once in a lifetime. The health criterion (ERPG-2 level) was the concentration below which, if exposure occurred for an hour, the exposed individual could still avoid irreversible health effects by taking emergency action. The results of the modeling yielded the following conclusions:

- The threat zone from each of the four accidents would not extend to the boundary with the public under either typical or extreme meteorological conditions.
- Nearby buildings and personnel outside would be at risk if any of the four accidents occurred. The assumptions were made that the release would not be inhibited by walls of NIF Laser and Target Area Buildings and that the wind

would take the plume away from the building. The distances beyond which concentrations would fall below the ERPG-2 level from each of the accidents are as follows:

- Mercury scenario—237 m (778 ft) for both the Conceptual Design and Enhanced options
- Alumina/silica scenario—174 m (571 ft) for the Conceptual Design Option and 231 m (758 ft) for the Enhanced Option
- Carbonyl fluoride scenario—70 m (230 ft) for both the Conceptual Design and Enhanced options
- Hydrogen fluoride release—101 m (331 ft) for both the Conceptual Design and Enhanced options

The hazard zones for the Conceptual Design Option and Enhanced Option are the same for accidents 1, 3, and 4. These zones are for persons outdoors. People in nearby buildings would likely be protected because the release (typically lasting for 15 minutes) would pass by the buildings with little infiltration. Typically, the concentrations experienced inside single-story structures are a factor of five or more lower than the outdoor levels. Personnel in the Laser and Target Area Building and those outside in the immediate vicinity might be affected.

I.4.5.2.8 Waste Management Impacts

This section evaluates wastes generated by NIF that might affect current waste management practices at SNL during construction, normal operation, and the ultimate decommissioning of NIF if it were located at SNL.

I.4.5.2.8.1 *Waste Generation and Management During Construction and Operation*

The contractor would be required to remove construction-related wastes, including fill generated by site foundation work, from SNL for disposal by the contractor.

During operation, various low-level, mixed, hazardous, and nonhazardous wastes would be generated at NIF. The same waste-handling methods would be used for both the Conceptual Design Option and the Enhanced Option. Although total waste quantities would be somewhat higher for the Enhanced Option, no changes in handling methods would be necessary. Table I.4.1.2.8.1–2 (section I.4.1.2.8.1) lists the quantities of wastes that would be generated (by category) for both the Conceptual Design Option and Enhanced Option, and the following sections describe the proposed disposition of those wastes.

Low-Level Waste. Onsite disposal of LLW at SNL was terminated in December 1988. Currently, all newly generated LLW is stored temporarily above ground at generator sites or in transportation containers at the inactive Technical Area III disposal site.

The Radioactive and Mixed Waste Management Facility at SNL was completed in 1990. Because of changes in regulations during construction, some facility upgrades are required before operations can begin. This 730-m^2 (7,858-ft^2) facility will serve as a centralized packaging and storage facility for LLW and LLW-mixed waste that meet the facility waste acceptance criteria. It is projected that the Radioactive and Mixed Waste Management Facility will be operational in 1996.

Additionally, SNL has an approved program for the NVO-325 "Nevada Test Site Defense Waste Acceptance Criteria, Certification and Transfer Requirements." All NIF solid LLW could be added to the program and disposed of at the NTS LLW disposal site. Liquid radioactive waste could be solidified and disposed of at NTS as well.

Mixed Waste. As was the case for LLW, onsite disposal of mixed waste at SNL was also terminated in December 1988, and all newly generated mixed wastes are stored temporarily above ground at generator sites or in transportation containers at the inactive Technical Area III disposal site. The Radioactive and Mixed Waste Management Facility is expected to be operational in 1996 and would be able to accept NIF-generated mixed wastes. When the treatment of the hazardous portion of the mixed waste is not feasible, the waste would be stored onsite until DOE determined the appropriate disposal option for mixed waste.

Hazardous Waste. All RCRA-regulated wastes generated by SNL (except mixed waste) are transported offsite for disposal at EPA-permitted treatment, storage, and disposal facilities. Chemical wastes generated by SNL R&D activities are collected from generator locations, segregated according to DOT hazard class, and transported to the RCRA-permitted Hazardous Waste Management Facility for storage. At Hazardous Waste Management Facility, the wastes are consolidated and packaged according to EPA-permitted treatment, storage, and disposal facilities or recyclers for final disposition. Packaged wastes are transported by EPA-permitted carriers to EPA-permitted treatment, storage, and disposal facilities or recyclers for final disposition. The same procedure would be used for NIF-generated hazardous wastes.

During 1993, 484 t (533 tons) of chemical waste were managed by SNL's chemical waste management program, including 141 t (155 tons) of RCRA-regulated hazardous waste and 343 t (378 tons) of nonregulated industrial waste. NIF-generated hazardous waste would not adversely affect SNL's capacity to manage this waste stream.

Nonhazardous Wastes. SNL nonhazardous wastes are managed by the Waste Operations Department of the Environmental Operations Center and are disposed of at the solid waste landfills of two local cities of Albuquerque and Rio Rancho. NIF-generated, nonhazardous waste streams would be incorporated into the existing procedures.

Possible Waste Minimization During Operation. A formal Waste Minimization and Pollution Prevention Awareness Program was initiated in 1989. The program addresses waste reduction activities for all media (air, water, and solid) for nonhazardous, hazardous, mixed, and radioactive wastes. The program's objective is to foster a philosophy to conserve resources and make pollution prevention an integral part of design, operations, and maintenance.

If NIF were to be sited at SNL, the Waste Minimization and Pollution Prevention Awareness Program staff would work with NIF design and operations staff to identify opportunities for waste minimization and pollution prevention. Strategies for achieving these opportunities would be designed by the program staff in conjunction with NIF staff.

Impacts on Existing Waste Management Capabilities at SNL. Data on the estimated waste generation by NIF (table I.4.1.2.8.1–2) and on current waste management capacities at SNL have been used to evaluate the capability of the existing SNL facilities to undertake the various waste management tasks associated with NIF. For reference, table I.4.5.1.8–1 lists the current waste management capacity at SNL, and table I.4.5.2.8.1–1 shows the anticipated impact of NIF wastes on that capacity. Table I.4.5.2.8.1–2 compares the NIF waste generation rate to the annual handling/treatment capacity at SNL.

As discussed above, SNL waste management operations are focused around two facilities, the Hazardous Waste Management Facility for hazardous waste management, and the Radioactive and Mixed Waste Management Facility for radioactive and mixed waste management. All hazardous wastes are staged, processed, and packaged for shipment to RCRA-permitted commercial treatment, storage, and disposal facilities at the Hazardous Waste Management Facility. All mixed and radioactive wastes are currently stored at the generator sites throughout SNL or in transportation containers at SNL's inactive disposal site in Technical Area III. These wastes will be transferred to the Radioactive and Mixed Waste Management Facility when it is opened for operations. At the Radioactive and Mixed Waste Management Facility, LLW will be temporarily stored and then packaged for shipment to offsite disposal facilities to be selected by DOE. Mixed wastes will be processed and treated, then packaged for shipment to offsite facilities approved for either treatment or disposal.

I.4.5.2.8.2 *Waste Management at Sandia National Laboratories During National Ignition Facility Decommissioning*

NIF would be decommissioned after 30 years of operation. The major activated/contaminated components would be located in the target area, so decommissioning of this component poses the most complex operation. The procedures would be similar to those discussed in previous sections for NIF decommissioning at other candidate sites.

Decommissioning of NIF Laser. During decommissioning of the laser systems, the waste quantities

TABLE I.4.5.2.8.1–1.—*Impact of Estimated National Ignition Facility-Generated Waste on Waste Storage at Sandia National Laboratories*

Category	NIF-Generated Waste/Year (m^3)		Years to Fill Storage with NIF Flow Alone[a]		Is Existing or Planned Storage Capacity Adequate	
	Solid[b]	Liquid[b]	Solid	Liquid	Solid	Liquid
Low-Level						
Conceptual design total	2.98	0.60	$0.3x10^3$	NA[c]	Yes	Yes
Enhanced total	7.25	1.56	$0.1x10^3$	NA[c]	Yes	Yes
Mixed						
Conceptual design total	0.34	2.00	297	NA[c]	Yes	Yes
Enhanced total	0.88	4.98	114	NA[c]	Yes	Yes
Hazardous[d]						
Conceptual design total	8.0	2.3	NA[e]	NA[e]	NA[e]	Yes[f]
Enhance total	8.0	4.6	NA[e]	NA[e]	NA[e]	Yes[f]

[a] The following values for the densities of the materials were assumed: molecular sieves: density of diatomaceous earth (0.27 g/cm^3); personal protective equipment and wipes: density of paper (0.4 g/cm^3); pre- and high-efficiency particulate air filters: density of charcoal (1.8 g/cm^3); paper capacitors: density of paper (0.4 g/cm3); hardware from chamber: density of 50 percent aluminum and 50 percent stainless steel (5.3 g/cm^3).

[b] The total amount of the low-level waste was found by adding the values in the column "Cleaned" of table I.4.1.2.8.1–2 to the column "Low-Level" of the same table. The density of the debris shield was assumed to be the density of iron (7.87 g/cm^3). The density of the low-level liquid waste was assumed equal to 1.0 g/cm^3. The amount of the "cleaned" personal protective equipment and wipes/general cleaning was added to he solid low-level radioactive waste.

[c] All liquid low-level waste and mixed waste are currently stored temporarily at the site of generation. SNL is conducting treatability studies before applying for RCRA permit for treating and storage of liquid low-level waste and mixed waste.

[d] The values for the hazardous waste are the sum of Laser and Target Area Building and Optics Assembly Area values.

[e] Hazardous waste is stored temporarily and then shipped offsite to a commercial RCRA waste disposal facility.

[f] Temporarily stored, then shipped offsite to RCRA-permitted storage/disposal facility.

Note: NA - not applicable.

Source: Calculated from tables I.4.1.2.8–2 and I.4.5.1.8–1.

listed in table I.4.1.2.8.2–1 would be handled as discussed in the sections on hazardous, nonhazardous, radioactive, and mixed waste management above.

Decommissioning of NIF Target Area. The waste quantities listed in table I.4.1.2.8.2–2 from target area decommissioning would be handled as discussed in the sections on hazardous, nonhazardous, radioactive, and mixed waste management above. There are no special issues related to any waste topics, including tritium handling. All waste handling would be done in accordance with the waste management procedures outlined above. Quantities and dose rates listed in tables I.4.1.2.8.2–3 and I.4.1.2.8.2–4 do not present any special problems.

TABLE I.4.5.2.8.1–2.—*Comparison of National Ignition Facility Waste to Annual Treatment Capacity at Sandia National Laboratories*

Category	Ratio of NIF Generation to Annual Treatment Capacity	Treatment Capacity (m^3/yr)	Is Existing or Planned Treatment/Disposal Capacity Adequate
Low-Level			
Liquid			
Conceptual design total	NA	Included in mixed low-level	Yes
Enhanced total	NA		Yes
Solid			
Conceptual design total	NA	Included in mixed low-level	Yes
Enhanced total	NA		Yes
Mixed			
Liquid			
Conceptual design total	NA	Data not available	Yes
Enhanced total	NA		Yes
Solid			
Conceptual design total	NA	Data not available	Yes
Enhanced total	NA		Yes
Hazardous			
Liquid			
Conceptual design total	NA[a]	Data not available[a]	Yes[b]
Enhanced total	NA[a]		
Solid			
Conceptual design total	NA	9.1 kg/campaign[a]	Yes[b]
Enhanced total	NA		

[a] Treatment capacities are expanded to meet requirements.
[b] Shipped offsite to a RCRA-permitted storage/disposal facility.
Note: NA - not applicable.
Source: Calculated from tables I.4.1.2.8–2 and I.4.5.1.8–1.

I.4.6 No Action

Under the No Action alternative, NIF would not be constructed or operated. Without the facility, the missions to be accomplished by operation of NIF (sections I.2.2 and I.2.3) would be adversely affected. Any other course of action could have its own unique set of environmental impacts that would differ from those of NIF. Thus, while the No Action alternative would avoid the direct impacts of NIF, it might also result in other impacts. The nature and extent of such impacts would depend on the ultimate course of action taken to ensure the Nation's nuclear deterrent and cannot be analyzed at this time.

If NIF were not constructed and operated, the impacts of these activities would not occur at any of the alternative sites. Land use, air quality, noise, water resources, biotic resources, cultural and paleontological resources, radiological and hazardous chemical environments, and waste management would remain as described in the affected environment sections for each of the alternative sites (sections I.4.1.1, I.4.2.1, I.4.3.1, I.4.4.1, and I.4.5.1). Current land use would continue. There would be no changes in the visual environments. Other programs at the alternative sites would continue to generate air pollutants, use water, and produce wastes.

If NIF were not constructed and operated, a number of socioeconomic and operational impacts could occur at several of the candidate sites. At LLNL, the Nova Facility would continue to operate, but with a changed mission to support stockpile stewardship (section I.3.3). All NIF-dependent functions of the ICF program would be discontinued at LLNL, LANL, and SNL. For the purpose of this PSA, it was assumed that no NIF would directly result in the loss of approximately 100 full-time equivalent employees at LLNL, 20 employees at LANL, and 20 employees at SNL. Reductions in personal consumption expenditures by laboratory personnel and in program-related operational procurement expenditures would result in additional indirect effects on the regional economy surrounding each of these sites because the demand for capital investment, commodities, and services would decline. These additional indirect effects would include the loss of approximately 53 additional jobs in the economic study region for LLNL, 7 jobs in the economic study region for LANL, and 9 jobs in the economic study region for SNL. Overall, the loss of jobs as a result of NIF not being constructed would cause a decrease in projected average annual employment growth in the economic study region of the three candidate sites. Although the loss of jobs in the economic study region might lead to some out-migration from the ROI at each site under the No Action alternative, the extent of out-migration is not known. The impact of the No Action alternative on population, housing, public finance, and public services in the ROI at each site cannot, therefore, be estimated. The No Action alternative would slightly reduce the average number of daily trips to each site (100 at LLNL, 20 at LANL, and 20 at SNL).

No change in socioeconomic conditions would occur at NTS and NLVF under the No Action alternative. Baseline conditions would continue as described in sections I.4.3.1 and I.4.4.1.

I.4.7 Mitigation

I.4.7.1 *Summary of Mitigation Commitments*

The following section addresses specific mitigative measures that the candidate sites have enacted for any construction action, including potential NIF construction. While each of these mitigative measures may be minor, their overall combined contribution would significantly reduce impacts to the environmental resources of the candidate sites. The evaluations of environmental consequences of NIF construction and operation addressed in sections I.4.1.2, I.4.2.2, I.4.3.2, I.4.4.2, and I.4.5.2 are based on the assumption that the mitigative measures would be carried out if the proposed action was undertaken.

I.4.7.1.1 Biotic Resources

No more than 60 days before the start of construction at LLNL, a preconstruction survey for protected and sensitive biological resources would be conducted within the proposed NIF and laydown locations, as well as the access routes and bridge that would connect these locations. Exclusion or buffer zones would be established around any sensitive locations in these areas. Appropriate mitigation measures would be implemented to avoid or minimize potential adverse impacts to protected and sensitive resources, such as Federal- or state-listed species.

Reclamation plans for the staging area, bridge, and access road are to be developed. Reclamation activities would include removal of all temporary construction features, stabilization of soils to prevent erosion, and reseeding with appropriate plant species.

At LANL, an ecological studies team (see DOE 1995b) would be consulted for the following:

- To conduct a preconstruction site-specific survey
- To determine whether any raptor nesting sites were present in or around the construction area (if nesting sites were discovered, an ecological studies team would recommend spatial and/or temporal restrictions on construction activities)
- To approve all tree removal (live or snag)
- To recommend mitigation measures before construction disturbance
- To help determine plant species for revegetation activities

At LANL, all light sources during construction and operation of NIF would have to be arranged so that light is not directed toward LANL canyons in order to protect habitat that might be used by the Mexican spotted owl (Risberg 1995). Because fencing could affect wildlife movements, an ecological studies team would be contacted to determine whether fencing around NIF would need to be minimized.

At NTS, preconstruction surveys would be required to determine the occurrence of listed plant species in the area to be disturbed (DOE 1995c). Mitigative measures required for the desert tortoise would include (1) conducting surveys for the tortoise and removing any tortoises found in affected areas; (2) conducting periodic inspections and eventual backfilling, covering, or installing of tortoise-proof fencing around open construction trenches and excavations; and (3) reducing vehicle speed limits on site roadways (DOE 1995c).

I.4.7.1.2 Cultural and Paleontological Resources

No archaeological sites or historic structures currently listed on or eligible for the NRHP, or paleontological resources, are present within the areas proposed for NIF at the five candidate sites. Thus, mitigation measures would not be necessary.

I.4.7.2 Potential Mitigation

The candidate sites have committed to a broad spectrum of mitigative measures that would minimize adverse environmental impacts from the construction and operation of NIF. The following are additional mitigative measures that may be adopted at one or more of the candidate sites.

I.4.7.2.1 Land Use

During construction at the LLNL site, traffic should be monitored along Greenville Road between Interstate 580 and East Avenue. A road directly accessing the proposed site from Greenville Road could reduce traffic congestion if monitoring indicated a problem. If the option I staging area is selected, the temporary access road from Patterson Pass Road could also serve as access to NIF during operations. For NLVF, traffic on Commerce Avenue along the western edge of the installation and on Losee Road near the facility's south gate should be monitored during and after the construction phase. At all sites, construction traffic should be encouraged to avoid essential gates and other site access points during morning traffic peaks.

I.4.7.2.2 Visual Resources

Fugitive dust suppression techniques during the construction phase of the NIF project would be impacted. While landscaping could improve the visual quality of any buildings constructed for NIF, landscaping is particularly recommended for the proposed site at LANL. Tree removal on the proposed NIF location at LANL should be monitored to ensure that the fewest trees possible are taken.

I.4.7.2.3 Air Quality

Generation of fugitive particulate (PM_{10}) emissions (dust) during site clearing and facility construction could be mitigated with the use of appropriate dust control measures. With conventional dust control methods using water spray, an estimated 50 percent control can be achieved during earthmoving activities, and 60 percent control can be achieved for traffic on unpaved roads (EPA 1989). The addition of dust suppressants such as calcium to the water can decrease unpaved road traffic emissions by up to 90 percent of uncontrolled levels (Nalco 1987). Additives can also decrease earthmoving dust emissions by up to 65 percent (EPA 1989). Uncontrolled nitrogen oxide air pollutant emissions from gas- or liquid petroleum gas-fired external-combustion (boiler) sources can be reduced by best available control technology (for example, by use of boilers equipped with nitrogen oxide controls). Boilers above a specific size are required by regulation to install best available control technology, which defines the amount of reduction of nitrogen oxide emissions required.

The public should be notified in advance that elevated noise levels would occur during daylight hours for up to several months (depending on the candidate site selected) during the construction period.

I.4.7.2.4 Biotic Resources

To ensure compliance with the *Migratory Bird Treaty Act*, a determination should first be made as to whether protected migratory birds nest in the areas to be cleared for NIF (this activity would include conducting site surveys to locate any nests of migratory birds). If nests or eggs of migratory birds were present, the U.S. Department of the Interior would be consulted regarding the appropriate precautions that might be necessary during construction. This consultation should occur as far in advance of construction as practicable.

Additionally, the following mitigation measures might be needed:

- If migratory birds were nesting at the proposed NIF construction areas, clearing operations would be avoided during the breeding season, where practicable.
- To minimize disturbance of wildlife, construction workers would be prevented from entering undisturbed areas adjacent to any construction sites.
- The area around NIF (and the staging area at LLNL) would be revegetated with native plants, in keeping with the spirit of the Presidential Memorandum of April 26, 1994 (*Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds*).
- Construction crews would receive environmental briefings as appropriate to alert them to specific areas of concern and to explain the reasons for such concerns.
- Passive reminders (such as signs) to warn work crews to use only designated access roads or to inform them that they are working in an environmentally sensitive area should be considered (particularly at LANL and NTS). Passive reminders should also be considered for the option I staging area and its access road at LLNL to avoid potential impacts to wetlands in the Arroyo Las Positas. Use of temporary physical barriers (such as fencing) to remind crews to avoid short cuts across sensitive areas should also be considered.
- Construction traffic would be restricted to existing roads, whenever possible.
- Parking and equipment storage areas would be limited to as few designated sites as possible, in order to limit unnecessary disturbance of vegetation.
- Pre-construction surveys of the NIF location would be made to determine if any rare, threatened, or endangered species were present. If listed species are found, specific mitigation measures would be developed in conjunction with the U.S. Fish and Wildlife Service and/or appropriate state agencies entrusted with natural resources management authorities to minimize impacts to the species from construction of NIF.

I.4.7.2.5 Pollution Prevention and Waste Minimization During Operation

Several actions or technologies have been identified that, if successfully implemented, could significantly reduce or even eliminate certain forms of pollution or waste now projected for generation by NIF. In addition, some steps might be taken to reuse or recycle waste material. The proposed technology and procedures are briefly described here and in section I.4.1.2.8.1. That information is based on the assumption that various new methods proposed to minimize the waste streams would be successfully implemented. The data in table I.4.1.2.8.1–3 represent an optimistic lower limit of waste generation. Comparison of these projections with the data in table I.4.1.2.8.1–2 indicates that pollution and waste could be reduced significantly, that is, by a factor of 2 to 10. Some key aspects of the minimization plan relative to NIF components and operations are outlined below.

The life span of a molecular sieve could be extended if, during flushing, the tritium was captured at a low atmospheric pressure, increasing the tritium concentration. One method to accomplish this would be to flush the chamber at subatmospheric pressures. A second method would be to pump the tritium (following a NIF experiment) through liquid helium cryopanels.

The amount of scrap hardware requiring removal from the chamber could be minimized by using low-activation materials, minimizing the mass and volume of structures, and discouraging the use of temporary setups.

Installation of an oil-less vacuum-roughing pump system could eliminate 200 L (53 gal) of liquid mixed waste each year. Such pumps have become available only recently, and their suitability for use at NIF would be evaluated; however, their cost and dependability remain uncertain.

Cleaning of the debris shields with carbon dioxide pellets could remove the anti-reflective coating and particulate matter. This procedure, if successful, could significantly reduce or even eliminate the production of radioactive sodium hydroxide, which is currently listed as liquid mixed waste.

A large fraction of the general chemical waste from the Optics Assembly Building would involve the anti-reflective coating solution. One method for reducing this waste would be to distill the ethanol from the waste solution and reuse it as a cleaner.

Capacitors in the Laser and Target Area Building would be the predominant source of hazardous waste. This source could be reduced by purchasing units with a longer service life. This decision, however, would depend on the development and cost of longer-lasting capacitors.

In addition to reducing or eliminating the liquid LLW from cleaning the debris shield, carbon dioxide cleaning might also reduce solid LLW. Far fewer wipes would be needed for general decontamination purposes if a "general decontamination carbon dioxide station" were developed and functional. Such a system might also reduce other liquid LLW streams, as well as solid-mixed and liquid-mixed streams, because carbon dioxide could remove activated particulates, as well as tritium contamination, and eliminate the need for solvents.

I.4.8 Unavoidable Adverse Effects

Construction and operation of NIF at LLNL, LANL, NTS, NLVF, or SNL could result in adverse environmental impacts. The impact assessment sections (I.4.1.2, I.4.2.2, I.4.3.2, I.4.4.2, and I.4.5.2) have identified these potential adverse impacts along with mitigative measures (see section I.4.7) that could be implemented to either avoid or minimize these impacts. The remaining unavoidable residual adverse effects following mitigation are discussed below.

Depending on the site selected, up to 18.2 ha (45 acres) of land could be disturbed to construct NIF and provide additional supporting infrastructure and access roads (table I.3.6.1–1). Land requirements would represent less than 11 percent of the uncommitted land at each candidate site except at NLVF, where 56 percent (3.2 ha [7.9 acres]) of the uncommitted land would be required. In the areas disturbed for construction, soil erosion from wind and stormwater runoff would be minor.

Construction and operation of NIF would generate air pollutants that have the potential to exceed Federal and state ambient air quality standards and guidelines. Concentrations of particulate matter and TSPs are expected to be close to or exceed the 24-hour ambient PM_{10} and TSP standards during peak construction periods under dry and windy conditions. Such exceedances are not uncommon for large construction projects. Air pollutant concentrations during operation are expected to remain within Federal and state ambient air quality standards, except for 1-hour ozone concentrations at LANL and SNL, 1-hour nitrogen dioxide concentrations at LLNL, 1-hour carbon monoxide levels at SNL, and 24-hour PM_{10} at NTS.

For each of the candidate sites, use of water is unavoidable, but would not represent an adverse impact.

Loss of wildlife habitat within the disturbed areas would be unavoidable. However, only one percent or less of uncommitted lands at candidate sites with high-quality habitat (LANL and NTS) would be potentially disturbed by NIF construction. Additionally, the potential NIF locations at these sites are not critical habitat for threatened or endangered species and do not consist of ecotypes rare to the area. Construction of NIF would have some unavoidable adverse effects on biota. Larger and more mobile animals could move out of the construction areas to similar habitats nearby, but smaller, less mobile animals could be destroyed during land-clearing activities. Rare, threatened, or endangered species could be affected directly or indirectly by construction of NIF. Where potential exists for impacts on listed species, mitigation measures would be developed in consultation the U.S. Fish and Wildlife Service or the state's Department of Natural Resources.

No unavoidable adverse impacts to cultural resources would be expected at any of the NIF candidate sites.

Few unavoidable adverse impacts related to socioeconomic issues would occur in any of the ROIs for the NIF candidate sites. Burdens on community infrastructure would increase, but subsequent effects on the public finances of local governments in the ROI would be positive for the most part. Localized increases in traffic would result from construction and operation of NIF. No adverse, disproportionate environmental justice concerns would be expected at any of the candidate sites, except for a minor potential to impact minority populations in the ROI for NLVF.

Over the 30-year operational life of NIF, the public would be exposed to a very small dose of radiation (table I.3.6.1–1). No cancer fatalities would be expected to occur from exposures associated with routine NIF operations under either the Conceptual Design or Enhanced options. A radiological accident at NIF would not cause any cancer fatalities to the public, except possibly at NLVF and SNL. At NLVF, one death could occur from a maximum-release accident scenario under the Conceptual Design Option or two cancer deaths could occur for the maximum-release accident under the Enhanced Option. At SNL, one cancer death is calculated as possible for a maximum-release scenario under the Enhanced Option. However, because the chance of such an accident actually occurring is so low, the risk of such deaths is extremely unlikely. The cancer fatality risk associated with radiological exposure from an accident involving transport of the NIF tritium targets would range from $8x10^{-10}$ to $1x10^{-8}$; the nonradiological fatality risks associated with vehicular emissions and accidents are in the $1x10^{-3}$ to $1x10^{-4}$ range (table I.3.6.1–1).

Although each candidate NIF site would implement waste minimization techniques, the generation of additional low-level, hazardous, and nonhazardous wastes would be unavoidable. However, all candidate sites have current or planned capacity to handle wastes associated with NIF (although this would entail offsite shipment for some of the wastes for all sites but LANL) (table I.3.6.8–1).

I.4.9 Irreversible and Irretrievable Commitments of Resources

Resources that would be committed irreversibly or irretrievably during construction and operation of NIF include materials that could not be recovered or recycled and materials or resources that would be consumed or reduced to irrecoverable forms. Use of concrete, steel, fuel, power, and other materials would constitute an irreversible and irretrievable commitments of those resources (see table I.4.9–1). The use and consumption of these resources are believed appropriate and justified in terms of the national importance of the missions and objectives of NIF.

TABLE I.4.9–1.—*Irreversible and Irretrievable Commitments of Resources*

Resources	No Action	LLNL	LANL	NTS	NLVF	SNL
Construction Materials						
Concrete (m^3)	None	$5.3x10^4$	$5.6x10^4$	$5.5x10^4$	$5.7x10^4$	$5.6x10^4$
Steel (t)	None	$7.0x10^3$	$8.5x10^3$	$8.0x10^3$	$9.0x10^3$	$8.5x10^3$
Water (L/yr)[a]	None	$1.5x10^6$	$2.0x10^6$	$1.8x10^6$	$2.3x10^6$	$2.0x10^6$
Fuel						
Diesel fuel (L)	None	$8.0x10^5$	$1.1x10^6$	$1.0x10^6$	$1.2x10^6$	$1.1x10^6$
Natural gas (m^3)	None	$4.8x10^3$	$6.5x10^3$	$6.0x10^3$	$7.3x10^3$	$6.5x10^3$
Electricity (kWh)	None	$1.3x10^4$	$1.7x10^4$	$1.6x10^4$	$2.0x10^4$	$1.7x10^4$
Operations (Annual)						
Water (L)	None	$1.1x10^7$	$2.1x10^7$	$2.0x10^7$	$2.2x10^7$	$2.1x10^7$
Diesel fuel (L)	None	$7.0x10^2$	$2.8x10^3$	$2.2x10^3$	$3.7x10^3$	$2.8x10^3$
Natural gas (m^3)	None	$6.1x10^5$	$8.1x10^5$	$7.5x10^5$	$9.0x10^5$	$8.1x10^5$
Electricity (kWh)	None	$3.0x10^7$	$4.2x10^7$	$3.8x10^7$	$4.9x10^7$	$4.2x10^7$

[a] Based on 250 construction days/yr.
Note: Based on new buildings required for each site.
Source: Foley 1996.

The land that would be occupied by NIF could ultimately be returned to open space if buildings, roads, and other structures were removed and the land revegetated. Alternately, the NIF buildings could be modified for use in other programs. Therefore, the commitments of land to the NIF project is not necessarily irreversible. However, land rendered unfit for other purposes, such as that set aside for radiological and hazardous chemical waste disposal facilities, represents an irreversible commitments of those resources because wastes in belowground disposal areas may not be completely removed at the end of the project. The land could not be restored to its original condition or to minimum cleanup standards, nor could the site feasibly be used for any other purposes following closure of the disposal facility. This land would be perpetually unusable because the substrata would not be available for other potential intrusive uses such as mining, utilities, or foundations for other buildings. However, the surface area appearance and biological habitat lost during construction and operation of the disposal facilities could, to a large extent, be restored.

The irreversible and irretrievable commitments of material resources for NIF would include construction materials that could not be recovered or recycled, materials that would be rendered radioactive but could not be decontaminated, and materials consumed or reduced to unrecoverable forms of waste. Where construction is necessary, the required materials would include wood, concrete, sand, gravel, plastics, steel, aluminum, and other metals. These construction resources, except for those that could be recovered and recycled with current technology, would be irretrievably lost. However, none of these identified construction resources are in short supply, and all are readily available in the vicinity of locations being considered for NIF. The commitment of materials to be manufactured into new equipment that could not be recycled at the end of the project's useful lifetime would be irretrievable.

Consumption of operating supplies, miscellaneous chemicals, and gases, while irretrievable, would not constitute a permanent drain on local resources or involve any material in critically short supply in the United States as a whole. Materials consumed or reduced to unrecoverable forms of waste, such as radioactive waste, are also irretrievable. However, strategic and critical materials, or resources having small natural reserves, are of such value that economics promotes recycling. Plans to recover and recycle as much of these valuable, depletable resources as is practical would depend on need, and each item would be considered individually at the time a recovery decision is required.

The irretrievable commitment of resources during construction and operation of NIF would include the consumption of fossil fuels used to generate heat and electricity. Energy would also be expended in the form of diesel fuel, gasoline, and oil for construction equipment and transportation vehicles. The estimated amount of energy required to construct and operate NIF is presented in table I.4.9–1 and would be irretrievable.

I.4.10 Relationships Between Short-Term Uses and Long-Term Productivity

Adequate land exists at each of the five candidate sites to support ongoing programs and other foreseeable short-term uses of undeveloped areas. Construction of NIF at LLNL would require about 8 ha (20 acres) of land, which represents about 11 percent of land currently available for development within site boundaries. An additional 2.0 ha (4.9 acres) at LLNL would be used for a staging area during the construction period. The NIF land requirements at LANL would be 4 ha (10 acres), or about 1 percent of the land available for development. Both NTS and SNL are relatively large sites and would not experience conflicts between NIF construction/operation and short-term uses of land suitable for development. NIF construction at NTS would require an area of 18.2 ha (45 acres) within Area 22. Area 22 would have about 200 additional acres for future development, a relatively small percentage of a site with an area of approximately 350,000 ha (867,000 acres). SNL would require about 11 ha (27 acres) for NIF construction. This area represents about 7 percent of the land currently available for development but a much smaller portion of available land throughout the DOE complex.

The NLVF site consists of only 32 ha (80 acres), most of which is already developed. The NIF project would require approximately 4 ha (10 acres), which represents 56 percent of the land at NLVF that could be used for future development.

The use of land on any of the five candidate sites being considered for NIF would enhance the long-term productivity on each site in two ways. First, NIF represents long-term R&D production functions compatible with historic nuclear weapons support and would require a technically competent, skilled, and stable workforce. Second, in light of current reductions in the nuclear weapons stockpile, the lack of new weapons development or production, the moratorium on nuclear testing, and concerns about safety and reliability in the aging stockpile, DOE plans to downsize or consolidate existing facilities and provide upgraded or new experimental and computational capabilities that would enhance the long-term productivity of the selected sites.

Each candidate site would require the use of additional land (either onsite or offsite) for disposal of radiological and hazardous materials. Such short-term usage would remove this land from other beneficial uses indefinitely because of the presence of long-lived hazards. Disposal of solid nonhazardous waste generated from NIF construction and operation would continuously require additional land at a sanitary landfill site. This land would be unavailable for other uses over the long term. LLW would require additional space for onsite storage and processing and would involve the commitment of associated land, transportation, processing facilities, and other disposal resources. Creation of land disposal facilities would allow the site to be productive for the long term by protecting the overall environment and complying with Federal and state environmental requirements.

Land clearing and construction activities for NIF would eliminate habitat and destroy or displace wildlife. Although some destruction would be inevitable during and after construction, these losses would be minimized by site selection and through environmental reviews at the site-specific level. In addition, short-term disturbances of previously undisturbed biological habitats from the construction of new facilities could cause long-term reductions in the biological productivity of an area. These long-term reductions could occur primarily at LANL and NTS, where forested and desert habitat would be cleared, respectively. These habitats recover slowly from disturbances.

I.4.11 Cumulative Impacts

Cumulative impacts refer to the effect on the environment resulting from the incremental effects of the proposed action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Because NIF would be located at a large multipurpose DOE laboratory, this section examines the potential impacts (at each candidate site) of constructing and operating NIF relative to other similar impacts of DOE laboratory operations, as well as similar events occurring elsewhere in the region.

In addition to the regional economic impacts addressed for each of the candidate sites, construction and operation of the proposed NIF will create additional economic activity throughout the United States. At the national level, NIF would create 500 direct jobs during the peak construction and target/laser assembly phase. Indirect economic activity resulting from procurement for capital, materials, and services, and investment in research and development will create an additional 5,400 jobs throughout the U.S. economy. Direct economic impacts from NIF operations include support for at least 330 full-time positions. Continued investment in research and development and procurement associated with maintenance and operation will indirectly create more than 1,200 jobs throughout the U.S. economy, sustained for the duration operational campaign.

I.4.11.1 *Lawrence Livermore National Laboratory*

Siting NIF at LLNL would be consistent with land-use plans for both LLNL and for the town of Livermore. The proposed location for NIF is within an area of similar structural features and increasing land development; therefore, NIF would not contribute to cumulative changes in the visual landscape of the surrounding portions of Livermore.

In the LLNL region, the 24-hour average background concentration for particulates, as measured by PM_{10}, is currently above the state ambient air quality standards. Fugitive dust emissions from construction of NIF would be an incremental addition to the already existing regional environmental impact. The greatest potential fugitive dust emission would occur during the one-month site clearing phase of construction. Mitigation measures would be used to reduce fugitive dust emission during construction by up to 90 percent for construction traffic and up to 65 percent for excavation activities.

Construction and operation of NIF at LLNL would contribute to the cumulative water demand of continuing operation of LLNL and urban developments in the region, which is experiencing water supply shortages during years of low precipitation. Operation of NIF would add about 16 percent to LLNL's site water requirement. LLNL has been implementing water conservation measures since 1988 to help reduce the cumulative impact. Stormwater runoff from the NIF location would contribute to the cumulative adverse effect of all industrial, commercial, and municipal developments on storm water quality. However, the incremental effect of NIF would be minor because stormwater pollution prevention measures would be implemented during both construction and operation of the project. Similarly, the siting of NIF at LLNL would contribute to the reduction of groundwater recharge through addition of impervious areas. However, the incremental effect of NIF would be minor because the area around the proposed location is already built-up with a high percentage of impervious area.

Construction of NIF would replace grassy habitats with areas of pavement and buildings. This conversion would be similar to that occurring with industrial and housing development at the boundaries of LLNL. However, the LLNL area contains extensive areas of grassy habitats, so any loss of grassy habitats would be incrementally very small, and the habitats would not be fragmented. Construction and operation of NIF would not affect any threatened or endangered species.

Construction and operation of NIF at LLNL would not affect any cultural, historical, or paleontological sites. No cultural resources are known for LLNL.

The construction and operation of NIF would result in a small incremental increase in employment, housing demand, and expenditures in the large, diverse economy of Alameda County. The potential development of NIF would sustain employment at LLNL in non-NIF jobs in the physics of inertial confinement fusion, dense materials applications, and weapons physics. If NIF were not constructed at any site (No Action), then employment at LLNL would decline by about 100 workers. No environmental justice issues were identified for either regional or local area impacts.

NIF operations would involve both radioactive and hazardous materials. NIF would be classified as a low hazard radiological facility on the basis of predictions of very low exposures from potential accidents at the facility. The radiological dose to the general public from 30-year NIF operations would be 6 person-rem, which is about 25 percent of the 23 person-rem (based on constant 1994 level) resulting from all other LLNL operations for 30 years. The cumulative dose of 29 person-rem is less than one millionth of the dose to the population from normal background radiation, consumer products, and medical sources. No cancer fatalities are expected in the region from the operation of NIF and other facilities at LLNL. Risks to the public from a NIF accident at LLNL would also be extremely low. The risk of a NIF accident-related cancer fatality occurring in the population within an 80-km (50-mi) radius of LLNL over the 30-year lifetime of the facility is approximately 1 in 10 million. Risks of a radiation-related cancer fatality from accidents during transportation of tritium targets to LLNL are also very low (less than 1 in 1 million over 30 years) in comparison with the risk from fatal vehicular accidents during transportation (about 1 in 8 over 30 years) or the cancer risk associated with exhaust emissions from transportation vehicles (about 1 in 16 over 30 years).

LLNL has the plans and capacity to handle wastes from NIF operations without facility expansion and resultant cumulative effects on either site or regional waste management.

I.4.11.2 *Los Alamos National Laboratory*

Although the proposed location for NIF at LANL is in an undeveloped forested area, placing NIF in that area would be consistent with the area's designation as an experimental science land-use zone. New buildings at the NIF location would alter the local visual environment and contribute to the developed aspect of the central portion of LANL.

Emissions of air pollutants from NIF construction and operation would not contribute to the violation of any air quality standard or to any regional air quality problem.

Construction and operation of NIF at LANL would contribute to the cumulative water demand of continuing operation of LANL and continuing urban developments in the region. Operation of NIF would add about 8 percent to LANL's site water requirement. Water requirements for projected development, including NIF, would be adequately met with utility upgrades under a long-range utility development plan. Stormwater runoff from the NIF location would contribute to the cumulative adverse effect of all industrial, commercial, and municipal developments on stormwater quality. However, the incremental effect of NIF would be minor because stormwater pollution prevention measures would be implemented during both construction and operation of the project.

Construction of NIF at the proposed LANL location would convert natural ponderosa pine and pinyon juniper habitats to managed habitats, pavement, and buildings. This conversion would extend the influence of urbanized/industrial habitats and increase fragmentation of wooded habitat. However, natural wooded habitats are abundant at LANL. Minor habitat loss might be experienced by several listed species at LANL, should they be present at the NIF location. No critical habitats would be affected.

Construction and operation of LANL would not affect any known or suspected cultural, historical, or paleontological sites. No cultural resources are known for the NIF location.

The construction and operation of NIF would result in a small incremental increase in employment, housing demand, and expenditures in a community developed around the presence of a large Federal facility. Housing demand for 1,500 NIF-related workers would be 17 percent of the expected housing vacancies, and such a high demand for housing could stimulate housing starts and affect housing costs in the area. The potential development of NIF would sustain employment at LANL in non-NIF jobs in the physics of ICF, dense materials applications, and weapons physics. If NIF were not constructed at any site (No Action), then employment at LANL would decline from current levels by about 20 workers. No environmental justice issues were identified for either regional or local area impacts.

NIF operations would involve both radioactive and hazardous materials. NIF would be classified as a low hazard radiological facility on the basis of predictions of very low exposures from potential accidents at the facility. The radiological dose to the general public from 30-year NIF operations would be 2 person-rem, which is about 5 percent of the 42 person-rem (based on constant 1994 level) resulting from all other LANL operations for 30 years. The cumulative dose of 44 person-rem is less than 0.002 percent of the dose to the population from normal background radiation, consumer products, and medical sources. No cancer fatalities are expected in the region from the operation of NIF and other facilities at LANL. Risks to the public from a NIF accident at LANL would also be extremely low. The risk of a NIF accident-related cancer fatality occurring in the population within an 80-km (50-mi) radius of LANL over the 30-year lifetime of the facility is approximately 1 in 10 million. Risks of a radiation-related cancer fatality from accidents during transportation of tritium targets to LANL are also very low (less than 1 in 1 million over 30 years) compared with the risk from fatal vehicular accidents during transportation (about 1 in 8 over 30 years) or the cancer risk associated with exhaust emissions from transportation vehicles (about 1 in 16 over 30 years).

LANL has the plans and capacity to handle wastes from NIF operations without facility expansion and resultant cumulative effects on either site or regional waste management.

I.4.11.3 *Nevada Test Site*

The proposed location for NIF at NTS is in Area 22 at an undeveloped desert site. NTS has not designated land-use zones for the area. However, development of NIF in Area 22 would not be a change to the historical land-use for the general area because the Mercury Base Camp and Desert Rock Air Strip are nearby. New buildings at the NIF location would alter the local and area-wide visual environment. Buildings would be visible from U.S. Highway 95, about 6.5 km (4 mi) away.

At the NTS location, the 24-hour average background concentration for particulates, as measured by PM_{10}, is currently above both the national and state ambient air quality standards. Fugitive dust emissions during construction of NIF would be an incremental addition to this existing regional environmental impact. Greatest potential fugitive dust emission would occur during the 2.5-month site clearing phase of construction. Construction activities at NTS would require an operating permit for any surface area disturbance of more than 2 ha (5 acres). During construction, fugitive dust air pollutant emissions would be controlled by using the best practical methods.

Construction and operation of NIF at NTS would not be expected to contribute cumulatively to regional water supply problems. Operation of NIF would add about 21 percent to NTS's site water requirements, but the NTS water supply system has adequate production and storage capacity to meet the additional demand.

Construction of NIF at the proposed NTS location would convert natural creosote bush desert habitats to managed habitats, pavement, and buildings. Creosote bush desert habitats are widespread in the NIF location area and would not be fragmented. Minor loss of desert tortoise habitat would occur, and individual tortoises might be threatened by construction activities. The ferruginous hawk would be discouraged from hunting in areas of human disturbance, but loggerhead shrikes would use the surrounding fence for perching and hunting. No critical habitats would be affected.

Construction and operation of NIF at NTS would not affect any known or suspected cultural, historical, or paleontological sites. No cultural resources are known for the NIF location.

The construction and operation of NIF would have little influence on the socioeconomics of the diverse regional economy in the Las Vegas area. Because of the number of vacant housing units in the region, there would be little demand for new construction. The No Action alternative would not affect NTS because NIF-related studies in ICF, high-density materials, or weapons physics are not pursued at NTS. No environmental justice issues were identified for either regional or local area impacts.

NIF operations would involve both radioactive and hazardous materials. NIF would be classified as a low hazard radiological facility on the basis of predictions of very low exposures from potential accidents at the facility. The radiological dose to the general public from 30-year NIF operations would be 0.03 person-rem, which is about 8 percent of the 0.36 person-rem (based on constant 1994 level) resulting from all other NTS operations for 30 years. The cumulative dose of 0.4 person-rem is less than two millionths of the dose to the population from normal background radiation, consumer products, and medical sources. No cancer fatalities are expected in the region from the operation of NIF and other facilities at NTS. Risks to the public from a NIF accident at NTS would also be extremely low. The risk of a NIF accident-related cancer fatality occurring in the population within an 80-km (50-mi) radius of NTS over the 30-year lifetime of the facility is less than 1 in 10 million. Risks of a radiation-related cancer fatality from accidents during transportation of tritium targets to NTS are also very low (less than 1 in 1 million over 30 years) compared with the risk from fatal vehicular accidents during transportation (about 1 in 6 over 30 years) or from the cancer risk associated with exhaust emissions from transportation vehicles (about 1 in 16 over 30 years).

NTS has the plans and capacity to handle wastes from NIF operations without facility expansion and resultant cumulative effects on either site or regional waste management.

I.4.11.4 *North Las Vegas Facility*

Siting NIF at NLVF would not change land use because this area is zoned for general industrial use. New buildings at the NIF location would alter the local visual environment and be visible from nearby residential areas. However, the visual environment in this area is characterized by industrial-type structures, so NIF would not substantially change the visual character of the local area.

In the NLVF region, the 24-hour average background concentration for particulates, as measured by PM_{10}, is just slightly less than the national and state standards. Fugitive dust emissions from construction of NIF would raise PM_{10} above the standard at the site boundary, but use of calcium-based dust suppressant and a reduction in workload would result in a cumulative concentration that complies with the standard. Otherwise, standards would be exceeded for the period of one month during the site-preparation phase of construction. Abatement of visible fugitive dust emissions is required under the Clark County Air Pollution Control regulations.

Construction and operation of NIF at NLVF would contribute to the cumulative water demand of continuing operation of NLVF and urban developments in the region. Operation of NIF would add about 220 percent to NLVF site water requirements, but current water supply capacity would be adequate to meet the additional demand. Stormwater runoff from the NIF location would contribute to the cumulative adverse effect on stormwater quality from all industrial, commercial, and municipal developments in the region. However, the incremental effect of NIF would be minor because stormwater pollution prevention measures would be implemented during both construction and operation of the project. Similarly, the siting of NIF at NLVF would contribute to the reduction of groundwater recharge through addition of impervious areas. However, the incremental effect of NIF would be minor because the area around the proposed location is already built-up with a high percentage of impervious area.

Construction of NIF at the proposed NLVF location would not result in the conversion of any natural habitats; the disturbed soil and scattered grasses and forbs in this industrial area are of negligible value to wildlife. Landscaping around the NIF buildings could improve the wildlife value of the site and contribute to maintenance of urban wildlife in this industrial area. NLVF does not contain any habitat of value to listed species.

Construction and operation of NIF at NLVF would not affect any known or suspected cultural, historical, or paleontological sites. No cultural resources are known for the NIF location.

The construction and operation of NIF would have little influence on the socioeconomics of the diverse regional economy. Because of the number of vacant housing units in the region, there would be little demand for new housing construction. The No Action alternative would not affect the North Las Vegas area because NIF-related studies in ICF, high-density materials, and weapons physics are not pursued at NTS. Environmental justice issues were identified for the NLVF location. The proportion of minority populations is higher in the local area than in Nevada as a whole. Thus, beneficial socioeconomic impacts and adverse radiological effects could disproportionately affect minority populations. The adverse effects on minorities (as identified in tables I-S.5-1 and I.3.6.1-1) are low and are based on the unlikely accident scenario which could result in one or two cancer fatalities.

NIF operations would involve both radioactive and hazardous materials. NIF would be classified as a low hazard radiological facility on the basis of the very low exposures from potential accidents at the facility. The radiological dose to the general public from 30-year NIF operations would be 18 person-rem, which is about two-millionths of the dose to the population from normal background radiation, consumer products, and medical sources. No radiation doses are expected from other NLVF operations. There would be no cancer fatalities in the region from the operation of NIF and other facilities at NLVF. Risks to the public from a NIF accident at NLVF would also be low. Although the postulated NIF bounding accident, if it occurred, might result in one or two cancer fatalities occurring in the population within an 80-km (50-mi) radius of NIF, the risk of that actually happening over the 30-year lifetime of the facility is approximately 1 in 700,000. Risks of a radiation-related cancer fatality from accidents during transportation of tritium targets to NTS are very low (less than 1 in 1 million over 30 years) compared with the risk from fatal vehicular accidents during transportation (about 1 in 7 over 30 years) or from the cancer risk associated with exhaust emissions from transportation vehicles (about 1 in 16 over 30 years).

NTS has the plans and capacity to handle wastes from NIF operations at NLVF without facility expansion and resultant cumulative effects on either site or regional waste management.

I.4.11.5 *Sandia National Laboratories*

Siting NIF at SNL would be consistent with existing land uses of the area. The proposed location is within an area of similar structures and would be removed from public view.

In the SNL region, the 24-hour average background concentration for particulates, as measured by PM_{10}, is currently within applicable standards. With the use of conventional dust control techniques, fugitive dust emissions from construction of NIF would not result in any violation of standards for particulates.

Construction and operation of NIF at SNL would contribute to the cumulative water demand of continuing operation of SNL and continuing urban developments in the region. Operation of NIF would add about 11 percent to SNL site water requirements. Stormwater runoff from the NIF location would contribute to the cumulative adverse effect on stormwater quality from all industrial, commercial, and municipal developments in the region. However, the incremental effect of NIF would be minor because stormwater pollution prevention measures would be implemented during both construction and operation of the project. Similarly, the siting of NIF at SNL would contribute to the reduction of groundwater recharge through the addition of impervious areas.

Construction of NIF would replace disturbed grassy habitats with areas of pavement and buildings. However, extensive areas of grassy habitat occur close to NIF location, and habitats would not be fragmented. Construction and operation of NIF would not affect any threatened or endangered species.

No cultural, historical, or paleontological sites at SNL would be affected by construction or operation of NIF. No cultural resources are known for SNL.

The construction and operation of NIF would result in a small incremental increase in employment, housing demand, and expenditures in a large, diverse urban region. The potential development of NIF would sustain employment at SNL in non-NIF jobs in the physics of ICF, dense materials applications, and weapons physics. If NIF were not constructed at any site (No Action), then employment at SNL would decline by about 20 workers. No environmental justice issues were identified for either regional or local area impacts.

NIF operations would involve both radioactive and hazardous materials. It would be classified as a low hazard radiological facility on the basis of the very low exposures from potential accidents at the facility. The radiological dose to the general public from 30-year NIF operations would be 6 person-rem, which is an 8-fold increase from the 0.8 person-rem (based on constant 1994 level) resulting from all other SNL operations. However, the cumulative dose of 6.8 person-rem is extremely low; about one millionth of the dose to the population from normal background radiation, consumer products, and medical sources. No cancer fatalities are expected in the region from the operation of NIF and other facilities at SNL. Risks to the public from the postulated bounding NIF accident would also be low. Such an accident might result in one cancer death in the population within an 80-km (50-mi) radius, but the risk of that actually happening is less than 1 in 1 million. Risks of a radiation-related cancer fatality from accidents during transportation of tritium targets to SNL are also very low (less than 1 in 1 million over 30 years) compared with the risk from fatal vehicular accidents during transportation (about 1 in 8 over 30 years) or the cancer risk associated with exhaust emissions from transportation vehicles (about 1 in 8 over 30 years).

SNL has the plans or capacity to handle some of the wastes that would be generated by NIF operations without facility expansion and resultant cumulative effects on either site or regional waste management.

I.5 Environmental, Occupational Safety, and Health Permits and Compliance Requirements

I.5.1 Introduction

This chapter identifies the major laws, regulations, Executive Orders, and compliance instruments that apply to the National Ignition Facility (NIF) proposed action and alternatives. Various Federal environmental statutes impose environmental protection and compliance requirements upon the Department of Energy (DOE). Further, certain state and local environmental authorities are also applicable because they are delegated to the state for enforcement or implementation under Federal law. It is DOE policy to conduct its operations in an environmentally safe manner in compliance with all applicable statutes, regulations, and standards. Although this chapter does not address pending legislation or regulations that may become effective in the future, DOE recognizes that the regulatory environment is rapidly changing and that the construction and operation of NIF must be conducted in compliance with the applicable statutes, regulations, and standards in effect at the time.

Under the *National Environmental Policy Act* (NEPA) of 1969 (42 *United States Code* [U.S.C.] 4321 et seq.), Federal agencies are required to prepare an environmental impact statement (EIS) for proposed major Federal actions that might significantly affect the quality of the human environment. DOE has determined that the proposed siting, construction, and operation of NIF is such an action. Therefore, this project-specific analysis has been prepared as a part of the *Stockpile Stewardship and Management Programmatic Environmental Impact Statement* in accordance with the Council on Environmental Quality (CEQ) Regulations (40 *Code of Federal Regulations* [CFR] 1500-1508) implementing NEPA and DOE NEPA Implementing Procedures (10 CFR 1021).

Under the *California Environmental Quality Act* (California Statutes, Public Resources Code, Division 13 - Environmental Quality, Section 21000 et seq.), any California state public agency taking any action that may cause either a direct physical change in the environment or a reasonably foreseeable indirect physical change in the environment must consider qualitative factors, economic and technical factors, long-term benefits and costs, and alternatives to the proposed action. Public agency actions include the issuance of a state permit, license, certificate, or other entitlement. The public agency must determine whether it will prepare an environmental impact report to identify the significant effects of the proposed project on the environment. All applicants for permits, license, certificates, or other entitlements from a public agency in support of the NIF proposed action may be required to submit data and information necessary to enable the public agency to determine whether the proposed project may have a significant affect on the environment and whether to prepare an environmental impact report.

The *Atomic Energy Act* of 1954 (42 U.S.C. 2011 et seq.) authorized DOE to establish standards to protect health or minimize dangers to life or property for its facilities and operations. DOE has established an extensive system of standards and requirements through DOE orders to ensure safe operation of its facilities.

Executive Order No. 12088, Federal Compliance with Pollution Control Standards, requires Federal agencies—including DOE—to comply with applicable administrative and procedural pollution control standards established by, but not limited to, the *Clean Air Act* (section I.5.2.1), the *Noise Control Act* (section I.5.2.1.4), the *Clean Water Act* (section I.5.3.1), the *Safe Drinking Water Act* (section I.5.3.2), the *Toxic Substances Control Act* (section I.5.7.2), and the *Resource Conservation and Recovery Act* (section I.5.8.1).

I.5.2 Air Quality and Noise Requirements

I.5.2.1 *Clean Air Act*

Construction and operation of NIF would result in air emissions of criteria and noncriteria pollutants, including sulfur dioxide, nitrogen dioxide, volatile organic compounds (VOCs), carbon monoxide, and particulates (PM_{10}). These emissions would be subject to the *Clean Air Act* (CAA) (42 U.S.C. 7401 et seq.), as amended. NIF would also be a source of radionuclide emissions, also subject to the CAA. No other emissions of hazardous air pollutants would be anticipated during construction or operation of NIF.

CAA requires the U.S. Environmental Protection Agency (EPA) to establish national primary and secondary ambient air quality standards as necessary to protect public health with an adequate margin of safety from any known or anticipated adverse effects of a pollutant. CAA also requires promulgation of national standards of performance for new major stationary sources, setting emissions limitations for any new or modified building, structure, facility, or installation that emits or may emit an air pollutant (42 U.S.C. 7411) and standards for emission of hazardous air pollutants (42 U.S.C. 7412). CAA also requires that specific emission increases from major sources be evaluated so as to prevent a significant deterioration in air quality (42 U.S.C. 7470). In addition, CAA requires EPA to promulgate rules to ensure that Federal actions conform to the appropriate state implementation plans (42 U.S.C. 7506).

Pursuant to such direction, EPA promulgated the primary and secondary National Ambient Air Quality Standards, including standards for emissions of sulfur oxides (measured as sulfur dioxide), nitrogen dioxide, carbon monoxide, PM_{10}, ozone, and lead (40 CFR 50); the standards of performance for new stationary sources within specific source categories enumerated in 40 CFR 60.16, including electric steam generating units, industrial-commercial-institutional steam generating units, and stationary gas turbines (40 CFR 60); the National Emission Standards for Hazardous Air Pollutants, including radionuclides (40 CFR 61); and the Prevention of Significant Deterioration (PSD) of Air Quality review regulations (40 CFR 52.21).

On November 30, 1993, EPA published its final rule for Determining Conformity of General Federal Actions to State or Federal Implementation Plans (58 *Federal Register* [FR] 63214). This rule requires states to file revisions to their state implementation plans to include conformity requirements (40 CFR 51.850-860). Once the state plans are revised, Federal agencies are subject to those revised state implementation plans. Until such revisions are submitted and approved, however, the rule adopts conformity requirements applicable to all Federal agencies (40 CFR 93.150-160). Only New Mexico and the Albuquerque/Bernalillo County Air Quality Control Board have revised their regulations to require conformity determinations for Federal actions (*New Mexico Regulations*, Title 20, Part 98 [uncodified]; Board Regulation No. 43). The regulations apply to all nonattainment and maintenance areas for criteria pollutants for which the area is designated.

Under the new rules, a Federal agency must make a formal determination that a Federal action conforms to the applicable implementation plan before such action may be taken. For Federal actions, a conformity determination is required for each pollutant when the total of direct and indirect emissions in a nonattainment or maintenance area caused by a Federal action would equal or exceed certain limits (40 CFR 51.853 or 93.153) (table I.5.2.1–1).

The direct and indirect emissions from the construction and operation of NIF at any site would not exceed these limits (sections I.4.1.2.2, I.4.2.2.2, I.4.3.2.2, I.4.4.2.2, and I.4.5.2.2). In addition, the total of direct and indirect emissions of any pollutant from a Federal action must not equal or exceed 10 percent of a nonattainment or maintenance area's total emissions of that pollutant. If it does, it is defined as a regionally significant action and a conformity determination is required. It is not expected that emissions from NIF would equal or exceed this 10 percent limit.

CAA provides that each state must develop and submit for approval to EPA implementation plans for controlling air pollution and air quality in that state. Under EPA regulations, California, Nevada, and New Mexico all have approved state implementation plans; however, not all parts of the CAA requirements are met in such plans and, in some cases, dual Federal/state regulations must be implemented.

California and Nevada have not been delegated the authority to regulate the emission of radionuclides from DOE facilities, and, therefore, Federal regulations would apply to such emissions at the

TABLE I.5.2.1-1.—*Conformity Determination Exceedance Limits*

Pollutant	Limit (tons/yr)[a]
Nonattainment Areas	
Ozone (volatile organic compounds or nitrogen oxides)	
Serious Nonattainment Areas	50
Severe Nonattainment Areas	25
Extreme Nonattainment Areas	10
Other ozone nonattainment areas outside an ozone transport region	100
Marginal and moderate nonattainment areas inside an ozone transport region	
Volatile organic compounds	50
Nitrogen oxides	100
Carbon monoxide	100
Sulfur dioxide or nitrogen dioxide	100
Particulate matter 10 microns or smaller	
Moderate Nonattainment Areas	100
Serious Nonattainment Areas	70
Lead	25
Maintenance Areas	
Ozone (nitrogen oxides), sulfur dioxide or nitrogen dioxide	100
Ozone (volatile organic compounds)	
Maintenance areas inside an ozone transport region	50
Maintenance areas outside an ozone transport region	100
Carbon monoxide	100
Particulate matter 10 microns or smaller	100
Lead	25

[a] To determine metric tons/year (t/yr), multiply values by 0.90718.

Source: 40 CFR 51.853 and 93.153.

Lawrence Livermore National Laboratory (LLNL) and the Nevada Test Site (NTS). In Nevada, the District Board of Health of Clark County and the Albuquerque/Bernalillo County Air Quality Control Board have adopted the Federal regulations, which would then be applicable to radionuclide emissions from the North Las Vegas Facility (NLVF) and Sandia National Laboratories/New Mexico (SNL). New Mexico has adopted the Federal standards for the emission of hazardous air pollutants (40 CFR 61); however, it has excluded from adoption Subparts H (National Emission Standards for Emissions of Radionuclides other than Radon from Department of Energy Facilities) and Q (National Emission Standards for Radon Emissions from Department of Energy Facilities). Therefore, Federal regulations would apply in New Mexico for the Los Alamos National Laboratory (LANL).

The Federal regulations for emissions of radionuclides and radon-222 from DOE facilities are set in 40 CFR 61, Subparts H and Q. Pursuant to 40 CFR 61.07, an application for approval of construction must be filed before construction begins (with Region IX for LLNL and NTS, with Region VI for LANL, with the District Board of Health of Clark County for NLVF, and with the Albuquerque/Bernalillo County Air Quality Control Board for SNL). Further, DOE must provide written notification to EPA (or appropriate authority) no more than 60 nor less than 30 days before the anticipated date of initial start-up of operations (40 CFR 61.09). However, if it is estimated that radionuclide emissions from the new construction or modification would be less than 1 percent of the effective dose equivalent of 10 mrem/yr to any member of the public, no application for approval of construction or notification of start-up is necessary (40 CFR 61.96).

I.5.2.1.1 *Clean Air Act* Requirements for California

The LLNL site is within the Bay Area Air Quality Management District (BAAQMD), and the district's regulations would apply to air emissions from NIF. NIF is not expected to have sufficient emissions to meet the definition of a major facility under California air regulations. The definition of one facility, however, includes related sources on a single property or contiguous properties, even though under different ownership, and related sources on noncontiguous properties under the same ownership. For this review, facilities under the same ownership that are located within a distance of 4.8 kilometers (km) (3 miles [mi]), property line to property line, are considered one facility if the facilities have the same first two digits in the Standard Industrial Classification code. However, current calculations show that LLNL's existing sources do not meet the definition of a major facility under the California regulations. Therefore, there is no requirement for a PSD review or major facility review for the construction and operation of NIF at LLNL (Regulation 2, Rules 2 and 6). New Source Performance Standards (40 CFR 60, Subpart D, as adopted by BAAQMD Regulation 10) would have to be met for the operation of steam boilers constructed as or modified to be support facilities for NIF. Under such requirements, any fossil-fueled steam boilers exceeding 73 megawatts (MW) input rate (250 million British thermal units per hour [Btu/hr]) must meet the standards for PM_{10}, nitrogen oxides, sulfur dioxide, and opacity.

Under BAAQMD regulations, any person responsible for the emission of air contaminants must register with the district (Regulation 1, Rule 1-410). In addition, any person who builds, installs, modifies, alters, or replaces any article, machine, equipment, or other contrivance, the use of which might cause, reduce, or control the emission of air contaminants, must first apply for and obtain an authority to construct from the Air Pollution Control Officer (Regulation 2, Rule 1-301). Also, any person wishing to use or operate such article, machine, equipment, or other contrivance must obtain a permit to operate from the Air Pollution Control Officer (Regulation 2, Rule 1-302).

Any facility that must obtain an authority to construct must be reviewed as a new source. Under the new source review rules (Regulation 2, Rule 2), the aggregate sum of all increases in emissions from a new or modified source must be calculated. These calculations will provide mechanisms, including the identification of best available control technology (BACT) and emission offsets, by which the District will grant the new or modified source the authority to construct (Regulation 2, Rule 2-101). Fugitive emissions of PM_{10} from temporary construction activities are not included in the calculation of the total potential to emit for the facility (DeBoisblance 1995). BACT must be applied to any new or modified source that will result in emissions of precursor organic compounds, non-precursor organic compounds, nitrogen oxides, sulfur dioxide, PM_{10}, or carbon monoxide in excess of 4.5 kilograms (kg) (10 pounds [lb]) per highest day (Regulation 2, Rule 2-301). Estimated emissions from boiler operations may exceed 4.5 kg (10 lb) per day, and BACT may have to be applied as determined by the permit process.

If the facility will emit more than 45 metric tons (t) (50 tons) per year of precursor organic compounds or nitrogen oxides, federally enforceable emission offsets will be required before a permit will be granted (Regulation 2, Rule 2-302). If the facility will emit more than 13.6 t (15 tons) per year but less than 45 t (50 tons) per year of precursor organic compounds or nitrogen oxides, the district will provide the emission offsets from the Small Facility Banking Account (Regulation 2, Rule 2-302). Offsets for PM_{10} and sulfur dioxide are mandatory only for major facilities with emissions over 91 t (100 tons) per year. A facility that emits less than 91 t (100 tons) per year of PM_{10} or sulfur dioxide may voluntarily provide emission offsets for all or any portion of their cumulative increase.

I.5.2.1.2 *Clean Air Act* Requirements for Nevada

NTS is located in Nye County and air emissions for the construction and operation of NIF would be governed by the Nevada State Air Pollution Control Regulations (NAC 445B.001 through 445B.395). NIF at NTS is not expected to be a major facility under Nevada regulations. The District Board of Clark County Air Pollution Control Regulations (APCR) are approved as part of the Nevada state implementation plan, and these regulations would govern air emissions from the construction and operation of NIF at NLVF. NIF is not expected to be a major facility under Clark County regulations. New Source Performance Standards (40 CFR 60, Subpart D, as adopted by NAC 445B.308 and Clark County APCR, section 14) would have to be met for the operation of steam boilers constructed as, or modified to be, support facilities for NIF. Under such requirements, any fossil-fueled steam boilers exceeding 73 MW heat input rate (250 million Btu/hr) must meet the standards for PM_{10}, nitrogen oxides, sulfur dioxide, and opacity.

In Clark County, all new, reconstructed, or modified stationary sources of volatile organic compounds, lead, PM_{10}, particulate precursors, and carbon monoxide that are proposed to be located in the Las Vegas Valley must register with the District (APCR, section 15.14). Under Clark County Air Pollution Control regulations, any person who proposes to install or construct any new stationary source of air emissions must apply for an "Authority to Construct" certificate before construction is begun (APCR, section 12.1.1.1).

Certain requirements must be met for specific air contaminants before a permit will be issued. NIF project, as a nonmajor source of PM_{10} in Las Vegas Valley (with a potential to emit less than 64 t [70 tons] per year), must incorporate BACT (APCR, section 12.2.1.1). The applicant must also provide documentation of emission reduction credits against other emissions if the total potential to emit for the new source will exceed 23 kg (50 lb) per day of total suspended particulates (APCR, section 12.2.1.3). Qualified road paving projects approved by the local public works department are recognized by the Control Officer as emission reduction credits for PM_{10} (APCR, section 12.4.1). Such credits are good for seven years. A one-year emission reduction credit is available by payment to the closest local participating public works department (APCR, section 12.4.2).

As a nonmajor source of VOCs in Las Vegas Valley (VOC emissions under 45 t [50 tons] per year), NIF must incorporate emissions controls that are designed for BACT (APCR, section 12.2.4.1). The applicant must also provide documentation of emission reduction offsets to all anticipated annual emission increases (APCR, section 12.2.4). The applicant must also apply BACT for sulfur dioxide and lead emissions and demonstrate that the total potential to emit will not cause, or contribute to, ambient concentrations that exceed ambient air quality standards for sulfur dioxide or lead (APCR, sections 12.2.8 and 12.2.10).

An applicant must apply BACT for all emissions of nitrogen oxides and must demonstrate that the total potential to emit will not cause, or contribute to, ambient concentrations exceeding the ambient air quality standard for nitrogen oxides (APCR, section 12.2.10.1). Emission credits equivalent to twice the new source's potential to emit are required (APCR, section 12.2.10.4). As a nonmajor source of carbon monoxide in Las Vegas Valley (potential to emit less than 64 t [70 tons] per year), NIF must incorporate emission controls that are designed with the BACT (APCR, section 12.2.11.1), and emission reduction credits must be greater than twice the potential to emit for the new source (APCR, section 12.2.11.4).

In addition, an operating permit is required for the operation of any emission unit in a stationary source (APCR, section 16). Such an operating permit might contain conditions, including emission limits, production rates, control methods, or operation limitations, subject to annual review.

For construction activities at NIF within Clark County, a Permit for Construction Activities is required (APCR, section 17) to satisfy the Authority to Construct requirements of APCR, section 12.2.1. As a condition of such a permit, the applicant must present and agree to implement an acceptable method to prevent particulate matter from becoming airborne. In addition, any person engaged in the operation of machines and equipment, the grading of roads, and the operation and use of unpaved parking facilities must take all reasonable precautions to abate fugitive dust from becoming airborne. Reasonable precautions may include, but are not limited to, the conditions agreed upon in the permit for the project, sprinkling, compacting, enclosure, chemical and asphalt sealing, cleaning up, sweeping, or other such measures as the Control Officer may specify.

APCR, section 41, also requires control of fugitive emissions during construction activities. Fugitive emission prohibitions include the following:

- Visible plume of dust, resulting from construction activities beyond the nearest property line, whichever is less
- Visible dust emissions on an unpaved road at a construction site being used by haul trucks
- Visible dust emissions generated by vehicles traveling over mud and directly carried out to a paved road near or adjacent to a construction site
- Handling, transporting, or storing material in such a manner as to become airborne

The regulations further indicate that a visible plume of dust resulting from construction activities that extends more than 45.7 meters (m) (150 feet [ft]) from the point of origin, but less than 91.4 m (300 ft) and that has not crossed the nearest property line may be subject to a Notice of Violation, including an Order to take Corrective Action.

Under Nevada air regulations, NTS, as the owner or operator of a proposed new nonmajor stationary source or a proposed modification to an existing nonmajor stationary source, must file an application and obtain a Class II operating permit before construction is begun (NAC, section 445B.291). A separate operating permit is required for each new and existing stationary source (NAC, section 445B.287). Before an operating permit may be issued for a new stationary source, any source that has the potential to emit greater than 23 t (25 tons) of a regulated air pollutant per year must submit an environmental evaluation to enable the director to make an independent air quality impact assessment and determine that the source will not prevent the attainment and maintenance of the state or national ambient air quality standards, cause a violation of the applicable control strategy contained in the approved state implemented plan, or cause a violation of any applicable requirement (NAC, section 445B.310). Because NIF is not expected to emit in excess of 23 t (25 tons) of any regulated air pollutant per year, no assessment would be necessary.

Construction activities at NTS would require an operating permit for any surface area disturbance (such as clearing, excavating, and leveling the land) involving more than 2 hectares (ha) (5 acres) of land (NAC, section 445.365). No person may engage in construction or use of unpaved or untreated areas without first putting into effect an ongoing program using the best practical methods to prevent particulate matter from becoming airborne (NAC, section 445B.365).

I.5.2.1.3 *Clean Air Act* Requirements for New Mexico

New Mexico Air Quality regulations would apply to air emissions from NIF if it was located at LANL. However, the Albuquerque/Bernalillo County Air Quality Control Board regulations would apply to air emissions from NIF if located at SNL.

Under New Mexico Air Quality regulations (which would apply at LANL), a permit must be obtained before constructing a stationary source or modifying an existing source with a potential emission rate greater than 4.5 kg/hr or 23 t/yr (10 lb/hr or 25 tons/yr) of any regulated air contaminant for which there is a Federal or New Mexico ambient air quality standard (Environmental Improvement Board/Air Quality Control Regulations [EIB/AQCR] 702, Part 2). If the threshold is exceeded for any one regulated air contaminant, all regulated air contaminants emitted are subject to permit review. A permit is also required for any source or equipment that is subject to the New Source Performance Standards, for any toxic air pollutant emissions or any major source of hazardous air pollutants, any source meeting the applicability requirements of the PSD review, or for permits for nonattainment areas (EIB/AQCR 702). It is not anticipated that the construction or operation of NIF at LANL would emit toxic air pollutants, be a major source of hazardous air pollutants, or be located in a nonattainment area. Therefore, no permit application would be required under this section. One PSD Class I Area, the Bandelier National Monument Wilderness Area, borders LANL to the south; however, to date, LANL has not been subject to PSD requirements (see section I.4.2.1.2.2). New Source Performance Standards (40 CFR 60, Subpart D, as adopted by 20 NMAC 2.77) would have to be met for the operation of steam boilers constructed as or modified to be support facilities for NIF. Under such requirements, any fossil-fueled steam boilers exceeding 73 MW heat input rate (250 million Btu/hr) must meet the standards for PM_{10}, nitrogen oxides, sulfur dioxide, and opacity.

Under Albuquerque/Bernalillo County Air Quality Control Board regulations, SNL as the owner or operator of NIF, a commercial or industrial stationary source that emits more than 0.9 t (1 ton) of any air contaminant per year, must obtain a registration certificate for the source (Regulation No. 22). In addition, any person planning to construct a new stationary source or modify an existing stationary source of air contaminants over certain thresholds must obtain a permit from the Albuquerque/Bernalillo County Air Quality Control Board before construction. Permits are required for any stationary source that will emit more than 4.5 kg/hr or 23 t/yr (10 lb/hr or 25 tons/yr) of one or more regulated air contaminants for which there is a Federal, state, or local air quality control standard, or if an already permitted source is to be modified (Regulation 20). However, since NIF would not be a major source under the regulations, no PSD review (Regulation 29) or operating permit (Regulation 41) is necessary. New Source Performance Standards (40 CFR 60, Subpart D, as adopted by the Albuquerque/Bernalillo County Air Quality Control Board) would have to be met for the operation of steam boilers constructed as or modified to be support facilities for NIF. Under such requirements, any fossil-fueled steam boilers exceeding 73 MW heat input rate (250 million Btu/hr) must meet the standards for PM_{10}, nitrogen oxides, sulfur dioxide, and opacity.

For construction of NIF in Albuquerque/Bernalillo County, a permit would be necessary for the disturbance of more than 0.30-ha (.75-acre) surface area (Regulation 8.03). In addition, the permittee must employ means specified in the permit to prevent the escape from the site of airborne particulate matter, if the opacity of which exceeds the opacity of the surrounding airborne background particulate matter by 10 percent.

I.5.2.1.4 Noise Requirements

Section 4 of the *Noise Control Act* of 1972 (42 U.S.C. 4901 et seq.) directs all Federal agencies to carry out programs in a manner that furthers a national policy of promoting an environment free from noise that jeopardizes health or welfare. EPA has not published regulations concerning noise levels from construction operations. However, the agency has issued guidelines for outdoor noise levels that are consistent with the protection of human health and welfare against hearing loss, annoyance, and activity interference (EPA 1974). Such guidelines state that "undue interference with activity and annoyance will not occur if outdoor levels [of noise] are maintained at an energy equivalent of 55 decibel." These levels are not to be construed as standards, however.

I.5.3 Water Resources Requirements

Regardless of the site selected for the project, NIF would use water for sanitary and domestic purposes, low-conductivity cooling, manufacturing, and processing operations for target and optics maintenance, environmental control of the site and facilities, and emergency and safety systems. It is also anticipated that industrial and sanitary/domestic water would be discharged from the operation of NIF at all sites. For construction activities, stormwater discharges are regulated.

I.5.3.1 *Clean Water Act*

The Federal *Clean Water Act* (CWA) (33 U.S.C. 1251 et seq.) provides that it is illegal to discharge pollutants from a point source into navigable waters of the United States except in compliance with a National Pollutant Discharge Elimination System (NPDES) permit. Through administrative and judicial interpretation, the navigable waters of the United States encompass any body of water for which the use, degradation, or destruction would affect or could affect interstate or foreign commerce, including but not limited to interstate and intrastate lakes, rivers, streams, wetlands, playa lakes, prairie potholes, mudflats, intermittent streams, and wet meadows. This program is administered by the Water Management Division of EPA pursuant to regulations in 40 CFR 122 et seq. Any state may administer its own permit program for discharges into navigable waters within its jurisdiction by submitting the state program to EPA for approval (33 U.S.C. 1342[b]).

Sections 401 and 405 of the *Water Quality Act* of 1987 added section 402(p) to the CWA, which requires EPA to establish regulations for issuing permits for stormwater discharges associated with industrial activity. The language of the *Water Quality Act* of 1987 requiring an NPDES permit for stormwater discharge was codified into EPA regulations at 40 CFR 122.26 (54 FR 246, effective January 4, 1989). Pursuant to revised 40 CFR 122.26(a)(1)(ii), any stormwater discharge associated with industrial activity requires an NPDES permit application. EPA has delegated NPDES permitting authority to the States of California and Nevada. New Mexico, however, has not received such delegation, and NPDES permits in New Mexico are issued by EPA, Region VI. The New Mexico Environment Department certifies that permits meet all state and Federal regulations.

Pursuant to Section 404 of the CWA (33 U.S.C. 1344), there may be no discharges of dredged or fill material into waters of the United States, including rivers, streams, wetlands, and playa lakes (33 CFR 328.8), done by or on behalf of any Federal agency, other than the Corps of Engineers, without a permit issued pursuant to Corps of Engineers rules and regulations (33 CFR 320 through 328). These regulations prescribe special policies, practices, and procedures to be followed by the Corps of Engineers in reviewing applications for such permits to authorize such discharges (33 CFR, Parts 320, 323, and 325). Pursuant to 33 CFR 320.4, the Corps in issuing such permits must consider the impact that such an activity would have on floodplains and wetlands in accordance with Executive Orders 11988 and 11990.

I.5.3.1.1 *Clean Water Act* Requirements in California

California has NPDES permitting authority, and any permits or permit modifications required by the construction or operation of NIF at LLNL would be issued by the State Water Resources Control Board, Division of Water Quality. Sanitary wastewater from NIF located at LLNL would be discharged to the city of Livermore Water Reclamation Plant. Therefore, no NPDES permit would be necessary for NIF operations. Under current calculations, wastewater treatment capacity at the Reclamation Plant is expected to be sufficient to meet the additional requirements of NIF. However, it might be necessary to report any change in amount or character of discharges to the Livermore Plant under LLNL/city of Livermore pretreatment agreements, since discharge of spent cooling water would be considered an industrial discharge (Steenhoven 1995).

Construction activity associated with NIF would require Notice of Intent to the State Water Resources Control Board to participate in the California General Construction Activity Stormwater Permit. Under the permit, a stormwater pollution prevention plan would have to be developed to mitigate potential water quality impacts from construction activities through the use of best available technology and best conventional pollutant control technology. Once construction was completed, NIF would have to be added to the Livermore Site Industrial Activity Stormwater Pollution Prevention Plan through notification to the State Water Resources Control Board.

I.5.3.1.2 *Clean Water Act* Requirements in Nevada

Nevada is an NPDES-delegated state with general permitting authority. Although NTS holds a sewage treatment permit (GNEV 93001) from the Department of Conservation and National Resources for its current treatment systems, a sanitary wastewater treatment lagoon would have to be constructed to accommodate NIF operations at NTS. The new lagoon would not discharge to any water of the state (Monroe 1995). Under the Nevada Water Pollution Control Law, it is unlawful to discharge pollutants into waters of the state (which includes all streams, lakes, ponds, impounding reservoirs, marshes, watercourses, waterways, wells, springs, irrigation and drainage systems, and all bodies or accumulations of water, surface and underground, natural and artificial) without a written permit for such discharge under such reasonable terms and conditions as required by the Department of Conservation and Natural Resources and Environmental Protection Division (NRS, Title 40, chapter 445.287).

Industrial wastewater and sanitary sewage from NLVF are discharged into the city of North Las Vegas Water Treatment Plant. The North Las Vegas plant holds a current NPDES permit issued by the Nevada Division of Environmental Protection. Under Nevada Water Pollution Control regulations, no permit is required for discharges of pollutants, other than toxic materials, into a publicly owned treatment works, if the owner of such publicly owned treatment works has a valid permit from the state (NAC, section 445.140). Therefore, no permit is necessary for the discharge of NIF wastewater into the North Las Vegas plant. However, under pretreatment agreements and permits with the publicly owned treatment works, NLVF might have to report to the publicly owned treatment works the change in amount and character of its discharge resulting from the construction and operation of NIF. (NAC, section 445.169).

Both NTS and NLVF have requested the Department of Conservation and Natural Resources to issue a determination that stormwater from the sites does not discharge to waters of the state, and, therefore, no stormwater permits, for construction or industrial activity are necessary.

I.5.3.1.3 *Clean Water Act* Requirements in New Mexico

New Mexico has not been delegated NPDES permitting authority; therefore, EPA, Region VI, would issue any new NPDES permits or modify existing permits as necessary. The New Mexico Environment Department reviews and certifies NPDES draft permits issued by EPA to ensure that they meet all state and Federal regulations and standards. Sanitary wastewater from NIF construction and operations would be discharged into LANL's existing sewer system, which has been permitted by the Federal EPA (NPDES Permit NM 0028355). All reporting requirements under the permit regarding changes in the quantity, quality, or character of the discharge resulting from NIF operations must be made to EPA, Region VI (40 CFR 122.41(l), 122.62, 122.63). This requirement would include significant changes in process and quantity or quality of effluent discharged into the existing system and any new discharges. DOE, LANL, and New Mexico Environment Department have entered into a Settlement Agreement to study the stream uses associated with LANL effluent discharges under its NPDES regulations.

In addition to Federal requirements, the New Mexico Water Quality Control Commission regulations require that any person intending to make a new water contaminant discharge, or to alter the character or location of an existing discharge, must file a notice with the Water Pollution Control Bureau of the Environmental Improvement Division (WQCC 821-1-201). If it were necessary to modify the sewer system in a manner that would substantially change the quantity or quality of the discharge from the system, LANL would also have to file plans and specifications of the construction or modification with the Bureau. Otherwise, modifications having a minor effect on the character of the discharge would only have to be reported as of January 1 and June 30 of each year (WQCC 821-1-202).

Sanitary and industrial wastewater from SNL are discharged to the Albuquerque Wastewater Treatment Plant, which holds a Federal NPDES permit. SNL has pretreatment agreements with the plant to meet certain pretreatment standards for SNL industrial wastewaters prior to discharge to the plant. Therefore, it would have to notify the plant of any changes in discharges associated with the operation of NIF (40 CFR 403.12).

Since New Mexico has not been delegated NPDES permitting authority, LANL has submitted a Notice of Intent to the Federal EPA, Region VI, to participate in the Federal General Permit for Stormwater Discharges Associated with Construction Activities. As a condition of the permit, each facility must have a Stormwater Pollution Prevention Plan. Any construction associated with NIF would have to conform to the conditions of this permit.

I.5.3.2 *Safe Drinking Water Act*

The primary objective of the *Safe Drinking Water Act* (42 U.S.C. 300(f) et seq.) is to protect the quality of public water supplies, water supply and distribution systems, and all sources of drinking water. Sections of the Act address public water systems, protection of underground sources of drinking water, emergency powers, general provisions, and additional requirements to regulate underground injection wells. The National Primary Drinking Water regulations (40 CFR 141 et seq.), administered by EPA, establish standards applicable to public water systems. The regulations include maximum contaminant levels, including those for radioactivity, for community and noncommunity water systems. No new public water supply system is anticipated to be constructed at any of the sites.

I.5.3.2.1 *Safe Drinking Water Act* Requirements in California

Water used at the LLNL site is purchased primarily from the city of San Francisco Hetch Hetchy Aqueduct and from the Alameda County Flood and Water Conservation District, Zone 7. Significant alterations to LLNL's drinking water supply requirements due to NIF construction and operation might require that the suppliers be notified of such modification to ensure the new service connection would not cause pressure reduction below state standards (22 *California Code of Regulations* [CCR] 64568).

I.5.3.2.2 *Safe Drinking Water Act* Requirements in Nevada

Nevada has adopted the National Drinking Water regulations (40 CFR 141) for its public water systems regulations (NAC 445.247). NTS will acquire domestic water from its permitted water supply system to serve NIF requirements. Notification of any modification to accommodate NIF operations would be made to the Department of Health Services, including submission of water system modification plans for approval (NAC 445A.657). NLVF would acquire domestic water for NIF from the city of North Las Vegas under an existing agreement. The city would have to be notified of any increase in NLVF water supply usage (Monroe 1995).

I.5.3.2.3 *Safe Drinking Water Act* Requirements in New Mexico

New Mexico has a comprehensive water supply program (NM Regulations [NMR] Title 20, Chapter 7 [uncodified]), under which every public water supply system must site, construct, and maintain its operation in compliance with the requirements of such program. Domestic water to be used at NIF would come from LANL's public water supply system. Under the New Mexico regulations, prior written approval from the New Mexico Environment Department must be obtained before starting any addition to, or modification of, an existing public water supply system that may affect the system reliability or the quantity or quality of the water supplied (NMR 20-7 502). Such approval is not required if the construction or modification is less than 305 m (1,000 ft) of distribution piping appurtenance during any 60-day calendar period, or if such construction or modification takes place at a facility where the water utility staff includes a professional engineer registered in New Mexico who will have responsibility for the project (NMR 20-7-502).

SNL does not own or operate a public water supply system but instead obtains its domestic water supply from the city of Albuquerque system or the Kirtland Air Force Base system. Official approval for any additional usage might have to be obtained from these water suppliers, although current water supply capacity is expected to be sufficient to meet the requirements of NIF (section I.4.5.2.3). Any new hookups would have to conform with any requirements of those suppliers.

I.5.3.3 *Executive Order 11988—Floodplain Management; Executive Order 11990—Protection of Wetlands*

Executive Order 11988 (May 21, 1977) requires Federal agencies to establish procedures to ensure that any actions undertaken in a floodplain consider the potential effects of flood hazards and floodplain management and that floodplain impacts be avoided to the extent practicable. Executive Order 11990 (May 24, 1977) requires all Federal agencies to consider protection of wetlands in decision making for a proposed action.

DOE has established procedures for compliance with these orders entitled "Compliance with Floodplain/Wetlands Environmental Review Requirements" (10 CFR 1022). These regulations require DOE to assess the effects of a proposed action on the survival, quality, and natural or beneficial values of wetlands and to avoid impacts to floodplains to the extent practicable. Pursuant to the regulations and concurrent with DOE's review of a proposed action, DOE shall prepare a floodplain/wetlands assessment that evaluates the positive and negative, direct and indirect, and long- and short-term effects of NIF construction on wetlands and floodplains and alternatives to the proposed action that might avoid adverse effects to floodplains or wetlands, and measures to mitigate the adverse effects of actions in a floodplain or wetlands area (10 CFR 1022.12). None of the sites selected for the construction are located in floodplains or wetlands (sections I.4.1.2.3, I.4.2.2.3, I.4.3.2.3, I.4.4.2.3, I.4.5.2.3, I.4.1.2.4.2, I.4.2.2.4.2, I.4.3.2.4.2, I.4.4.2.4.2, and I.4.5.2.4.2). However, the option I temporary construction staging area for LLNL would be built in the 500-year floodplain, and the bridge spanning Arroyo Las Positas would be within the 100-year floodplain. The bridge would be designed not to increase the risk of flooding. Also, no highly volatile, toxic, or water reactive materials would be stored in the staging area.

I.5.4 Ecological Resources Requirements

I.5.4.1 *Endangered Species Act*

The *Endangered Species Act* (16 U.S.C. 1531 et seq.) is intended to prevent the further decline of endangered and threatened species of animals and plants and to bring about the restoration of these species and their habitats. The Act is jointly administered by the U.S. Department of Commerce (marine species and their habitats under 5 CFR 222.23 and 227.4) and the U.S. Department of the Interior (all other plant and animal species and their habitats). Section 16 U.S.C. 1536 requires DOE to consult with the Department of the Interior, Fish and Wildlife Service, and/or Department of Commerce, National Marine Fisheries Service, to determine whether endangered and threatened species are known to have critical habitats on or in the vicinity of the sites for the proposed action. The identification of endangered and threatened species and their habitats is provided in 50 CFR 17 and 402. Each site has consulted with the Department of the Interior, Fish and Wildlife Service, concerning impacts on endangered and threatened species, migratory birds, and their critical habitats in the vicinity of the proposed locations for NIF.

I.5.4.2 *Migratory Bird Treaty Act*

The *Migratory Bird Treaty Act*, as amended (16 U.S.C. 703 et seq.), is intended to protect birds that have common migration patterns between the United States and Canada, Mexico, Japan, and the former Union of Soviet Socialist Republics. It regulates the harvest of migratory birds by specifying the mode of harvest, hunting seasons, and bag limits. The Act stipulates that it is unlawful at any time, by any means, or in any manner to "kill . . . any migratory bird." Although no permit is required under this Act, DOE would consult with the U.S. Fish and Wildlife Service, as appropriate, regarding impacts to migratory birds and to evaluate ways to avoid or minimize these impacts.

I.5.4.3 *Bald and Golden Eagle Protection Act*

The *Bald and Golden Eagle Protection Act* (16 U.S.C. 668-668d) makes it unlawful to take, pursue, molest, or disturb bald (American) and golden eagles, their nests, and their eggs anywhere in the United States. No permits or approval procedures are required unless a nest is found to interfere with resource development; in that case, a permit must be obtained from the Department of the Interior to relocate the nest. If a bald (American) or golden eagle nest was found in the vicinity of NIF activities during NIF development and construction, DOE would consult with the Department of the Interior regarding requirements under this Act.

I.5.5 Cultural and Paleontological Resources Requirements

Executive Order 11593, Protection and Enhancement of the Cultural Environment (May 15, 1971), requires Federal agencies to locate, inventory, and nominate qualifying properties under their jurisdiction or control to the National Register of Historic Places (NRHP). This process requires DOE to provide the opportunity for the Advisory Council on Historic Preservation to comment on the possible impacts of the proposed action on any potentially eligible or listed resources.

I.5.5.1 *National Historic Preservation Act*

The *National Historic Preservation Act* (16 U.S.C. 470 et seq.) provides that places with significant national historic value be placed on the NRHP. No permits or certifications are required under this Act. However, pursuant to regulations in 36 CFR 800 et seq., if a proposed action might impact a historic property resource, consultation with the State Historic Preservation Officer and the Advisory Council on Historic Preservation is required. Such consultation generally results in execution of a Memorandum of Agreement that includes stipulations that must be followed to minimize adverse impacts. No historic places were identified by the appropriate State Historic Preservation Officers at any of the sites.

I.5.5.2 *Archaeological and Historic Preservation Act*

The *Archaeological and Historic Preservation Act* (16 U.S.C. 469a et seq.) is directed at the preservation of historic and archaeological data that would otherwise be lost as a result of Federal construction.

It authorizes the Department of the Interior to undertake recovery, protection, and preservation of archaeological and historic data. If the Federal agency determines that a proposed action might cause irreparable damage to archaeological resources, that agency is required to notify the Department of the Interior in writing. The agency involved may then undertake recovery and preservation or may request that the Department of the Interior undertake preservation measures. No such sites were identified at the proposed NIF locations.

I.5.5.3 *American Indian Religious Freedom Act*

The purpose of the *American Indian Religious Freedom Act* (42 U.S.C. 1996) is to protect and preserve for Native Americans their inherent right of freedom to believe, express, and protect the traditional religions of Native Americans, including, but not limited to, access to religious or traditional sites, use and possession of sacred objects, and freedom to worship through ceremonial and traditional rites. DOE has consulted with all affected Native American groups, and no Native American cultural resources were identified at any proposed NIF location (sections I.4.1.1.5, I.4.2.1.5, I.4.3.1.5, I.4.4.1.5, and I.4.5.1.5).

I.5.6 Environmental Justice

On February 11, 1994, President Clinton issued Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 FR 7629). This Executive Order, with accompanying cover memorandum, calls on Federal agencies to incorporate environmental justice as part of their missions, including decisions made in compliance with NEPA. Specifically, the President's cover memorandum to the Environmental Justice Executive Order mentions NEPA in two contexts:

Each Federal agency shall analyze the environmental effects, including human health, economic and social effects, of Federal actions, including effects on minority communities and low-income communities, when such analysis is required by NEPA. Mitigation measures outlined or analyzed in an environmental assessment, environmental impact statement, or record of decision, whenever feasible, should address significant and adverse environmental effects of proposed Federal actions on minority communities and low-income communities.

Each Federal agency shall provide opportunities for community input in the NEPA process, including identifying potential effects and mitigation measures in consultation with affected communities and improving the accessibility of meetings, crucial documents, and notices.

No formal guidance has been issued by the Federal Working Group on Environmental Justice or DOE concerning this Executive Order. Therefore, the analysis of environmental justice issues presented in the Socioeconomics sections of chapter I.4 may somewhat vary from whatever final guidance may be issued.

I.5.7 Radiation and Hazardous Chemical Environment

I.5.7.1 *Atomic Energy Act* of 1954

The *Atomic Energy Act* of 1954 (42 U.S.C. 2011 et seq.) authorized DOE to establish standards to protect health or minimize dangers to life or property for its operations and facilities. In accordance with the *Energy Reorganization Act* of 1974, DOE-related operations are not subject to licensing by the U.S. Nuclear Regulatory Commission (10 CFR 50.11). The transportation, storage, and use of radioactive and hazardous materials is governed by DOE orders. The major DOE orders pertaining to radioactive and hazardous material management at NIF are listed in table I.5.7.1–1.

In addition, DOE has promulgated regulations for the protection of occupational workers from radiation exposure (10 CFR 835). These regulations set occupational exposure limits and require DOE facilities to develop and comply with a radiation program, including periodic audits.

I.5.7.2 *Toxic Substances Control Act*

EPA has promulgated regulations governing the use, marking, storage, and disposal of polychlorinated biphenyl (PCB)-contaminated transformers or hydraulic equipment (40 CFR 761) under the *Toxic*

TABLE I.5.7.1-1.—*U.S. Department of Energy Orders Applicable to the National Ignition Facility Project*

Order	Subject
O 151.1	Comprehensive Emergency Management System
O 232.1	Occurrence Reporting and Processing of Operations Information
O 430.1	Life Cycle Asset Management
O 440.1	Worker Protection Management for DOE Federal and Contractor Employees
O 460.1	Packaging and Transportation Safety
O 460.2	Departmental Materials Transportation and Packaging Management
O 470.1	Safeguards and Security Program
5400.1	General Environmental Protection Program
5400.5	Radiation Protection of the Public and the Environment
5480.4	Environmental Protection, Safety, and Health Protection Standards
5482.1B	Environment, Safety, and Health Appraisal Program
5484.1	Environmental Protection, Safety, and Health Protection Information Reporting Requirements
5630.12A	Safeguards and Security Inspection and Assessment Program
5700.6C	Quality Assurance

Substances Control Act (15 U.S.C. 2601-2671). If any such PCB articles are removed during the renovation of existing buildings, they must be stored and disposed of properly. PCB transformers and equipment would be disposed of at licensed incinerators or chemical waste landfills. Shipment offsite of transformers or equipment contaminated with waste PCBs would be manifested, and a proper Certificate of Destruction would be obtained.

I.5.7.3 *Emergency Planning and Community Right-to-Know Act* of 1986

Under the *Emergency Planning and Community Right-to-Know Act* of 1986 (EPCRA or SARA, Title III) (42 U.S.C. 1101 et seq.), industrial facilities are required to provide information, such as inventories of specific chemicals used or stored there, to the appropriate State Emergency Response Commission and Local Emergency Planning Committee (LEPC) to ensure that emergency plans are sufficient to respond to accidental releases of hazardous substances. This Act originally did not appear to apply to Federal agencies; however, on August 3, 1993, Executive Order 12856 was issued making each Federal agency and its jurisdictional facilities subject to the provisions of EPCRA and the *Pollution Prevention Act* of 1990. Under EPCRA, facilities with more than a threshold quality of an "extremely hazardous substance" (40 CFR 355, appendixes A and B) must provide a representative to the LEPC, promptly inform LEPC of any "relevant changes" at the facility, and upon request, promptly provide LEPC with "information . . . necessary for developing and implementing the emergency plan." Also, all covered facilities that exceed certain volume thresholds must provide an inventory of the types and quantities of hazardous materials stored or used onsite to LEPC (40 CFR 370). It is not anticipated that NIF operations would require storage of extremely hazardous substances; however, if the site already has submitted information to LEPC, any relevant changes resulting from NIF operations should be communicated to LEPC.

The transportation of radioactive or hazardous materials is governed by the *Hazardous Materials Transportation Act* (49 U.S.C. 1801 et seq.). The implementing regulations by the Department of Transportation (DOT) (49 CFR 171-179) establish requirements for shipments along public highways, including shipping papers, marking, labeling, placarding, training, emergency response information, and packaging. Therefore, any shipments of radioactive or hazardous materials to or from the NIF location would have to comply with DOT shipping requirements.

I.5.8 Waste Management

I.5.8.1 *Solid Waste Disposal Act,* as Amended by *the Resource Conservation and Recovery Act* and the *Hazardous Solid Waste Amendments* of 1984

The treatment, storage, or disposal of solid, both nonhazardous and hazardous, waste is regulated under the *Solid Waste Disposal Act*, as amended by the *Resource Conservation and Recovery Act* (RCRA) (42 U.S.C. 6901 et seq.) and the *Hazardous Solid Waste Amendments* of 1984 (HSWA). Under Section

3006 of the Act, any state that seeks to administer and enforce a hazardous waste program pursuant to RCRA may apply for EPA authorization of such program. Approved state programs are not static, and as new Federal regulations, limitations, and restrictions are promulgated by EPA, state programs must be revised in response to such changes. Prior to HSWA, changes to Federal requirements were not enforced in authorized states until the state's program was appropriately modified and approved by EPA. Now, EPA enforces Hazardous Solid Waste Amendments requirements in an authorized state until the state receives approval under section 3006(g).

California, Nevada, and New Mexico have all received authorization to enforce a hazardous waste program under Subpart C of RCRA. Nevada and New Mexico have adopted the Federal requirements for hazardous waste management. California has an authorized hazardous waste program; however, not all the Hazardous Solid Waste Amendments to RCRA have been incorporated, and California operates under a dual state-Federal regulatory system.

Under RCRA, "source, special nuclear, and by-product materials," as defined by the *Atomic Energy Act* of 1954, are excluded from the definition of solid waste and, therefore, cannot be considered hazardous waste. However, by definition, a mixture of hazardous and radioactive wastes (mixed waste) contains constituents that require regulation under RCRA. On July 3, 1986, EPA issued a clarification that the hazardous components of radioactive mixed waste are regulated under RCRA, and the radioactive components are governed by applicable *Atomic Energy Act* regulations. Because of the dual nature of this waste, it was not until 1988 that EPA issued another clarification that states could submit for authorization to regulate mixed waste storage, treatment, and disposal under state programs. When treatment standards for the land disposal restrictions were issued for mixed waste in 1990, problems arose with the long-term storage of mixed waste, since under land disposal restrictions, restricted wastes may not be stored for more than one year (40 CFR 268.50). The storage and treatment capacity problems for mixed wastes created an enforcement problem for those storing mixed wastes, including DOE.

Congress addressed the problems of DOE mixed waste storage in the *Federal Facility Compliance Act* (FFCA) of 1992 (Public Law 102-386, 106 Stat. 1505, October 6, 1992). Although FFCA made it clear that sovereign immunity is waived for the enforcement of state RCRA regulations, it granted DOE facilities a 3-year extension period before waiving sovereign immunity concerning the enforcement of land disposal restrictions regulations as applied to mixed waste (October 1995). Section 104 of the Act requires DOE to submit a draft report to EPA and to authorized states that lists national inventories of all mixed waste on a state-by-state basis and analyzes mixed waste treatment capacities and technologies. To extend the application of such sovereign immunity beyond the 3-year period, DOE must also comply with section 105 of the Act, which requires DOE to develop a comprehensive plan to treat mixed wastes for all DOE facilities. Such plans must include a comprehensive requirement for developing schedules for almost all phases of mixed waste disposal. The plans are submitted to EPA, which in turn submits them to the authorized state. DOE announced it would develop such a National Compliance Plan for its mixed waste (57 FR 57710).

Currently California, New Mexico, and Nevada have been authorized to regulate mixed waste under RCRA. Therefore, any necessary permitting of facilities for the treatment, storage, or disposal of mixed waste resulting from NIF operations in California, New Mexico, and Nevada would proceed through their normal RCRA permitting process.

I.5.8.1.1 *California Resource Conservation and Recovery Act* Requirements

LLNL operates treatment, storage, or disposal facilities under Part A interim status pursuant to filings to the California Environmental Protection Agency, Department of Toxic Substances Control (previously the Department of Health Service). Under California regulations, no facility operating under interim status may manage hazardous wastes that are not specified in Part A of the facility's permit application, employ processes not described in Part A of the permit application, or exceed the design capacities specified in Part A of the permit application (22 CCR § 66265.1[c]). LLNL's Part A Permit application does have limitations as to the waste streams that may be stored or treated in the facilities and capacity limitations. However, if all hazardous waste and mixed waste generated at NIF were accumulated onsite and shipped offsite for treatment and disposal within 90 days, such permit requirements would not apply (22 CCR § 66265.1[d]). If hazardous or mixed wastes were to be stored for more than 90 days in the permitted treatment, storage, or disposal facility, it might be necessary to amend the facility permit to include new waste streams or new capacity requirements resulting from NIF operations (22 CCR § 66270).

I.5.8.1.2 *Nevada Resource Conservation and Recovery Act* Requirements

NTS has a permitted treatment, storage, or disposal facility for storage of hazardous wastes near the Radioactive Waste Management Site in Area 5; however, it is anticipated that hazardous waste, except mixed waste, will be accumulated onsite and shipped offsite for treatment and disposal. Such accumulation does not require a permit if it meets all Federal RCRA generator requirements (40 CFR 262), as adopted by Nevada (NAC 444.8632). NTS has submitted a revised Part B Permit application, which includes a separate storage and disposal unit for solid mixed waste. Such application is pending action by the Nevada Division of Environmental Protection. NTS operates a mixed waste storage facility under Part A interim status. Under agreement between DOE and the State of Nevada, no offsite mixed waste is being accepted, pending the permit review (DOE, Permit No. NV 3890090001; Settlement Agreement for Transuranic Mixed Waste Storage Issues between the State of Nevada and DOE; Mutual Consent Agreement for the Storage of Low Level Land Disposed Restricted Mixed Waste between the State of Nevada and DOE). No mixed waste disposal is currently being conducted at the Part A interim status land disposal unit, pending land disposal restriction treatment determination. Mixed liquid waste may not be disposed of at NTS pursuant to the NTS Waste Acceptance Criteria, NVO-325. However, there are plans to develop this capability, and such a liquid mixed waste treatment facility would have to be permitted by the Nevada Division of Environmental Protection. Otherwise, mixed liquid waste can be stored at the NTS Part A interim status mixed waste storage facility for shipment to an offsite facility for treatment and disposal.

NLVF does not have a permitted treatment, storage, or disposal facility, and hazardous waste at NIF would be accumulated for transportation to offsite treatment, storage, or disposal facilities. Mixed waste would be accumulated for shipment to NTS, once the NTS Part B Permit is issued. Such accumulation would not require a permit if it met all Federal RCRA generator requirements (40 CFR 262), as adopted by Nevada (NAC 444.8632). If hazardous or mixed waste were to be stored for more than 90 days, a treatment, storage, or disposal facility would have to be sited, permitted, and operated under the regulations governing and operators of such facilities (40 CFR 264).

I.5.8.1.3 *New Mexico Resource Conservation and Recovery Act* Requirements

SNL has a permitted treatment, storage, or disposal facility for storage of hazardous waste. Hazardous waste generated at NIF would be stored in this facility until it is shipped offsite to an approved disposal facility. SNL is currently storing its liquid mixed waste at the site of generation (Wheeler 1995). Such accumulation does not require a permit if it meets all Federal RCRA generator requirements (40 CFR 262), as adopted by New Mexico (NM Regulations, Title 20, chapter 4). SNL is currently performing treatability studies at its Radioactive and Mixed Waste Management Facility to obtain a Part B Permit from the State of New Mexico. Once the facility is permitted, mixed waste will be treated there to remove the hazardous component. The residue will be disposed of as radioactive waste. When treatment of the hazardous component is not feasible, the mixed waste will be stored onsite until a disposal option becomes available. It may be necessary to amend the facility permit or the Part A application to include new waste streams or new capacity (40 CFR 270.42 and 270.72).

LANL has a permitted treatment, storage, or disposal facility; however, it is anticipated that all hazardous waste and mixed waste at NIF would be accumulated onsite and shipped offsite for treatment and disposal. Such accumulation would not require a permit if it met all Federal RCRA generator requirements (40

CFR 262), as adopted by New Mexico (NM Regulations, Title 20, chapter 4). LANL also has Part A interim status facilities. It might be necessary to amend the facility permit to include new waste streams or new capacity (40 CFR 270.42).

I.5.8.2 *Low-Level Radioactive Waste*

It is anticipated that low-level radioactive waste (LLW) will be generated as a result of the operation of NIF. As stated above, the *Atomic Energy Act* of 1954 authorized DOE to establish standards to protect health or minimize dangers to life or property. In accordance with the *Energy Reorganization Act* of 1974, DOE-related operations, including the treatment, storage, and disposal of LLW, are not subject to licensing by the U.S. Nuclear Regulatory Commission (10 CFR 50.11). Under the *Low-Level Radioactive Waste Policy Act* (42 U.S.C. 2021b et seq.), the Federal Government is responsible for the disposal of LLW owned or generated by DOE. The disposal of LLW at disposal facilities established or operated exclusively for the disposal of waste generated by the Federal Government is not subject to the other portions of the Act concerning the establishment of state-governed compacts for the disposal of LLW in those states. Therefore, the transportation, treatment, storage, and disposal of LLW generated by DOE is governed by DOE orders. The major DOE orders pertaining to LLW resulting from operation of NIF are listed in table I.5.8.2–1. DOE Order 5820.2A establishes policies and guidelines that are the framework for the LANL LLW management program.

TABLE I.5.8.2–1.—*U.S. Department of Energy Orders Concerning Low-Level Waste*

Order	Subject
O 232.1	Occurrence Reporting and Processing of Operations Information
5400.5	Radiation Protection of the Public and the Environment
5820.2A	Radioactive Waste Management

On March 25, 1993, DOE published a Notice of Proposed Rulemaking to establish standards for the protection of the public and the environment against radiation from DOE activities (Draft 10 CFR 834). The requirements would be applicable to the control of radiation exposures to the public and the environment from normal operations under the control of DOE and DOE contractor personnel. The regulations include the four basic elements of the radiation protection system:

- Establish dose limits for exposure of members of the public to radiation and implementation of DOE's as low as reasonably achievable policy.
- Manage radioactive materials in liquid waste discharges, in soil columns, and in selected solid-waste-containing radioactive materials, including groundwater protection programs for each DOE site.
- Establish requirements for decontamination, survey, and release of buildings, land, equipment, and personal material; and for the management, storage, and disposal of wastes generated by these activities.
- Establish an environmental radiation protection program and plan, including an effluent monitoring and environmental surveillance program, to set forth the programs, plans, and other processes to protect the public from exposure to radiation. On August 31, 1995, DOE issued a Notice of Limited Reopening of Comment Period for the draft regulation.

Once promulgated as a final rule, 10 CFR 834 would govern the management of radioactive materials and wastes at all the proposed NIF sites.

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I.7 GLOSSARY

acoustic: Containing, producing, carrying, arising from, actuated by, related to, or associated with sound.

activation products: The radionuclides formed as a result of a material being activated. For example, cobalt-60 is an activation product resulting from neutron activation of cobalt-59.

acute exposure: The absorption of a relatively large quantity of radiation or intake of radioactive material over a short period of time.

Air Quality Control Region (AQCR): An interstate or intrastate area designated by the Environmental Protection Agency for the attainment and maintenance of National Ambient Air Quality Standards.

air quality maintenance area: An area which, due to current air quality or projected residential and industrial growth, has the potential for exceeding a national ambient air quality standard.

air quality: Measure of the health-related and visual characteristics of the air, often derived from quantitative measurements of the concentrations of specific injurious or contaminating substances. Air quality standards are the prescribed level of constituents in the outside air that cannot be exceeded during a specific time in a specified area.

ALARA (as low as reasonably achievable): A philosophy of protection that controls and maintains exposures to individuals and to the work force and general public as low as technically and economically feasible below the established limits.

alluvial fan: Cone-shaped deposits of alluvium made by a stream. Fans generally form where streams emerge from mountains onto the lowland.

alluvial/alluvium: Relating to material deposited by running water, such as clay, silt, sand, and gravel. Sedimentary material transported and deposited by the action of flowing water.

alpha particle: A positively charged particle consisting of two protons and two neutrons that is emitted during radioactive decay from the nucleus of certain nuclides. It is the least penetrating of the three common types of radiation (alpha, beta, and gamma). Symbol: α.

ambient air: The surrounding atmosphere as it exists around people, plants, and structures.

ambient noise levels: All encompassing background noise levels associated with a given environment, usually a composite of sounds from many sources, near and far.

ambient sound level (LDN): The 24-hour equivalent continuous sound level with a night-time penalty added, i.e., the time-averaged A-weighted sound level, in decibels, from midnight to midnight, obtained after the addition of 10 dB to sound levels from midnight to 7:00 a.m. and from 10:00 p.m. to midnight.

***American Indian Religious Freedom Act* of 1978:** This Act establishes national policy to protect and preserve for Native Americans their inherent right of freedom to believe, express, and exercise their traditional religions, including the rights of access to religious sites, use and possession of sacred objects, and the freedom to worship through traditional ceremonies and rites.

AP-42: see "emission factors".

aquifer: A saturated geologic unit through which significant quantities of groundwater can migrate under natural hydraulic gradients.

Argus: Laser system at Lawrence Livermore National Laboratory.

arithmetic mean: The average of a set of terms, computed by dividing their sum by the number of terms. See "geometric mean".

arroyo: A gully or channel cut by an intermittent stream.

atmospheric dispersion: The spreading downwind of airborne material due to wind speed and atmospheric turbulence; the greater the spread, the greater the dilution and the smaller the airborne material concentrations.

attainment area: An area considered to have air quality as good as or better than the national ambient air quality standards as defined in the *Clean Air Act*. An area may be an attainment area for one pollutant and a nonattainment area for others (see "nonattainment area").

background radiation: Ionizing radiation present in the environment from cosmic rays and natural sources in the Earth; background radiation varies considerably with location.

basement rocks: The undifferentiated complex of rocks that underlies the rocks of interest in an area. The crust of the earth below sedimentary deposits, extending downward to the Mohorovicic discontinuity. In many places the rocks of the complex are igneous and metamorphic and of Precambrian age.

beamlets: Independent laser beams.

Best Available Control Technology (BACT): A term used in the Federal *Clean Air Act* that means the most stringent level of air pollutant control considering economics for a specific type of source based on demonstrated technology.

Best Management Practices: Activities, procedures, or physical structures for reducing the amount of pollution entering the surface water and groundwater.

beta particle: An elementary particle emitted from a nucleus during radioactive decay; it is negatively or positively charged, identical in mass to an electron, and in most cases easily stopped, as by a thin sheet of metal. Symbol: β.

Biological Resources Evaluations Team (BRET): The team within the Environmental Protection Group of Los Alamos National Laboratory responsible for biological assessments.

biota: The plant and animal life of a region.

bounding: In the context of accident analysis, bounding is a condition, consequence, or risk that provides an upper bound that is not exceeded by other conditions, consequences, or risks. The term is also used to identify conservative assumptions that will likely overestimate actual risks or consequences.

British thermal unit (Btu): A unit of heat; the quantity of heat required to raise the temperature of one pound of water by one degree Fahrenheit. One British thermal unit equals 1,055 joules (or 252 calories).

cancer: A group of diseases characterized by uncontrolled cellular growth. Increased incidence of cancer can be caused by exposure to radiation or to certain chemicals at sufficient concentrations and exposure durations.

candidate sites: Candidate sites for the National Ignition Facility are Lawrence Livermore National Laboratory (LLNL) as the preferred site, and Los Alamos National Laboratory (LANL), Sandia National Laboratories (SNL), and the Nevada Test Site (NTS) (Area 22 main site location and North Las Vegas Facility [NLVF] location near NTS) as alternative sites.

carbon monoxide (CO): A colorless, odorless gas that is toxic if breathed in high concentration over a period of time.

change-out: A procedure by which components affected by induced radioactivity are periodically rotated between in-service and out-of-service status to allow the induced radioactivity to decay below predetermined limits and thus maintain a lower total level of radioactivity or a longer useful life. In some cases, decontamination cleaning may also be done during the out-of-service period.

chronic exposure: The absorption of radiation or intake of radioactive and/or chemical materials over a long period of time.

Class I area: Pristine areas in the United States whose air quality requires special protection from pollution from new sources.

Class II area: Areas in the United States with acceptable air quality levels where moderate increases in air pollutant concentrations from new sources are allowed.

Class III area: Areas in the United States with acceptable air quality levels where larger increases in air pollutant concentrations from new sources are allowed than in Class II areas.

***Clean Air Act Amendments* of 1990:** Expands the Environmental Protection Agency's enforcement powers and adds restrictions on air toxins, ozone-depleting chemicals, stationary and mobile emissions sources, and emissions implicated in acid rain and global warming.

***Clean Air Act*:** Federal Act that mandates the promulgation and enforcement of air pollution control standards for stationary sources and motor vehicles.

***Clean Water Act* of 1972, 1987:** Federal Act regulating the discharge of pollutants from a point source into navigable waters of the United States in compliance with a National Pollution Discharge Elimination System permit as well as regulating discharges to or dredging of wetlands.

climatology: The science that deals with climates and investigates their phenomena and causes.

***Code of Federal Regulations* (CFR):** All Federal regulations in force are published in codified form in the *Code of Federal Regulations*.

collective committed effective dose equivalent: The committed effective dose equivalent of radiation for a population.

colluvium: A general term applied to any loose, heterogeneous, and incoherent mass of soil material and/or rock fragments deposited by rainwash, sheetwash, or slow continuous downslope creep, usually collecting at the base of gentle slopes or hillsides. Deposition by a combination of gravity and water.

committed dose equivalent: The predicted total dose equivalent to a tissue or organ over a 50-year period after an intake of radionuclides into the body. It does not include external dose contributions. Committed dose equivalent is expressed in units of rem or Sievert. The committed effective dose equivalent is the sum of the committed dose equivalents to various tissues of the body, each multiplied by the appropriate weighting factor.

Composite Noise Rating: see "Modified Composite Noise Rating" (CNR).

Conceptual Design Option: This option would use an ICF approach called indirect drive. In indirect drive, laser beams would illuminate and heat the interior surfaces of a metal case (hohlraum) containing a deuterium-tritium-filled capsule. The beams would cause the case to emit x rays that would strike the fusion target capsule and drive the fusion reaction.

criteria pollutants: Six air pollutants for which national ambient air quality standards are established by the Environmental Protection Agency under Title I of the Federal *Clean Air Act*. The six pollutants are sulfur dioxide, nitrogen oxides, carbon monoxide, ozone, particulate matter smaller than 10 microns in diameter (PM_{10}), and lead.

critical habitat: Air, land, or water area and constituent elements, the loss of which would appreciably decrease the likelihood of survival and recovery of a listed species or a distinct segment of its population.

cryogenic target positioner: The system that is composed of a telescoping arm that is used to insert and withdraw the complete target cryogenic system and target, and allows aiming, alignment, and engagement by the NIF laser.

cultural resources: Archaeological sites, architectural features, traditional use areas, and Native American sacred sites or special use areas.

curie (Ci): A unit of radioactivity equal to 37 billion disintegrations per second; also, activity of that quantity of material in which 3.7×10^{10} atoms are transformed per second.

dBA (Decibel, A-weighted): A unit of weighted sound pressure level that correlates overall sound pressure levels with the frequency response of the human ear; measured by the use of a metering characteristic and the "A" weighting specified by the American National Standard Institute S1.4-1971(R176).

decommissioning: The process of removing a facility from operation, followed by decontamination, entombment, dismantlement, or conversion to another use.

decontamination: The actions taken to reduce or remove substances that pose a substantial present or potential hazard to human health or the environment—such as radioactive contamination from facilities, soil, or equipment—by washing, chemical action, mechanical cleaning, or other techniques.

deuterium: The hydrogen isotope that is twice the mass of ordinary hydrogen and that occurs in water; also called heavy hydrogen.

diatomaceous: Composed of or containing numerous diatoms or their siliceous remains.

DOE Orders: Requirements internal to the U.S. Department of Energy (DOE) that establish DOE policy and procedures, including those for compliance with applicable laws.

dose: The amount of energy deposited in body tissue due to radiation exposure. Various technical terms—such as dose equivalent, effective dose equivalent, and collective dose—are used to evaluate the amount of radiation an exposed individual or population receives.

driver: A device for supplying the primary source of energy to an inertial fusion energy target; drivers can be lasers, ion beams, or intense gamma ray sources.

effective dose equivalent (EDE): The sum of the products of the dose equivalent to the organ or tissue and the weighting factors applicable to each of the body organs or tissues that are irradiated. The EDE includes the dose from radiation sources internal and/or external to the body and is expressed in units of rem. The International Commission on Radiological Protection defines this as the effective dose.

emission factors: An average value that relates to the quantity of an air pollutant released to the atmosphere with the activity associated with the release of the pollutant and usually expressed as the weight of pollutant divided by a unit weight, volume, distance, or duration of the activity that emits the pollutant. Emission factors are widely used for estimating air pollutant emissions and are often acceptable by regulatory authorities as an appropriate estimation of air pollution emissions to determine compliance with regulations.

emission offsets: Areas that allow no net increase in air pollution emissions require that a new source offset emission increases by decreasing an equivalent amount of emissions from an existing source. In some cases emission offsets or credits can be obtained from a depository that collects emission credits from retired sources.

endangered species: Any species that is in danger of extinction throughout all or a significant portion of its geographic range.

Enhanced Option: The Enhanced Option would include the indirect drive operations of the Conceptual Design Option and a second approach called direct drive. The Enhanced Option would also include the capability to perform an increased number of yield experiments to accommodate greater user needs. No hohlraum would be used in the direct drive approach. Instead, a large number of laser beams would be employed to ensure good uniformity of the driving force (laser light) over the face of the target. The laser beams would impinge directly on the deuterium-tritium-filled capsule to drive the fusion reaction.

Environmental Assessment (EA): A concise public document that provides sufficient evidence and analysis for determining whether to prepare an environmental impact statement (EIS) or a finding of no significant impact for a proposed action. An EA includes brief discussions of the need for the proposed action, the features of alternatives, the environmental impacts of the proposed action and alternatives, and a listing of agencies and persons consulted.

Environmental Impact Statement (EIS): A document required of Federal agencies by the *National Environmental Policy Act* for major proposals or legislation significantly affecting the environment. A tool for decisionmaking, it describes the positive and negative effects of the undertaking and alternative actions.

environmental justice: The fair treatment of people of all races, cultures, incomes, and educational levels with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment implies that no population of people should be forced to shoulder a disproportionate share of the negative environmental impacts of pollution or environmental hazards due to a lack of political or economic strength.

ERPG-2 (Emergency Response Planning Guidelines-2): Concentration level for a 1-hour inhalation exposure that would allow a person to take protective action and avoid irreversible health effects.

exposure pathways: The course a chemical or physical agent takes from the source to the exposed organism. An exposure pathway describes a unique mechanism by which an individual or population is exposed to chemicals or physical agents at or originating from a release site. Each exposure pathway includes a source or release from a source, an exposure point, and an exposure route. If the exposure point differs from the source, a transport/exposure medium such as air is also included.

exposure: The condition of being made subject to the action of radiation. Sometimes also used as a generic term to refer to the dose of radiation absorbed by an individual or population.

fault: A fracture in the earth's crust accompanied by displacement of one side of the fracture with respect to the other and in a direction parallel to the fracture.

federally listed species: see "threatened, endangered, candidate, or rare species".

fission: The splitting of a heavy atomic nucleus into two nuclei of lighter elements, accompanied by the release of energy and generally one or more neutrons. Fission can occur spontaneously or be induced by neutron bombardment.

flood, 100-year: A flood event of such magnitude it occurs, on average, every 100 years (equates to a 1-percent probability of occurring in any given year).

flood, 500-year: A flood event of such magnitude it occurs, on average, every 500 years (equates to a 0.2-percent probability of occurring in any given year).

floodplain: The lowlands adjoining inland and coastal waters and relatively flat areas including, at a minimum, that area inundated by a 1-percent or greater chance flood in any given year. The base floodplain is defined as the 100-year (1.0 percent) floodplain. The critical action floodplain as defined as the 500-year (0.2 percent) floodplain.

footprint: The layout of a facility on the ground; also refers to an area affected by release of radioactive materials.

fugitive dust: The dust released from activities associated with an alternative such as construction, manufacturing, or transportation.

fugitive emissions: Uncontrolled emissions to the atmosphere from pumps, valves, flanges, seals, and other process points not vented through a stack. Also includes emissions from area sources such as ponds, lagoons, landfills, and piles of stored material.

fusion: Nuclear reaction in which light nuclei are fused together to form a heavier nucleus, accompanied by the release of immense amounts of energy and fast neutrons.

fusion fuel: Mixture of deuterium and tritium contained in a small capsule called the target.

fusion reaction: When two nuclei of lighter elements are brought into close enough proximity, they can undergo thermonuclear fusion forming a single nucleus and releasing energy at the slight expense in mass of the original constituents. Typically, a deuterium and tritium nucleus are fused in such a reaction to produce a helium nucleus plus one free neutron. The released energy of 17.6 MeV (million electron volts) is carried mostly as kinetic energy by the neutron (14 MeV).

gamma: High-energy, short-wavelength electromagnetic radiation (a packet of energy) emitted from the nucleus. Gamma radiation frequently accompanies alpha and beta emissions and always accompanies fission. Gamma rays are very penetrating and are best stopped or shielded against by dense materials such as lead or uranium. Gamma rays are similar to x rays, but are usually more energetic. Symbol: γ.

geometric mean: For a set of *n* terms, the *n*th root of their product. For a set of positive numbers, the geometric mean is always less than or equal to the arithmetic mean (see "arithmetic mean").

habitat: Area where a plant or animal lives.

hazardous chemical: Any chemical that is a physical hazard or a health hazard as defined by the Occupational Safety and Health Administration (29 CFR 1910.1201). For *Superfund Amendments and Reauthorization Act* (SARA) Title III, Section 311, the term is defined the same with certain named exceptions.

hazardous waste: Under the *Resource Conservation and Recovery Act*, a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may (a) cause or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or (b) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed. Source, special nuclear material, and byproduct material, as defined by the *Atomic Energy Act*, are specifically excluded from the definition of solid waste.

hohlraum: The metal case surrounding the target on indirect-drive inertial confinement fusion.

igneous: Refers to a rock or mineral that solidified from molten or partly molten material, i.e., from a magma; also, applied to processes leading to, related to, or resulting from the formation of such rocks. Igneous rocks constitute one of the three main classes into which rocks are divided, the others being metamorphic and sedimentary.

ignition: Ignition (fusion) is defined as the conditions leading to the self-heating of the fusion fuel by the fusion driver (such as laser beams). That condition occurs during the final part of the laser pulse when the fuel core is compressed to 20 times the density of lead (226 g/cm^3) and simultaneously heated to 100 million °C. The self heating of the fuel capsule is caused by alpha particle (fusion reaction byproduct) deposition. Ignition occurs when the reaction product deposition becomes faster than the heating caused by compression.

ignitron switch: A high current switch used to discharge energy storage capacitors, which are used to fire laser flashlamps.

inertial confinement fusion (ICF): An energetic driver beam (laser, x ray, or charged particle) initiated nuclear fusion using the inertial properties of the reactants as a confinement mechanism.

inertial fusion energy (IFE): The use of high-repetition-rate lasers or ion drivers (about 10 pulses per second) to accomplish laboratory and commercial thermonuclear fusion.

ingestion dose: An internal dose that results from the oral intake of food, water, soil, or other media contaminated with radioactive material.

input parameters: Values of variables needed to run a computer model.

interim (permit) status: Period during which treatment, storage, and disposal facilities coming under the *Resource Conservation and Recovery Act* of 1980 are temporarily permitted to operate while awaiting denial or issuance of a permanent permit.

isotope: An atom of a chemical element with a specific atomic number and atomic mass. Isotopes of the same element have the same number of protons but different numbers of neutrons and different atomic masses.

Joule: A metric unit of energy, work, or heat, equivalent to 1 watt-second, 0.737 foot-pound, or 0.239 calorie.

Key Decisions (KDs): The Department of Energy's procedure for approving large projects such as NIF is based on "Critical Decisions" (formerly known as Key Decisions) made by the Secretary of Energy. In January 1993, the Secretary approved "Key Decisions" 0, which affirmed the need for NIF and authorized a collaborative effort by the three DOE defense laboratories and the University of Rochester Laboratory for Laser Energetics to produce a conceptual design report. This report was completed in April 1994. "Key Decisions" 1 was signed by the Secretary in October 1994. This decision initiated preliminary design, safety analysis, cost and schedule validation and a two-year EIS, which will include public involvement. Critical Decision 3 (formerly known as Key Decision 3), scheduled for late 1997, will authorize construction and major procurements.

laser optics: Many large optical components are required for NIF and are located throughout the laser system. These include laser slabs housed within the amplifier columns, lenses used in the spatial filters for image relaying and on the target chamber for final focusing of the beams on the target, mirrors to reflect the beams within the laser cavity, and to direct the beam on the target chamber, polarizers and potassium dihydrogen phosphate crystal for switching and frequency conversion, and phase plates to smooth the beams and protect the final focus lenses from debris. Many other optical elements are used in laser diagnostics, in beam control systems, and for pulse injection into the main amplifiers.

laser pulse: The duration of time from the beginning of laser deposition on a surface to the end of the laser deposition.

laser: A device that produces a beam of monochromatic (single-color) "light" in which the waves of light are all in phase. This condition creates a beam that has relatively little scattering and has a high concentration of energy per unit area of the beam.

latent cancer fatality: Term used to indicate the estimated number of cancer fatalities which may result from exposure to a cancer-causing element. Latent cancer fatalities are similar to naturally occurring cancers and may occur at any time after the initial exposure.

LDN: see "ambient sound level".

leaching test: A test conducted to determine the leach rate of a waste form. The test results may be used for judging and comparing different types of waste forms, or may serve as input data for a long-term safety assessment of a repository.

level of concern: The concentration of an extremely hazardous substance (EHS) in the air above which there may be serious irreversible health effects or death as a result of a single exposure for a relatively short period of time.

level of service (LOS): The extent of community, health care and educational services provided by local jurisdictions in the vicinity of the proposed NIF sites. LOS is measured in terms of per capita expenditures on services in each of these categories. In traffic studies, LOS means the different operating conditions that occur in a lane or roadway when accommodating various traffic volumes. A qualitative measure of the effect of traffic flow factors such as special travel time, interruptions, freedom to maneuver, driver comfort, convenience, and (indirectly) safety and operating cost. Levels of service are described by a letter rating system of A through F, with LOS A indicating stable traffic flow with little or no delays and LOS F indicating excessive delays and jammed traffic conditions.

location: In this EIS, location refers to the proposed location of the National Ignition Facility within or near the larger DOE-controlled Federal site.

LOS: see "level of service."

low-income status: Based on Census data definitions of individuals below the poverty line. For the 1990 Census, for example, low-income status included individuals in 4-person families with 1989 incomes at or below $12,674. Other poverty thresholds are provided by the Census Bureau for larger and smaller family sizes.

low-level waste (LLW): Waste that contains radioactivity but is not classified as high-level waste, transuranic waste, spent nuclear fuel, or "11e(2) by-product material" as defined by DOE Order 5820.2A, *Radioactive Waste Management.* Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level waste, provided the concentration of transuranic waste is less than 100 nanocuries per gram.

maintenance pollutants: Criteria air pollutants in an Air Quality Maintenance Area that may exceed the ambient air quality standard over time.

master-oscillator power-amplifier (MOPA) chain: Solid-state laser design that provides the required laser beam energy and power amplification using a single-pass MOPA chain. The MOPA chain starts with a small oscillator (the master oscillator) that produces a laser pulse, which enters a preamplifier before making a single pass through a chain of amplifiers of gradually increasing size.

Master Oscillator Room (MOR): A self-contained special-purpose room that would house the NIF Master Oscillators and their supporting equipment. The purpose of this facility is to supply the 192 individually shaped and timed low-level laser pulses to the Preamplifier Modules located beneath the Spatial Filters in the main laser hall.

maximally exposed individual (MEI): A hypothetical individual who could potentially receive the maximum possible dose of radiation (or hazardous chemical).

maximum contaminant levels: Maximum permissible concentration of a contaminant in water which is delivered to any user of a public water system.

maximum design yield: The NIF Target Area has been designed to safely confine and withstand the effects of the yield of its targets up to this yield on some routine basis (e.g., weekly).

maximum yield experiment: A fusion ignition experiment that generates maximally expected fusion energy.

meteorology: The science dealing with the atmosphere and its phenomena, especially as it relates to weather.

millirem (mrem): One-one-thousandth of a rem (see "rem").

minority populations: Includes individuals who report themselves as belonging to any of the following racial groups: Black (reported their race as "Black or Negro," or reported entries such as "African American, Afro-American, Black Puerto Rican, Jamaican, Nigerian, West Indian, or Haitian"); American Indian, Eskimo, or Aleut; Asian or Pacific Islander, or "Other Race." In addition, individuals identifying themselves as Hispanic origin are also included in the minority category. Hispanics can be of any race, however. To avoid double-counting minority Hispanic individuals, only white Hispanics were included in the number of racially based minorities in a tabulation, since nonwhite Hispanics had already been counted under their minority racial classification.

Miocene: A geologic epoch in the Cenozoic Era dating from 26 to 7 million years ago.

mixed waste: Radioactive waste that contains nonradioactive toxic or hazardous materials that could cause undesirable effects in the environment. Such waste has to be handled, processed and disposed of in such a manner that considers the chemical as well as its radioactive components.

model: A conceptual, mathematical, or physical system obeying certain specified conditions, whose behavior is used to understand the physical system to which it is analogous.

Modified Composite Noise Rating (CNR): Noise rating system that determines impacts from a fixed noise source using objective and subjective factors. Noise ranked A through D is generally considered to be acceptable with "A" representing essentially no impacts. Rankings above "D" are usually addressed with mitigative measures unless the source is temporary.

molecular sieve: A material with a rigid, uniform pore structure that completely excludes molecules larger than the structure pore openings and that can absorb certain classes of small molecules from a fluid in contact with the material.

MOR: see "Master Oscillator Room".

mrem: One one-thousandth of a rem (see "rem").

NAAQS: see "National Ambient Air Quality Standards".

National Ambient Air Quality Standards (NAAQS): Air quality standards established by the *Clean Air Act*, as amended. The primary National Ambient Air Quality Standards are intended to protect the public health with an adequate margin of safety, and the secondary National Ambient Air Quality Standards are intended to protect the public welfare from any known or anticipated adverse effects of a pollutant.

***National Environmental Policy Act* (NEPA) of 1969:** The Act that established the national policy to protect humans and the environment, requiring environmental reviews of Federal actions that have the potential for significant impact on the environment, and established the Council on Environmental Quality.

***National Historic Preservation Act* of 1966, as amended:** This Act provides that property resources with significant national historic value be placed on the National Register of Historic Places. It does not require any permits but, pursuant to Federal code, if a proposed action might impact an historic property resource, it mandates consultation with the proper agencies.

National Ignition Facility (NIF): The proposed international research center comprising the world's most powerful laser, NIF would achieve ignition of fusion fuel and energy gain for the first time in a laboratory.

National Pollutant Discharge Elimination System (NPDES): Federal permitting system required for hazardous effluents regulated through the *Clean Water Act*, as amended.

***National Register of Historic Places*:** A list maintained by the National Park Service of architectural, historic, archaeological, and cultural sites of local, state, or national significance.

neodymium: A rare-earth metal listed in the periodic table of elements with an atomic number of 60 and an atomic weight of 144.24. The metal has a bright silvery metallic luster. Neodymium is one of the more reactive rare-earth metals and quickly tarnishes in air, forming an oxide that spalls off and exposes the metal to oxidation. Besides its use in producing coherent light in glass lasers, this metal has been used in astronomical work to produce sharp bands by which spectral lines may be calibrated. Neodymium salts are also used as a colorant for enamels, and in its separated form it is used to color glass in delicate shades ranging from pure violet to wine-red and warm gray.

neodymium glass laser: A type of solid-state laser that uses neodymium-doped optical fibers, rods, or glass slabs, with small amounts neodymium added, in which laser generation and amplification equipment are made. This equipment includes a master oscillator, preamplifier, and a series of amplifiers needed to generate and propagate laser beamlines that are highly stable and with the desired peak power level and frequency.

NEPA: see *National Environmental Policy Act.*

neutron: An uncharged elementary particle with a mass slightly greater than that of the proton, found in the nucleus of every atom heavier than hydrogen-1; a free neutron is unstable and decays with a half-life of about 13 minutes into an electron and a proton.

nitrogen oxides (NO_x): Refers to the oxides of nitrogen, primarily NO (nitrogen oxide) and NO_2 (nitrogen dioxide). These are produced in the combustion of fossil fuels and can constitute an air pollution problem. When nitrogen dioxide combines with volatile organic compounds, in sunlight, ozone is produced.

No Action alternative: Under this alternative, DOE would not construct and operate NIF and its support facilities. In the absence of NIF, the Nova Facility at LLNL would continue to operate beyond the year 2000.

***Noise Control Act* of 1972:** This Act directs all Federal agencies to carry out programs in a manner that furthers a national policy of promoting an environment free from noise that jeopardizes health or welfare.

nonattainment area: An air quality control region (or portion thereof) in which the Environmental Protection Agency has determined that ambient air concentrations exceed national ambient air quality standards for one or more criteria pollutants.

nonhazardous wastes: Routinely generated, nonhazardous wastes include general facility refuse such as paper, cardboard, glass, wood, plastics, scrap, metal containers, dirt, and rubble. These wastes are segregated and recycled whenever possible.

normal operations: All normal conditions and those abnormal conditions that frequency estimation techniques indicate occur with a frequency of more than 0.1 event per year.

Nova: A 10-beam, neodymium glass fusion laser facility at Lawrence Livermore National Laboratory capable of operating at 50 terawatts at 1/3 micrometers that was completed in 1984 and used for inertial confinement fusion target irradiation experiments.

NPDES: see "National Pollutant Discharge Elimination System".

nuclear weapon: The general name given to any weapon in which the explosion results from the energy released by reactions involving atomic nuclei, either fission, fusion, or both.

Occupational Safety and Health Administration (OSHA): Oversees and regulates workplace health and safety, created by the *Occupational Safety and Health Act* of 1970.

opacity restrictions: Visible-emission regulations that are based on the light-scattering properties of suspended matter in the ambient atmosphere and apply to near-field emissions of fixed sources.

ozone (O_3): The triatomic form of oxygen. In the stratosphere, ozone protects the Earth from the sun's ultraviolet rays; in lower levels of the atmosphere, ozone is considered an air pollutant.

paleontology: The study of fossils.

particulate (airborne): Small particles that are emitted from fixed or mobile sources and dispersed in the atmosphere.

Pasquill stability categories: Classification scheme that describes the degree of atmospheric turbulence. Categories range from extremely unstable (A) to extremely stable (F). Unstable conditions promote the rapid dispersion of atmospheric contaminants and result in lower air concentrations as compared with stable conditions.

perennial stream: A watercourse that flows year-round.

Permissible Exposure Limit (PEL): Occupational exposure limits endorsed by OSHA. May be for short-term or 8-hour duration exposure.

person-rem: The unit of collective radiation dose commitment to a given population; the sum of the individual doses received by a population group.

pH (potential of hydrogen): A measure of the hydrogen ion concentration in aqueous solution. Pure water has a pH of 7, acidic solutions have a pH less than 7, and basic solutions have a pH greater than 7.

photochemical oxidant: A class of compounds typified by ozone that represents oxidizing compounds created in the atmosphere with sunlight as a catalyst under low wind conditions.

piedmont: An area, plain, slope glacier, or other feature at the base of a mountain.

playa: Level area at the bottom of a desert basin that at times is temporarily covered with water; a dry lake bed.

Pleistocene: The geologic epoch that began approximately 1.8 million to 10,000 years ago (is generally equated with the "Ice Age").

Pliocene: Geologic epoch between the Miocene and the Pleistocene epochs approximately 5.5 to 1.8 million years ago.

plume: The spatial distribution of a release of airborne or waterborne material as it disperses in the environment.

PM_{10}: Particulate matter of aerodynamic diameter less than 10 micrometers.

population dose (population exposure): Summation of individual radiation doses received by all those exposed to the source or event being considered. The collective radiation dose received by a population group, usually measured in units of person-rem.

Precambrian: Dating from before the Cambrian geologic period more than 570 million years ago.

precursor pollutants: Pollutants that must be present in the atmosphere before chemical reactions take place and form the pollutant of interest. For example, nitrogen oxides, volatile organic compounds, and carbon monoxide are precursor pollutants to the formation of ozone.

preferred alternative: The preferred alternative for NIF is the Enhanced Option (indirect and direct drive) constructed at LLNL, the preferred site.

Prevention of Significant Deterioration (PSD): Regulations established by the 1977 *Clean Air Act* Amendments to limit increases in criteria air pollutant concentrations above baseline.

Project-Specific Analysis (PSA): This document provides an environmental evaluation of the impacts of construction and operation of the NIF as a basis for DOE's decision on whether to construct and operate such a facility at any of five locations at four candidate sites.

Proposed Action alternative: To site, construct, and operate the National Ignition Facility, which would be capable of achieving fusion ignition by the inertial confinement fusion process.

PSD: see "Prevention of Significant Deterioration".

public: Anyone outside the boundary of a DOE site at the time of an accident or during normal operations.

Quaternary: The period of geologic time since the end of the Pliocene, comprising the Pleistocene and Holocene, from about 1.6 million years ago to the present.

radiation: The emitted particles or photons from the nuclei of radioactive atoms. Some elements are naturally radioactive; others are induced to become radioactive by bombardment in a reactor. Naturally occurring radiation is indistinguishable from induced radiation.

radioactive decay time: Associated with the spontaneous transformation of one nuclide into a different nuclide or into a different energy state of the same nuclide; the process results in a decrease, with time, in the number of original radioactive atoms in the sample. The half-life decay "time" is generally defined in terms of the time required for one-half of the original species to decay.

radioactive decay: The decrease in the quantity of a radioactive material with the passage of time.

radioactive waste: Materials from nuclear operations that are radioactive or are contaminated with radioactive materials and for which use, reuse, or recovery are impractical.

radioactivity: The spontaneous decay or disintegration of unstable atomic nuclei, accompanied by the emission of radiation.

radiological risk: The product of the accident consequence (dose) and the probability of the accident occurring; calculated by considering a wide range of accidents, from high-probability low-consequence events to low-probability high-consequence events.

radionuclide: An atom that exhibits radioactive properties. Standard practice for naming a radionuclide is to use the name or atomic symbol of an element followed by its atomic weight (e.g., cobalt-60 or Co-60, a radionuclide of cobalt).

rare species: Populations and/or individuals occurring in very low numbers relative to other similar taxa in the state, although common or regularly occurring throughout much of their range. They may be found in a restricted geographic region or occur sparsely over a wider area. Although rare, populations are apparently stable.

region of influence (ROI): The area surrounding each proposed NIF site in which at least 90 percent of the current DOE workforce lives, and counties in which at least 5 percent of the DOE workforce lives.

rem: The dosage of an ionizing radiation that will cause the same biological effect as one roentgen of x ray or gamma-ray exposure.

***Resource Conservation and Recovery Act* (RCRA), as amended:** The Act that provides a "cradle to grave" regulatory program for hazardous waste and that established, among other things, a system for managing hazardous waste from its generation until its ultimate disposal.

resuspended inhalation: Exposure route in which radioactive materials enter the body through inhalation of air contaminated with radioactive particulates that were previously deposited on the ground following an accidental release.

riparian: Of, on, or pertaining to the bank of a river, stream, or lake.

risk factor: Numerical estimate of the severity of harm associated with exposure to a particular risk agent.

roentgen: a unit of exposure to ionizing x- or gamma radiation equal to or producing 1 electrostatic unit per cubic centimeter of air. It is approximately equal to 1 rad.

***Safe Drinking Water Act*, as amended:** This Act protects the quality of public water supplies, water supply and distribution systems, and all sources of drinking water.

SARA: see *Superfund Amendments and Reauthorization Act.*

sedimentary rock: A rock resulting from the consolidation of loose sediment that has accumulated in layers, consisting of mechanically formed fragments of older rock transported from its source and deposited in water or from air or ice.

seismic zone: An area defined by the Uniform Building Code (1991), designating the amount of damage to be expected as the result of earthquakes. The United States is divided into six zones: (1) Zone 0 - no damage; (2) Zone 1 - minor damage; corresponds to intensities V and VI of the modified Mercalli intensity scale; (3) Zone 2A - moderate damage; corresponds to intensity VII of the modified Mercalli intensity scale (eastern United States); (4) Zone 2B - slightly more damage than 2A (western United States); (5) Zone 3 - major damage; corresponds to intensity VII and higher of the modified Mercalli intensity scale; (6) Zone 4 - areas within Zone 3 determined by proximity to certain major fault systems.

seismicity: The tendency for the occurrence of earthquakes.

severity: Function of the magnitudes of the mechanical forces (impact) and thermal forces (fire) to which a package may be subjected during an accident; any sequence of events that results in an accident in which a transport package is subjected to forces within a certain range of values is assigned to the accident severity category associated with that range.

shielding: Any material or obstruction (bulkheads, walls, or other constructions) that absorbs radiation in order to protect personnel or equipment.

shot: Refers to all (192) laser beams hitting the target simultaneously.

site: In this PSA, the term "site" refers to a DOE-controlled Federal site, such as Los Alamos National Laboratory or the Nevada Test Site.

socioeconomics (analyses): Analyses of those parts of the human environment in a particular location that are related to existing and potential future economic and social conditions. The welfare of human beings as related to the production, distribution, and consumption of goods and services.

Solid Waste Management Unit (SWMU): Any discernible unit at which solid wastes have been placed at any time regardless of whether the unit was intended for solid or hazardous waste management.

source: Any physical entity that may cause radiation exposure, for example by emitting ionizing radiation or releasing radioactive material.

stability class: see "Pasquill stability categories".

Stockpile Stewardship and Management Program: A single, highly integrated technical program for maintaining the safety and reliability of the U.S. nuclear stockpile in an era without nuclear testing and without new weapons development and production.

Stormwater Pollution Prevention Plan: A plan required by an NPDES permit for controlling stormwater pollution resulting from construction or industrial activities.

sulfur oxides (SO_x): A general term used to describe the oxides of sulfur; pungent, colorless gases formed primarily by the combustion of fossil fuels. Sulfur oxides, which are considered major air pollutants, may damage the respiratory tract as well as vegetation.

***Superfund Amendments and Reauthorization Act* (SARA):** Public Law 99-499 passed in 1986 which amends the *Comprehensive Environmental Response, Compensation and Liability Act* (CERCLA) of 1980. SARA more stringently defines hazardous waste cleanup standards and emphasizes remedies that permanently and significantly reduce the mobility, toxicity, or volume of wastes. Title III of SARA, the *Emergency Planning and Community Right-to-Know Act*, mandates establishment of community emergency planning programs, emergency notification, reporting of chemicals, and emission inventories.

targets: Refers to a microstructure containing a tiny fuel capsule at which the lasers are directed.

tectonic: Pertaining to the processes causing, and the rock structures resulting from, deformation of the earth's crusts.

terawatt (TW): The equivalent of one trillion watts (10^{12}).

terrestrial: Pertaining to plants or animals living on land rather than in water.

thermoluminescent dosimeter: A radiation detection device that accumulates a dose or exposure over a period of time.

threatened species: Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

threshold limit value (TLV): The recommended concentration of a contaminant that a worker may be exposed to according to the American Council of Governmental Industrial Hygienists.

time-weighted average (TWA): Time-weighted average representing 8 hours per day for 40 weeks for 40 years of exposure.

total suspended particulates (TSP): Particulate matter present in the atmosphere.

***Toxic Substances Control Act* of 1976 (TSCA):** Act authorizing the Environmental Protection Agency to secure information on all new and existing chemical substances and to control any of these substances determined to cause an unreasonable risk to public health or the environment. This law requires that the health and environmental effects of all new chemicals be reviewed by the Environmental Protection Agency before they are manufactured for commercial purposes.

transuranic (TRU) waste: Waste contaminated with alpha-emitting radionuclides of atomic numbers greater than 92 with half-lives greater than 20 years and concentrations greater than 100 nanocuries/gram at time of assay. It is not a mixed waste.

tritium: A radioactive isotope of the element hydrogen with two neutrons and one proton. Common symbols for this isotope are H-3 and T.

tuff: A rock formed of compacted volcanic fragments, generally smaller than 4 millimeters in diameter.

Type A packaging: Packaging designed to retain the integrity of containment and shielding required by regulation under normal conditions of transport as demonstrated by the required test. Type A packaging (e.g., 55-gallon drums) is typically used to transport materials such as low-level radioactive waste.

volatile organic compounds (VOCs): A broad range of organic compounds (such as benzene, chloroform, and methyl alcohol), often halogenated, that vaporize at ambient or relatively low temperatures.

waste management: The planning, coordination, and direction of those functions related to generation, handling, treatment, storage, transport, and disposal of waste, as well as associated surveillance and maintenance activities.

waste minimization: Actions that economically avoid or reduce the generation of waste by source reduction, reducing the toxicity of hazardous waste, improving energy usage, or recycling. These actions will be consistent with the general goal of minimizing current and future threats to human health, safety, and the environment.

weapons effects: Deals with outputs of nuclear weapons and the associated effects on materials and the environment.

wetland: Land or area containing hydric soils, saturated or inundated soil during some portion of the plant growing season, and containing plant species tolerant of such conditions (includes swamps, marshes, and bogs).

wind rose: A depiction of wind speed and direction frequency for a given period of time.

x rays: Penetrating electromagnetic radiations with wavelengths shorter than those of visible light, usually produced by irradiating a metallic target with large numbers of high-energy electrons. In nuclear reactions, it is customary to refer to photons originating outside the nucleus as x rays and those originating in the nucleus as gamma rays, even though they are the same.

yield experiments: A measure of fusion energy/neutron production in experiments that use a mixture of deuterium and tritium isotopes as fuel.

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APPENDIX J

Appendix J

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ACRONYMS, ABBREVIATIONS, CHEMICAL SYMBOLS, AND UNITS OF MEASURE

Acronyms and Abbreviations

AMCCOM	U.S. Army Armament, Munitions, and Chemical Command
CFF	Contained Firing Facility
D&D	decontamination and decommissioning
DOE	Department of Energy
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
FR	*Federal Register*
FXR	Flash X-Ray
HEPA	high-efficiency particulate air
HTO	tritiated water
LLNL	Lawrence Livermore National Laboratory
LLW	low-level waste
MAP	Mitigation Action Plan
MMRP	Mitigation Monitoring and Reporting Program
NEPA	*National Environmental Policy Act*
NESHAP	National Emissions Standards for Hazardous Air Pollutants
ROD	Record of Decision
SJVUAPCD	San Joaquin Valley Unified Air Pollution Control District
TRU	transuranic
UC	University of California
VOCs	volatile organic compounds

Chemical Symbols

CO	carbon monoxide
HCl	hydrogen chloride
HCN	hydrogen cyanide
HF	hydrogen fluoride
NH_3	ammonia
NO_x	nitrogen oxides

Units of Measure

cm	centimeters
ft	feet
ft^2	square feet
ft^3	cubic feet
gal	gallons
ha	hectares
hr	hour
in	inches
kg	kilogram
km	kilometers

L	liters
lb	pounds
μg	micrograms
m	meters
m^2	square meters
m^3	cubic meters
mg	milligrams
$\mu g/m^3$	micrograms per cubic meter
mi	miles
rem	roentgen-equivalent-man (a measure of radiation dosage)
yd	yards
yd^3	cubic yards

Metric Conversion Chart and Metric Prefixes

To Convert to Metric			To Convert from Metric		
If You Know	**Multiply By**	**To Get**	**If You Know**	**Multiply By**	**To Get**
Length					
inches	2.54	centimeters	centimeters	0.3937	inches
feet	30.48	centimeters	centimeters	0.0328	feet
feet	0.3048	meters	meters	3.281	feet
yards	0.9144	meters	meters	1.0936	yards
miles	1.60934	kilometers	kilometers	0.6214	miles
Area					
square inches	6.4516	sq. centimeters	sq. centimeters	0.155	sq. inches
sq. feet	0.092903	sq. meters	sq. meters	10.7639	sq. feet
sq. yards	0.8361	sq. meters	sq. meters	1.196	sq. yards
acres	0.40469	hectares	hectares	2.471	acres
sq. miles	2.58999	sq. kilometers	sq. kilometers	0.3861	sq. miles
Volume					
fluid ounces	29.574	milliliters	milliliters	0.0338	fluid ounces
gallons	3.7854	liters	liters	0.26417	gallons
cubic feet	0.028317	cubic meters	cubic meters	35.315	cubic feet
cubic yards	0.76455	cubic meters	cubic meters	1.308	cubic yards
Weight					
ounces	28.3495	grams	grams	0.03527	ounces
pounds	0.45360	kilograms	kilograms	2.2046	pounds
short tons	0.90718	metric tons	metric tons	1.1023	short tons
Temperature					
Fahrenheit	Subtract 32, then multiply by 5/9	Celsius	Celsius	Multiply by 9/5, then add 32	Fahrenheit

Prefix	Symbol	Multiplication Factor
exa-	E	$1\ 000\ 000\ 000\ 000\ 000\ 000 = 10^{18}$
peta-	P	$1\ 000\ 000\ 000\ 000\ 000 = 10^{15}$
tera-	T	$1\ 000\ 000\ 000\ 000 = 10^{12}$
giga-	G	$1\ 000\ 000\ 000 = 10^{9}$
mega-	M	$1\ 000\ 000 = 10^{6}$
kilo-	k	$1\ 000 = 10^{3}$
hecto-	h	$100 = 10^{2}$
deka-	da	$10 = 10^{1}$
deci-	d	$0.1 = 10^{-1}$
centi-	c	$0.01 = 10^{-2}$
milli-	m	$0.001 = 10^{-3}$
micro-	μ	$0.000\ 001 = 10^{-6}$
nano-	n	$0.000\ 000\ 001 = 10^{-9}$
pico-	p	$0.000\ 000\ 000\ 001 = 10^{-12}$
femto-	f	$0.000\ 000\ 000\ 000\ 001 = 10^{-15}$
atto-	a	$0.000\ 000\ 000\ 000\ 000\ 001 = 10^{-18}$

APPENDIX J: CONTAINED FIRING FACILITY PROJECT-SPECIFIC ANALYSIS

J.1 Introduction

The Department of Energy (DOE) proposes to construct and operate a facility to provide containment of explosives test experiments at Lawrence Livermore National Laboratory (LLNL). These tests are currently conducted outdoors on a firing pad (also called a firing table) at the existing operational Building 801 (B801) facility, located at LLNL's Experimental Test Site (Site 300). Detonation experiments using explosives have been conducted outdoors at Site 300 since the early 1950s. The proposed Contained Firing Facility (CFF) would be a modification to the existing B801 Flash X-Ray (FXR) Facility and would consist of an enclosed Firing Chamber, a Support Facility, and a Diagnostic Equipment Facility. An Office Module, to be constructed approximately 46 meters (m) (150 feet [ft]) from the proposed Firing Chamber, is also proposed.

Two alternatives to the proposed action are addressed in this environmental assessment:

- No action (continue operation of the current B801 facility and its outdoor firing activities at planned levels).
- Build the CFF at an alternative Site 300 location (vicinity of B851).

The Record of Decision (ROD) issued January 27, 1993, for the August 1992 *Final Environmental Impact Statement and Environmental Impact Report for Continued Operation of Lawrence Livermore National Laboratory and Sandia National Laboratories*, Livermore, DOE/Environmental Impact Statement (EIS) 0157, (1992 EIS/Environmental Impact Report [EIR]) (DOE/University of California [UC] 1992), published the Secretary of Energy's decision to continue to operate LLNL, including near-term proposed projects (those within 5 to 10 years). The proposed B801 CFF is described as one of the projected, budgeted new facilities under the proposed action, (table 3–3) in the 1992 EIS/EIR, and is further discussed in section A.2.5.3 (Proposed Construction Projects, LLNL, Site 300) and table 4.15–2 (LLNL Site 300, Overview) of the 1992 EIS/EIR. The potential impacts of construction and operation of the proposed CFF are expected to be within the scope of the impacts of normal Site 300 operations and potential Site 300 accidents as outlined in the 1992 EIS/EIR. This environmental impact analysis is tiered from the 1992 EIS/EIR and provides additional detailed information on CFF operations and its potential impacts.

This environmental impact analysis was prepared in accordance with the *National Environmental Policy Act* (NEPA) of 1969, as amended, (42 *United States Code* section 4321 et seq.) and adheres to policies and procedures for DOE compliance with the NEPA as set forth in 10 *Code of Federal Regulations*, Part 1021 (57 *Federal Register* [FR] 15122, April 24, 1992).

J.2 Purpose and Need for Action

To meet its present and future strategic stockpile stewardship responsibilities DOE needs to insure its long-term ability to continue conducting hydrodynamic testing of certain explosive and metal containing materials at its existing FXR Facility (Building 801) at LLNL's Site 300. As the most up-to-date U.S. hydrodynamic test facility, the current Building 801 FXR Facility serves a key role in providing essential hydrodynamic test data needed by DOE to assess key elements of stockpile safety and reliability in the absence of nuclear testing by the United States.

In order to assure its continued future ability to provide this needed test data at its Site 300 facility and consistent with its policy of improving environmental, safety, and health posture of its operations, DOE proposes to further reduce the environmental, safety, and health impacts of its current Site 300 explosives tests by conducting certain experiments (such as those involving depleted uranium, tritium, and beryllium) in an enclosed Firing Chamber.

The purpose of the CFF enclosure would be to reduce gaseous and particulate air emissions from explosives testing, reduce the generation of solid low-level radioactive waste (LLW) (resulting from present Site 300 outdoor firing table activities), reduce testing noise, improve the safety of testing by controlling fragment dispersion, and improve the quality of diagnostics data derived from testing by better controlling experimental conditions.

Without the CFF's enclosed Firing Chamber and supporting project elements, hydrodynamic testing would have to continue to be done in the outdoor environment, thus reducing test scheduling flexibility, and continuing the currently projected outdoor firing, environmental, and safety postures.

Siting such a facility at LLNL's Experimental Test Site, Site 300, was included as a projected facility under the proposed action of DOE's 1992 EIS/EIR to continue operation of LLNL (section 3.1.2 and table 3–3, 1992 EIS/EIR); the Secretary of Energy issued the ROD on this EIS January 27, 1993 (58 FR 6268).

J.3 Description of the Proposed Action and Alternatives

J.3.1 Proposed Action

The proposed action is to design, construct, operate, and ultimately decontaminate and decommission (D&D) a CFF in the area of B801 at LLNL's Site 300 (figures J.3.1–1 and J.3.1–2) and to modify the existing FXR Facility in B801 so as to preclude damage to FXR equipment when detonations occur in the adjacent, proposed CFF Firing Chamber (figure J.3.1–3) (LLNL 1995).

J.3.1.1 *Design*

J.3.1.1.1 Current B801 Complex

The core elements of the current 1,628 square meters (m^2) (17,522 square feet [ft^2]) B801 complex are the bunker, housing the firing control room, and the linear induction accelerator/FXR Facility and other diagnostic equipment, as well as an outdoor gravel pad firing table. Detonations of explosives assemblies (which may contain depleted uranium, beryllium, and/or tritium-containing components) are done on the gravel firing table, and the dynamics of the detonation process are recorded by the FXR system and associated diagnostics equipment through ports in the B801 FXR Facility. Other infrastructure at the present B801 complex includes support buildings, loading docks, underground control and gas storage bunkers, an underground camera (optics) room, and utilities.

J.3.1.1.2 Proposed Contained Firing Facility Design Concept

The proposed CFF would augment and be collocated with (adjacent to) the current B801 (see figure J.3.1–3). The four main elements of CFF would be the Firing Chamber, Support Facility, Diagnostic Equipment Facility, and an Office Module, totaling approximately 2,685 m^2 (28,900 ft^2) of additional developed space within the present B801 complex area. The present B801 gravel firing table would be partially paved after it was ensured that any gravel and debris contaminated above regulatory limits were removed. The new proposed facility elements would be designed and placed to provide an efficient, safe, fully integrated test and diagnostics complex that would operate for a projected 30-year lifetime. The facility would be designed and operated in full compliance with applicable DOE orders as well as applicable Federal and state laws and regulations.

J.3.1.1.3 Firing Chamber

The Firing Chamber would be designed to contain the blast overpressure and fragment effects from detonations of explosives assemblies (figure J.3.1.1.3–1). It would retain solid debris, gases, and particulate and aerosol products generated from the detonation, allowing for their selective removal, or, in the case of certain gases, their controlled release to the atmosphere through use of scrubbers, absorbents, high-efficiency particulate air (HEPA) filters, and other similar equipment. The explosives quantities would vary with a maximum of 60 kilograms (kg) (132 pounds [lb]) of plastic-bonded explosive 9404, or an equivalent trinitrotoluene design weight of 94 kg (207 lb). The inside walls of the chamber would be protected from high-velocity detonation fragments by replaceable shielding.

The Firing Chamber would be a cast-in-place, steel-reinforced concrete structure with diagnostic and optical line-of-sight ports for data collection. Walls would be 1.2-m (4-ft) thick and would support a

FIGURE J.3.1–1.—*Locations of Lawrence Livermore National Laboratory at Livermore Site and Experimental Test Site, Site 300.*

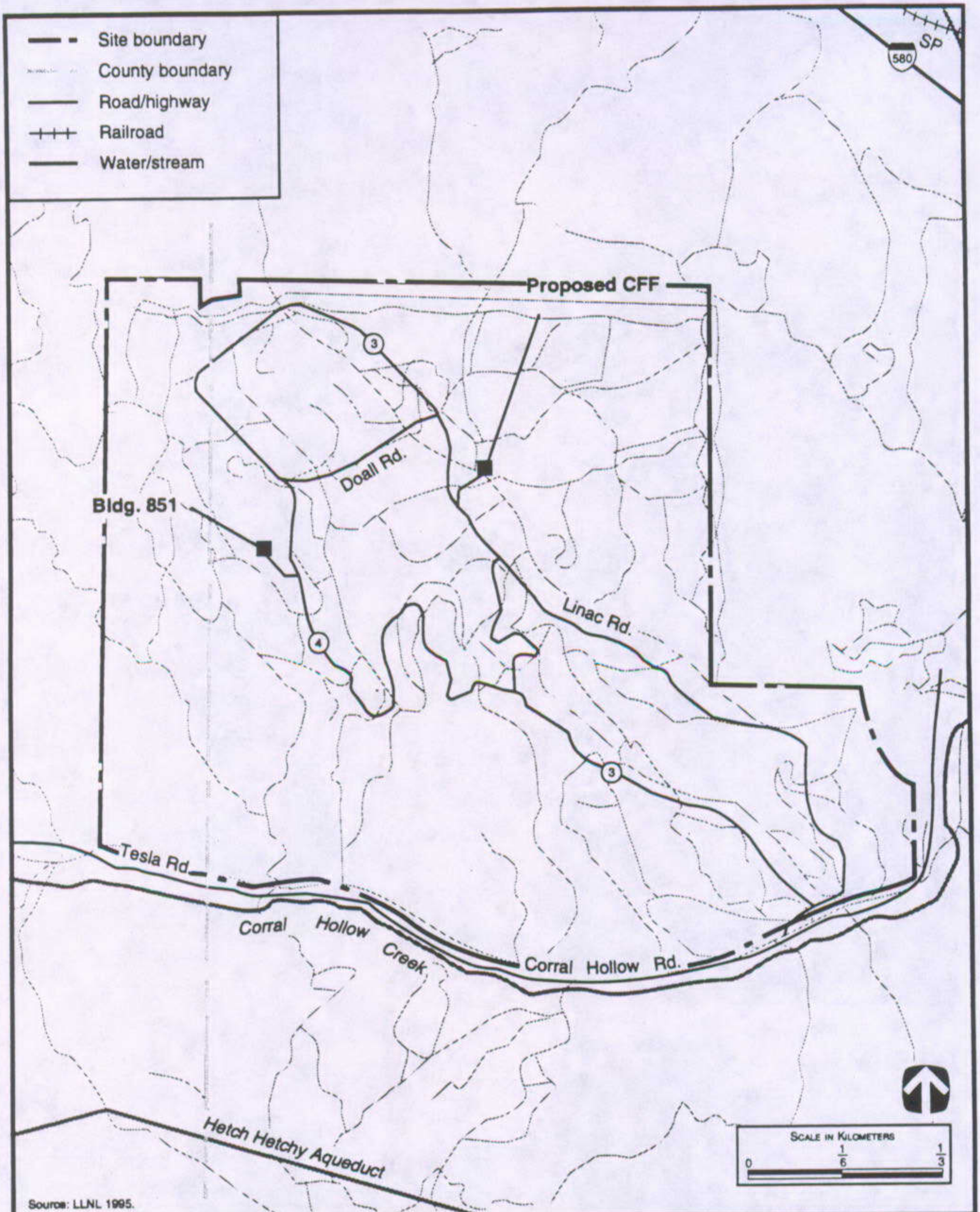
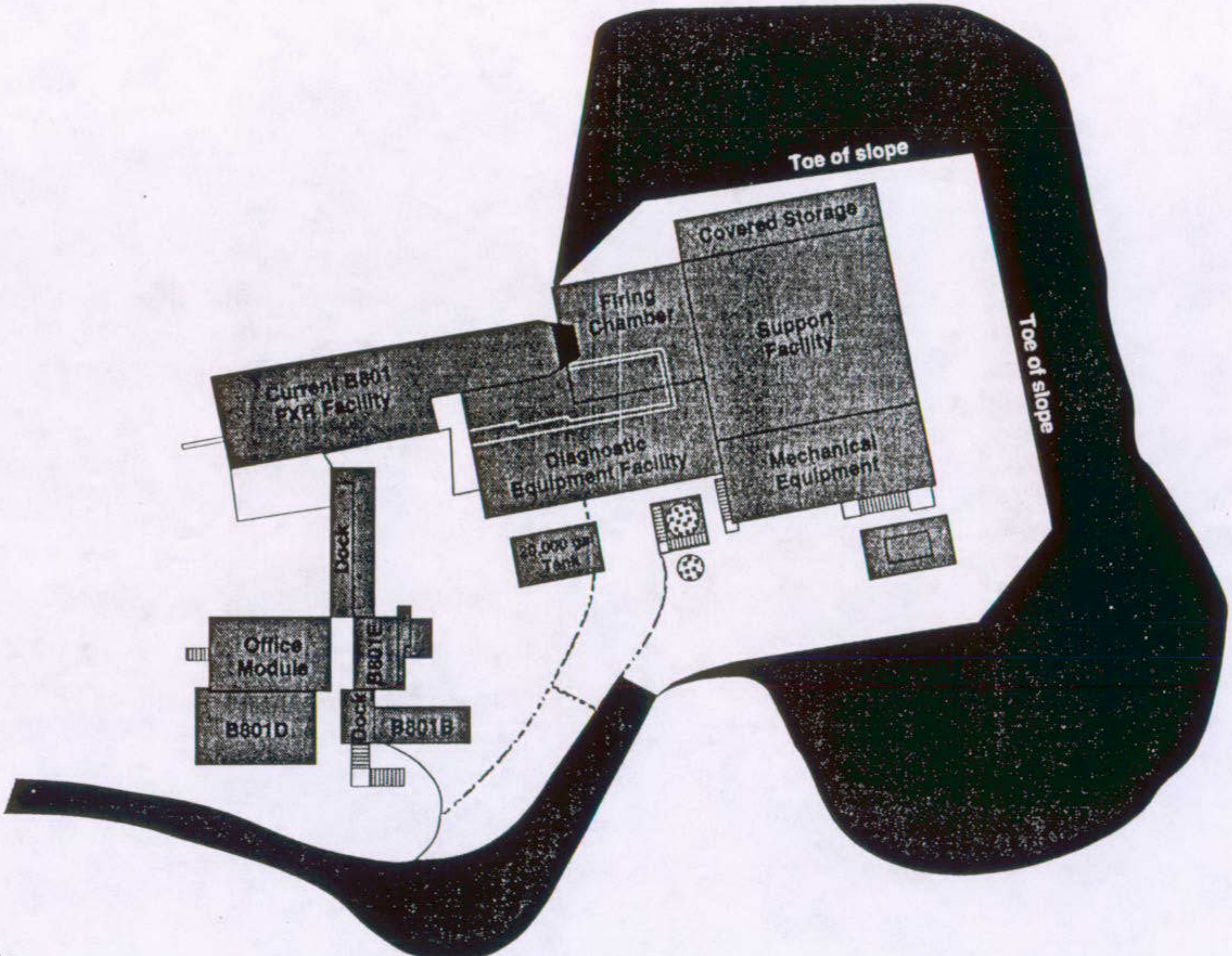


FIGURE J.3.1–2.—*Location of Buildings 801 and 851 at Site 300.*



Note: Not to scale.
Source: LLNL 1995.

3112/SSM

FIGURE J.3.1–3.—*Building 801 Showing Addition of the Firing Chamber, Diagnostic Equipment Facility, Support Facility, and Office Module.*

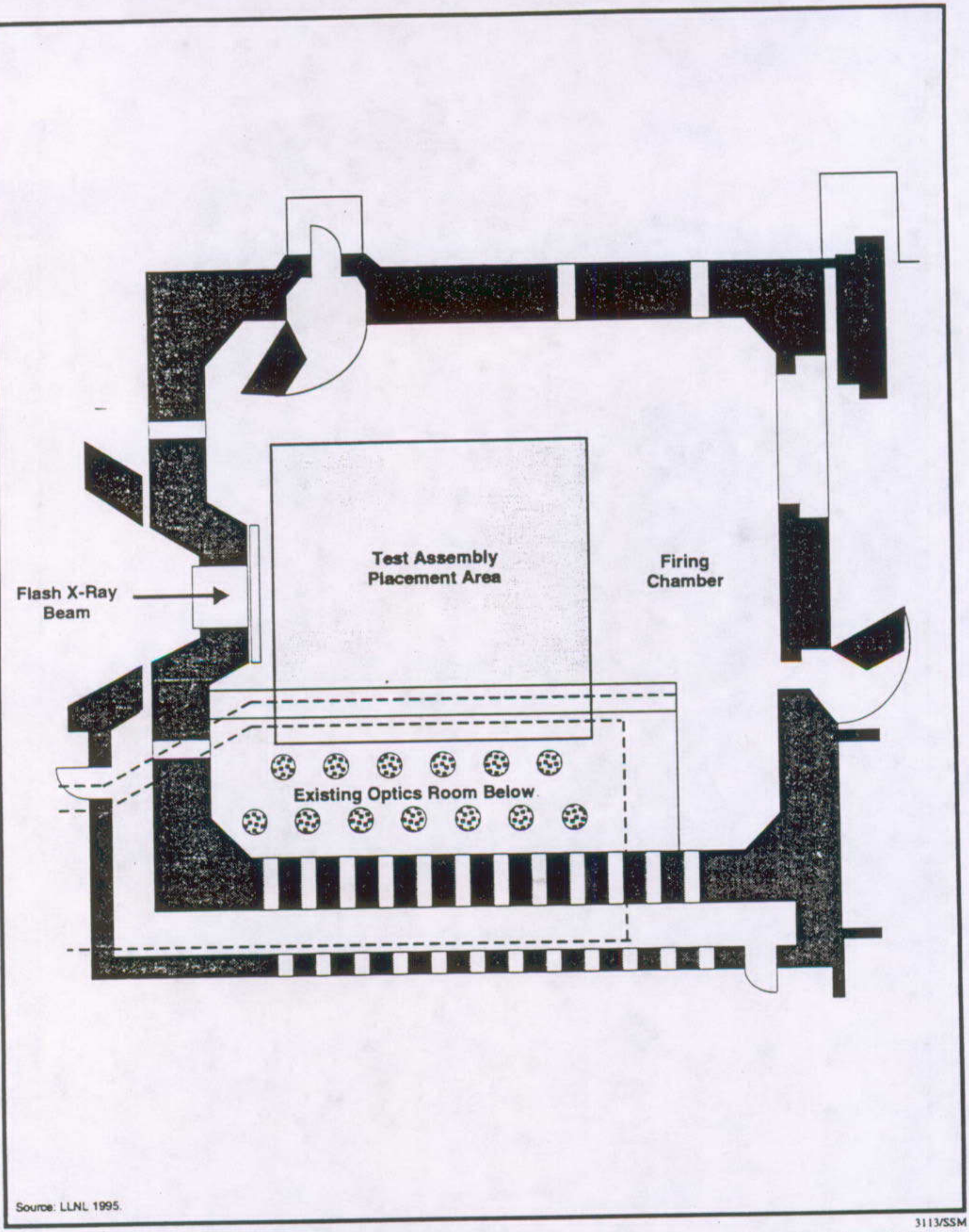


FIGURE J.3.1.1.3–1.—*Firing Chamber Portion of the Contained Firing Facility in Building 801.*

1.4-m- (4.5-ft)-thick ceiling slab and be supported on a 1.8-m- (6-ft)-thick floor slab. On the south side, an existing camera room would be integrated into and be used as part of the chamber. The 0.9-m (3-ft)-thick existing roof of the camera room would be covered by a 0.6-m- (2-ft)-thick concrete overlay to increase its structural capacity.

All interior surfaces of the chamber would be lined with 1.3 centimeters (cm) (0.5 inches [in]) steel plate. Replaceable 2.5 cm (1 in) thick steel tiles would be attached to the steel-lined walls and ceiling. Floors would also be covered with replaceable steel tiles whose thickness would vary with the experiment. Equipment would be brought into the Firing Chamber through a 3.7 m (12 ft) by 4.3 m (14 ft) blast door. Two personnel safety exit doors would be situated to provide egress during test setup. Blast doors would also be protected from detonation fragments. The chamber would have conditioned air, lighting, a water washdown system, a separate tritiated-gas stripping system, a drain leading to a holding tank, and water recycling and evaporation systems. The air supply and exhaust openings would also be protected from blast damage by shielding dampers and blast valves.

The air management system supporting the chamber would consist of a normal operation exhaust system with a post-firing air purge system, and a gas-stripping system for use after experiments involving tritium. During normal operation, the exhaust system (figure J.3.1.1.3–2) would maintain a negative pressure in the Firing Chamber relative to the Support Facility.

Following a test firing, an air purge system would exhaust air, suspended particulates, and gases from the chamber through filter and scrubber systems before the discharge of air and remaining gases to the atmosphere through a roof-mounted stack approximately 15.2 m (50 ft) above ground level. Air would be taken in through openings in the chamber wall. Ductwork would be protected from dynamic and static blast overpressure. The filtration system for use after detonations would consist of a centrifugal precipitator; a 95-percent efficient pulse-jet dust collector with fusible sprinkler head; 30-percent efficient prefilters; 99.97-percent efficient, nuclear-grade HEPA filters; a scrubber system to remove gases and vapors; and a fan. The filter housing would be a bag-out type, and would include ports for testing HEPA filter-bank efficiency and monitoring pressure drop across the filters. Any waste storage and treatment areas that may be required for processing liquid from the gas absorption wet scrubber would be designed and operated in conformance with applicable waste management procedures and DOE orders.

After tests involving tritium-containing materials, a tritium scrubber system would be activated. In addition to filtering particulate, this system would also remove at least 95 percent of any tritium. The tritium scrubbing system would consist of a standard hot catalyst/desiccant system designed to ensure oxidation and removal of airborne tritium as primarily tritiated water (HTO).

The chamber also would be designed with water washdown systems for post-test cleaning and fire protection (figure J.3.1.1.3–3). The washdown system installed in the ceiling of the chamber, consisting of an articulating nozzle, would direct water to all interior surfaces. The high-velocity spray nozzle could operate automatically or manually via remote controls with the use of video monitoring. When operated manually, personnel would use hoses from reels located outside the chamber. Residual water retained by pitted floor tiles would be removed by manual or mechanical methods. A floor drain (protected by a blast-resistant valve) would collect contaminated water and direct it to a holding tank for analysis followed by filtration and evaporation or transfer to an appropriate treatment facility.

J.3.1.1.4 Support Facility

The Support Facility would provide a staging area for preparation of the nonexplosive components of an experiment; storage of equipment and materials; and personnel locker rooms, rest rooms, and decontamination showers. A mezzanine above the personnel area would house mechanical equipment. A mechanical equipment area would be located adjacent to the staging area. The size of the Support Facility would be approximately 1,542 m^2 (16,600 ft^2).

The Support Facility would be separated into gray and clean areas. The gray areas would be areas in which contamination could occur. Egress from the gray areas would require passage through decontamination and change areas prior to entering the clean areas. The Support Facility rooms would have a negative air pressure relative to the clean areas to control the potential for migration of contamination to clean areas.

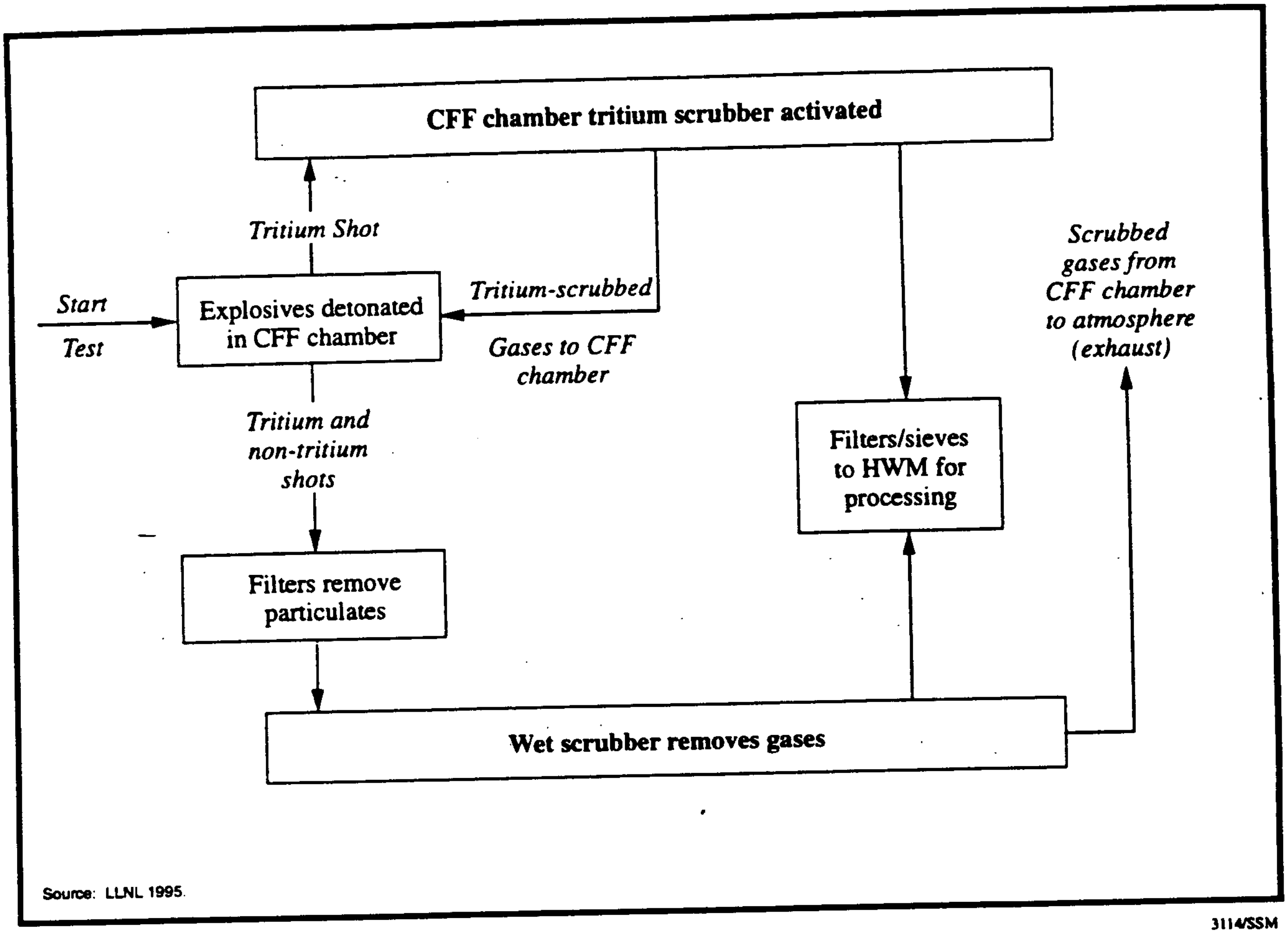


FIGURE J.3.1.1.3–2.—*Simplified Post-Test Contained Firing Facility Gas Scrubbing Schematic.*

J.3.1.1.5 Diagnostic Equipment Facility

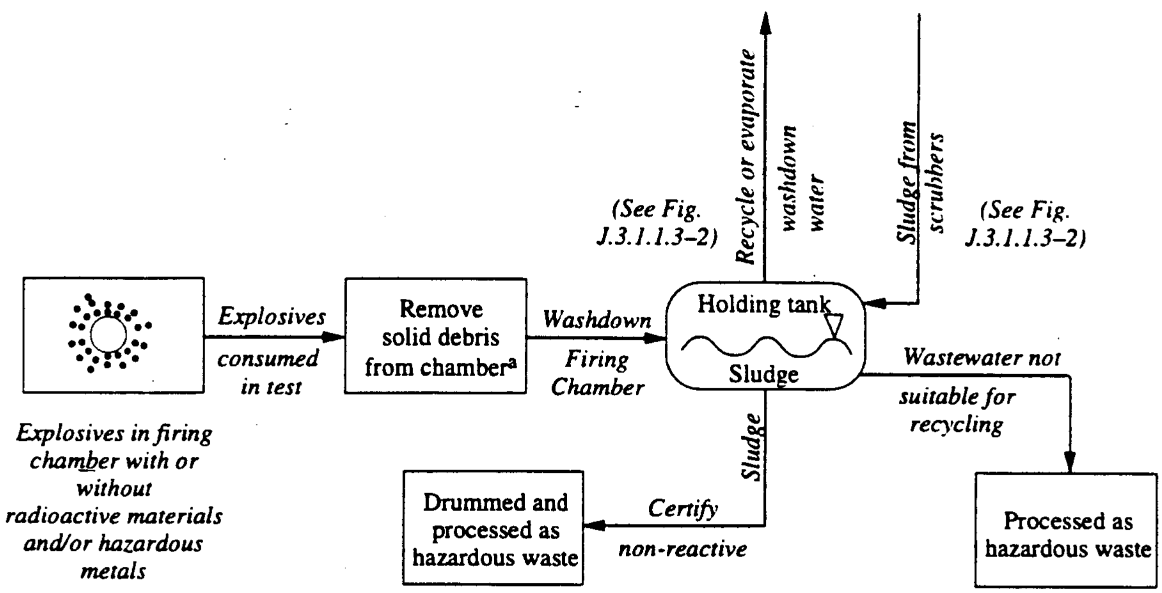
The Diagnostic Equipment Facility would house various diagnostic equipment used to evaluate the results of explosives tests. The Diagnostic Equipment Facility would be similar in construction to the Support Facility but would be designed to protect personnel who occupy this area during the tests. The facility would be approximately 576 m^2 (6,200 ft^2). The Diagnostic Equipment Facility would be controlled as, and be considered to be, a clean area. An additional 0.6 m (2 ft) thickness of reinforced concrete wall would be placed 1.2 m (4 ft) from the Firing Chamber wall to create a utility corridor for diagnostic devices, as well as to provide an additional safety buffer wall for personnel. Pressure-rated personnel doors would be installed at either end of the corridor for access. The Diagnostic Equipment Facility would be the main personnel entrance into the new CFF complex.

J.3.1.1.6 Office Module

A premanufactured Office Module of approximately 223 m^2 (2,400 ft^2) would be constructed adjacent to the north side of the existing B801D, approximately 46 m (150 ft) southwest of the proposed Firing Chamber. This facility would provide administrative space for the B801 complex staff.

J.3.1.2 *Construction*

Site preparation would require site excavation and demolition work. The CFF design concept would require excavation of about 41,300 cubic meters (m^3) (54,000 cubic yards [yd^3]) of existing soil from adjacent hillsides. This material would be sampled and analyzed to verify that it is uncontaminated. Any identified hazardous, LLW, or mixed wastes would be appropriately packaged and labeled in accordance with all applicable regulatory, DOE, and LLNL



[a] Solid debris characterized, sorted, and processed as low-level radioactive, mixed, or hazardous waste, as appropriate.
Source: LLNL 1995.

3115/SSM

FIGURE J.3.1.1.3–3.—*Post-Test Water Washdown Schematic.*

requirements. Site preparation would also require removal of an underground utility bunker and the relocation of a 0.8 m (2.5 ft) storm drain line. Explosives tests would be diverted from the B801 complex to other firing facilities (principally to B851) during construction at B801. Site improvements would include excavation, grading, trenching, electrical service augmentation, underground utilities augmentation, curbs and gutters, and debris removal. Structures would be designed in accordance with the requirements of the most current edition of the Uniform Building Code.

J.3.1.3 *Operation*

When CFF is constructed and operational, it is estimated that approximately 100 explosives research and diagnostic experiments could be conducted annually. Quantities of explosives expended in most typical tests would be less than 25 kg (55 lb). Certain of these tests typically involve some components of beryllium and depleted uranium. General pre-test, test, and post-test activities at CFF are described below.

J.3.1.3.1 Pre-Test and Test Activities

Nonexplosive support fixtures and apparatus needed for the test assemblies would be assembled in the Support Facility, then transported to and set up in the Firing Chamber. This apparatus often includes heavy foundations or shot stands to support the explosive experiment, armored radiographic film cassettes, heavy steel momentum-transfer plates, mild steel and wooden shrapnel shields, glass optical turning mirrors and mounting hardware, expendable capacitor discharge units, high-pressure gas-filled devices, and other special diagnostic equipment. Much of this apparatus is expended in the test. Motor-driven cranes and forklifts may be used to move both the inert apparatus and the explosives, if needed. Strict administrative controls would be applied to restrict personnel movement and location while certain of these setup operations are conducted.

The explosive charge would usually be the last item to be placed at the Firing Chamber. When all other equipment has been readied, the explosives assembly would be brought by truck to the chamber from its assembly point at the Site 300 process area or from an explosives storage magazine and carefully set in position, with only essential personnel in attendance. System checks in the form of dry runs would be performed to show that all electrical and mechanical systems have been properly connected and to verify that proper time delays between individual events have been programmed.

When all dry run testing is complete, the chamber would be secured, personnel assembled and accounted for (mustered) within the protected control room (bunker), and the experiment conducted.

J.3.1.3.2 Post-Test Activities

Tests Not Involving Tritium. After an experiment that does not involve tritium, the Firing Chamber would be allowed to cool. Television cameras and infrared sensors would be used to survey the chamber interior for burning debris. Fires would be quenched by a short-duration water washdown or allowed to self-extinguish. The chamber purge system would draw air through scrubber, filtration, and exhaust systems (figure J.3.1.1.3–2). Gas sampling devices would monitor the chamber gas concentrations before and after purging.

After about 10 fresh-air makeup exchanges (and after observation of the television monitor indicates that entry is permissible), qualified explosives handlers (using breathing protection, if necessary) would reenter the chamber. Any smoldering materials or unreacted explosive would be rendered safe so that others could enter. Diagnostics data would be collected and the chamber cleaned in preparation for the next experiment.

The chamber washdown system, consisting of an articulating, ceiling-mounted nozzle would be used to periodically wash detonation test residue from the chamber walls (figure J.3.1.1.3–3). A manually operated hose would be used to complete the washdown once access is permitted. The washdown water would be supplied from Site 300's domestic water supply system, supplemented by recycled washdown water. This washdown water and spent scrubber liquid would be diverted to a holding tank, filtered, and reused, evaporated, or sent to LLNL's Hazardous Waste Management Division for processing. Floor drains, floor sinks, drainage trenches, wash basins, and emergency shower and eyewash drains from portions of the Support Facility would also be gravity-fed into a separate water collection system. This wash water would be monitored, filtered, and recycled for reuse as part of the Firing Chamber washdown system.

Evaporation would be used to substantially reduce the volume of wastewater. Waste residues from this process would be treated by methods that meet applicable criteria for handling industrial wastewater (e.g., treatment and/or stabilization). Sludge containing metals and other contaminants that would be typical residue from evaporating this form of wastewater would be routinely handled by LLNL's waste management facilities.

Tests Involving Tritium. Tests involving tritium-containing components are administratively limited to 20 milligrams (mg) (200 curies) tritium each, and it is estimated that a maximum of 10 such tests per year would be performed. After an experiment, the tritium scrubber system would be activated. The system would operate in a recirculating mode until monitoring and analysis indicated that most undesirable gases had been removed. Additional tritium removal would then be accomplished by adding a few liters of water as a mist to moisturize the air and chamber surfaces to help remove additional tritium (as tritiated water, HTO). (The chamber air would then be scrubbed again to remove additional tritium.) These moisturize/scrub cycles would be repeated until most readily exchanged tritium (as HTO) had been removed and monitored chamber tritium levels were deemed acceptable for reentry. Reentry scheduling would also be dependent on the levels of any other residual radiation, the intensity of which would also be monitored during and after an experiment. The tritium (as tritiated water vapor, HTO) would be absorbed and collected onto a solid medium, such as molecular sieves, during this air-scrubbing process.

As an adjunct to the air-scrubbing removal of tritium, a more aggressive water washdown of the chamber surfaces would be done with about 1,900 liters (L) (500 gallons [gal]) of water. The volume of this washdown water would be controlled to minimize generation of tritium-contaminated water. This would be achieved by regulating the flow into the articulating, ceiling-mounted nozzle, limiting washdown time, and/or manual washing of the chamber. Washdown water would separately be collected and may be reduced in volume, then be managed as low-level liquid (or solidified) radioactive waste. The estimated volume of the wastewater filtration sludge expected from this process would be approximately 85 L (22 gal).

It is estimated that up to 25 55-gallon (208 L) drums and 2 2.8 m^3 (100 ft^3) boxes of solid LLW would be generated for each tritium-containing test.

J.3.1.4 *Decontamination and Decommissioning (Closure)*

A useful lifetime of 30 years is assumed for CFF. Projections of the need for D&D versus conversion to different usages for CFF after that time cannot yet be made. Such proposals, when identified, would be subject to separate NEPA review, if necessary.

J.3.2 Alternatives to the Proposed Action

J.3.2.1 *No Action Alternative*

The No Action alternative would leave B801 in its current configuration and would continue the routine detonation of explosives experiments outdoors. No construction disturbance would occur with this alternative. The primary effect of adopting the No Action alternative would be an annual release of emissions from up to an estimated 100 test detonations of explosives and associated materials, equipment, and assemblies directly into the atmosphere and surrounding soils or gravel; the continued generation of solid LLW from test debris and the periodic removal and processing of firing table gravel; and the continued noise levels and blast overpressure to the surrounding area.

An indication of the explosion-related product amounts released to the environment under the No Action alternative (continued outdoor testing) can be derived from the database of materials used in past outdoor explosives experiments at Site 300. Table J.3.2.1–1 shows the estimates of annual hazardous, radioactive, and other material dispersals that could be expected each year under the No Action alternative, based on compositions of tests at B801 for calendar years 1990 to 1994. Most of this material dispersal would be in the form of solid debris that is recovered after the test or is deposited in firing table gravel. Because the experiments were conducted outdoors, the remainder has, for the most part, been dispersed to the environment (primarily as metal or oxides). The materials listed in table J.3.2.1–1 are, therefore, an indication of what would constitute the source terms for waste streams and/or emissions that would likely result from conducting approximately 100 tests per year outdoors at B801 under the No Action alternative.

As noted above, solid LLW in the form of contaminated firing pad gravels after a series of outdoor tests involving radioactive material at B801 would continue if CFF is not built and operated. (By comparison, no contaminated gravel from enclosed B801 CFF operations would be generated under the preferred alternative.) Additional solid LLW in the form of test debris (such as wood, plastic, metal, and burlap bags) is generated each year under the No Action alternative; the generation of these types of test debris would likely continue under the No Action alternative as well as under the proposed action.

The organic explosives (noted in table J.3.2.1–1) used at B801 can be expected to oxidize very efficiently upon detonation to produce gaseous carbon dioxide less than 97 percent, water, and trace amounts of nitrogen, carbon monoxide, carbon (soot), oxides of nitrogen, and assorted volatile organic compounds (VOCs) (U.S. Army Armament, Munitions, and Chemical Command [AMCCOM] 1992).

J.3.2.2 *Build the Contained Firing Facility at an Alternative Site 300 Location (B851)*

B851 is a 1,270 m^2 (13,681 ft^2) complex located in the northwest quadrant of Site 300. It features a gravel firing pad, an electron beam accelerator, and several laboratories, shop areas, and offices. B801 has a more powerful and modern accelerator (the FXR) than B851 and is therefore much more capable of performing a thorough data analysis of test results from certain tests than the facilities at B851.

Construction of CFF at the B851 site would have about the same construction-related impacts as construction at B801. Operational impacts would also be similar in terms of safety, potential accident impacts,

TABLE J.3.2.1–1.— *Estimated No Action Hazardous Materials Release to the Environment (Air, Solid Debris, and Particulate)*

Material	Estimated Dispersal per Year, kg[a,b]
Barium	0.002
Beryllium	15.3
Chromium[c]	6.9
Cobalt	0.01
Copper[d]	580
Fluoride salts	3.6
Lead	4.1
Molybdenum	1.3
Nickel[c]	8.6
Silver	1.6
Vanadium	3.6
Zinc	0.1
Lithium salts	22.6
Depleted uranium[e]	430
(Explosives)[f]	(1,662)
Tritium[g]	0.0002

[a] Projected future dispersals per year based on the estimated composition of 100 tests. The basis for these projections is the B801 shot materials database for the previous 5 years (1990 to 1994), during which the number of tests ranged from 21 to 97 per year and averaged 50 per year.

[b] Only a very small fraction of the weights of the metallic materials and salts listed in this table would be expected to be volatilized as gaseous or aerosol products.

[c] Source is primarily alloying materials on test hardware, such as nuts, bolts, etc. Most of this material is large enough to be retrieved by hand following an experiment, so that it can be disposed of in a managed waste stream, or recycled.

[d] Source is primarily electrical leads and wire. Most pieces of this material are large enough in size as to be retrieved by hand following an experiment, where it is disposed of in a managed waste stream or recycled.

[e] In rare instances, thorium may be used in place of depleted uranium.

[f] This weight of explosives would be converted to thermodynamically stable products of combustion (such as carbon dioxide and water) very efficiently upon detonation.

[g] Tritium has not been used in the most recent past few years. However, the 1992 DOE/UC EIS/EIR discusses an administrative limit of 20 milligrams (mg) of tritium, an environmental emission that can be expected under the No Action alternative. This projection is based on an estimated maximum of ten tests per year at 20 mg each.

Source: Model results.

and noise. Thus, although possibly a reasonable alternative, it offers no significant advantages and several significant disadvantages to the B801 site.

J.4 DESCRIPTION OF THE AFFECTED ENVIRONMENT

A brief description of the environment surrounding the location of the proposed facilities is presented in this section. A more detailed description can be found in the 1992 EIS/EIR (DOE/UC 1992), which is incorporated by reference.

J.4.1 Topography

Site 300 is located in the Altamont Hills and consists of southeasterly trending ridges and canyons of moderate-to-high relief. These ridges vary in elevation from slightly more than 153 m (500 ft) at the Corral Hollow Creek entrance to the site to over 518 m (1,700 ft) at the highest point. The onsite drainage pattern is well-developed and flows generally east and south toward Corral Hollow Creek.

CFF would be built as a modification to B801 and would, therefore, be nestled among hills ranging from 34 to 104 m (110 to 340 ft) above its floor elevation to the north, east, and south. The floor level would be at approximately 323 m (1,060 ft) above mean sea level.

J.4.2 Seismicity

Site 300 is located on the eastern edge of the seismically active San Francisco Bay area. A number of active faults are considered capable of causing strong ground motion at Site 300. The nearest of these faults to Site 300 is the Carnegie-Corral Hollow Fault, which crosses the southwest portion of the site (Carpenter et al., 1991). No significant recorded earthquakes have occurred on any of the local faults. The effect of seismic activity at Site 300 is likely to be confined to ground shaking with no surface displacement. Raber and Carpenter (1983) have identified the principal seismic hazard at Site 300 as being the potential for strong ground shaking caused by an earthquake on the Greenville Fault, located about 8 kilometers (km) (5 miles [mi]) west of Site 300.

J.4.3 Climate

Site 300 has a semi-arid, Mediterranean-type climate. Annual mean precipitation is approximately 28 cm (11 in), most of which falls between October and April during major winter storms. Strong, persistent winds are characteristic of the Site 300 area as marine air flows through the canyons of the Site into Corral Hollow and the San Joaquin Valley to the east. This flow results in strong afternoon and evening winds with gusts up to 70 km/hour (hr) (44 mi/hr).

J.4.4 Air Quality

J.4.4.1 *Criteria Air Pollutants*

The California Air Resources Board conducts criteria pollutant monitoring for the San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD), which includes Site 300. Based on the California Air Resources Board's measurements, the district is classified as a nonattainment area for ozone and particulate matter smaller than 10 micrometers (or microns).

J.4.4.2 *Hazardous Air Pollutants*

Toxic air contaminants are subject to the National Emission Standards for Hazardous Air Pollutants (NESHAP). NESHAP standards pertaining to operations at Site 300 are those for beryllium and radionuclides. Beryllium concentrations from test activities at Site 300 are monitored by LLNL and average 0.42 percent of the SJVUAPCD NESHAP standard. Airborne radionuclide concentrations also are monitored at Site 300. In 1994, uranium-238 and uranium-235 concentrations were $5x10^{-5}$ $\mu g/m^3$ and $3x10^{-7}$ $\mu g/m^3$, respectively. In contrast, the derived concentration guide (a calculated concentration of radionuclides that could be continuously consumed or inhaled and not exceed the DOE primary radiation protection standard to the public of 100 millirem per year effective dose equivalent) for uranium-238 and uranium-235, respectively, were 0.3 $\mu g/m^3$ and 0.047 $\mu g/m^3$. The effective dose equivalent to the maximally exposed member of the public due to potential radionuclide releases from B801 testing in 1994 was 0.041 millirem (the NESHAP allowable standard is 10 millirem). Thus, the monitored concentrations for outdoor testing activities at Site 300 are already well below guideline levels, and operations also comply with the NESHAP limits.

J.4.5 Hydrology: Surface and Groundwater

Several ephemeral streams flow through Site 300 during the wet winter months and discharge into Corral Hollow Creek at the southern boundary of the site. Most flow is direct runoff with a very small contribution from both intermittent and perennial springs. Minor erosion results from both natural and induced conditions.

The groundwater of the Site 300 area is characterized by two regional aquifers or major waterbearing zones: (1) an upper water-table aquifer in the sandstones and conglomerates of the Neroly formation about 30 m (100 ft) below ground surface, and (2) a deeper, confined aquifer located in Neroly sandstones just above the Neroly/Cierbo contact, about 91 m (300 ft) below ground surface (Raber and Carpenter, 1983).

In addition to the two regional aquifers, several localized perched aquifers contain water at higher elevations above low-permeability layers (6 to 15 m [20 to 50 ft] belowground surface). Depth to groundwater beneath B801 is estimated as at least 30 m (100 ft). Neither the groundwater beneath firing tables at B801 nor B851 are known to be contaminated with tritium or uranium from past operations.

J.4.6 Vegetation

Five major vegetation types are found at Site 300. They are (1) introduced annual grassland, (2) native perennial grassland, (3) coastal sage scrub, (4) oak woodland, and (5) riparian (Taylor and Davilla, 1986). Most of the vegetation at Site 300 is grassland dominated by mixtures of introduced annual and native perennial grasses.

A detailed, systematic survey for populations of rare and endangered plants was conducted at Site 300 in the spring of 1986 (Taylor and Davilla, 1986); an additional survey was conducted in 1991 in support of the 1992 EIS/EIR (DOE/UC 1992). The only sensitive plant species known to exist at Site 300 is the large-flowered fiddleneck (*Amsinckia grandiflora*), listed as both federally-endangered and state-endangered. This species has been identified in two locations at Site 300. Neither are near the proposed B801 CFF site. Both *Amsinckia grandiflora* populations are closer to B851 than to B801.

J.4.7 Wildlife

The wildlife at Site 300 strongly reflects the dominance of grasslands. Twenty-six species of mammals, 70 species of birds, and 20 species of reptiles and amphibians were observed at Site 300 during threatened and endangered species surveys in 1986 and 1991. The 1991 survey was conducted for the 1992 EIS/EIR (DOE/UC 1992). Since the 1991 surveys, an additional 12 species have been identified: 1 mammal, 1 amphibian, 9 birds, and 1 nonsensitive fairy shrimp species. The only sensitive species that might be expected to exist in the vicinity of the proposed CFF are the burrowing owl (*Athene cunicularia*) and the American badger (*Taxidea taxus*), both state species of special concern. The 1992 EIS/EIR mitigation measures routinely implemented before conducting construction projects (such as the proposed CFF) include the field surveys for these latter two species. Burrowing owl dens are known to occur approximately 1.6 km (1 mi) north of the present B801 complex, in spite of the conduct of routine outdoor testing of explosives at that site. A burrowing owl den was identified in 1994 to be within 0.32 km (0.2 mi) (west) of B851 (figure J.4.7–1). Transient badgers also use ground squirrel dens in areas near B801 and B851.

Site 300 is located in the extreme northern portion of the range of the San Joaquin kit fox (*Vulpes macrotis mutica*) (Federal endangered species, state threatened species). Detailed surveys for the kit fox were conducted at Site 300 in 1980 (Rhoads et al., 1981), 1986 (Orloff 1986), and 1991 (DOE/UC 1992). Since that time, approximately 54 project-specific surveys for active kit fox dens have been made at Site 300; all have been negative. Neither the kit fox nor active dens were observed at Site 300 during any of these surveys. At present, the kit fox is not considered a resident species at Site 300, although the site may offer potential habitat. Field surveys for the presence of the kit fox are, however, still routinely performed before conduct of any ground-disturbing project (as they will be before construction of the proposed CFF) as part of the mitigation measure commitments implemented subsequent to issuance of the 1992 EIS/EIR ROD in January 1993.

J.4.8 Cultural Resources

Site 300 was surveyed for cultural resources in 1981, and 24 archaeological sites were identified (Busby, Garaventa, and Kobori, 1981). Of these 24 sites, 3 were prehistoric, 20 were historic, and 1 was a multi-component site consisting of both prehistoric and historic materials. Also, recent archival research and field surveys were performed in support of the 1992 EIS/EIR (DOE/UC 1992). An additional 4 prehistoric and 1 historic sites have been located since 1992. One identified site is within approximately 396 m (1,300 ft) of B851 and another is within approximately 396 m (1,300 ft) of B801.

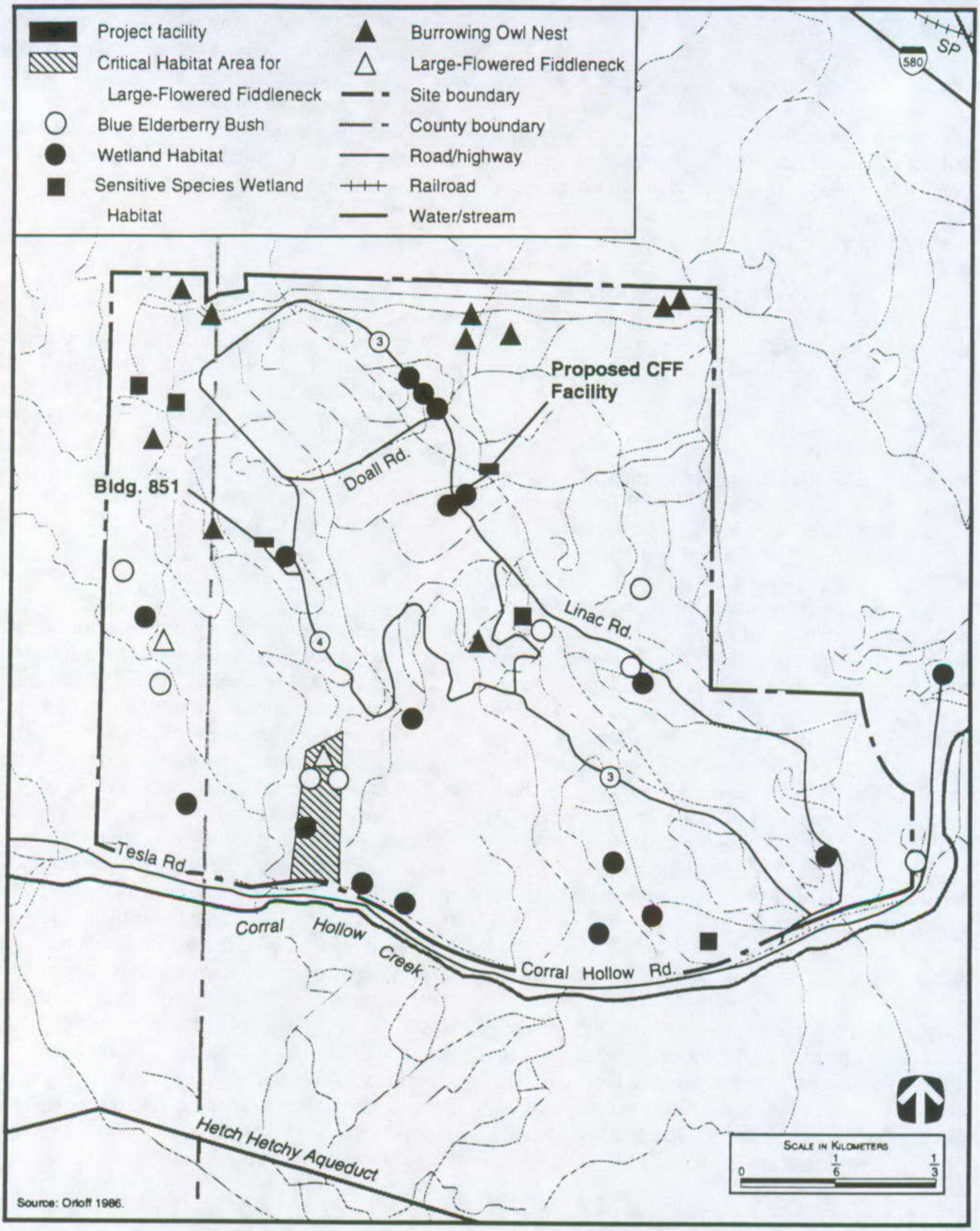
J.4.9 Land Use and Socioeconomic Factors

Most of Site 300 is located in San Joaquin County, with a small portion in Alameda County. The proposed action is located entirely within San Joaquin County. Site 300 is located approximately 13 km (8 mi) southwest of Tracy in a remote rural area in the Altamont Hills that has traditionally been used for cattle grazing and recreation. Much of the land adjacent to Site 300 is private ranch land and is used for grazing. Physics International, Inc. (adjacent to Site 300) and SRI International (south of Site 300) also have facilities that are used to routinely test explosives. The Carnegie State Vehicular Recreation Area off-road motorcycle park is located immediately south of Site 300 on Corral Hollow Road.

The San Joaquin County General Plan land-use designation for Site 300 is Public and Quasi-Public Other Governmental and Institutional (DOE/UC 1992). This designation allows the use of Site 300 for military installations and other major Government buildings. There is no prime agricultural land at Site 300, and grazing and other agricultural activities are excluded.

Since 1993, private developers have been pursuing a proposal to build residential units adjacent to Site 300's northern and eastern boundaries (Tracy Hills project) and commercial and industrial facilities further east of Site 300, astride Interstate 580 and west of the Tracy Municipal Airport. A project-specific EIR under provisions of the *California Environmental Quality Act* is being planned for preparation by the city of Tracy in 1995.

The 1993 population of Tracy has been estimated to be 34,000. Approximately 200 full-time LLNL employees and full-time support contractor staff work at Site 300; of this number, an average of approximately 20 employees work at the present B801/FXR complex.



3161/SSM

FIGURE J.4.7–1.—*Selected Sensitive, Natural Resources, Site 300.*

J.4.10 Soils

Site 300 soils have developed on marine shales and sandstones, uplifted river terraces, and fluvial deposits. They are classified as loamy Entisols (young soils with little or no horizon development). Clay-rich soils (Vertisols) are also present and have been mapped as the AloVaquero complex. Vertisols are mineral soils, characterized by a high clay content, that are subject to marked shrinking and swelling with changes in water content. The Entisols erode easily; the Vertisols exhibit low permeability and are subject to moderate erosion. Soils in the B801 area are generally classified in the AloVaquero complex.

J.4.11 Wetlands

Wetlands at Site 300 were mapped during 1991 using the unified Federal method (Federal Interagency Committee for Wetland Delineation, 1989), and a total of 2.7 hectares (ha) (6.76 acres) of wetlands were identified (DOE/UC 1992) (figure J.4.7–1). These wetlands are small and are in areas associated with natural springs or runoff from several building complexes onsite. The majority of the wetlands 1.9 ha (4.58 acres) exist at springs in the bottom of deep canyons in the southern half of the site. Other wetlands 0.76 ha (1.88 acres) were formed from building runoff, including a small *Typha latifolia* wetland formed by B801 cooling tower drainage that begins approximately 61 m (200 ft) south-southwest of B801. A small wetlands patch 0.032 ha (0.08 acre) exists approximately 213 m (700 ft) southeast of B851 and another 0.072 ha (0.18 acre) exists immediately adjacent to the B851 complex.

J.4.12 Noise

Existing chronic noise sources at Site 300 include vehicular traffic and heating, ventilating, and air conditioning equipment. Acute sources include construction activities; a small arms range; and explosives testing. Background noise levels are generally low, ranging from 56 to 66 decibels (DOE/UC 1992).

Meteorological conditions at Site 300 are monitored before each test, so that noise levels can be projected through use of a well-established computer program. Based on the results of this computer modeling, the quantities of the explosives that can be tested at the present B801 outdoor firing table without adverse noise generation as measured at six Tracy-area receptor site locations (stations) are projected. These stations monitor peak noise levels for a period of 90 seconds, starting at detonation. The results of these noise-monitoring activities demonstrate that noise levels from explosives testing at LLNL Site 300 have not exceeded 126 decibels at the city of Tracy station locations.

J.4.13 Water Use

Water consumption for domestic, infrastructure operation, and programmatic activities at Site 300 averaged approximately 120 million liters per year (31.8 million gallons per year) during the period from 1986 to 1990 (DOE/UC 1992).

J.5 Potential Effects of the Proposed Action and Alternatives

J.5.1 Impacts Related to Construction Activities

Containment of firing operations at B801 would result in minor construction-related impacts at Site 300 in the vicinity of the B801 complex. Construction noise and dust would be experienced throughout a 21-month excavation and construction period. Soils from the hill to the north of the firing pad, and the berm to the east of the firing pad would be excavated and removed to provide space for the new facility. Dust suppression and stormwater pollution prevention (runoff) mitigation technologies would be applied to reduce these impacts to insignificance. Biological surveys for special status, threatened, and endangered species would be conducted prior to any land-disturbing activities. If sensitive species are observed, appropriate mitigation measures to avoid any significant impact would be taken, as outlined in the 1992 EIS/EIR (DOE/UC 1992) and its associated Mitigation Action Plan (MAP) and Mitigation Monitoring and Reporting Program (MMRP). These measures have been routinely applied at Site 300 since 1992. The closest archaeological site is approximately 396 m (1,300 ft) away and is not expected to be affected by the proposed action. Experimental tests would be scheduled at other firing facilities (principally at B851) during construction in the B801 area, possibly increasing the workload and traffic to this area to a minor degree.

J.5.1.1 *Ground Disturbance Topography Change*

Construction of CFF would require excavation of about 41,300 m^3 (54,000 yd^3) of material surrounding the current facility. The proposed facility extends into hillsides to the northeast and southeast of the existing bullnose (the high-energy end of FXR, which is covered with protective armor) (figure J.3.1–3). Cut hillsides would be sloped and, where local geology allows, revegetated (using hydroseeding) to prevent erosion. The direction and volume of existing runoff would not be altered by the proposed site work because all earthwork would be accomplished within the same micro-drainage area below the division for adjacent watersheds. All construction and ground-disturbing activities would be done according to the requirements of the National Pollutant Discharge Elimination System California General Construction Activity Stormwater Permit.

All cut slopes, excavations, and/or fills would be designed and constructed in accordance with the Uniform Building Code Chapters 29 and 70 and any other applicable requirements. It is expected that the area of permanent ground disturbance immediately around the B801 complex would only be about 1.2 ha (3 acres) as a result of necessary slope contouring and construction of CFF.

J.5.1.2 *Soils*

In 1991, soils surrounding the existing firing pad were sampled and analyzed for 17 different metals and radioactivity (gamma radiation) using approved methods. LLNL has previously determined that surface soils contamination from beryllium cadmium, copper, and uranium-238 exists near the B801 firing pad (or table) (Webster–Scholten 1994). Samples will be taken and tested during construction to determine whether or not contamination exists. If isolated areas are determined to be contaminated, the soils would be handled in accordance with approved DOE procedures and all applicable Federal and state regulations.

Soils exposed by project construction, especially on the hillsides, are considered to be moderately vulnerable to erosion; their clay content provides slightly more resistance to erosion than does the high loam content of Entisols, which dominate Site 300 soil types. Erosion, if it occurs, would not be an important impact because of the brevity of the erosion event and the small quantity of soils expected to be lost. Erosion of the small hillsides surrounding the proposed project would not be expected beyond one growing season.

J.5.1.3 *Air Quality*

Construction could result in some short-term particulate matter emissions; dust suppression measures would be implemented to mitigate these emissions to levels that meet SJVUAPCD requirements. Site 300 air emissions from vehicle and equipment exhausts would be expected to increase approximately 15 to 20 percent temporarily (during the early months of the 21-month construction period). This incremental increase is expected to be an insignificant contributor to air basin emission levels, given the continued high rate of construction activity envisioned by the city of Tracy's growth projections noted in its 1993 Urban Management Plan/General Plan.

J.5.1.4 *Cultural Resources*

No impact is expected to one identified cultural resource site approximately 396 m (1,300 ft) from the proposed project at the existing B801 Facility. If culturally important artifacts are discovered during construction activities, work would stop until the discovery could be evaluated by a qualified archaeologist in accordance with the DOE MAP and the University of California MMRP, implemented in conjunction with the 1992 EIS/EIR (DOE/UC 1992).

J.5.1.5 *Sensitive Species*

No known Federal- or state-listed endangered plant or animal species are present within the zone of direct or indirect influence of project construction (1992 EIS/EIR DOE/UC 1992 and later surveys). However, a preconstruction survey monitoring for San Joaquin kit fox (*Vulpes macrotis mutica*) would be conducted not earlier than 60 days prior to the start of construction, as outlined by the mitigation measures discussed in the MAP, MMRP, and 1992 EIS/EIR (DOE/UC 1992). If kit fox is discovered within the project site, the steps prescribed in the MAP and MMRP would be followed prior to construction startup.

Dens of the American badger, a state species of special concern, have been identified within the vicinity of the proposed project in the past. Similarly, dens of the burrowing owl are known to occur within approximately 1.6 km (1 mi) (north) of the proposed site. The proposed project's impact on the badger is considered slight to none because of the relatively small portion of the badger's home range (less than 1 percent) occupied by the project, the large amount of unrestricted land at Site 300, and the widely recognized transient nature of badgers. Similarly, no impacts to burrowing owl dens are expected because they have actually become established during periods of road construction south of B801 and during long periods of outdoor explosives testing at the present B801 complex. A pre-construction survey for dens of American badger and burrowing owl would be conducted within 60 days of project start. If found, active dens of the badger or owl would be avoided by construction activity through the establishment of exclusion zones around the dens. If direct impact to an active den is considered unavoidable, the California Department of Fish and Game would be consulted for permission to reduce the size of the exclusion zone or for permission to relocate the animal to other lower-impact areas within Site 300, as outlined in the MMRP and the 1992 EIS/EIR.

J.5.1.6 *Wetlands*

Soil transport from stormwater runoff during construction would be controlled so as to ensure that there is no potential for adverse impact to the wetlands patch identified approximately 61 m (200 ft) south-southwest of the B801 complex.

J.5.1.7 *Socioeconomic Factors*

Construction of CFF will take place over a 21-month period during which CFF contractor construction crew and staff day-shift population may reach a maximum peak of 20 to 30 workers during a peak 6-month period, while being less during the remaining parts of the construction period. The addition of this incremental number of onsite, day-shift contractor crew is not expected to significantly affect Site 300 infrastructure and support services or facilities or city of Tracy support services for its 34,000 population.

J.5.1.8 *Water Usage*

A maximum of 3,800,000 L (1,000,000 gal) of water would be used for dust suppression and other related activities during construction.

J.5.2 Impacts Related to Facility Operations

J.5.2.1 *Air Quality*

It is expected that emissions (such as particulate metal oxides and soot, acid gases, and VOCs) from Firing Chamber operations would be below regulatory limits because of the extensive air scrubbing, filtration, and absorption systems that would be operated in conjunction with CFF. The bulk of the resulting emissions from the air control system should then be limited to those such as carbon dioxide, nitrogen, water, and, when tritium is used in the chamber, tritiated water as well as very minor amounts of activated air gas molecules.

It is expected that the projected scrubber removal rate for the gases ammonia (NH_3), hydrogen cyanide (HCN), hydrogen fluoride (HF), and hydrogen chloride (HCl) would be 90 percent, and would be 50 percent for oxides of nitrogen (NO_x) which may be produced. Although some removal of detonation-produced carbon monoxide (CO) by air scrubbing would occur, no reduction of CO is assumed, resulting in a conservative conclusion. Based on these factors, the following approximate levels of CFF-related emissions can be expected to reach the atmosphere annually from detonating explosives during 100 tests at CFF: NH_3 < 1.8 kg (4 lb), HCN ~0.9 kg (2 lb), HF ~0.9 kg (2 lb), HCl < 1.4 kg (3 lb), and NO_x < 12 kg (27 lb). Additionally, CO emissions would be expected to be less than 15 kg (33 lb) and all VOCs and semivolatile combustion products combined should be limited to approximately 0.2 kg (0.4 lb) (based on emission factors from trinitrotoluene detonation data contained in Volume 2 of the 1992 AMCCOM report). Particulate air emissions are expected to be negligible due to the extensive use of air scrubbing and filtration systems. These emission levels should have an insignificant (negligible) adverse impact on the air quality of the area air basin. The net impact of containing these 100 CFF tests per year by use of CFF (when compared to the No Action alternative) is beneficial.

The air emission of potentially greatest (bounding) impact is HTO. On approximately 10 tests per year, up to 200 curies (20 mg) of tritium may be used on each test. It is assumed that, as a worst case, all tritium would become converted to HTO. Of the 200 curies of tritium present in the chamber, 180 curies (90 percent) is expected to be vapor, and 20 curies (10 percent) would condense on the steel walls, floor, equipment, and debris. After completion of air scrubbing and chamber cleanup, it is expected that the 200 curies of tritium would be partitioned as follows: approximately 175 curies would reside in solidified waste from processing the various air scrubbing and filtration systems, 18 curies (from the 20 curies of HTO condensed on walls or solids) would also reside in a separate solidified waste from a water washdown of the chamber walls and surfaces, a maximum of 5 curies might escape to the atmosphere by leakage from the chamber, and 2 curies would remain adsorbed on interior surfaces and may, therefore, become transferred to waste water used after a non-tritium-containing test which would normally follow as the next test. This 2 curies of HTO would be evaporated to the atmosphere as part of the approximately 94,600 L (25,000 gal) of such wastewater. On balance, a possible maximum of 7 curies of the original 200 curies of tritium used in the test may escape as HTO to the atmosphere over a several-day to week-long period following each of the 10 tritium-containing tests; the remainder would be captured as LLW. By comparison, the amount of tritium contained in the typical theater exit sign is about 10 curies.

All appropriate and applicable air permits would be obtained for facility construction and operation. It is expected, based on a preliminary analysis of proposed normal facility operation, that Environmental Protection Agency Region IX approval and notification of startup for operations involving radionuclides will not be required. Provisions for sampling radionuclide air effluents would be incorporated into the design of CFF, and continuous monitoring, if required, would be performed according to NESHAP requirements.

J.5.2.2 *Waste*

A beneficial impact of the proposed action is that essentially all detonation products would be captured before release of remaining, mainly innocuous gases, to the environment. Two distinct waste streams would result from totally containing the tests at B801. The first waste stream consists of the shot debris, canisters, HEPA filters, scrubber fluids, and any other component of the pollution control system that becomes contaminated. The second stream is the washdown water itself and/or components of the washdown water system. The levels of the washdown water would be processed (filtered), stored, reused throughout an extended number of firings and eventually evaporated. Components of the processing system, such as used filters and washdown water system sludge, would be characterized and handled as hazardous, radioactive, or mixed waste.

The proposed facility, with its washdown and tritium removal system, would result in the generation of LLW and/or mixed waste because of the collection of sludge produced by the washdown operations. Conservative estimates are that 25 55-gal (208-L) drums of evaporator solids, tritium adsorption media, and stabilized washdown water, and 2 2.8 m^3 (100 ft^3) boxes of shot or test debris would be generated from each test with tritium. Generation of mixed waste is not expected, but to be conservative, a projection of 0.1 m^3 (3.7 ft^3) of mixed waste per shot is assumed. The balance would be conservatively considered LLW. For tests performed without tritium, only one 2.8 m^3 (100 ft^3) box of debris (LLW) would be generated. Because CFF would eliminate the use of firing table gravels, the total amount of solid waste that would be generated represents a significant reduction from the total amount of solid waste that is now generated annually during uncontained testing at B801.

The proposed CFF represents a decrease in waste generation from current and projected levels should the CFF not be constructed and operated. The types of waste generated at CFF would have some, but manageable, impact on waste handling activities at LLNL. Table J.5.2.2–1 shows the amounts of mixed, hazardous, and radioactive waste generated in activities conducted at LLNL and compares those values with the amounts of wastes, by type, expected to be generated at CFF annually. The CFF data in this table are based on the assumption that an average of 50 tests, and possibly up to 100 tests would be conducted annually, either at CFF or at the present B801 gravel firing pad (the No Action alternative). These projected annual test rates are based on recent (1991-94) testing data at the present B801 Facility. None of the waste types expected to be generated by the CFF/FXR would be unique to LLNL and each type would be processed and managed, stored, treated, disposed, or transported appropriately as is routinely done at LLNL for the same types of wastes from other current LLNL operations.

TABLE J.5.2.2–1.—*Comparison of Annual Lawrence Livermore National Laboratory and Contained Firing Facility Waste-Generation Rates (Weights Rounded)*

Columns	1	2	3	4	
Category	Waste Generation from All LLNL Activities (1992 EIS/EIR) (kg)	Waste Generation from Only S300 Activities (kg)	Waste Generation from B801 (50 Tests per year) (kg)[a]	Projected Waste Generation from CFF, (kg)	
				50 Tests/yr	100 Tests/yr
Hazardous[b]	1,413,000	173,000	6,100	6,100	12,000
Low-level radioactive[c]	295,000	152,000	53,000	23,000	45,000
Mixed[d]	43,000	~900	~0	(0 to 2,200)	(0 to 4,400)
Transuranic[e]	36,000	0	0	0	0
Total	1,789,000	325,000	59,000	31,000	62,000

[a] The selection of the 50-tests-per-year level analyzed here is based on an annual average of tests done at B801 from 1990 through 1994. The maximum annual testing level was approximately 100 tests a year. Waste projections were based on average annual data from 1991 to 1994. If 100 tests per year were conducted (the No Action alternative), waste projections shown in this column would be doubled.

[b] Columns (1), (2), and (3) reflect hazardous waste generation data found in tables B-15 and B-17 of the 1992 EIS/EIR. This waste consists primarily of waste oil, oil-contaminated rags and equipment as well as film processing solids and solutions used in support operations. The solid portion is approximately 4,000 kg (8,800 lb). Liquid volumes were converted into kg using 1,000 kg per m^3. Column (4) represents wastes projected from CFF operations at a level of 50 tests per year (average annual) and 100 tests per year (maximum annual).

[c] Columns (1), (2), and (3) reflect LLW values. Column (1) data was derived from tables B-10 and B-12 of the 1992 EIS/EIR for the Livermore Site, plus Site 300 data from Column 2. Column (2) was derived by averaging annual Site 300 shipping log information from 1989 to 1994. Column (3) was derived from annual average from 1991 to 1994. Column (4) data includes an estimated expected 25-percent reduction in the weight of waste debris below that of current operations and complete elimination of the generation of gravel waste since the CFF would not use a gravel firing table and would not use tent structures as are presently used at B801.

[d] Columns (1) and (2) reflect mixed waste values derived from Table B-13 and the discussion in Section B.4.3.3 of the 1992 EIS/EIR. Column (4) estimates were derived from conservative assumptions that operation of CFF could generate up to 0.1 m^3 (440 kg per m^3) of mixed waste from each test although none is expected. This waste would derive from evaporator sludge, from water washdown activities, and spent filter media. This further assumes that all CFF wastes would potentially be contaminated by low-level radioactivity after the first test that involves uranium, thorium, or tritium.

[e] Transuranic (TRU) wastes are not now generated from explosives testing at Site 300. Table B-11 of the 1992 EIS/EIR shows 6 months of generation at the LLNL Livermore Site in 1990 to be 36 m^3 (1,271 ft^3). Thus, a year's generation would be estimated to be 72 m^3 (2,543 ft^3). An average density of 500 kg per m^3 was used to convert volume to weight (Column [1]).

Source: DOE/UC 1992.

Waste generated by facility D&D is assumed to be all LLW and is conservatively estimated to be 110 percent of the volume of the Firing Chamber construction materials. This would be approximately 1,830 m^3 (64,610 ft^3). If built at B851, as an alternative, these waste generation impacts should not be different than those for CFF that would be sited at B801. The waste would be handled in the same manner as other solid LLW generated from LLNL operations at that time.

J.5.2.3 *Noise*

The proposed action would have beneficial effects on the environment and on employees by reducing noise levels onsite and offsite, respectively. The current practice at the Site 300 firing areas relies on a combination of administrative and operating controls to ensure that neither site workers nor the public are adversely affected by exposure to high-impulse noise generated by the explosives test activities. These controls include restricted entry into the firing area when tests are scheduled, required accounting for all test-site-area personnel inside the protective building prior to testing, and limiting the size of the test (or precluding testing altogether) during unfavorable meteorological conditions. Containing the detonations of explosives would greatly reduce noise levels under all conditions and would eliminate the possibility that a test would need to be canceled or rescheduled because of potential noise levels resulting from inappropriate atmospheric conditions.

Noise sources anticipated during and following explosives tests in a containment facility would include low-energy impulse from the test, the relief of containment vessel overpressure, and other noises associated with the operation of the air handling system used to purge the containment vessel. These noises are not expected to be perceptible to Tracy-area residents or area ranchers, and they would not exceed the occupational noise exposure limits adopted by DOE for the protection of employees.

J.5.2.4 *Ionizing Radiation*

Detonations in the Firing Chamber could involve radioactive materials such as tritium (up to 20 mg on each of 10 tests), depleted uranium, and on some tests, thorium. Additionally, certain test configurations may occasionally generate small quantities of neutrons, which may then yield neutron-activation products. Because of the modest neutron production potential, (10^{16} neutrons per test on certain tests), the very effective shielding provided by the Firing Chamber, and the low specific activity of depleted uranium, the potential radiation impacts are dominated by tritium and activation-product buildup. These potential impacts to involved workers, noninvolved workers, and members of the general public are summarized in table J.5.2.5–1. Because these results are based on very conservative assumptions used when calculating projected impacts (as described below), they are considered bounding for routine CFF operations.

Some of the assumptions used in deriving table J.5.2.5–1 estimates were:

- A maximum of 10 detonation tests per year involving a maximum of 20 mg (200 curies) of tritium each.
- A maximum level of diagnostic neutron production (10^{16}) per test, on a maximum of 10 tests per year.
- From each of 10 tests per year, up to 5 curies of released tritium as HTO from the Firing Chamber at ground level by leakage during chamber cooling and scrubbing, and an additional 2 curies of residual tritium released as HTO later during evaporation of washdown water through the facility stack that is also assumed released at ground level for purposes of dispersion modeling.
- Up to three involved CFF-area workers spend up to 2 days each within the Firing Chamber, entering the first day after detonation, and after air-scrubbing and chamber cleanup have reduced the tritium level in the chamber to approximately 5×10^{-6} curies/m^3; all three workers are assumed to spend full time within 2 m of the shot location, where activation product doses would be maximized.
- Primary washdown water and dry air-scrubbing would yield an estimated maximum of 193 curies per test as solid low-level radioactive waste.

If the maximally exposed individual in the general public stayed at the nearest fenceline to CFF over the entire expected 30-year lifetime of the facility, the estimated lifetime fatal cancer risk to that individual from potential whole-body effective dose equivalent exposure to 3.8×10^{-5} person-rem would be 5.7×10^{-7} (that is, about one fatal cancer in 2 million). This potential dose is about 1,000 times less than the DOE guideline dose limit (that which might produce 1 fatal cancer per 2,000). Additionally, each of the three CFF workers who would be expected to accrue the greatest exposure dose (from removing debris from and cleaning the Firing Chamber after each test) should each receive a dose of less than 0.25 rem per year. This is less than 5 percent of the DOE worker exposure limit guideline of 5 rem per year. By comparison, the average annual dose received by an aircraft flight attendant is about 0.5 rem, or twice the dose expected for these CFF Firing Chamber workers.

J.5.2.5 *Slope Stability*

Document review suggests that existing B801 site slopes are stable. Unconsolidated overburden is only a few feet thick in the area and bedrock dips at a shallow angle (about 5 degrees) northeast. However, a recently active landslide deposit has been observed within about 244 m (800 ft) east of the site. This landslide is reported having generated a mudflow which reached the vicinity of the B801 site during a 15-year period prior to 1983. This mudflow appears to have been mitigated by placement of an earthen fill between the flow and the B801 site. Appropriate slope

TABLE J.5.2.5–1.—***Maximum Potential Annual Radiation Exposure Impacts from Normal Contained Firing Facility Operations***

Individual or Group	Tritium	Activation	Total	Excess Cancer Fatalities (per year)[b]
Individual Potential Dose, Rem Per Year[a]				
Involved CFF-area worker	0.09	0.16	0.25	1.0×10^{-4}
Non-involved worker (50 m)[c]	5.2×10^{-3}	0	5.2×10^{-3}	2.1×10^{-6}
Total worker[d]	1.6	0.5	2.1	8.4×10^{-4}
Collective Potential Dose, Person-Rem Per Year				
Maximally exposed member of general public (site boundary, 1,340 m)	3.8×10^{-5}	0	3.8×10^{-5}	1.9×10^{-8}
Total general public[e]	0.32	0	0.32	1.6×10^{-4}

[a] See discussions, section J.5.2.4.
[b] Based on DOE dose-to-risk conversion factor of 4×10^{-4} (4 in 10,000) latent cancer fatalities per person-rem for workers and 5×10^{-4} (5 in 10,000) for the general public.
[c] Assumed to be all Site 300 noninvolved workers (approx. 260) standing 50 m from CFF resulting in an extremely conservative estimate.
[d] The total worker cumulative dose is the sum of doses to both the involved CFF workers and noninvolved workers within 50 m of the CFF.
[e] Using the EPA-approved computer code, CAP88-PC, version 1.00, the total general public cumulative dose estimate was calculated by considering the approximate population within 80 km (50 mi) of Site 300 and using annual site meteorological data.
Source: Model results.

stabilization measures would be taken in design and construction of graded slopes (see also section J.5.1.1).

J.5.2.6 *Water Use*

It is expected that washdown of the CFF Firing Chamber, after considering the contribution of planned water recycling activities, would involve the use of 950,000 L (250,000 gal) of water annually. This water consumption level, plus that for cooling towers (1,100,000 L [300,000 gal]), and domestic uses 190,000 L (50,000 gal), would add a total of approximately 2,300,000 L (600,000 gal) annually to the Site 300 water consumption rate of approximately 120 million L (31.8 million gal) over projected groundwater use (DOE/UC 1992), which is less than a 3-percent increase.

J.5.3 Accident Scenarios

The reasonably foreseeable accident scenarios that could produce the greatest potential impacts are the following:

- Case 1: Accidental detonation of a test of a 60-kg (132-lb) charge of explosives at the B801 firing table. (Applicable to No Action alternative.)
- Case 2: Accidental detonation of a 60-kg (132-lb) test that could contain up to 20 mg (200 curies) of tritium with dispersal through an unsecured blast door during final preparation. No neutron generation potential would exist, because blast doors would be closed before any accident scenario that would involve neutron generation (misfire). (Applicable to either B801 or B851 alternatives.)

One accident scenario that was considered but was not felt to be reasonably foreseeable included:

- Case 3: Same test configuration as in Case 2, but the planned detonation takes place yielding the potential for neutron generation; accidental rupture of the CFF Firing Chamber occurs (considered to be a beyond-design basis accident and therefore, not reasonably foreseeable). (Applicable to either B801 or B851 alternatives.)

In each case, the involved workers would probably be fatally injured from blast effects due to peak overpressure and debris, but there would be no injury offsite to members of the general public. No damage to current buildings offsite or in other areas of Site 300 would be expected, although window rattling might occur. Projected radiation effects from two scenarios are summarized in table J.5.4–1.

These projected radiation doses are still lower than DOE guideline limits for workers and for the general public; thus, the greatest effects would be fatalities or injuries to workers due to primary blast effects, as noted above.

J.5.4 Cumulative Impacts

The primary negative impacts resulting from the proposed action would occur as a result of construction-related activities. These activities would be short term and are not expected to result in significant increases in ambient amounts of airborne dust or noise. Approximately 45,000 kg (20,500 lb) of solid LLW from Firing Chamber air-scrubbing and washdown following contained firing operations could be generated each year. This volume of waste represents a reduction from the levels that would be projected if the same number of detonations were to take place at the current facility (No Action alternative). The proposed project is expected to greatly reduce the air emission of detonation combustion products and to reduce cumulative buildup of LLW by eliminating outdoor explosive testing on gravel firing tables (which must be handled as LLW because some of the explosive test devices would contain radioactive components). The proposed action would therefore greatly reduce the release of emittants to the air and ground.

J.5.5 Conformity

Site 300 is in an air basin area designated as non-attainment with respect to ozone. The design, construction, operation, and ultimate D&D of CFF would not result in levels of emissions of ozone precursors (oxides of nitrogen and precursor organic compounds) that would place Site 300 above conformity thresholds; and the facility would not cause or contribute to any violation of the National Ambient Air Quality Standards. The facility would be operated in conformance with all rules and regulations of the SJVUAPCD which are included as part of the state implementation plans.

J.5.6 Socioeconomic Factors and Environmental Justice

J.5.6.1 *Staffing*

The addition of another 5 to 6 full-time LLNL employees (for CFF operation) to augment the present B801/FXR operating staff (which averages 20 employees) will be an insignificant incremental impact over that of operating the current FXR Facility and its associated firing table.

J.5.6.2 *Environmental Justice*

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires that Federal agencies identify and address, as appropriate, dispro-

TABLE J.5.4–1.—*Radiation-Related Dose Effects Due to Accidents; Contained Firing Facility and Alternatives*

Scenario	Involved Worker, 30 m, rem	Uninvolved Worker, 50 m, rem	Offsite Member of Public, 1,340 m, rem	Excess Cancer Fatalities, Offsite Member of Public[a]
Case 1	0	0	0	0
Case 2	0.026	0.015	1.1×10^{-4}	5.5×10^{-8}
Case 3[b]	0.031	0.015	1.1×10^{-4}	5.5×10^{-8}

[a] See footnote b, table J.5.2.5–1, for conversion factors used.
[b] Beyond-design basis accident considered not to be reasonably foreseeable.
Source: Model results.

portionately high and adverse human health or environmental effects of their programs and activities on minority and low-income populations. DOE is developing official guidance on the implementation of the Executive Order. However, given the demographic makeup of Tracy and its surrounding agricultural areas, it is expected that there would be insignificant or no potential for differential or disproportionate impacts from the proposed action (or from its alternatives) to offsite populations that could be characterized as predominantly minority or low-income.

J.6 Persons and Agencies Contacted

No persons or agencies outside the LLNL and DOE have been contacted.

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APPENDIX K

Appendix K

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ACRONYMS, ABBREVIATIONS, AND UNITS OF MEASURE

Acronyms and Abbreviations

ac	alternating current
AQCR	Air Quality Control Regulation
DARHT	Dual-Axis Radiographic Hydrodynamic Test
dc	direct current
DOE	Department of Energy
EIS	environmental impact statement
EMF	electromagnetic force
HE	high explosives
LANL	Los Alamos National Laboratory
NEPA	*National Environmental Policy Act*
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NHMFL	National High Magnetic Field Laboratory
NMEIB	New Mexico Environmental Improvement Board
PEIS	programmatic environmental impact statement
PM_{10}	particulate matter of aerodynamic diameter equal to or less than 10 micrometers
R&D	research and development
RCRA	*Resource Conservation and Recovery Act*
SFE	Special Facilities Equipment
TA	technical area

Units of Measure

cc	cubic centimeters
cm	centimeters
eV	electron volts
ft	foot (feet)
ft^2	square feet
ft^3	cubic feet
g	grams
G	gauss
gal	gallons
hr	hours
Hz	cycles per second
kJ	kilojoules
km	kilometers
L	liters
µs	microseconds
m	meters
m^2	square meters
m^3	cubic meters
MA	megamperes
mg	milligrams
MJ	megajoules
mi	miles
mph	miles per hour
m/s	meters per second
MVA	mega volt amperes
MW	megawatts
oz	ounces
rem	unit of radiation dose equivalent
rpm	revolutions per minute
yd^3	cubic yards
yr	years

Metric Conversion Chart and Metric Prefixes

To Convert to Metric			To Convert from Metric		
If You Know	**Multiply By**	**To Get**	**If You Know**	**Multiply By**	**To Get**
Length					
inches	2.54	centimeters	centimeters	0.3937	inches
feet	30.48	centimeters	centimeters	0.0328	feet
feet	0.3048	meters	meters	3.281	feet
yards	0.9144	meters	meters	1.0936	yards
miles	1.60934	kilometers	kilometers	0.6214	miles
Area					
square inches	6.4516	sq. centimeters	sq. centimeters	0.155	sq. inches
sq. feet	0.092903	sq. meters	sq. meters	10.7639	sq. feet
sq. yards	0.8361	sq. meters	sq. meters	1.196	sq. yards
acres	0.40469	hectares	hectares	2.471	acres
sq. miles	2.58999	sq. kilometers	sq. kilometers	0.3861	sq. miles
Volume					
fluid ounces	29.574	milliliters	milliliters	0.0338	fluid ounces
gallons	3.7854	liters	liters	0.26417	gallons
cubic feet	0.028317	cubic meters	cubic meters	35.315	cubic feet
cubic yards	0.76455	cubic meters	cubic meters	1.308	cubic yards
Weight					
ounces	28.3495	grams	grams	0.03527	ounces
pounds	0.45360	kilograms	kilograms	2.2046	pounds
short tons	0.90718	metric tons	metric tons	1.1023	short tons
Temperature					
Fahrenheit	Subtract 32, then multiply by 5/9	Celsius	Celsius	Multiply by 9/5, then add 32	Fahrenheit

Prefix	Symbol	Multiplication Factor
exa-	E	$1\ 000\ 000\ 000\ 000\ 000\ 000 = 10^{18}$
peta-	P	$1\ 000\ 000\ 000\ 000\ 000 = 10^{15}$
tera-	T	$1\ 000\ 000\ 000\ 000 = 10^{12}$
giga-	G	$1\ 000\ 000\ 000 = 10^{9}$
mega-	M	$1\ 000\ 000 = 10^{6}$
kilo-	k	$1\ 000 = 10^{3}$
hecto-	h	$100 = 10^{2}$
deka-	da	$10 = 10^{1}$
deci-	d	$0.1 = 10^{-1}$
centi-	c	$0.01 = 10^{-2}$
milli-	m	$0.001 = 10^{-3}$
micro-	µ	$0.000\ 001 = 10^{-6}$
nano-	n	$0.000\ 000\ 001 = 10^{-9}$
pico-	p	$0.000\ 000\ 000\ 001 = 10^{-12}$
femto-	f	$0.000\ 000\ 000\ 000\ 001 = 10^{-15}$
atto-	a	$0.000\ 000\ 000\ 000\ 000\ 001 = 10^{-18}$

APPENDIX K: ATLAS FACILITY PROJECT-SPECIFIC ANALYSIS

K.1 PURPOSE AND NEED FOR AGENCY ACTION

K.1.1 Background

This project-specific analysis for the proposed Atlas Project is intended to provide specific information about the siting and construction of Atlas at the Los Alamos National Laboratory (LANL) in Los Alamos, NM. The purpose and need set forth in this document is focused on the additional capabilities that the Atlas Project would provide to LANL. Environmental impacts resulting from this proposed action are assessed for LANL only. Information relating the Atlas Project to the broader assessment of complex wide Stockpile Stewardship and Management environmental impacts is found in the *Stockpile Stewardship and Management Programmatic Environmental Impact Statement* (PEIS).

Modeling of nuclear weapons to assess and ensure safety, reliability, and performance as weapons age or are modified or remanufactured, is part of the science-based stockpile stewardship mission. Without nuclear testing, mathematical calculations based on experimental data would be the only way to obtain needed information on weapons performance and reliability. However, the Department of Energy (DOE) has not yet determined how to predict this behavior with sufficient accuracy from calculations alone. Developing and verifying more accurate predictive modeling requires both empirical data on underlying physics and benchmarking of computational predictions against experimental observations. This is particularly necessary in the case of nuclear weapon stewardship, for which substantial simplifications of physics are necessary for practical computational models. To ensure that the physical approximations and models are adequate, and provide proper physical data and adequate benchmarking, experiments must be done in regimes of appropriate physical parameters.

It is the requirement as presented in the Stockpile Stewardship and Management PEIS for experimental data in the regimes of extreme physical parameters common to nuclear weapons that underlie the need for high-energy-density experimental facilities. Lasers and pulsed-(electrical)-power experimental facilities are complementary in providing these capabilities. High-energy lasers provide the highest temperatures and pressures in small experimental volumes for a few billionths of a second. High energy pulsed-power facilities make different aspects of this high-energy-density regime accessible because pulsed power can focus much higher total energy on a larger (e.g., centimeter [cm] scale) experimental target for a much longer time, albeit at somewhat lower temperature and pressures. Pulsed power will be of most value to the science-based stockpile stewardship program in addressing properties of materials, implosion hydrodynamics, and radiation flow physics. These are some of the areas identified by DOE as the most significant concern to weapons scientists.

LANL already has capability in pulsed power in the microsecond regime and applies it to stockpile stewardship. In particular, LANL uses the Pegasus II 4-megajoule (MJ[1]) capacitor bank, as well as high-explosive (HE)-driven pulsed power generators such as the Procyon generator, which are used in single-shot experiments at appropriate HE firing locations. Typically, the pulsed electrical currents produced by the capacitor bank or HE generator create strong magnetic fields that implode a cylindrical "liner," which would impact a centimeter-scale target to produce hydrodynamic pressure. Alternatively a liner accelerated to high velocity toward the axis of the cylinder could produce soft x rays when it impacts. The 4-MJ Pegasus II capacitor bank is already used for a variety of experiments associated with the physics of both primaries and secondaries. Heavy liners can provide highly symmetric and smooth implosion drive, with asymmetries of 0.5 percent or less, that can help weapons scientists isolate and study certain physical phenomena without complicating effects.

K.1.2 Purpose and Need

DOE must maintain the safety, security, and reliability of the U.S. nuclear weapons stockpile. As a result

[1] 1 megajoule is 0.28 kilowatt-hrs of electricity.

of the moratorium on underground nuclear testing and pursuit of a *Comprehensive Test Ban Treaty*, DOE is forming a science-based stockpile stewardship program. This program is being carried out by the weapons laboratories using a variety of technologies, including lasers and pulsed power to support the computer modeling of nuclear weapons' performance over time as the stockpile ages.

As a result of the stockpile stewardship mission, LANL is tasked with enhancing their pulsed-power capability, resulting in the ability to accurately benchmark calculations on weapon performance. An extensive amount of high-energy shots need to be performed for a variety of potential physical defects such as cracks, voids, corrosion, or other modifications to material that may be caused by aging or introduced from remanufacturing. The capability and energy of existing facilities is insufficient to reach the pressures, volumes, and energy densities needed to accurately benchmark weapon-related computational predictions as required to support the stockpile stewardship mission at LANL. In particular, existing facilities cannot support large-scale experiments in the ionized regime, an important capability for analyzing primary and secondary-physics issues, such as implosion hydrodynamics, materials properties, and interactions.

K.2 DESCRIPTION OF ALTERNATIVES

K.2.1 Proposed Action

K.2.1.1 *Description*

The need to perform experiments with macroscopic pulsed-power targets, as well as with lasers, exists not only because of the limits of measurement diagnostics or improved ease of measurement at larger scale, but also because some of the physical phenomena that must be investigated cannot be readily scaled down to smaller sizes without affecting some parameters of importance. For example, DOE must perform experiments to develop and benchmark calculations on weapon performance for a variety of potential physical defects such as cracks, voids, corrosion, or other local modifications to material that may be caused by aging or introduced from remanufacturing. Studying the hydrodynamic effects of such perturbations in a pulsed-power experiment and comparing the results to calculations is one of the means used. Figure K.2.1.1–1 illustrates this hydrodynamic process. If the perturbations being investigated were scaled down to the volumes accessible by laser experiments, in many cases the perturbations would be of a similar size to natural material grains or pores, which would complicate or even obscure the experimental results.

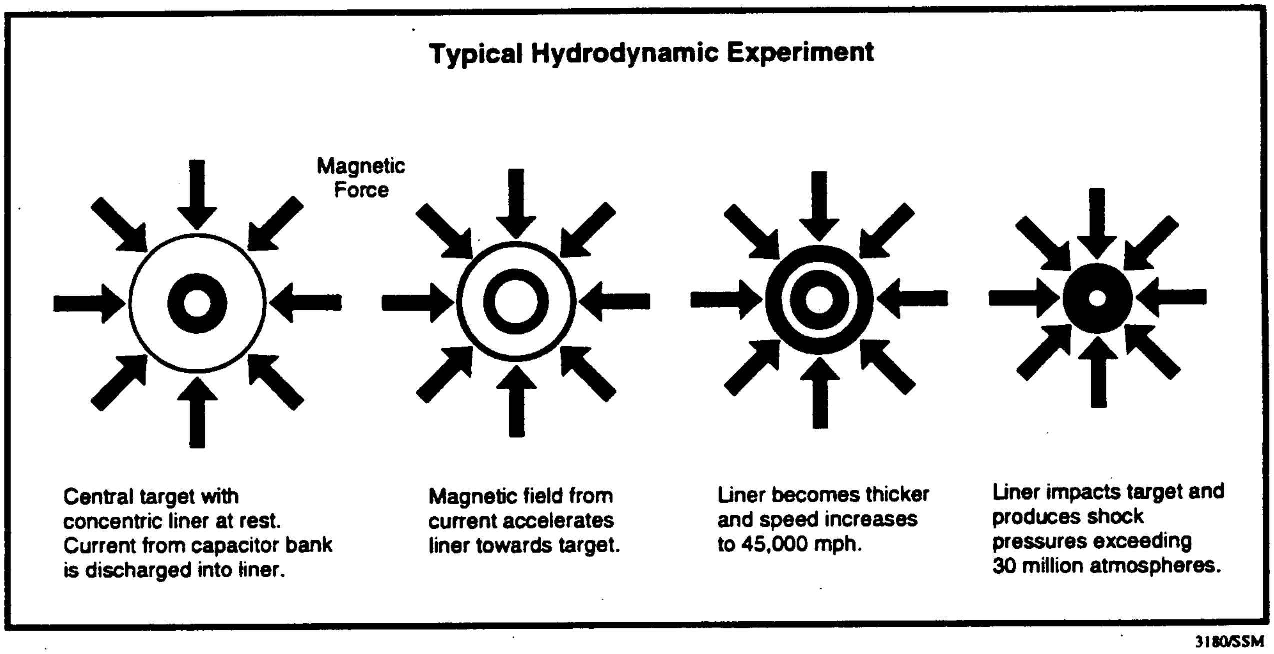

FIGURE K.2.1.1–1.—*Hydrodynamic Process of Pulsed Power Experiments at Atlas Facility, Los Alamos National Laboratory.*

However, the energy of Pegasus II is insufficient to reach the pressures and volumes needed to accurately benchmark weapon-related computational predictions. In particular, Pegasus is not adequate to drive dense hydrodynamic targets into the ionized regime, an important capability for analyzing some secondary-physics issues.

Atlas has been designed to provide enhanced pulsed-power capability specifically to address these areas. Atlas has been conceptually designed as a 36-MJ inductive energy store capacitor bank that would nominally deliver 25 to 30 megamperes (MA) (60 MA peak) to an imploding liner or plasma. For hydrodynamic experiments, Atlas would implode heavy precision liners to velocities of over 2 cm/microsecond with final kinetic energies of 2 to 5 MJ. Pressures of >5 to >30 megabars would be achieved (depending on design of the experiment). One dimensional calculations benchmarked to past HE pulsed-power results predict that Atlas will produce x-ray yields > 2 MJ with temperatures >100 electron volts (eV). In a switched mode of operation, Atlas x-ray output would approach 200 eV temperature.

For study of material properties and development of dynamic materials models, Atlas would produce pressures and strain rates in cubic centimeter (cc) scale samples at least 5 to 10 times greater than possible with the present Pegasus Facility.

Fidelity of scaled implosion hydrodynamics experiments is essential for them to be used to verify predictions of design codes. Even the simplest set of physical equations governing compressible hydrodynamics have four parameters that should be the same for fidelity. High-energy density hydrodynamic flow calculations must be validated by experiments with an energy density high enough to get materials into the appropriate state of matter, to ensure adequate fidelity of the important parameters.

A key need satisfied by the Atlas Facility would be the capability of doing large-scale hydrodynamic experiments at high temperatures to ionize the material. This is important for understanding physics phenomena associated with late stages of primary as well as secondary implosion. Atlas will be the first pulsed-power facility that will have the capability for generating the state of matter — ionized, highly correlated materials — that governs two of the most important of these similarity parameters, compressibility and Reynolds number. For metals, this requires 500 kilojoules (kJ)/cc, and for plastics 200 kJ/cc. To access this energy density regime, a typical experiment large enough to have easily resolved features needs to be driven with 2 to 5 MJ of kinetic energy. Solid-liner kinetic energies in this range cannot be achieved on presently operating pulsed-power facilities.

Atlas would provide these conditions in large experimental volumes (cc) for benchmarking and verifying models used to evaluate effects of aging (e.g., high aspect ratio cracks), or changes due to remanufacturing, on weapon performance and reliability. Atlas would make available an order of magnitude increase in dynamic pressure over Pegasus, which would greatly enhance DOE's ability to study such important phenomena as melting and hydrodynamics in primaries, early and late time spall in converging geometries, distortion in implosion systems, and effects of gaps.

The expected lifetime of the Atlas Facility is 20 years. After that time, the facility would be cleaned up and decommissioned, which would generate an estimated quantity of nonhazardous waste totaling approximately 841 cubic meters (m^3) (30,000 cubic feet [ft^3]). This waste would be recycled or disposed of at a sanitary landfill. A separate *National Environmental Policy Act* (NEPA) analysis would be conducted at that time.

K.2.1.2 *Facility*

The Atlas Facility would be located at LANL's Technical Area (TA)-35 (see figure K.2.1.2–1). TA-35 is used primarily for research and development (R&D) activities in the fields of physics, chemistry, fusion, and materials science. Construction of the facility would involve renovating existing buildings for use in performing pulsed-power experiments. The construction phase would also involve the installation of high-power electrical Special Facilities Equipment (SFE). To accommodate the facility and its support requirements, five existing buildings within TA-35 would be modified, and external concrete pads, transportable office/diagnostic space, and storage tanks would be added. These relatively minor

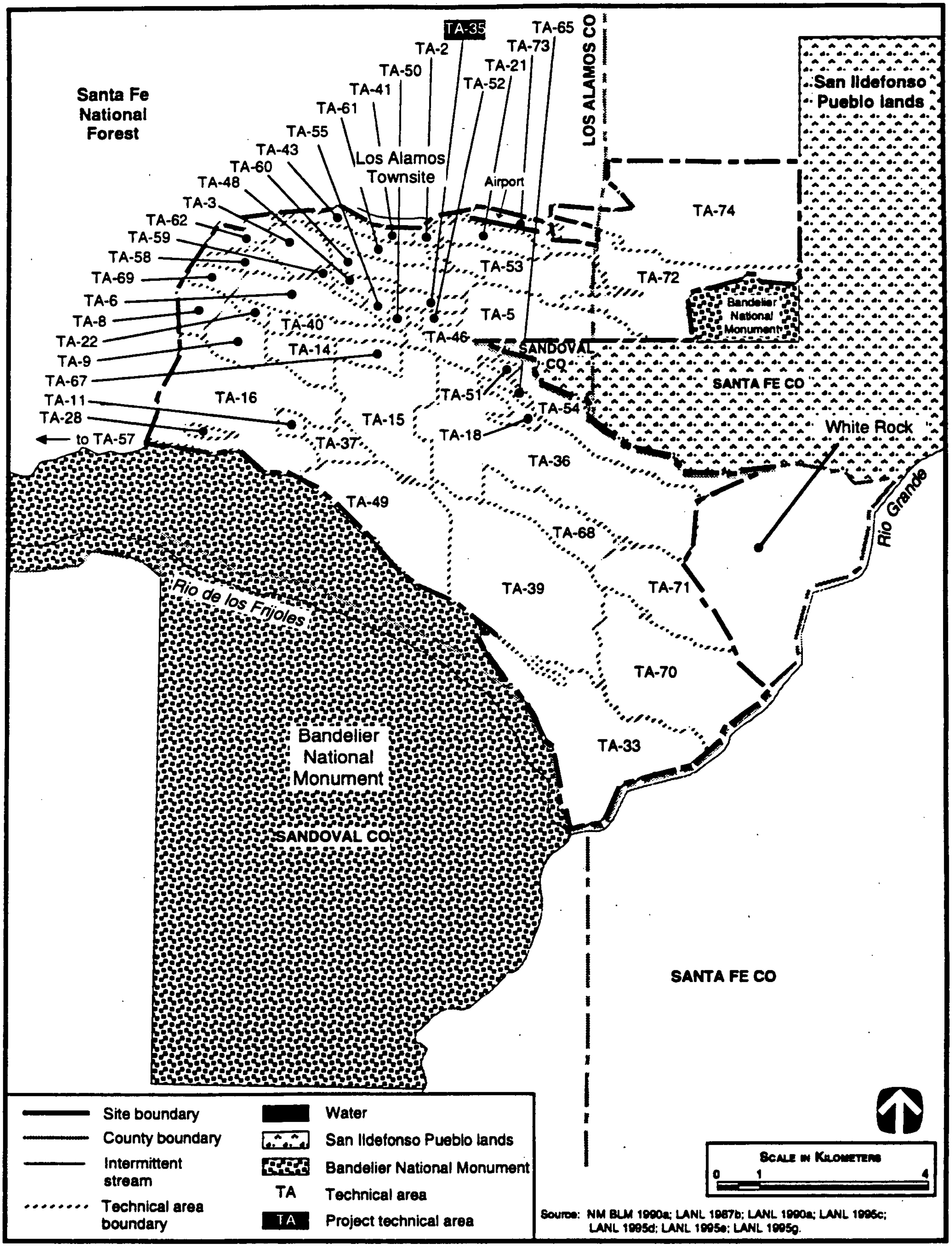

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FIGURE K.2.1.2–1.—*Proposed Location of Atlas at Los Alamos National Laboratory.*

modifications have an estimated cost of $2.5 million and would be completed within 6 to 9 months of the facility construction start-date.

Atlas operations would require the following major SFE elements: 1,430 megawatt (MW) generator (existing); 80 MW alternating current to direct current (ac-to-dc) converter; 50 MJ inductive energy transfer system; 36 MJ capacitor bank; target chamber; and various control, diagnostic, and data acquisition equipment. The facilities and infrastructure requirements necessary to support this SFE include heavy lab construction with overhead material handling capability, vibration-free high-power generation, electromagnetically-shielded and security-hardened data acquisition areas, and dielectric fluid storage and transfer equipment. All SFE and supporting facilities/infrastructure meet or will be designed to meet the construction requirements for a "low hazard, non-nuclear" facility.

The Atlas Facility would use portions of Buildings 124, 125, 126, 294, and 301 at TA-35 (see figure K.2.1.2–2) in the following manner to meet these SFE facility and infrastructure requirements:

TA-35-124/125	Atlas Experimental Area, Control Room and Coordination Center
TA-35-126	Mechanical Services Building
TA-35-294	Power Supply Building
TA-35-301	Generator Building

Detailed building-use information, including building modifications, is included in the following paragraphs. Up to 35 construction workers would be involved in the building modifications and equipment installations at any given time; the workers would be a combination of relocated workers from other completed construction sites and a limited number of new hires as needed. Approximately 15.3 m^3 (20 yd^3) of noncontaminated construction waste would be generated during construction.

Buildings 35-124 and 35-125. The total space the Atlas Facility would use in these buildings is approximately 1,151 square meters (m^2) (11,770 square feet [ft^2]). Buildings 124 and 125 are proposed to house the primary Atlas Facility components because they could provide safe, secure, and convenient working and experimentation space; access to the Atlas capacitor bank could be controlled and limited; and diagnostic support platforms are available for conducting and analyzing proposed experiments. These buildings have the following special features:

- *Heavy-industrial, high-bay construction.* Atlas requires, at a minimum, 929 m^2 (10,000 ft^2) of high-bay building with a heavy-duty gantry crane to house the capacitor bank and user-support facilities. Building 124 and 125 were designed for large-scale experimental work and have high ceilings with heavy duty gantry cranes that can access the entire interior space. Buildings 124 and 125 satisfy all the Atlas space requirements.

- *Reinforced walls and ceiling.* Atlas requires reinforced walls and ceilings to protect workers and the public against shrapnel from possible high-energy electrical faults in the capacitor bank. Buildings 124 and 125 were designed to house the power amplifiers and target chamber of a laser-fusion facility. To protect the public from associated hazards, the buildings were constructed with concrete walls and roofs. This type of construction is ideal for a high-energy capacitor bank because shrapnel from possible faults will be contained within the building. The walls and ceiling will also contain any diagnostic x rays produced. Buildings 124 and 125 satisfy all the containment requirements of Atlas.

- *Collocation with the 1430-megavolt ampere (MVA) generator.* Atlas would utilize a multi-hundred MVA generator to charge the capacitor bank rapidly. The facility housing this generator (Building 301) includes a spring-mounted generator pad which isolates vibrations due to generator operations from surrounding experimental areas. This rapid charging technique is similar to other large physics facilities for which power from the existing electrical grid is insufficient to meet the facility technical requirements. In the case of Atlas, this

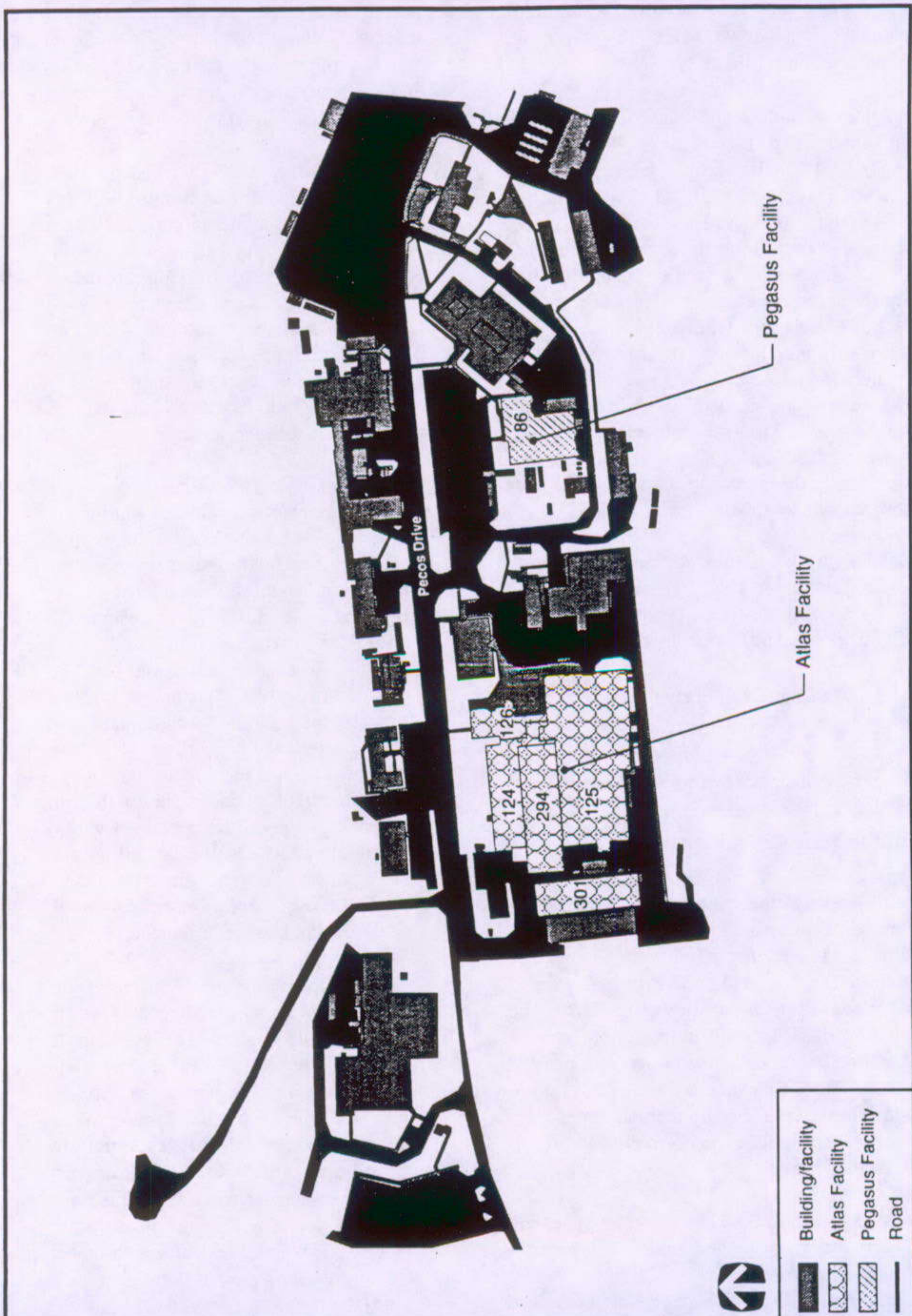

FIGURE K.2.1.2–2.—*Proposed Location of Atlas Facilities and Location of Pegasus II Facility.*

requirement stems from a common fault mode for large capacitor banks; premature electrical breakdown (prefire) of a capacitor switch. A prefire usually destroys the target and much of the rest of the experimental assembly, both of which are expensive and require days to replace. Since the probability of prefire is proportional to the time during which the switches must hold high voltage, the problem is greatly diminished by rapidly charging the capacitor bank and then quickly triggering the switches.

Due to the large number (300) of capacitor switches in Atlas and the programmatic and cost impacts of recovering from frequent prefires, Atlas will use rapid charging to satisfy its reliability requirements. Because of the extremely large energy storage required, even multi-megawatt power lines would still take 10 to 20 seconds to charge the Atlas capacitor bank. DOE has estimated that a faster charging rate will be required to provide sufficient confidence that Atlas will meet its reliability requirements. Buildings 124 and 125 are proposed to house Atlas because a 1430-MVA generator, located adjacent to these buildings in Building 301, is available and is capable of charging the capacitor bank in as little as 0.04 seconds. This configuration forms the basis of the Atlas conceptual design.

- *Electromagnetically shielded, data-acquisition room for classified data.* Atlas will require an electromagnetically shielded, data-acquisition room for classified data. The laser-fusion machine, for which Building 124 was originally designed, has many similarities to Atlas' operational requirements, including the capability to retrieve and store classified data. Inside the building is an electrically shielded data acquisition room that is also protected by a concrete wall. During classified tests, the entire building could be secured, and all classified data could be electronically routed to this room.

  This room satisfied the requirement for a secure site for classified data for the laser-fusion machine, and would also satisfy the Atlas requirement.

- *Electromagnetically shielded room for machine-control and unclassified data.* Atlas requires a machine-control room that is isolated from the machine and provides space for unclassified data acquisition. Just outside Building 124 in Building 125 is an 86 m^2 (925 ft^2) electrically shielded control and data acquisition room that was originally constructed to control the laser-fusion facility. This room already has conduit to Building 124 for machine-control and unclassified data acquisition lines. This room satisfies Atlas requirements for machine-control and unclassified data acquisition.

- *Oil storage.* Atlas will likely require storage capabilities for electrically insulating mineral oil. Just outside Building 125 are 3 underground oil storage tanks with a total capacity of 90,850 liters (L) (24,000 gallons [gal]). These tanks were installed to support the laser-fusion pulsed-power systems. Ownership of these tanks recently became available, and if Atlas uses oil for capacitor-bank insulation, these tanks would help satisfy Atlas oil-storage requirements.

Figure K.2.1.2–3 provides a perspective of the Atlas primary facility components, including the SFE, proposed for installation at TA-35. These consist of:

- Target chamber containing implosion target
- Imaging radiography darkrooms
- 36 MJ capacitor bank
- Target assembly clean room
- Laser diagnostic systems
- Satellite control room

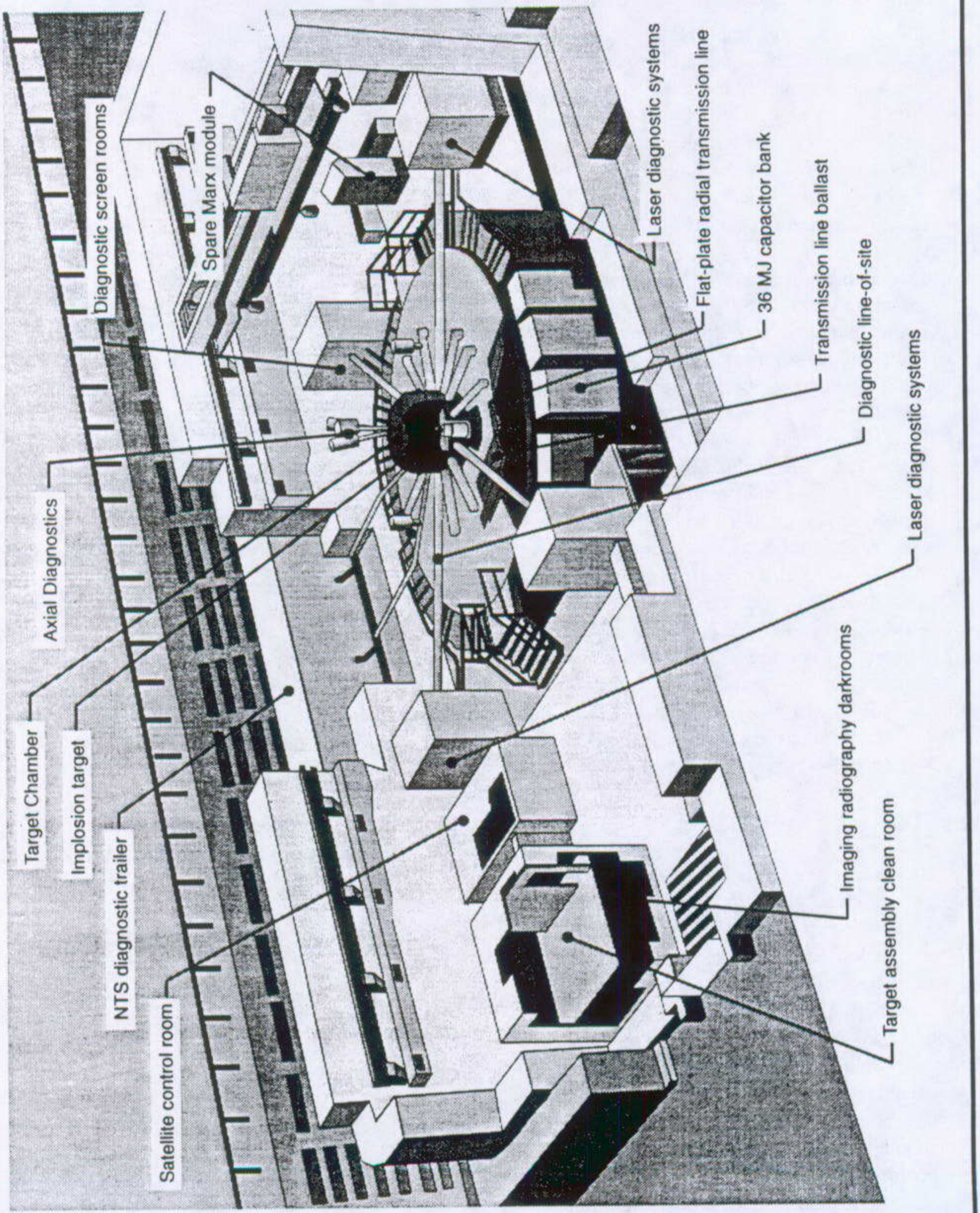

FIGURE K.2.1.2–3—*Atlas Facility Conceptual Perspective.*

- Diagnostic screen rooms
- Diagnostic trailer
- Axial diagnostics
- Spare Marx module
- Vacuum pumps
- Structural platforms and stairwells
- Flat-plate radial transmission line
- Oil storage and transfer system
- Transmission line ballast
- Chilled water, nitrogen, and compressed air systems

Structural modifications and improvements to Buildings 124 and 125 and surrounding areas required to accommodate the Atlas Facility components would include the following:

- The heating, ventilation, and air conditioning may be modified or relocated. Stairwells may require installation in the floor to permit access to and from the interior of the capacitor bank inner area. A 300 L (80 gal) liquid nitrogen storage tank and a supplemental 151,400 L (40,000 gal) non-polychlorinated biphenyl mineral oil storage tank would be stationed aboveground outside these buildings and piping connecting the tanks to the facility would be added. The oil storage tank would be bermed or similarly contained and would comply with all Spill Prevention Control and Countermeasures requirements.
- Support utilities such as compressed air, chilled water and electrical distribution systems would be added or improved to support the SFE equipment.
- A new 16.8-meter (m) by 24.4-m by 15-cm (55-feet [ft] by 80-ft by 6-inch [in])-thick concrete slab would be installed to accommodate two portable diagnostic trailers, a mobile air conditioning unit, and a power pedestal. The pad would slope slightly from north to south to provide positive drainage.
- A diagnostics data center, project management office, and a visitor center would be constructed and housed in Building 125.

All other facility requirements already exist in Buildings 124 and 125, and no other facility modifications would be required.

Building 35-126. Building 126 was constructed in 1980 of concrete block and cast-in-place concrete with exterior-applied insulation. The roof system is made of precast concrete tees with insulation and single-ply roofing. The 640 m^2 (6,900 ft^2) building houses the existing heating, ventilation, and air conditioning and major electrical equipment that serves Building 125 and 294. No modifications to this building would be required.

Building 35-294. Building 294 was constructed in 1990 of steel framing with synthetic stucco panels at the east and west ends. The building is approximately 75.6 by 20 by 11.6 m (248 by 66 by 38 ft) in size. The building fills the space between Building 124 to the north and Building 125 to the south and shares the exterior north and south walls of these buildings. The Atlas Facility components in this building would occupy about 163.5 m^2 (1,760 ft^2). Atlas component equipment to be installed in this building includes an ac-to-dc converter, communication circuits, and the switching system.

The only building modifications would be the addition of internal trenches and cable tray supports for the communication and electrical systems.

Building 35-301. Building 301 was constructed in 1990. The structure is a pre-engineered steel building set on a concrete pad. The 1087 m^2 (11,700 ft^2) building houses a 1430 MVA generator, unique in the DOE-Defense Program complex, which can rapidly charge the Atlas capacitor bank. This building has several significant features to isolate generator vibrations from surrounding buildings. The generator and associated controls and alarms currently serves the National High Magnetic Field Laboratory (NHMFL), located in Building TA-35-127. The NHMFL would continue to use the generator when it is not in use serving the Atlas Facility. Only one application would be run by the generator at any one time. No modifications are planned for this building.

K.2.1.3 *Operations*

The heart of the Atlas Facility would be a pulsed-power capacitor bank that would deliver a large amount of electrical and magnetic energy to a centimeter-scale target in a very short time ($\leq$10 microseconds [(μs]). Each experiment would require extensive preparation of the experimental assembly and diagnostic instrumentation. The Atlas Facility would be designed to handle up to 100 experiments per year, but not more than 3 experiments per week. Approximately 15 workers would be employed at TA-35 in support of the Atlas Facility once it is operational. The workers would be a combination of relocated workers from currently operating facilities and a limited number of new hires as needed.

Atlas would support many related types of experiments. For example, in a typical experiment, a hollow cylindrical piece of metal (such as aluminum, copper, or gold) fabricated with known cracks, voids, or other defects would be placed in the target chamber. Heavy (e.g., 30 gram (g) [1.1 ounce {oz}]) targets would be used in such experiments designed to validate computer simulations of the hydrodynamic effects of such defects, which in turn support evaluation of potential defects in aging weapons. Light (e.g., 50 milligram [0.00175 oz]) targets would be imploded to produce a hot plasma source of soft (<200 eV) x rays to study radiation physics pertinent to stockpile stewardship.

During an experiment, electromagnetic energy would go sequentially from the generator to the ac-to-dc converter, through the inductor (optional), to the capacitor, and would finally be delivered to the target.

The Atlas capacitor bank would be designed to be flexible enough so that it has the capability to transfer energy in various quantities and within a spectrum of time intervals. The following is a description of what would happen during an experiment requiring maximum possible currents and generating the maximum possible magnetic fields from the facility.

When such an experiment setup was completed, power from the LANL electrical grid would be used to spin the generator to 1,800 revolutions per minute (rpm) over a period of 15 to 20 minutes (the generator may already be spinning for NHMFL experiments). When full speed is reached, a switch would close to allow electricity to flow from the generator to an 80-MW ac-to-dc converter. This converter would transform the high-voltage ac output of the generator to a low-voltage dc charging current in the inductor. The converter would provide this charging current for 3 to 5 seconds. When the peak current of 28 kiloamperes is reached, a switch would disconnect the converter from the inductor. The inductor would produce peak magnetic fields of 40,000 gauss (G) at the coil surface during this few-second interval.

When the inductor reaches 50 MJ of stored energy, various switches would close and open, and energy would be transferred to the capacitor bank, which consists of an array of Marx modules. Within 40 milliseconds, each stage in the Marx modules would acquire a voltage of 60 kilovolts. When the capacitor bank reaches full charge, switches would connect all of the modules into a series configuration, producing many times the original voltage (nominally <1 MV) at the terminals of the transmission line. At this time, the 36 MJ of energy stored in the capacitor bank would be discharged as electric current through the transmission line into a load or liner in the target chamber. The discharge would take approximately 10 μs. If the experiment requires low energy x-ray production, then Atlas may utilize a "plasma flow switch" in the electrical transmission section near the target to decrease the implosion time from several μs down to half a μs or less.

This very large current would produce a large magnetic field in the localized area around the target, causing it to implode, and possibly vaporize or melt, depending on the thickness of the metal. A light liner used inside the target would collide with itself on axis, producing a plasma and low energy x rays. A heavy liner used within the target would compress sample materials to high pressures or, when driven into a central target, would produce extremely high shock pressures that can produce partial material ionization. Solid shrapnel and vaporized molecules would be generated but would be stopped by the walls of the target chamber. Vaporized molecules would deposit onto the walls of the target chamber.

The target chamber would be equipped with a number of ports to allow connection of diagnostic equipment and data acquisition equipment. Diagnostic equipment would include air monitoring devices, voltage probes, current probes, and magnetic field measuring instruments. Data acquisition equipment would consist of cameras, lasers, x-ray detectors, and other similar equipment. Experiments with heavy targets would yield laser holographic images and x-ray radiographs of the implosion which would be captured and recorded to determine the hydrodynamic behavior of the experiment. Experiments with light targets would measure the quantity and energy of radiation (x rays) generated during the implosion and investigate the interaction of this radiation with other parts of the experimental assembly.

After each experiment, LANL personnel would clean the target chamber of metallic debris and deformed metallic targets. Up to 150 L (42 gal) of ethanol would be used each year for cleaning. Discarded materials following each experiment would consist mostly of small amounts of aluminum, copper, very small quantities of gold, and oxides of these metals, or other similar nonradioactive heavy metals. Any metal pieces recovered would be salvaged for reuse. Personnel would also perform routine maintenance, such as replacement of worn dielectric insulation. All waste would be sampled and analyzed in accordance with LANL procedures to determine whether *Resource Conservation and Recovery Act* (RCRA)-regulated hazardous materials are present in regulated quantities. For purposes of this analysis it is assumed that a small amount (<1 m^3 annually) of liquid or solid hazardous waste would be generated by occasional experiments involving lead or other simulant materials. This waste would be staged in the onsite hazardous waste accumulation area and shipped to off-site commercial RCRA-permitted treatment, storage and disposal facilities. Uncontaminated waste (such as paper waste), expected to be about 0.15 m^3 (5 ft^3) per week, would be disposed of at the Los Alamos County Landfill.

K.2.2 Continued Operations Alternative (No Action)

K.2.2.1 *Description*

For the purpose of this analysis, Pegasus II would remain at its current energy level and current rate of experiments. The Pegasus II Facility is located at TA-35 and features a capacitor bank consisting of 8 Marx modules that store up to 4.3 MJ of electrical energy. The Pegasus II Facility is being used by personnel in the weapons physics community to perform experiments in hydrodynamics and radiation transport. It has served as a test bed and will continue to provide important data for experiments in a particular energy regime.

The No Action alternative analysis provides an environmental baseline from which to measure the potential impacts of the proposed action and other alternatives against. However, the No Action alternative does not meet DOE's purpose and need for action. Continued operation of only the Pegasus II Facility would mean that pressure and temperature regimes, critical to understanding weapon aging effects, will not be attained. For instance, in hydrodynamic experiments, Pegasus does not have sufficient power to drive shock pressures that can ionize dense materials. In radiation transport experiments, Pegasus does not have sufficient power to produce >1 MJ of x rays with temperatures >100 eV. Both of these capabilities are important to study relevant issues associated with thermonuclear secondary devices. For experiments relevant to primary physics, Pegasus has insufficient power to drive the larger-scale hydrodynamic targets required for high-fidelity diagnostic access. Operation of only Pegasus II would prevent DOE from providing adequate experimental validation of computer predictions of the effects of certain aging phenomena.

The expected lifetime of the Pegasus II Facility is 15 to 20 years; it became operational in 1987. Future decontamination and decommissioning activities associated with the Pegasus II Facility would require separate NEPA analyses.

The Pegasus II Facility is included as part of the No Action alternative for the Stockpile Stewardship and Management PEIS (DOE 1995a).

K.2.2.2 *Facility*

The Pegasus II Facility is located at TA-35, Building 86 (see figure K.2.1.2–1). The Pegasus II capacitor bank is situated in Room 100, and the control center, data collection room, and office areas are located in Rooms 101 and 205. The detonators used in firing the capacitor bank are stored in a non-propagating container in a steel safe in Room 101.

The Pegasus II Facility occupies 1,300 m^2 (14,000 ft^2) of combined laboratory and office space. The building is constructed of prefabricated metal building components (steel columns, sheet metal siding, and masonry brick) on a concrete pad. The lower level (Room 100) houses the experimental area.

No construction or remodeling of the Pegasus II Facility is anticipated under the No Action alternative.

K.2.2.3 *Operations*

The heart of the Pegasus II Facility is a 4.3 MJ capacitor bank used to deliver a pulse of electrical and magnetic energy to a target. The capacitor bank has eight modules and uses air as the dielectric between the individual capacitors. The Pegasus II Facility is used for up to 24 experiments per year. In a typical experiment, a metal cylinder is placed in the target chamber, diagnostic equipment is attached to the target chamber, and the air in the chamber is pumped out with a vacuum system to form a vacuum condition for the experiment. Operators in Room 100 prepare the power supply system, and personnel are evacuated from the room. Operators in Room 205 open and close switches to charge up the individual capacitors and allow the eight modules to be hooked up in the test configuration. HE detonator switches then fire to transfer energy from the capacitor bank. The 4.3 MJ of energy stored in the capacitor bank discharges as a 12 MA current through a transmission line to the target. The discharge rises in about 6 µs. For experiments which require production of low energy x rays, a special switch ("plasma flow switch") can be placed just before the target to decrease the discharge rise time to only a few tenths of a microsecond.

After each experiment, LANL personnel clean the target chamber of metallic debris and deformed metallic targets. About 5 L (1.3 gal) of ethanol are used per year to clean the target chamber and other parts. Discarded materials generated from each experiment consist mostly of aluminum and copper and oxides of these metals. Any metal parts are salvaged for reuse. About 0.06 m^3 (2 ft^3) of uncontaminated waste (such as paper waste) per month is disposed of at the Los Alamos County Landfill. No hazardous waste is generated.

The detonator switches use a total of 19.2 g (0.672 oz) of HE per experiment, for a total of about 461 g (16.2 oz) per year. All HE is destroyed during detonation. After the test shot is complete, switches are disposed of at the Los Alamos County Landfill.

K.2.3 Alternatives Considered but Eliminated from Further Consideration

The following alternatives were considered but eliminated from further analysis in this project-specific analysis because they fail to meet the purpose and need for DOE action. Failure to meet this purpose and need results from programmatic deficiencies identified in the Stockpile Stewardship and Management PEIS or from technical inadequacies which preclude these alternatives from being reasonable alternatives to the proposed action.

K.2.3.1 *Build Atlas at Another DOE Site*

DOE considered, but dismissed as unreasonable, the alternative of locating, constructing, and operating the Atlas Facility at a site other than LANL and other than at the Pegasus II Facility. As discussed in section 2.1.1, Atlas would expand the capabilities of the existing Pegasus II Facility through the addition of enhanced pulsed-power and other equipment sufficient to reach the temperatures necessary to ionize materials. Other sites at LANL, as well as other DOE sites which have a hydrodynamic testing infrastructure, do not have the existing special equipment provided by the Pegasus II Facility. Although it would be possible to duplicate this special equipment elsewhere, DOE considers this to be an unreasonably expensive option.

K.2.3.2 *Use An Alternate Building at LANL*

Under this alternative, DOE would construct and operate the Atlas Facility at a LANL location other than TA-35. The requirements for an alternate site at LANL are the same requirements as those described in section K.2.1.2. Siting and construction of a new building at LANL to house the Atlas Facility would require placement near the 1430-MVA generator building. Additional environmental disturbances from foundation and utility work would occur. Although other existing buildings could fulfill requirement 1, with extensive and costly modifications, none of these sites fulfill requirements 2 to 6. Therefore, this alternative has been eliminated from further consideration.

K.2.3.3 *Modify Pegasus II to Conduct Atlas Experiments*

Action under this alternative would involve modifying the existing Pegasus II Facility so that it could function at the Atlas Facility power level to meet DOE's purpose and need for action. Currently, the Pegasus II Facility supplies limited data regarding weapons physics, but the facility does not have sufficient energy capability to reach all the conditions required to adequately investigate primary and thermonuclear secondary issues. Modifying the Pegasus II Facility would require extensive expansion of the existing building housing the facility. During this expansion process, which would include construction, procurement, and verification testing, the current Pegasus II operations could not be conducted. The current Pegasus II operations are critical to DOE's existing nuclear weapons stockpile stewardship and management mission. Due to direct conflicts with the existing critical operations of Pegasus II, this alternative does not meet DOE's purpose and need for action.

K.2.3.4 *Explosive-Based Pulsed Power Technology*

As an alternative to the proposed action, DOE could rely solely on conducting tests using explosive-based pulsed power technology, such as that used by the Procyon generator at LANL. Procyon currently furnishes limited data regarding weapons physics. Although the explosive-based pulsed-power technology would apply to the type of experimental tests needed, this technology can only support a maximum of 12 to 15 experiments per year due to test preparation time constraints, scheduling of detonation, and subsequent site cleanup following detonation. The Agency need for action requires a capability of conducting up to 100 experiments per year. Because of this factor, this alternative has been eliminated from further consideration.

K.3 AFFECTED ENVIRONMENT

This section presents a summary of information regarding the general environmental setting of LANL and the immediate TA-35 site vicinity. More extensive information about the LANL environment is presented in the annual LANL Environmental Surveillance Report (LANL 1994b), as well as LANL's Site-Wide Environmental Impact Statement (DOE 1979).

K.3.1 General Site Setting

LANL and the associated residential and commercial areas of Los Alamos and White Rock are located in Los Alamos County in north-central New Mexico (figure K.3.1–1). LANL facilities cover approximately 560 hectares (1400 acres) of the Federal land managed by DOE in Los Alamos County. The LANL developed area is divided into 30 active TAs for administrative purposes (figure K.2.1.2–1). Unoccupied land area surrounds LANL buildings, providing security, safety buffer zones, and a reserve for future development.

TA-35 is located near the center of Pajarito Mesa, a southeast-trending mesa immediately north and east of Pajarito Canyon in Los Alamos County. Pajarito Road bounds the proposed Atlas Facility site less than 0.8 kilometer (km) (0.5 mile [mi]) to the south, and Pecos Drive bounds the site directly to the north. Although the general public is currently allowed free access to these roads, and Pajarito Road has heavy public traffic, access to all roads in the general site area are DOE-controlled. They can be closed for brief periods as needed. The proposed TA-35 site is surrounded by adjacent TAs -63, -50, -55, -48, -60, and -52. These TAs include facilities conducting a variety of ongoing R&D that may involve use of chemicals and radioactive materials. The site is generally considered highly developed.

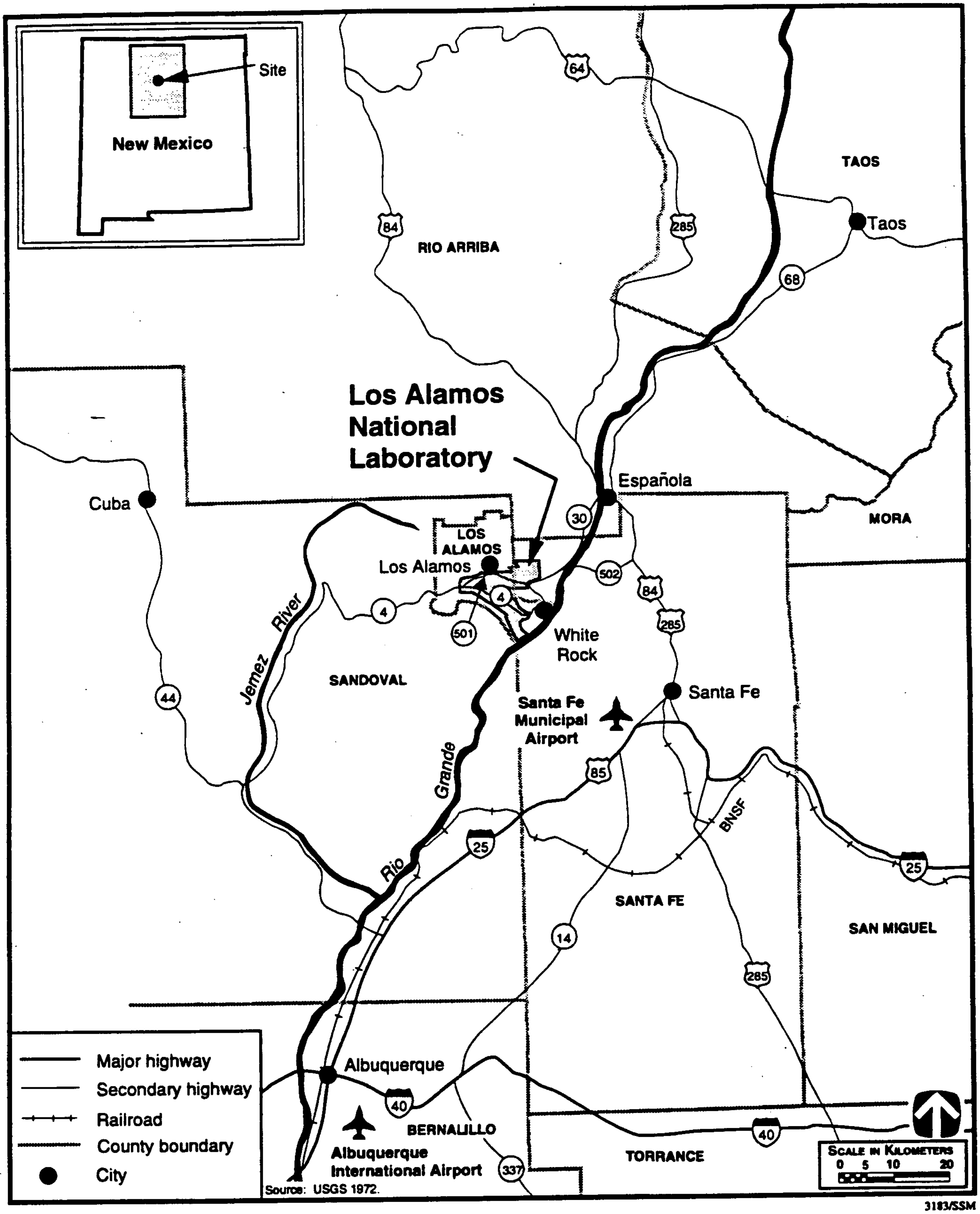

FIGURE K.3.1–1.—*Los Alamos National Laboratory, New Mexico, and Region.*

Los Alamos County has an estimated population of approximately 18,115 (U.S. Census 1994); the Los Alamos town site has an estimated population of 11,400, and White Rock has an estimated population of 6,800. There is a small, privately owned residential area, Royal Crest Trailer Park, surrounded by LANL property. Royal Crest Trailer Park is situated approximately 1.6 km (1 mi) northwest of the proposed project area with an estimated population of 500 (Morris 1994). The principal population centers are Santa Fe, Espanola, and the Pojoaque Valley located within an 80 km (50 mi) radius of LANL with an approximate population of 214,707 people. Fourteen pueblos are located within a 80 km (50 mi) radius of LANL. The populations of the four closest pueblos are as follows: the San Ildefonso Pueblo has a population of 1,499; the Santa Clara Pueblo has a population of about 3,000; the Cochiti Pueblo has a population of 1,342 people; and the Jemez Pueblo has a population of 1,750 people (Commerce 1991). LANL employs approximately 12,250 people (LANL 1994b) principally living within 80 km (50 mi) of LANL.

K.3.2 Environmental Issues Considered But Dismissed

The following environmental issues were not discussed as part of the affected environment because they either do not exist in the proposed action site vicinity (since the proposed action is in an existing building in a developed area) or neither the proposed action nor the No Action alternative would have any identified effect on these resources:

- Hydrology: surface and groundwater
- Vegetation
- Wildlife (Biotic Resources) — threatened, endangered and sensitive species, critical habitat, and migratory birds; wild horses and burros; wetlands and floodplains; wild and scenic rivers; coastal or tundra zones
- Cultural and Paleontological Resources
- Land Resources — mineral and timber resources; prime or unique farmlands
- Socioeconomics
- Water Quality — drinking water from surface or underground aquifers
- Soils and geology
- Parks, Monuments, Public Recreational Areas
- Site Infrastructure
- Visual Impacts
- Transportation

Under Executive Order 12898, Federal agencies are responsible for identifying and addressing the possibility of disproportionately high and adverse health and environmental impacts of programs and activities on minority (all people of color, exclusive of white non-Hispanics) and low-income (household incomes less than $15,000 per year) populations. Within a 16 km (10 mi) radius of the proposed Atlas site, about 14 percent of the population is of minority status. Within an 80 km (50 mi) radius, about 54 percent of the population is of a minority status. In terms of low-income populations, 8 percent of the households within a 16 km (10 mi) radius have annual incomes below $15,000. Within an 80 km (50 mi) radius of the site, 24 percent of the households have annual incomes below $15,000. Detailed environmental justice information is contained in the *Dual-Axis Radiographic Hydrodynamic Test* (DARHT) *Facility Final Environmental Impact Statement* (EIS) (DOE 1995b)[2].

TA-35 is situated on top of a mesa in a developed, disturbed area. Any impacts associated with building construction have already occurred and no new impact potential has been identified for the proposed action or the No Action alternative.

[2] The DARHT Final Environmental Impact Statement was issued on August 25, 1995. The Record of Decision for DARHT was issued on October 11, 1995.

K.3.3 Environmental Issues Considered

K.3.3.1 *Air Quality*

Prevailing winds at LANL are affected by several factors, including large-scale atmospheric wind patterns, regional weather disturbances (thunderstorms and cold fronts), complex surface terrain, and local cold-air drainage across the Pajarito Plateau. Winds in Los Alamos consist of light westerly surface winds that average 2.8 meters per second (m/s) (6.3 miles per hour [mph]). The strongest winds typically occur between March and June, when intense seasonal storms and cold fronts move through the region. During this season, sustained winds blow from the southwest to the northeast and can exceed 11 m/s (25 mph), with peak gusts exceeding 22 m/s (50 mph). Historically, no tornadoes have been reported to have touched down in Los Alamos County. Strong dust devils can produce winds up to 34.4 m/s (77 mph) at lower elevations in the area. The irregular terrain at Los Alamos affects wind motion and spreading. Localized wind gusts may not be in the same direction as average wind patterns. The wind behavior results in greater dilution of air contaminants that are released into the atmosphere.

Air quality in the LANL area is typical of arid-climate clean air. Median visibility ranges between 106 and 161 km (66 and 100 mi). The New Mexico Environment Department under the Environmental Protection Agency designated the LANL area as an air quality attainment area under the *Clean Air Act* or National Ambient Air Quality Standards in which all regulated ambient air quality standards are to be met. These standards apply to the following air emissions: total suspended particulates (TSP), particulate matter less than or equal to 10 microns in diameter (PM_{10}), sulfur dioxide, total reduced sulfur, hydrogen sulfide, carbon monoxide, and nitrogen oxides (New Mexico Environmental Improvement Board [NMEIB] 1981). Current emissions from operations around the proposed project site are within the required and existing permitted thresholds for LANL.

K.3.3.2 *Human Health*

As part of ongoing operations at LANL, several TAs, including TA-35 and those in close proximity to it, have facilities that conduct experiments involving electrical hazards and the generation of magnetic fields and x rays. Ongoing experiments and operations are conducted according to strict guidelines established by existing LANL standard operating procedures. Under these standard operating procedures, engineering and administrative controls are implemented to minimize worker and public exposure to electrical hazards, magnetic fields, and x rays. The magnitude of electrical hazards and x rays present from these experiments is regulated by Occupational Safety and Health Administration standards implemented under specific DOE orders. In addition, magnetic field threshold limit values have been developed as guidelines by the American Conference of Governmental Industrial Hygienists.

Generation and potential exposure to x rays is closely monitored under the implementation of existing health and safety requirements for maintaining worker exposure to as low as reasonably achievable standards, but not to exceed the current threshold of 5 rem per year. Magnetic fields are generated by the NHMFL at TA-35. These fields will not be additive to the fields produced during the charging of the Atlas capacitor bank because only one application can be conducted at a time. The public exposure to static magnetic fields in the TA-35 area is much less than the current pacemaker warning limit (10 G). Members of the public receive less than a 0.1 rem dose from x-ray sources generated in the TA-35 area or less than the admissible dose under DOE orders regulating public exposure to radiation.

K.3.3.3 *Waste Management Facilities*

RCRA-regulated hazardous chemical waste management is conducted at TA-54, Area L. TA-54, Area J, has a landfill dedicated to administratively controlled sanitary, non-hazardous wastes. All other sanitary waste is disposed in the Los Alamos County Landfill located near TA-3 along West Jemez Road.

K.4 Environmental Consequences

Neither the proposed action nor the No Action alternative would pose a disproportionate adverse health or environmental effect on minority or low-income populations within an 80 km (50 mi) radius of the proposed site.

K.4.1 Environmental Issues Considered

A summary of environmental issues is presented in table K.4.1–1. A discussion of the issues associated with the proposed action and the No Action alternative follows in the succeeding paragraphs.

K.4.2 Proposed Action

K.4.2.1 *Air Quality*

The air emissions expected due to operations at the Atlas Facility are presented in table K.4.2.1–1, along with the health-based New Mexico Air Quality Control Regulations (AQCR) 702-regulated levels. All expected emissions generated during normal operations would be below current regulatory levels. No permitting would be required under AQCR 702 or under the National Emission Standards for Hazardous Air Pollutants (NESHAP). No use of facility air filters or scrubbers would be required. Most of the metal targets used during experiments would vaporize and deposit onto the inside surface of the target chamber. Only minute quantities of metals would stay volatilized. Other nonradioactive heavy metals may also be used, but the metals listed in table K.4.2.1–1 are representative of any metals that would be used. The majority of the ethanol used for cleaning would evaporate. Small amounts of hazardous chemicals such as isopropyl alcohol, trichloroethylene and 1,1,2-trichloroethane may occasionally be used as cleaning solvents and would also evaporate. The quantity of air emissions as shown in table K.4.2.1–1 would not harm workers, collocated

TABLE K.4.2.1–1.—*Air Emissions from the Atlas Facility*

Constituent	Calculated Emissions[a]	AQCR 702 Limit
Aluminum	less than 1 g (0.0022 lb)	0.133 lb/hr
Copper	less than 1 g (0.0022 lb)	0.0133 lb/hr
Gold	less than 1 g (0.0022 lb)	0.42 lb/hr
Ethanol	less than $1.5x10^3$ g[b] (3.3 lb)	10 lb/hr
Isopropylalcohol	less than 30 g[c]	65.3 lb/hr
Trichloroethylene	less than 30 g[c]	18.01 lb/hr
1,1,2-Trichloroethane	less than 30 g[c]	3 lb/hr

[a] Amount calculated is per experiment using that specific type of metal or cleaning solvent. Any emissions would occur after the target chamber is repressurized to ambient pressure and temperature.

[b] Scientific notation (see glossary for explanation).

[c] Total for isopropyl alcohol, trichloroethylene, and 1,1,2-trichloroethane.

Source: Model results; NMEIB 1981.

TABLE K.4.1–1.— *Environmental Issues Considered for Normal Operations/Accidents*

Issue	Proposed Action Alternative	No Action Alternative
Air Quality	Potential impacts discussed in appendix section K.4.2.1. Per experiment: minor metals (copper, aluminum, gold [less than 1 g]); and solvent ($1.5x10^3$ g ethanol) air emissions. Occasional small (<30 g) quantities of isopropyl alcohol, trichloroethylene and 1,1,2-trichloroethane may also be used as solvents.	Potential impacts discussed in appendix section K.4.3.1. Per experiment: minor metals (same as proposed action for copper and aluminum, no gold used), solvent (18.1 g ethanol), and high explosive (12.7 g carbon monoxide, 34.0 g nitrogen oxides, 95.2 g PM_{10}, 0.91 g volatile organic compounds, all per year) air emissions.
Human Health	No radioactive materials; potential health effects of electricity, magnetic fields, x rays discussed in appendix sections K.4.2.2 (normal operations) and K.4.4 (accidents).	No radioactive materials; potential health effects of electricity, magnetic fields, x rays discussed in appendix sections K.4.3.2 (normal operations) and K.4.4 (accidents).
Waste	Disposal of uncontaminated construction waste (15.3 m^3), other uncontaminated, nonhazardous solid waste, such as paper, dielectric insulation, etc. (7 m^3 per year), and small amounts (<1 m^3 annually) of liquid or solid hazardous waste would be generated by occasional experiments involving lead or other simulant materials. Within normal scope of LANL waste management activities, appendix section K.4.2.3.	Disposal of uncontaminated, nonhazardous solid waste, such as paper and dielectric insulation, etc. (0.7 m^3 per year), within normal scope of LANL waste management activities, appendix section K.4.3.3.

workers (those at TA-35 but not involved with the Atlas project), or members of the public. Small amounts of dust would be generated due to outdoor excavation activities. Standard dust suppression techniques, such as watering, would be used as needed.

K.4.2.2 *Human Health*

This section presents potential health hazards to site workers, collocated workers, and the general public during normal operations of the Atlas Facility experiments. The identified hazards to human health are electrical hazards, magnetic field hazards, and radiological hazards.

Electrical. Normal operations at the Atlas Facility during conduct of experiments would include electrical hazards to researchers, technicians, and other Atlas Facility personnel because the capacitors associated with Atlas would be charged to a high-voltage. The Atlas capacitor bank could deliver an instantaneous lethal current if special operating precautions are not taken. To minimize electrical risks associated with Atlas experiments, all applicable electrical codes specified by DOE Order 6430.1A (such as adequate grounding and lightening protection) would be incorporated into the Atlas capacitor bank and facility and related electrical components. In conjunction with meeting local electrical codes and DOE Order requirements, the Atlas capacitor bank would be isolated in an interlocked room where access would be controlled. During the actual charging, discharging, and energy release of the system, personnel access to the room would be denied. To aid in assuring no admittance takes place, guards would also be posted at the entrance. Other engineering safety features would be built into the Atlas Facility, such as:

- All switches would be fail-safe; i.e., either a loss of compressed air or electrical power would disengage the switches.

- A direct cut-off to the Atlas Facility systems would be available to the control room operator should the master computer malfunction. The direct cut-off would automatically return systems to their normal fail-safe position.

- Switches could not be operated until all interlocks have been made.

- If an interlock is broken during a charge cycle, shutdown would occur.

These Atlas Facility engineering controls, as well as administrative controls such as personnel training and standard operating procedures, would significantly decrease the probability of an electrical accident occurring during normal operations.

Magnetic Fields. The generator located in Building 301 would be running for 15 to 20 minutes at the beginning of each experiment. The generator would generate magnetic fields during operations of either the Atlas Facility or the NHMFL, but only one operation would be conducted at any one time; therefore, no cumulative impacts to workers would be expected due to magnetic fields resulting from generator operations. The ultimate magnetic field generated would have a frequency dependent on the final rotation speed of the generator (1800 rpm); this frequency would be approximately 60 cycles per second. Workers and members of the public are shielded from the magnetic field by the building's walls, and the generator itself is designed with adequate shielding so that a magnetic field of less than 10 G would exist near the generator. The magnetic field due to the generator would be less than 1 G at Pecos Drive, the nearest public-access roadway, about 75 m (245 ft) from Building 301.

A second source of magnetic field would come from the energy transfer into the inductors' storage coils. During the 3 to 5 seconds that it would take to transfer energy into the inductor, a dc current would be present in the coils of the inductor located on the roof of Building 124. This dc current would have an associated magnetic field of 40,000 G near the coils. There would be a few-second duration magnetic field of less than 10 G at Pecos Drive, which is approximately 33 m (110 ft) from Building 124.

All Atlas Facility workers and nearby collocated workers would be informed of the magnetic hazards associated with individual proposed experiments and those with pacemakers, etc., would be moved to a safe location. Administrative and engineering controls would be in place during experiments to keep magnetic field exposure as low as reasonably achievable. Atlas Facility workers and nearby collocated workers would be exposed to the two magnetic fields during each experiment, for a total of up to 100 times per year. Atlas Facility workers and nearby collocated workers without pacemakers, etc., would not be exposed to more than an instantaneous magnetic field exceeding 500 G.

Magnetic fields of as much as 20,000 G are not considered harmful to individuals who do not have pacemakers or other metallic body inclusions (ACGIH 1993). A magnetic field (such as that produced by the generator) of 1 G can affect some types of cardiac pacemakers; larger fields can also exert a force on suture staples, aneurysm clips, prostheses, etc. Administrative controls, such as exclusion from Buildings 124, 125, and 294 during individual experiments, would be placed on employees with pacemakers or metallic inclusions so that exposure to excessive magnetic levels would be avoided for these individuals. If there is a potential for the public to be exposed to non-static magnetic fields of 1 G or more generated during experiments, warning signs and other administrative controls (such as road blocks) would be in place prior to operation of the Atlas Facility for conduct of those experiments. Magnetic fields would be monitored at various locations at and near the Atlas Facility during experiments to ensure that these levels are not exceeded.

Radiological. The Atlas Facility experiments would utilize a target chamber which would have walls of stainless steel 2.54 cm (1 in) thick, twice the thickness of the Pegasus II Facility's target chamber walls. An individual target implosion would produce an estimated one to four MJ of 100 to 200 eV x rays at the time of the experiment. These low-energy x rays are not expected to penetrate the stainless steel target chamber; the energy would be converted into heat and dissipated into the target chambers' walls.

Neither Atlas Facility workers, collocated workers, nor members of the public onsite or offsite would be exposed to these x rays because x rays would be contained within the target chamber and because personnel would be excluded from the area of the target chamber during an experiment. Standard LANL radiological protection procedures would be followed, including standard operating procedures developed for the Pegasus II Facility, and revised as needed.

Diagnostic apparatus used to take x rays of the events occurring during experiments within the target chamber would be located outside the chamber and would use high-energy x rays, similar to medical x rays. The diagnostic apparatus operation would be interlocked to the entrances to the target area such that the apparatus would not operate if an exterior door were opened. Existing standard operating procedures and facility shielding would be used to protect workers. In addition, personnel protection staff would conduct surveys in and around the target area to measure radiation produced by the diagnostic x-ray apparatus when they are operated. Additional shielding would be added if needed.

Collocated workers or members of the public, either onsite or offsite, would not be exposed to high-energy x rays. These x rays would be shielded and contained within the interlocking room housing the capacitor bank.

K.4.2.3 *Waste Management Facilities*

Uncontaminated waste (such as paper waste and dielectric insulation), expected to be about 7 m^3 (240 ft^3) per year, would be disposed of at the Los Alamos County Landfill. The landfill would not require expansion due to the waste generated by the Atlas Facility. For purposes of this analysis it is assumed that a small amount (<1 m^3 annually) of liquid or solid hazardous waste would be generated by occasional experiments involving lead or other simulant materials. This waste would be staged in the onsite hazardous waste accumulation area and shipped to offsite commercial RCRA-permitted treatment, storage, and disposal facilities. Construction waste (about 15.3 m^3 [20 yd^3]) would be disposed of at the Los Alamos County Landfill.

K.4.3 No Action Alternative

K.4.3.1 *Air Quality*

The air emissions due to the Pegasus II Facility are presented in table K.4.3.1–1, along with the health-based New Mexico AQCR 702-regulated levels and the AQCR 707 (Prevention of Significant Deterioration)-regulated levels. All emissions are below current regulatory levels. No permitting is required under AQCR 702, AQCR 707, or NESHAP. No special air filtration or scrubber is required for the

TABLE K.4.3.1–1.—*Air Emissions from the Pegasus II Facility*

Constituent	Calculated Emissions[a]	AQCR 702/707 Limits
Aluminum	less than 1 g (0.0022 lb)	0.133 lb/hr
Copper	less than 1 g (0.0022 lb)	0.0133 lb/hr
Ethanol	18.1 g (0.04 lb)	10 lb/hr
High Explosives[b]	12.7 g (0.028 lb) carbon monoxide	200,000 lb/yr
	34.0 g (0.075 lb) nitrogen oxides	40,000 lb/yr
	95.2 g (0.21 lb) particulate matter 10 microns or smaller	25,000 lb/yr
	0.91 g (0.002 lb) volatile organic compounds	40,000 lb/yr

[a] Amount calculated is per experiment using that specific type of metal. Any emissions would occur after the target chamber is repressurized to ambient pressure and temperature.

[b] Emissions due to high explosives are calculated for one year, not per experiment.

Source: Model results; NMEIB 1981; 40 CFR 52.21.

Pegasus II Facility. Most of the metals would vaporize and deposit onto the inside surface of the target chamber. Only minute quantities of metals would stay volatilized. The majority of the ethanol used for cleaning would evaporate. The quantity of air emissions would not harm workers, collocated workers (those at TA-35 but not involved with the Pegasus II project), or members of the public.

K.4.3.2 *Human Health*

Electrical. Normal operations during conduct of experiments at the Pegasus II Facility present electrical hazards to researchers, technicians, and other Pegasus II Facility personnel because the Pegasus II capacitor bank is charged to a high voltage. The Pegasus II capacitor bank could deliver an instantaneous lethal current if special precautions are not taken during experiments. Engineering controls and administrative controls the same as or similar to those described for the proposed Atlas Facility, such as interlocked rooms, fail-safe switches, standard operating procedures, and direct cut-offs, significantly decrease the probability of an electrical accident occurring during normal operations.

Magnetic Fields. Magnetic fields are not generated during the conduct of experiments under the No Action alternative; power for charging the Pegasus II capacitor bank is obtained from the existing LANL electrical power grid and does not require the use of a separate facility power generator.

Radiological. Experiments conducted at the Pegasus II Facility produce up to 0.2 MJ of low-energy x rays, 10 percent of the level expected during the same type of experiment from the proposed Atlas Facility (2.0 MJ). Operating experience has demonstrated that these low-energy x rays do not penetrate the target chamber. Neither Pegasus II Facility workers, collocated workers, nor members of the public either onsite or offsite would be exposed to x rays from continuing to operate the Pegasus II Facility experiments.

K.4.3.3 *Waste Management Facilities*

About 0.7 m^3 (24 ft^3) of uncontaminated waste (such as paper waste and dielectric insulation) per month is disposed of at the Los Alamos County Landfill. No RCRA-regulated hazardous waste is generated.

K.4.4 Impacts Associated With Accidents

This section considers bounding case accidents that could be associated with the operation of the Atlas Facility that could affect site workers, collocated workers, the public, and the environment. Accidents with the highest consequence to workers have the likelihood of occurring once in 100 years. Accidents with the highest consequence to collocated workers, the public, and the environment have the likelihood of occurring once in 10,000 years. This information is summarized in section K.7. Other accident scenarios are contained within the Preliminary Hazard Analysis for the proposed Atlas project (LANL 1995). Accidents analyzed in this project-specific analysis are summarized in table K.4.4–1.

TABLE K.4.4-1.—*Accidents Analyzed*

Accidents	Likelihood of Event	Worst Consequence
Worker Mechanical collapse of crane; High-energy power source electrocution	Less than 1 in 100 years	Serious worker injury or death
Collocated worker Fire resulting from capacitor bank failure and release of smoke and sprinkler system water	Less than 1 in 10,000 years	Irritation or discomfort but no permanent health effects
Public Fire resulting from capacitor bank failure and release of smoke and sprinkler system water	Less than 1 in 10,000 years	Irritation or discomfort but no permanent health effects
Environment Fire resulting from capacitor bank failure and release of smoke and sprinkler system water	Less than 1 in 10,000 years	Release of smoke and effluent discharge containing sprinkler system water and mineral oil

Source: LANL 1995.

K.4.4.1 *Site Worker*

The bounding case accident for a site worker involves electrocution from a high-energy power source or mechanical collapse of the overhead crane. Of these scenarios, both have an equal likelihood of occurrence. The impact to a site worker in these scenarios could be death; however, the likelihood of occurrence is less than once in 100 years of operation.

K.4.4.2 *Collocated Worker*

The most likely accident scenario that could result in an impact to collocated workers involves exposure to emissions and effluents from a capacitor bank fire. In this scenario, a collocated worker would receive minimal exposure to smoke and sprinkler system water containing mineral oil spilled from a Marx module. The impact to a collocated worker in this scenario would be temporary irritation and discomfort; however, the likelihood of occurrence is less than once in 10,000 years of operation. In the event of a fire, all site and collocated workers would be evacuated immediately.

K.4.4.3 *Public*

The most likely accident scenario that could result in an impact to the public involves exposure to emissions and effluents from a capacitor bank fire. In this scenario, a member of the public could receive minimal exposure to smoke. The impact to a member of the public in this scenario would be less than that experienced by a collocated worker. Exposure to smoke could result in very mild and temporary irritation and discomfort. The likelihood of this accident occurring is less than once in 10,000 years of operation. In the event of a fire, all members of the public would be evacuated from the site area immediately and road closures and exclusion zones would be implemented, as appropriate. Based on the accident scenario and impact analysis in section K.7, there are no probable accidents which would result in an adverse impact to the public.

K.4.4.4 *Environment*

The bounding case accident scenario that could result in an impact to the environment involves the release of emissions and effluents from a capacitor bank fire. In this scenario, smoke and sprinkler water containing spilled mineral oil could be released to the environment. The impact to the environment in this scenario would be temporary and minimal. Smoke from a fire in this scenario would disperse quickly and the sprinkler water containing mineral oil would be contained by site soils and controlled drainage systems. Water containing mineral oil does not present a serious environmental concern given the nonhazardous nature of mineral oil, and in the event of a fire, spill prevention control measures would be implemented immediately. The likelihood of such an accident occurring under normal operating conditions is once in 10,000 years.

K.5 Agencies and Persons Consulted

No external agencies or persons were consulted for the project-specific analysis of the proposed Atlas Facility.

K.6 Permit Requirements

No external regulatory or permit requirements have been identified for the Atlas Facility.

K.7 Supplementary Information: Accidents

Tables K.7–1 and K.7–2 provide a summary of the types of hazards and scenarios that could result in impacts to the public, environment, collocated worker or the facility worker. Listed in table K.7–2 are the risk ranks resulting from the likelihood and consequence of a given scenario and hazard.

Table K.7–1.— *Hazard Sources for Atlas Preliminary Hazard Assessment Chart*

Electricity	-High voltage current -Static electricity
Radiant energy	-Electromagnetic fields
Radiation	-X rays
Mechanical structures	-Failure and collapse of critical structural assemblies -Leaks from storage tanks
Chemicals	-Toxic materials -Flammable materials -Asphyxiant gas
Implosion/ explosion	-Target chamber malfunction
Fire	-Mechanical/electrical malfunction -Target chamber malfunction

Source: LANL 1995; Model results.

Table K.7–2 shows that the highest consequence of any Atlas hazard scenario would have the greatest impact on the facility worker (Column 5, Impact on Worker). This is indicated by three hazards (radiation, mechanical structures, and fire) showing a risk ranking factor of two. The other impact receptors (e.g., collocated worker or environment) all have maximum risk ranks of 3 which means that risks are acceptable with sufficient controls and safeguards in place. Information charts on the following pages of this project-specific analysis have been provided to present the methodologies used to determine risk categories, probabilities, consequences, and requirements for risk mitigation during the typical preliminary hazard assessment process. The final preliminary hazard assessment risk reduction recommendations would be incorporated into the project design or in the project standard operating procedures.

Further information may be found in the preliminary hazard assessment for Atlas (LANL 1995).

K.8 Glossary

Angstrom (Å): Unit of length equal to $1x10^{-10}$ meter.

Dielectric: A nonconductor of electric current.

Electrolyte recirculation system: A water circulation system with salt additives which is used for controlling resistance near the capacitors.

Electron volt (eV): The energy equivalent ($1.602x10^{-19}$ Joules) of an electron passing through a voltage differential of 1 volt.

Environmental impact statement: A document required by the *National Environmental Policy Act* (NEPA) of 1969, as amended, for proposed major Federal actions involving potentially significant environmental impacts.

Foil implosion: To burst inward; i.e., the effect of applying large doses of electrical current to a thin walled cylinder.

Gauss (G): Unit of magnetic induction in the electromagnetic and Gaussian systems of units. Equal to 1 maxwell (measure of magnetic flux through an area) per square centimeter.

High-energy pulsed-power: A technique used in compressing electrical energy and storing it at high levels and then releasing it to a target in a very short time period.

High-energy x ray: An x ray in the 0.03 to 1 Angstrom wavelength range (e.g., medical x rays).

TABLE K.7-2.—*Summary of Hazards and Impacts with Risk Ranks from the Atlas Preliminary Hazard Assessment* [Page 1 of 2]

Hazard	Scenario	Impact on Public (Risk Rank)	Impact on Collocated Worker (Risk Rank)	Impact on Worker (Risk Rank)	Impact on Environment (Risk Rank)	Highest Consequence (Risk Rank)
Electricity	Access Breach	No	No	Yes (3)	No	Potential fatality
Radiant energy (EMF)	Inadvertent access of personnel to roof during charging	No	No	Yes (3)	No	Potential exposure of personnel to EMF
Radiation (x rays)	Implosion of experiment	No	Yes (4)	Yes (2)	No	Potential exposure of facility/ collocated workers
Mechanical structures	Failure and collapse of critical structures	No	No	Yes (2)	No	Potential worker injury/fatality
Mechanical structures	Leaks from storage tanks	No	No	No	Yes (3)	Release of untreated fire suppression water
Chemicals	Marx tank oil leak	Yes (3)	Yes (3)	Yes (3)	Yes (3)	Mineral oil is leaked to the facility and possibly to the environment
Chemicals Asphyxiant	Sulfur hexafluoride resupply hose leaks	No	No	No	Yes (3)	Sulfur trifluoride vaporizes and escapes; Potential exposure of facility/co-located workers
Explosion	Capacitor explodes	No	No	Yes (3)	No	Debris and mineral oil released to facility, possible worker injury
Implosion	Target chamber malfunction	No	No	No	No	Loss of vacuum and operational capability
Fire	Generator fire during power generation	No	No	Yes (3)	No	Worker injury from inhalation of fire combustion products
Fire	Marx generator capacitor banks fail	Yes (3)	Yes (3)	Yes (2)	Yes (3)	Fire in capacitor banks, potential injury to facility worker

Consequence Likelihood Categories

I (1 to 0.1)	Normal Operations: Frequency as often as once in 10 operating years or at least once in 10 similar facilities operated for 1 year.
II (0.1 to 0.01)	Anticipated Events: Frequency between 1 in 10 years and 1 in 100 years or at least once in 100 similar operating facilities operated for 1 year.
III (10^{-2} to 10^{-4})	Unlikely: Frequency between 1 in 100 years and 1 in 10,000 years or at least once in 10,000 similar facilities operated for 1 year.
IV (10^{-4} to 10^{-6})	Very Unlikely: Frequency between 1 in 10,000 years and once in 1 million years or at least once in a million similar facilities operated for 1 year.
V	Improbable: Frequency of less than once in a million years.

Note: EMF - electromagnetic force.

Source: LANL 1995.

TABLE K.7–2.—*Summary of Hazards and Impacts with Risk Ranks from the Atlas Preliminary Hazard Assessment* [Page 2 of 2]

	Consequence Severity Categories, Maximum Possible Consequence			
Category	**Public**	**Collocated Worker**	**Worker**	**Environment**
A	Immediate health effects	Immediate health effects	Loss of life.	Substantial offsite contamination
B	Long-term health effects	Long-term health effects	Severe injury or disability.	Substantial contamination of originating facility/activity, minor onsite contamination; no offsite contamination.
C	Irritation or discomfort but no permanent health effects	Irritation or discomfort but no permanent health effects	Lost-time injury but no disability	Minor or no contamination of originating facility/activity; no offsite contamination
D	No substantial offsite release	No substantial offsite effect	Minor or no injury and no disability	Minor or no contamination of originating facility/activity; no offsite contamination

Note: Offsite: Public, private, or Indian lands that are not part of Laboratory property; Onsite: Laboratory property but not necessarily the originating technical area; Facility: Originating technical area of the Laboratory.

Risk Ranking Matrix

	Likelihood of Consequence				
Severity of Consequence	**I**	**II**	**III**	**IV**	**V**
A	1	1	2	3	3
B	1	2	2[a]	3	4
C	2	3	3	4	4
D	3	4	4	4	4

[a] Assign risk rank of 3 if severity category rank of B is based upon worker injuries and offsite consequence severity is less than B.

Risk Rank	Recommendation
1	Unacceptable: Should be mitigated to risk rank 3 or lower as soon as possible.
2	Unacceptable: Should be mitigated to risk rank 3 or lower within a reasonable time period.
3	Acceptable with Controls: Verify that procedures, controls, and safeguards are in place.
4	Acceptable as is: No action is necessary.

High explosives: Any chemical compound or mechanical mixture that, when subjected to heat, impact, friction, shock, or other suitable initiation stimulus, undergoes a very rapid chemical change with the evolution of large volumes of highly heated gases that exert pressures in the surrounding medium; the term applies to materials that detonate.

Joule: Unit of energy equivalent to one watt-second.

Low-energy x ray: An x ray in the 1 to 10 Angstrom wavelength range. Low-energy x rays do not have enough energy to penetrate a sheet of paper.

Marx modules: Assemblage of electric capacitors charged in parallel and discharged in a series are said to be of a "Marx Configuration."

Megajoule (MJ): One million joules which is a measure of energy or work in the meter-kilogram-second system of units, equal to 1 Newton.

Micron: A unit of length equal to one-millionth of a meter; one meter equals 3.2 feet.

National Emission Standards for Hazardous Air Pollutants: Hazardous air pollution standards established through the *Clean Air Act*, as amended.

Plasma flow switch: An electrical switch used to open a circuit through the use of ionized gas (plasma).

Prevention of Significant Deterioration: Refers to provisions in the *Clean Air Act*, as amended, and state air quality regulations, to ensure that an area in attainment with the National Ambient Air Quality Standards will stay in attainment.

Rem: Roentgen equivalent man; unit for measuring radiation dose equivalence. The rem takes into account the energy absorbed (dose) and the biological effect on the body (quality factor) due to the different types of radiation.

***Resource Conservation and Recovery Act* of 1976:** Establishes a comprehensive "cradle-to-grave" approach to the regulation of hazardous waste. Also establishes a framework for instituting corrective action for releases of hazardous wastes.

Reynolds Number: A dimensionless numerical value relating fluid density and viscosity to particle size and relative velocity.

Roentgen: A unit of exposure to ionizing x- or gamma radiation equal to or producing one electrostatic unit of charge per cubic centimeter of air.

Science-based stockpile stewardship: DOE program to develop a new approach, based on scientific understanding and expert judgment, to ensure continued confidence in safety, performance, and reliability of the nuclear weapons stockpile.

SOP: Standard operating procedures; written and authorized procedures for conducting an activity.

Special facilities equipment (SFE): An assemblage of high power electrical equipment and systems to support Atlas (i.e., target chamber, vacuum equipment, etc.).

Swale: A low-lying stretch of land where water could collect or puddle.

Threshold limit value: Refers to airborne concentrations of substances and represents conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse health effects.

K.9 References

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DOE 1995a: U.S. Department of Energy, "Notice of Intent to Prepare a Programmatic Environmental Impact Statement for the Stockpile Stewardship and Management Program," Office of Reconfiguration, U.S. Department of Energy, Alexandria, VA, Federal Register, June 6, 1995.

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LANL 1994b: Los Alamos National Laboratory, "Environmental Surveillance at Los Alamos During 1992," Report LA-12764-ENV, 1994.

LANL 1995: Los Alamos National Laboratory, "Preliminary Hazard Analysis for the Atlas Project," Los Alamos, NM, September 1995.

Morris 1994: Telephone conversation with D. Morris, co-owner of Royal Crest Trailer Park, June 16, 1994.

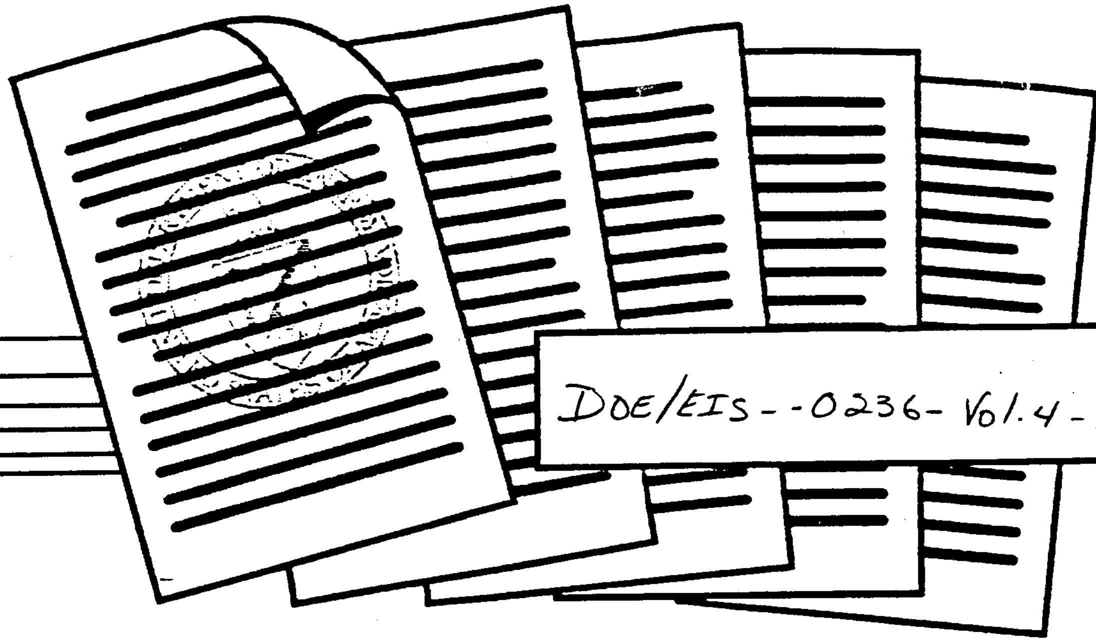
NMEIB 1981: New Mexico Environmental Improvement Board, "Air Quality Control Regulation 201: Ambient Air Quality Standards," June 15, 1981.

U.S. Census 1994: U.S. Bureau of the Census, "County and City Data Book: 1994," Washington, DC.

Appendix I

Appendix J

Appendix K



DOE/EIS--0236-Vol.4-Final

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Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management

Comment Response Document

Volume IV

United States Department of Energy

September 1996

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DOE/EIS-0236
Vol. 4 of 4

Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management

Comment Response Document

Volume IV

United States Department of Energy

September 1996

ABSTRACT: In response to the end of the Cold War and changes in the world's political regimes, the United States is not producing new-design nuclear weapons. Instead, the emphasis of the U.S. nuclear weapons program is on reducing the size of the Nation's nuclear stockpile by dismantling existing nuclear weapons. The Department of Energy (DOE) has been directed by the President and Congress to maintain the safety and reliability of the reduced nuclear weapons stockpile in the absence of underground nuclear testing. In order to fulfill that responsibility, DOE has developed a Stockpile Stewardship and Management Program to provide a single highly integrated technical program for maintaining the continued safety and reliability of the nuclear stockpile. The Stockpile Stewardship and Management PEIS describes and analyzes alternative ways to implement the proposed actions for the Stockpile Stewardship and Management Program.

Stockpile stewardship refers to activities associated with research, design, development and testing of nuclear weapons and the assessment and certification of the safety and reliability. The stockpile stewardship portion of the PEIS evaluates the potential impacts of three proposed facilities: the National Ignition Facility (NIF), the Contained Firing Facility (CFF), and the Atlas Facility. The stockpile stewardship alternatives involving these facilities could affect four sites: Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), Sandia National Laboratories (SNL), and Nevada Test Site (NTS).

Stockpile management refers to activities associated with the production, maintenance, surveillance, refurbishment, and dismantlement of the nuclear weapons stockpile. The stockpile management portion of this PEIS evaluates the potential impacts of carrying out stockpile management alternatives at eight sites: Oak Ridge Reservation (ORR), Savannah River Site (SRS), Kansas City Plant (KCP), Pantex Plant (Pantex), LANL, LLNL, SNL, and NTS. The stockpile management alternatives are assessed for nuclear weapons assembly/disassembly and for fabricating pits, secondaries and cases, high explosives, and nonnuclear components.

The Stockpile Stewardship and Management PEIS also evaluates the No Action alternative of relying on existing facilities and continuing the missions at current sites to achieve both the stockpile stewardship and management missions. The No Action alternative assesses the environmental impacts of the on-going Stockpile Stewardship and Management Program and provides a baseline against which alternatives can be evaluated.

DOE has identified the following preferred alternative for the Stockpile Stewardship and Management Program:

Stockpile Stewardship:
- Construct and operate NIF at LLNL
- Construct and operate CFF at LLNL
- Construct and operate the Atlas Facility at LANL

Stockpile Management:
- Secondary and Case Component Fabrication—downsize the Y-12 Plant at ORR
- Pit Component Fabrication—reestablish capability and appropriate capacity at LANL
- Assembly/Disassembly—downsize at Pantex
- High Explosives Fabrication—downsize at Pantex
- Nonnuclear Component Fabrication—downsize at KCP
- Based on the analyses performed to support this PEIS, the preferred alternatives for strategic reserve storage are as follows: (1) highly enriched uranium strategic reserve storage at Y–12; and (2) plutonium pit strategic reserve storage in Zone 12 at Pantex. The preferred alternatives for strategic reserve storage could change based upon decisions to be made in regard to the *Storage and Disposition of Weapons-Usable Fissile Materials Final PEIS*. Decisions on strategic storage will not be made in the upcoming ROD for the Stockpile Stewardship and Management Program. Storage decisions are not expected to be made until both the *Stockpile Stewardship and Management Final PEIS* and the *Storage and Disposition of Weapons-Usable Fissile Materials Final PEIS* are completed.

The preferred alternative for plutonium-242 oxide at SRS is to transport the material to LANL for storage.

Evaluation of impacts on land resources, site infrastructure, air quality, water resources, geology and soils, biotic resources, cultural and paleontological resources, socioeconomics, waste management, environmental justice, as well as radiological and hazardous chemical impacts during normal operation and accidents to workers and the public are included in the assessment. The PEIS presents unclassified information only. A classified appendix has also been prepared to support the PEIS.

DOE/EIS-0236
September 1996

COVER SHEET

RESPONSIBLE AGENCY: U.S. Department of Energy

COOPERATING AGENCY: U.S. Environmental Protection Agency

TITLE: Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management (DOE/EIS-0236)

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ABSTRACT: In response to the end of the Cold War and changes in the world's political regimes, the United States is not producing new-design nuclear weapons. Instead, the emphasis of the U.S. nuclear weapons program is on reducing the size of the Nation's nuclear stockpile by dismantling existing nuclear weapons. The Department of Energy (DOE) has been directed by the President and Congress to maintain the safety and reliability of the reduced nuclear weapons stockpile in the absence of underground nuclear testing. In order to fulfill that responsibility, DOE has developed a Stockpile Stewardship and Management Program to provide a single highly integrated technical program for maintaining the continued safety and reliability of the nuclear stockpile. The Stockpile Stewardship and Management PEIS describes and analyzes alternative ways to implement the proposed actions for the Stockpile Stewardship and Management Program.

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PUBLIC COMMENTS: The public comment period on the Draft PEIS was conducted from March 8, 1996 to May 7, 1996. During the comment period, public hearings were held in Los Alamos, NM; Albuquerque, NM; Las Vegas, NV; Oak Ridge, TN; Kansas City, MO; Livermore, CA; Washington, DC; Amarillo, TX; Santa Fe, NM; and North Augusta, SC. The Draft PEIS was made available through mailings, requests to DOE's Office of Reconfiguration, and at DOE Public Reading Rooms. In preparing the Final PEIS, DOE considered comments received by mail, fax, handed in at hearings, transcribed from messages recorded by telephone, and those transcribed via Internet. In addition, comments and concerns identified during discussions at public hearings were considered.

In response to comments submitted after issuance of the Draft PEIS and due to additional technical details not available at the time of issuance of the Draft, Volumes I, II, and III of the Final PEIS contain revisions and changes. The revisions and changes made since the issuance of the Draft document are indicated by a double underline for minor word changes or by a sidebar in the margin for paragraph or larger changes. In addition, Volume I and each appendix in Volume III provide a unique reference list to enable the reader to further review and research selected topics. Volume IV (Comment Response Document) of the PEIS contains the comments received during public review of the Draft PEIS and the DOE responses to those comments. DOE has public reading rooms near each affected site and in Washington, DC where these referenced documents may be reviewed or obtained for review.

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ACRONYMS AND ABBREVIATIONS

Acronyms and Abbreviations

ACRONYMS AND ABBREVIATIONS

A/D	assembly/disassembly
AHF	Advanced Hydrotest Facility
ARS	Advanced Radiation Source
BEEF	Big Explosives Experimental Facility
BEIR	biological effects of ionizing radiation
CAA	*Clean Air Act*
CEQ	Council on Environmental Quality
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act*
CFF	Contained Firing Facility
CFR	Code of Federal Regulations
Complex	Nuclear Weapons Complex
CTBT	*Comprehensive Test Ban Treaty*
DARHT	Dual Axis Radiographic Hydrodynamic Test (Facility)
D&D	decontamination and decommissioning
DOD	Department of Defense
DOE	Department of Energy
DOT	Department of Transportation
DP	DOE Office of the Assistant Secretary for Defense Programs
EA	environmental assessment
EIS	environmental impact statement
EM	DOE Office of the Assistant Secretary for Environmental Management
EPA	Environmental Protection Agency
ES&H	environment, safety, and health
FONSI	Finding of No Significant Impact
FR	*Federal Register*
FXR	Flash X-Ray (Facility)
HE	high explosives
HEPPF	High Explosive Pulsed Power Facility
HEU	highly enriched uranium
HI	hazard index
HLW	high-level waste
INEL	Idaho National Engineering Laboratory
K-25	K-25 Site, Oak Ridge Reservation
KCP	Kansas City Plant
LANL	Los Alamos National Laboratory
LLNL	Lawrence Livermore National Laboratory
LLW	low-level waste
NEPA	*National Environmental Policy Act*
NIF	National Ignition Facility
NLVF	North Las Vegas Facility
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPR	Nuclear Posture Review
NPT	Nuclear Nonproliferation Treaty
NRC	Nuclear Regulatory Commission
NRHP	National Register of Historic Places

NTS	Nevada Test Site
NWSM	Nuclear Weapon Stockpile Memorandum
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
OSHA	Occupational Safety and Health Administration
Pantex	Pantex Plant
PBFA II	Particle Beam Fusion Accelerator
PDD	Presidential Decision Directive
PEIS	programmatic environmental impact statement
PHERMEX	Pulsed High Energy Radiation Machine Emitting X-Rays (Facility)
R&D	research and development
RCRA	*Resource Conservation and Recovery Act*
RD&T	research, development, and testing
RIMS	Regional Input-Output Modeling System
ROD	Record of Decision
ROI	region of influence
SNL	Sandia National Laboratories/New Mexico
SRS	Savannah River Site
START	Strategic Arms Reduction Talks
TA	technical area
TRU	transuranic
TSCA	*Toxic Substances Control Act*
TSP	total suspended particulates
VOCs	volatile organic compounds
Y-12	Y-12 Plant, Oak Ridge Reservation
WIPP	Waste Isolation Pilot Plant

PUBLIC COMMENT PROCESS

Public
omment Process

CHAPTER 1: PUBLIC COMMENT PROCESS

This chapter of the Comment Response Document describes the public comment process for the **Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management** *and the procedure used in responding to those comments. Section 1.1 describes the means through which comments were acquired, summarized, and numbered. Section 1.2 discusses the public hearing format that was used to solicit comments from the public. Section 1.3 describes the organization of this document as well as how the comments were categorized, addressed, and documented. Section 1.3 also provides guidance on the use of this document to assist the reader. The chapter concludes with a discussion of the major comments and changes to the* **Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management** *resulting from the public comment process.*

1.1 INTRODUCTION

In February 1996, the Department of Energy (DOE) published the *Draft Programmatic Environmental Impact Statement (PEIS) for Stockpile Stewardship and Management*, which described and analyzed alternative ways to implement the proposed actions for the Stockpile Stewardship and Management Program. DOE developed the Program to provide a single highly integrated technical program for maintaining the safety and reliability of the nuclear stockpile in the absence of underground nuclear testing. The 60-day public comment period for the Stockpile Stewardship and Management Draft PEIS began on March 8, 1996, and ended on May 7, 1996.

During the comment period, public hearings were held in Los Alamos, NM; Las Vegas, NV; Albuquerque, NM; Oak Ridge, TN; Kansas City, MO; Livermore, CA; Washington, DC; Amarillo, TX; Santa Fe, NM; and North Augusta, SC. Figure 1.1–1 shows the locations and dates of the hearings. Five of those public hearings were joint meetings to obtain comments on both the Stockpile Stewardship and Management Draft PEIS and the *Storage and Disposition of Weapons-Usable Fissile Materials Draft Programmatic Environmental Impact Statement* (Storage and Disposition Draft PEIS) (DOE/EIS-0229-D, February 1996). Two of the joint meetings (Pantex Plant [Pantex] in Amarillo, TX and Savannah River Site [SRS] in North Augusta, SC) also included the *Draft Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components* (Pantex Site-Wide Draft EIS) (DOE/EIS-0225-D, March 1996). In addition, the public was encouraged to provide comments via mail, fax, electronic bulletin board (Internet), and telephone (toll-free 800-number).

Attendance at each hearing, together with the number of comment summaries recorded, is presented in table 1.1–1. Attendance numbers are based on the number of participants who completed and returned registration forms and may not include all of those present at the meetings. In addition to comments received at the public hearings, comments were also received during the public comment period through the other means described above.

All public hearing comment summaries were combined with comments received by other means during the public comment period. Comments received by mail, fax, Internet, or telephone were date stamped and assigned a sequential document number according to origin (e.g., fax or mail) of the document. Chapter 2 of this volume contains copies of the documents DOE received. Table 1.1–2 provides an overview of the number of documents and comments submitted by each method. The document number codes that were assigned to each document based on the method of submission are given in parentheses in table 1.1–2. For example, all documents that were handed in at public hearings have document numbers beginning with SSM-H.

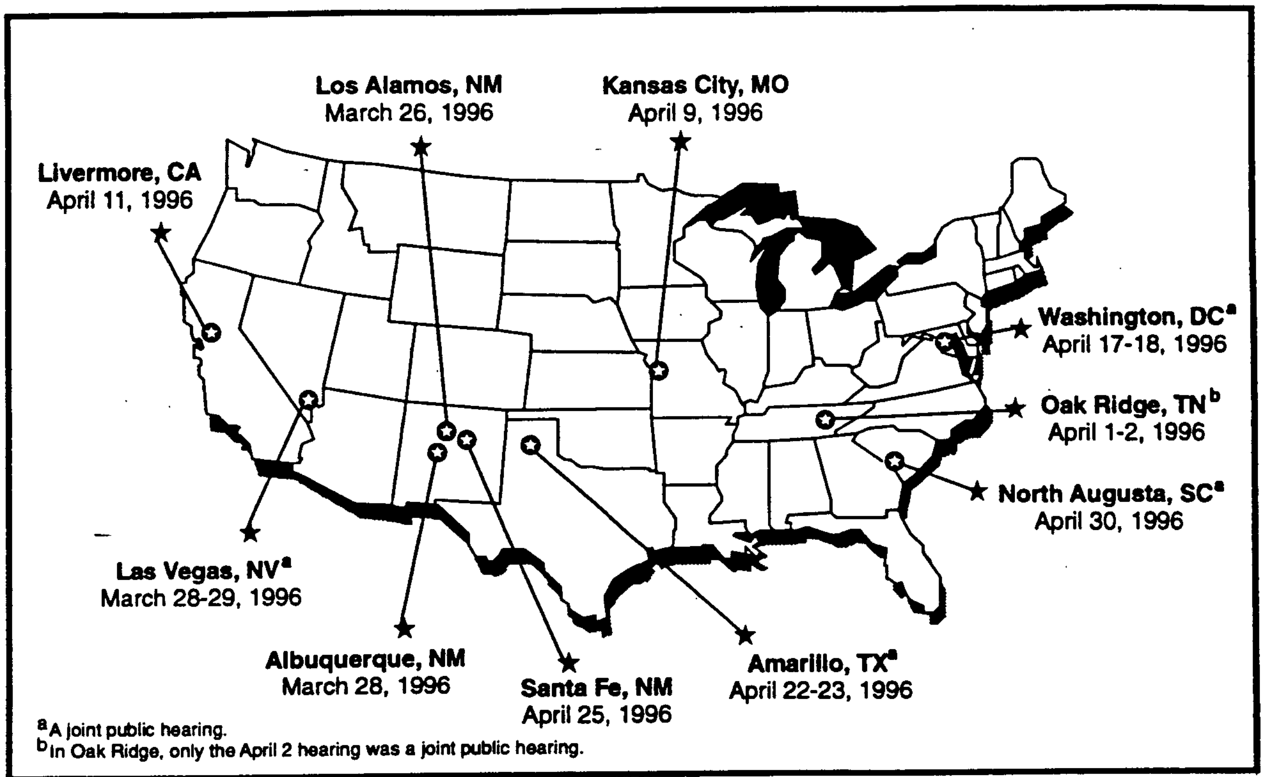


FIGURE 1.1–1.—*Public Hearing Locations and Dates, 1996.*

TABLE 1.1–1.—*Public Hearing Locations, Attendance, and Comment Summaries*

Hearing Location	Total Attendance	Comment Summaries
Los Alamos, NM	87	89
Las Vegas, NV	51	54
Albuquerque, NM	41	87
Oak Ridge, TN	200	128
Kansas City, MO	21	7
Livermore, CA	176	177
Washington, DC	145	21
Amarillo, TX	350	95
Santa Fe, NM	276	195
North Augusta, SC	91	68

TABLE 1.1–2.—*Document and Comment Submission Overview*

Method	Documents Received	Total Comments Received
Hand-in at public hearings (SSM-H)	101	222
Mail-in (SSM-M)	128	446
Letter/postcard campaigns (SSM-C)	6,675	7,038
Fax (SSM-F)	30	155
Phone (SSM-P)	9	10
Electronic bulletin board (SSM-B)	0	0
Transcripts (SSM-ET)	2	11

1.2 PUBLIC HEARING FORMAT

The public hearings used a modified traditional hearing format which allowed for two-way interaction between DOE and the public and encouraged informed public input and comments on the document. Neutral facilitators were present at the hearings to direct and clarify discussions and comments. Court reporters were also present to provide a verbatim transcript of the proceedings and record all formal comments that the public wished to present. The transcripts are available in DOE Public Reading Rooms near each site and in Washington, DC. These transcripts have been marked with sidebars to identify specific comments and how the comments were categorized into issue codes.

The format used for each hearing included a Program overview, interactive discussions, and a summary session. There was also an opportunity for formal comment provided for any attendee who wished to read a prepared statement of no more than 5 minutes. The Program overview session opened with a welcome from a site representative, followed by an overview of the Stockpile Stewardship and Management Program by a DOE representative. After clarifying questions, the facilitator opened the interactive general question and discussion period. A notetaker was present at each session to document and consolidate comments for the preparation of the Stockpile Stewardship and Management Final PEIS. Following the question and discussion period, a summary session was held to present the major comments and issues identified in each discussion group. An opportunity for additional comments or clarification was provided at this time. Modifications to the format were made at each public hearing location to best fulfill special needs or requests from the attendees. Following the public hearings, comment summaries were prepared by the notetakers (see chapter 2) with the verbatim transcripts being used as a reference.

1.3 ORGANIZATION OF THIS COMMENT RESPONSE DOCUMENT

This Comment Response Document has been organized into the following sections:

- Chapter 1 describes the public comment process and contains tables to assist readers.
- Chapter 2 contains notetaker-generated summaries of the comments received at the public hearings and scanned copies of comment documents received during the public comment period.
- Chapter 3 contains comment summaries and DOE responses by category.

Tables are provided at the end of this chapter to assist commentors and other readers in locating individual comments regarding the Stockpile Stewardship and Management Draft PEIS. Once comments were received, they were categorized by issue (e.g., land resources or water resources) and assigned a category code. Table 1.3–1 lists the issue categories and corresponding category codes. Similar comments within the same issue category were then summarized and assigned a summary code.

Table 1.3–2 identifies the individuals who attended public hearings and the pages where the notetaker-generated comment summaries from those hearings appear. Commentors interested in locating their comment document and reviewing how it was coded can use tables 1.3–3 and 1.3–4. Table 1.3–3 consists of a list of members of the general public who submitted comments. Commentors are listed by last name, with their assigned document numbers and the pages on which their comment documents appear. Table 1.3–4 consists of a list of state and local officials and agencies, companies, organizations, and special interest groups that submitted comments. The commentors in table 1.3–4 are listed by organization in alphabetical order with the names of the particular individuals who submitted those documents. For each commentor, the assigned document number and the pages on which their comment documents appear are listed.

In some instances multiple duplicate documents were received from a commentor. As a result of the multiple submissions, documents were deleted and gaps exist in the numerical sequence for tables 1.3–5 and 1.3–6. Some commentors submitted documents which were classified as letter writing or postcard campaigns. These campaigns were conducted by various organizations and special interest groups to express either support or opposition to aspects of the Stockpile Stewardship and Management Program. Although many postcards and duplicate documents were received, only one document scan of each type is included in chapter 2. The names of commentors who participated in most campaigns are included in tables 1.3–3 and 1.3–4. However, the names of commentors who participated in two very large campaigns, identified as campaign 4 (SSM-C-004) and campaign 5 (SSM-C-005), are not provided due to their volume. Lists of these commentors are available in DOE Public Reading Rooms near each site and in Washington, DC.

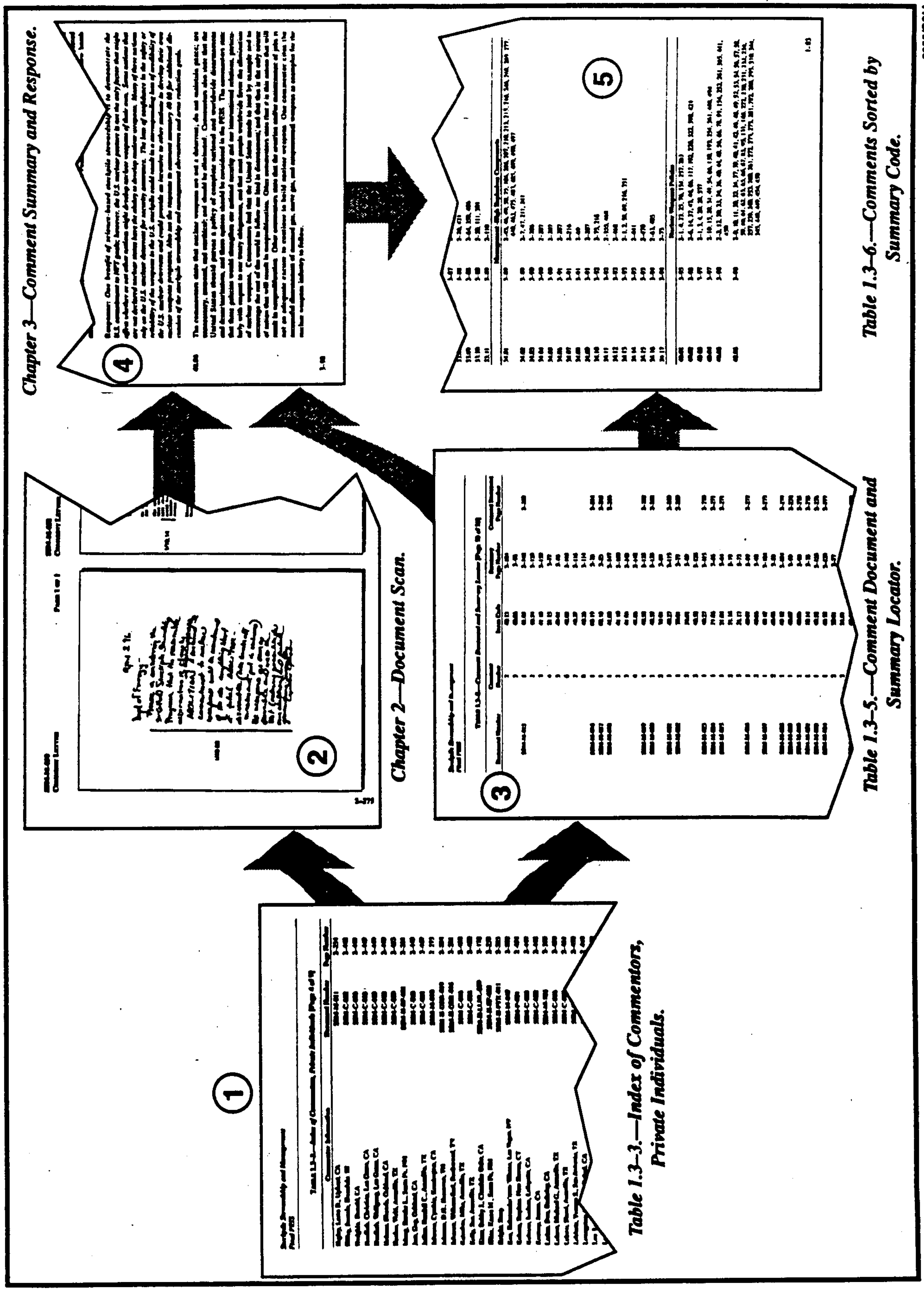
Table 1.3–6 is organized by summary code. Using the appropriate summary code, commentors can locate all of the comments that are reflected in each summary. The table also lists the page on which the comment summary and corresponding response appear and the pages on which the actual comment documents appear. Some comment documents presented in chapter 2 consist of multiple pages. The document page number given in tables 1.3–2 through 1.3–5 refers to the first page on which the comment document appears. The document page number given in table 1.3–6 refers to the page on which the individual comment begins within a document.

Scans of the documents received during the public comment period are shown in chapter 2. A document number code was assigned to each comment document based on the method of submission. Documents that were handed in at public hearings, mailed, or faxed have document numbers beginning with SSM-H, SSM-M, and SSM-F, respectively. Some documents were mailed in as part of letter writing or postcard campaigns and were given document numbers beginning with SSM-C. Comments that were received over the telephone were transcribed and given document numbers beginning with SSM-P. No comments were received through the electronic bulletin board. Comments from elected officials were given document numbers beginning with SSM-E. Documents from elected officials are not indicated separately in table 1.1–2, but are included in the total document counts based on the type of submission. Elected officials' comments that were transcribed at public hearings and were not submitted in another form were given document numbers beginning with SSM-ET.

1.4 How to Use this Comment Response Document

This section and figure 1.4–1 will assist the reader in tracking comment documents and determining how they were responded to. Begin by locating the appropriate name or organization in table 1.3–3 or 1.3–4. Table 1.3–3 consists of private individuals who submitted comments. Table 1.3–4 is a list of organizations and public officials who submitted comments. Both of these tables also list the document number that was assigned to each comment document and the page number on which that document appears in chapter 2. In order to see what issue codes were assigned to the comments identified within a document, locate the document number in table 1.3–5. Table 1.3–5 contains information on the number of comments identified in each document, the issue code assigned to each comment, and the page number for the corresponding summary and response that appears in chapter 3. In order to locate other comments in chapter 2 that address the same issues as a certain document, or to locate comments that address a certain issue code, use table 1.3–6. Table 1.3–6 lists the summary codes, the page on which the corresponding summary and response appears in chapter 3, and the page numbers on which each comment that was assigned that issue code appears in chapter 2.

For example, if Cynthia Johnson wanted to track her comments, she would go to table 1.3–3 to find her name, corresponding document number (SSM-M-030), and the corresponding page on which her document appears in chapter 2 (page 2–275). On page 2–275, Ms. Johnson would find that her scanned document has been side-barred and coded for summary number 40.06. After obtaining the comment document number SSM-M-030, she could use table 1.3–5 to locate the number of comments identified (one), the issue code that her comment was assigned (40.06), the summary page number on which the corresponding summary and response is found in chapter 3 (page 3–93), and the document page number (page 2–275). After obtaining the issue code from either the scanned document on page 2–275 or table 1.3–5, Ms. Johnson could use table 1.3–6 to see how her



3255/SSM

FIGURE 1.4-1.—*Use of this Comment Response Document.*

comment was categorized (nuclear weapons policies), and to locate the page numbers on which other comments that express similar concerns appear in chapter 2. Using table 1.3–6, Ms. Johnson would find that similar concerns were expressed in 80 notetaker-generated comment summaries and comment documents appearing in chapter 2 on pages 2–9, 10, 11, 30, 33, 34, 37, 39, 40, 41, 42, 46, 48, 49, 52, 53, 54, 56, 57, 58, 59, 60, 61, 62, 63, 65, 66, 67, 83, 95, 131, 165, 222, 230, 231, 232, 234, 237, 239, 240, 253, 260, 261, 272, 273, 275, 281, 282, 288, 295, 310, 344, 345, 448, 449, 454, and 458.

1.5 CHANGES FROM THE DRAFT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

In response to comments submitted after issuance of the Stockpile Stewardship and Management Draft PEIS, and due to additional technical details not available at the time of issuance of the Draft, Volumes I, II, and III of the Stockpile Stewardship and Management Final PEIS contain revisions and changes. The revisions and changes made since the issuance of the Draft PEIS are indicated by a double underline for minor word changes or by using a sidebar in the margin for paragraph or larger changes. In addition, Volume I and each appendix in Volume III provide a unique reference list to enable the reader to further review and research selected topics. These referenced documents and transcripts from the public hearings on the Draft PEIS may be reviewed or obtained for review in DOE Public Reading Rooms. A brief discussion of the more significant changes is provided in the following paragraphs.

Alternatives Considered but Eliminated from Detailed Study and Related Issues. In response to public comments expressing a concern DOE had not analyzed a reasonable range of alternatives, section 3.1.2 of Volume I was expanded. The changes were in response to specific questions concerning compliance with treaties, stockpile size, maintenance and remanufacturing options, and the stockpile stewardship alternatives, including No Action. The discussions in section 3.1.2 provide greater detail and more clarification on why alternatives were eliminated from detailed study in the PEIS. Together, chapter 2 and section 3.1.2 of Volume I explain the framework and the constraints of national security policy that have shaped the proposed actions and reasonable alternatives for the PEIS.

No Action Alternative. Several commentors did not think that the No Action alternative was clearly explained in the Draft PEIS. More specifically, they were not sure which existing facilities at Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), Sandia National Laboratories (SNL), and the Nevada Test Site (NTS) were part of the ongoing stockpile stewardship program. As a result, the description of No Action was modified in Volume II, appendix A (Stockpile Stewardship and Management Facilities) to include a listing of major DOE Office for Defense Programs (DP) function facilities at LANL, LLNL, SNL, and NTS. Additionally, the discussion of impacts of No Action at LANL (Volume I, section 4.6.3) was revised as appropriate to include the effects of the Dual Axis Radiographic Hydrodynamic Test (DARHT) Facility.

Socioeconomics at Oak Ridge Reservation, Kansas City Plant, and Pantex Plant. Based on public comments and revised workforce size estimates, the socioeconomic impact sections for the downsizing alternatives at Oak Ridge Reservation (ORR) (Volume I, section 4.2.3.8), Kansas City Plant (KCP) (Volume I, section 4.4.3.8) and Pantex (Volume I, section 4.5.3.8), have been revised. The analyses were also expanded to cover the "base case single-shift" options in greater detail. At these three sites, downsizing of existing facilities is the preferred alternative. For such downsizing, the "base case single-shift" scenario represents the bounding analysis for the workforce. The change in worker estimates did not cause any of the major indicators in the socioeconomic analysis to change in any significant manner.

Accident Impacts at Pantex Plant. The analyses of impacts due to an aircraft impact and resulting release of plutonium by a fire or an explosion were modified to include more updated data on probability and source terms developed for the Pantex Site-Wide EIS. Volume I, section 4.5.3.9, and Volume II, appendix sections F.2.1.1 and F.2.1.2, were revised to incorporate the new analytical results. Based on the updated data, the potential impacts and risks to the public from the composite accident presented in the PEIS would be less than previously reported in the Draft PEIS. This change was not significant.

Normal Operation Radiological/Chemical Impacts. The discussion of the normal operation radiological affected environment for LANL, Volume I, section 4.6.2.9, has been updated to include data from *Environmental Surveillance at Los Alamos During 1993* (LA-12973-ENV, October 1995). The normal operation radiological impact sections 4.2.3.9, 4.3.3.9, and 4.6.3.9 in Volume I have also been revised to include the contribution of recent facilities at ORR, SRS, and the new environmental surveillance data for LANL. The chemical health effects sections in Volume I, 4.6.3.9 for LANL and 4.7.3.9 for LLNL, were revised based on new analyses using updated dispersion rates. Tables in Volume II, appendix section E.3.4, supporting these sections were also updated. The majority of these changes affected the No Action alternative analyses. None of the changes to these sections significantly changed the analysis of impacts for the "action" alternatives.

Cumulative Impacts. Volume I, section 4.13, Cumulative Impacts, has been modified to incorporate a discussion of normal operation radiological impacts and other changes based on more recent data from *National Environmental Policy Act* documents and Record(s) of Decision. The changes to this section did not have a meaningful effect on the analysis/comparative evaluation of alternatives.

Los Alamos National Laboratory Water Resources. Changes were incorporated in Volume I, section 4.6.2.4, Water Resources, for LANL based on more recent water use and water quality data. The Draft PEIS had erroneously stated that the LANL water allotment would be fully used by about the year 2000. The Final PEIS correctly reports that this allotment would be fully used by about the year 2052. This change did not have a meaningful effect on the analysis/comparative evaluation of alternatives. Minor revisions reflecting the baseline changes were also made to the LANL water resources impact discussion in Volume I, section 4.6.3.4.

Health Effects Studies. Appendix section E.4 in Volume II outlining epidemiological studies at the alternative sites was rewritten to provide more detail and incorporate more recent and other applicable studies. Although these epidemiology sections do not affect the environmental analysis of future stockpile stewardship and management missions, they do provide relevant information regarding potential health effects from past actions. These changes did not have a meaningful effect on the analysis/comparative evaluation of alternatives.

New Section. A new section has also been added to the Final PEIS (Volume II, appendix section F.4, Secondary Impacts of Accidents). This section evaluates the secondary impacts of accidents that affect elements of the environment other than humans (e.g., farmland). The section was added because of public comments. The results of this analysis show that secondary impacts from accidents would generally not extend beyond site boundaries, except at Pantex and LLNL, where it is possible that some surface contamination could occur. This new analysis did not have a meaningful effect on the analysis/comparative evaluation of alternatives.

TABLE 1.3–1.—*Issue Categories*

Category Code	Issue Category
01	Land Resources
02	Site Infrastructure
03	Air Quality
04	Water Resources
05	Geology and Soils
06	Biotic Resources
07	Cultural and Paleontological Resources
08	Socioeconomics
09	Intersite Transportation
10	Waste Management
11	Radiation and Hazardous Chemicals
12	Environmental Justice
13	Cumulative Impacts
20	Stewardship—Contained Firing Facility
21	Stewardship—National Ignition Facility
22	Stewardship—Atlas Facility
30	Management—Weapons Assembly/Disassembly
31	Management—Nonnuclear Components
32	Management—Pits
33	Management—Secondaries and Cases
34	Management—High Explosives Components
40	Nuclear Weapons Policies
41	Regulatory Compliance
42	Relationship to Other DOE Programs/Activities
43	General/Miscellaneous Environmental

TABLE 1.3–2.—*Index of Attendance at Public Hearings* [Page 1 of 32]

Public Hearing Attendees	Document Page No.
March 26, 1996—Los Alamos, New Mexico	
Afternoon Session	2–1 to 2–2
Atencio, Priscilla, Eight Northern Indian Pueblos, San Juan Pueblo, NM	
Best, George H., Los Alamos, NM	
Cameron, Richard E., Department of Energy/AL, Albuquerque, NM	
Campbell, John R., Carlsbad, CA	
Chandler, George, Responsible Environmental Action League, Los Alamos, NM	
Coghill, Catherine E., Parsons Brinckerhoff, Los Alamos, NM	
Crockett, Jeanne, Marie, NMED-Department of Energy Oversight Bureau, Santa Fe, NM	
Daugherty, Dawn S., Department of Energy, Santa Fe, NM	
Deyo, Richard O., Santa Fe, NM	
Eitzen, Harold E., New Mexico Department of Health, Jemez Springs, NM	
Epstein, Arnold M., Department of Energy Defense Programs, Germantown, MD	
Faust, Cheryll L., Los Alamos, NM	
Griego, Juan L., Department of Energy, Los Alamos, NM	
Guthals, Paul R., Los Alamos, NM	
Hanson, Earlo M., Los Alamos National Laboratory, Los Alamos, NM	
Herbst, Richard J., Los Alamos Technical Association, Los Alamos, NM	
Hogan, John T., Gram Inc., Los Alamos, NM	
Holt, James L., Los Alamos, NM	
Hyder, James E., Los Alamos, NM	
Jiron, Albert G., Espanola, NM	
Johansen, Mat, Department of Energy, Los Alamos, NM	
Jolly, Edward L., Los Alamos, NM	
Khalil, Nazir S., Department of Energy, Albuquerque, NM	
Kirkman, Larry D., Department of Energy, Albuquerque, NM	
Ladino, Anthony G., Scientech, Los Alamos, NM	
Laeser, Joyce H., Department of Energy, Los Alamos, NM	
Larson, Thomas E., Los Alamos, NM	
Levy, Allen J., Arlington, VA	
Matthews R. S., WSRC, Aiken, SC	
McClellan, Doug, *Albuquerque Journal*, Santa Fe, NM	
McClure, Donald A., Los Alamos National Laboratory DX, Los Alamos, NM	
McCorkle, Melvin, Responsible Environmental Action League, Los Alamos, NM	
McNamara, Eric A., Los Alamos National Laboratory, Los Alamos, NM	
Mechels, Chris I., Santa Fe, NM	
Neal, Tim R., Los Alamos National Laboratory, Los Alamos, NM	
Nelson, Natalie N., Los Alamos National Laboratory, Los Alamos, NM	
Olivas, David, Department of Energy, Los Alamos, NM	
Palmer, Michael J., Los Alamos National Laboratory, Espanola, NM	
Phillips, Scott E., WSRC, Augusta, GA	
Phillips, Terrence, Los Alamos National Laboratory, Los Alamos, NM	
Price, Marty C., Los Alamos National Laboratory, Los Alamos, NM	
Prommel, Robert A., Los Alamos National Laboratory, Santa Fe, NM	
Purcell, Lisa D., Mescalero/Utility Project, Albuquerque, NM	

TABLE 1.3–2.—*Index of Attendance at Public Hearings* [Page 2 of 32]

Public Hearing Attendees	Document Page No.
March 26, 1996—Los Alamos, New Mexico (continued)	
Afternoon Session	2–1 to 2–2
Rangel, Ruben, Los Alamos National Laboratory, Los Alamos, NM	
Richardson, Charles R., Los Alamos National Laboratory, Los Alamos, NM	
Rochelle, Joe B., Rodry Law Firm, Albuquerque, NM	
Schaller, Charmian O., *Los Alamos Monitor*, Los Alamos, NM	
Stratton, William R., Los Alamos, NM	
Switlik, Clement T., Jr., Switlik and Associates, Engineers, Espanola, NM	
Thomson, David B., Los Alamos, NM	
Trapp, T. J., Department of Energy, Los Alamos, NM	
Venable, Douglas, Los Alamos, NM	
Vozella, Joe C., Department of Energy, Santa Fe, NM	
Webb, Diana, Los Alamos National Laboratory, Los Alamos, NM	
Willyard, Don, Allied Signal, Lees Summit, MO	
March 26, 1996—Los Alamos, New Mexico	
Evening Session	2–2 to 2–7
Athas, William F., New Mexico Tumor Registry, Albuquerque, NM	
Bartlit, John R., Los Alamos, NM	
Baughman, William J., Los Alamos National Laboratory, Los Alamos, NM	
Bennett, Deborah R., Los Alamos National Laboratory, Espanola, NM	
Black, Kelly J., Neptune & Co., Los Alamos, NM	
Boettner, Jay K., Los Alamos National Laboratory, Los Alamos, NM	
Browning, Richard V., Los Alamos National Laboratory, Los Alamos, NM	
Cabral, Al R., Los Alamos Monitor, Los Alamos, NM	
Chandler, Christine, Responsible Environmental Action League, Los Alamos, NM	
Cummings, Peter, Santa Fe, NM	
Cunningham, Gregory S., Los Alamos National Laboratory, Los Alamos, NM	
Dallman, John C., Los Alamos, NM	
Demuth, Nelson S., Los Alamos, NM	
Easthouse, Keith E., The Santa Fe New Mexican, Santa Fe, NM	
Ekdahl, Carl, Los Alamos NWT, Santa Fe, NM	
Gibbs, Scott, Los Alamos, NM	
Giesler, Gregg C., G Cubed, Los Alamos, NM	
Honey, Francis J., Los Alamos National Laboratory, Los Alamos, NM	
McCormick, Margery J., Los Alamos National Laboratory, Los Alamos, NM	
Mello, Greg, Los Alamos Study Group, Santa Fe, NM	
Naranjo, Fidel, Los Alamos, NM	
Noga, Suzanne M., Santa Fe, NM	
Olsen, Rodney L., Los Alamos, NM	
Parras, Bill, Los Alamos, NM	
Pendergrass, Ann, Los Alamos, NM	
Pongratz, Morris B., Los Alamos County Council, Los Alamos, NM	
Porterfield, Donivan R., Los Alamos, NM	
Roach, Alita M., Los Alamos National Laboratory, Los Alamos, NM	
Rodriguez, Carmen M., Los Alamos, NM	

TABLE 1.3–2.—*Index of Attendance at Public Hearings* [Page 3 of 32]

Public Hearing Attendees	Document Page No.
March 26, 1996—Los Alamos, New Mexico (continued)	
Evening Session	2–2 to 2–7
Savignac, Noel F., Consultant, Albuquerque, NM	
Shapolia, Al, Anti-Nuke, Santa Fe, NM	
Soohen, Jacquie, Los Alamos Study Group, Santa Fe, NM	
Stimmel, Jay J., Los Alamos, NM	
Webb, Diana, Los Alamos National Laboratory, Los Alamos, NM	
Yanicak, Steve, Espanola, NM	
March 28, 1996—Albuquerque, New Mexico	
Evening Session	2–7 to 2–13
Anderson, Robert, University of New Mexico, Albuquerque, NM	
Aquino, Michelle R., Battelle, Albuquerque, NM	
Avara, Everett W., Tetra Tech Inc., Amarillo, TX	
Baca, Stephen S., Department of Energy, Albuquerque, NM	
Baise, Melanie P., Albuquerque, NM	
Bergman, Donna A., Department of Energy, Albuquerque, NM	
Black, Cecil, Tetra Tech Inc., Albuquerque, NM	
Boyes, John D., Sandia National Laboratory, Albuquerque, NM	
Bunting, Dorie, Albuquerque Center for Peace & Justice, Albuquerque, NM	
Buvinger, Bruce J., Department of Energy Environment Protection Division, Albuquerque, NM	
Cady, Richard H., Albuquerque, NM	
David, McVey F., Sandia National Laboratory, Albuquerque, NM	
Diane, Susan, All Peoples Coalition, Albuquerque, NM	
Dimas, John U., WLC, Albuquerque, NM	
Dubuque, Carol G., Albuquerque, NM	
Dubuque, William R., Department of Energy, Albuquerque, NM	
Faich, Ron, Albuquerque, NM	
Fleck, John R., Albuquerque Journal, Albuquerque, NM	
Greenwald, Janet, Citizens for Alternatives to Radioactive Dumping, Albuquerque, NM	
Griffith, Karen A., Department of Energy, Albuquerque, NM	
Hancock, Don, Southwest Research & Information Center, Albuquerque, NM	
Harris, Garland, Citizens for Alternatives to Radioactive Dumping, Albuquerque, NM	
Haynsworth, Hazel A., Ruca Anti-Nuclear Campaign, Ruidoso, NM	
Kerliwsky, Daniel, Physicians for Social Responsibility, Albuquerque, NM	
Loeber, Charles R., Albuquerque, NM	
McDaniel, Corey K., Los Alamos, NM	
Mitchell, David K., All Peoples Coalition, Belen, NM	
Moore, Jason B., Tetra Tech Inc., Albuquerque, NM	
Myers, Susan E., Los Alamos Study Group, Santa Fe, NM	
Navarro, Karen E., Citizens for Alternatives to Radioactive Dumping, Albuquerque, NM	
O'Neill, Catherine M., Citizens Alter, Albuquerque, NM	
Pappas, George N., Albuquerque, NM	
Parilla, Mary Jane	
Pulliam, Dana J., Sandia National Laboratory, Albuquerque, NM	
Purcell, Lisa D., Mescallero/Utility Project, Albuquerque, NM	

TABLE 1.3–2.—*Index of Attendance at Public Hearings* [Page 4 of 32]

Public Hearing Attendees	Document Page No.
March 28, 1996—Albuquerque, New Mexico (continued)	
Evening Session	2–7 to 2–13
Rolland, Janna L., Physicians for Social Responsibility/New Mexico, Albuquerque, NM	
Rosson, David E., Albuquerque, NM	
Rosson, Jennifer R., Mescalero Utility Project LLC, Rio Ruacho, NM	
Seydel, G. Robin, Action Womens Health, Albuquerque, NM	
Stotts, Al, Department of Energy Al Public Affairs, Albuquerque, NM	
Thompson, Sally-Alice J., United States Citizen, Albuquerque, NM	
Van Lenten, Christine, Putting Words to Work, Albuquerque, NM	
Walter, John K., Albuquerque, NM	
March 28, 1996—Las Vegas, Nevada	
Evening Session	2–13 to 2–16
Armstrong, Dennis, Department of Energy, Las Vegas, NV	
Barre, Richard, Las Vegas, NV	
Battaglia, Carmen, Bechtel, Las Vegas, NV	
Bechtel, Dennis, Clark County Nuclear Waste Division, Las Vegas, NV	
Blodgett, Jim, Department of Energy, Las Vegas, NV	
Borden, John, Las Vegas, NV	
Bradfield, Felicia, Tetra Tech Las Vegas, Las Vegas, NV	
Chakrabarti, Andy, Woodward Clyde, Wijon, DC	
Chrisman, Robert, Las Vegas, NV	
Cotter, Joy, Bechtel Nevada, Las Vegas, NV	
Dillaplain, Michael, Nevada Test Site Community Advisory Board, Henderson, NV	
Edwards, Thomas O., Bechtel Nevada, Las Vegas, NV	
Flangas, William G., Las Vegas, NV	
Foster, Will, Las Vegas, NV	
Frishman, Steve, State of Nevada NWPO, Carson City, NV	
Harney, Corbin, Standahai Network, Battle Mountain, NV	
Henderson, James, Bechtel Nevada, Las Vegas, NV	
Knutsen, Reinard, Nuclear Abolition Summit, Las Vegas, NV	
Kok, Kenneth D., Los Alamos Technical Associates Inc., Las Vegas, NV	
McGee, W. Curt, Bechtel Nevada, Las Vegas, NV	
Ricciardi, Michael, Las Vegas, NV	
Smith, Robert, SAIC, Las Vegas, NV	
Stewart, Carrie, PAI, North Las Vegas, NV	
Stewart, Lana, Bechtel, Las Vegas, NV	
Szymanshi, Jerry S., TRAC-Na, Las Vegas, NV	
Treichel, Judy, Nevada Nuclear Waste Task Force, Las Vegas, NV	
Walker, John B., State of Nevada, Carson City, NV	
Zavattado, Peter, Las Vegas, NV	
Zimmerman, Janene, Las Vegas, NV	
March 29, 1996—Las Vegas, Nevada	
Morning Session	2–16 to 2–18
Allen, Gylan C., Department of Energy, Las Vegas, NV	
Bourn, Michael R., City of Amarillo Economic Development, Amarillo, TX	

TABLE 1.3–2.—*Index of Attendance at Public Hearings* [Page 5 of 32]

Public Hearing Attendees	Document Page No.
March 29, 1996—Las Vegas, Nevada (continued)	
Morning Session	2–16 to 2–18
Brown, Chris, Campaign for Nevada's Future, Las Vegas, NV	
Burton, Thomas, Nevada Indian Environmental Coalition, Reno, NV	
Cebe, Jim, Department of Energy/Nevada, Las Vegas, NV	
Chakrabarti, Andy, Woodward Clyde, Wijon, DC	
Cotter, Joy, Bechtel Nevada, Las Vegas, NV	
DiBartalo, Russel, Clark Co., Las Vegas, NV	
DiSanza, E. Frank, Department of Energy Environmental Management	
Flangas, William G., Las Vegas, NV	
Freeland, William, YMSCO, Las Vegas, NV	
Glines, Chad, Department of Energy/Nevada, Las Vegas, NV	
Goin, Patti, Las Vegas, NV	
Golden, Bobby, Department of Energy/Nevada Environmental Protection Division, Las Vegas, NV	
Gurka, Becky, Las Vegas, NV	
Hayes, Dennis, Bechtel Nevada, Boulder City, NV	
Iden, Barbara, Las Vegas, NV	
Leskovar, Christy, Bechtel Nevada, North Las Vegas, NV	
Nielsen, Richard A., Citizen Alert, Las Vegas, NV	
Prins, Gretchen E., Las Vegas, NV	
Ruggieri, Joseph, Henderson, NV	
Schutte, Dale, NTS CAB, Pahrump, NV	
Vasconi, William, International Brotherhood of Electrical Workers, Las Vegas, NV	
White, Roy M., Bechtel Nevada, Las Vegas, NV	
April 1, 1996—Oak Ridge, Tennessee	
Evening Session	2–18 to 2–25
Alexander, William A., III, Harriman, TN	
Anderson, Donnie R., LMES, Oak Ridge, TN	
Arp, Daniel R., Martin Marietta, Oak Ridge, TN	
Bailey, Harry L., Clinton, TN	
Bernander, Ken, Citizens for Safety, Oak Ridge, TN	
Bevill, Kenneth L., Andersonville, TN	
Bibb, Pat M., Oak Ridge, TN	
Bolden, Charles R., LME, Clinton, TN	
Bowers, Gary L., Martin Marietta Energy Systems, Clinton, TN	
Bradshaw, David R., Oak Ridge City Council, Oak Ridge, TN	
Bruce, Frank R., Oak Ridge, TN	
Bullock, Clyde E., Y-12 Lockheed Martin, Lake City, TN	
Burditt, Robert B., Citizens for Safety, Oak Ridge, TN	
Burroughs, Edward H., Lockheed Martin, Knoxville, TN	
Bush, Danny L., Oak Ridge, TN	
Butz, Todd R., Lockheed Martin Energy Systems Inc., Oak Ridge, TN	
Cagle, Gordon W., Lockheed Martin Energy Systems, Clinton, TN	
Catlett, Tony L., Y-12, Knoxville, TN	
Catron, Botch, ATLC, Knoxville, TN	

TABLE 1.3–2.—*Index of Attendance at Public Hearings* [Page 6 of 32]

Public Hearing Attendees	Document Page No.
April 1, 1996—Oak Ridge, Tennessee (continued)	2–18 to 2–25
Evening Session	
Chabot, Edward, Lockheed Martin Energy Systems, Powell, TN	
Chèvrien, Gilles, NVMATEC, Bethesda, MD	
Clement, John F., CFNS, Knoxville, TN	
Cook, David C., ATLC Citizens for National Security, Clinton, TN	
Cook, Jack L., Oak Ridge National Laboratory, Knoxville, TN	
Cook, Kenneth W., International Chemical Workers Union 252, Clinton, TN	
Cooke, Darrell L., Lockheed Martin Energy Systems, Friendsville, TN	
Cooper, Clovis A., Sunbright, TN	
Cooper, Conard F., Citizens for National Security, Wartburg, TN	
Corbett, Gail K., Oak Ridge Local Oversight Committee, Oak Ridge, TN	
Cox, Shirley O., Lockheed Martin Energy Systems, Clinton, TN	
Culbertson, Eddie E., Lockheed Martin Energy Systems, Knoxville, TN	
Davis, Harold L., Oak Ridge, TN	
Davis, Marsha Y., Department of Energy-Defense Programs-44, Germantown, MD	
Dillow, Weldon D., Private Citizen, Clinton, TN	
Dodson, William H., CNS, Knoxville, TN	
Euzns, George W., Oak Ridge, TN	
Fitzgerald, Amy S., Oak Ridge Local Oversight Committee, Oak Ridge, TN	
Ford, W. Edward, III, Farragut, TN	
Forrester, William K., II, Y-12 Pipefitter, Powell, TN	
Foster, Bill R., Lake City, TN	
Franklin, James C., Oak Ridge, TN	
Garber, Joel W., American Technologies Inc., Knoxville, TN	
Grady, Timothy J., OCAW, Oak Ridge, TN	
Griego, Pablo, Germantown, MD	
Guinn, Gerald R., Knoxville, TN	
Hastings, Don M., ATLC, Knoxville, TN	
Hearron, Stanley, Department of Energy, Albuquerque, NM	
Hickman, Herschel D., Oak Ridge, TN	
Holloway, Jacqueline C., Anderson County Commission, Oak Ridge, TN	
Hutchinson, Ralph, Oak Ridge Environmental Peace Alliance, Oak Ridge, TN	
Johnson, D. H., Harriman, TN	
Johnson, James D., Citizens for National Security, Oak Ridge, TN	
Johnson, James S., Jr., Friends Oak Ridge National Laboratory, Oak Ridge, TN	
Johnson, William E., Lockheed Martin Energy Systems Inc., Y-12, Rockwood, TN	
Jolly, Charles N., Ooltewah, TN	
Jones, Steve R., Lockheed Martin Y-12, Knoxville, TN	
Keyser, Ronald M., Y-12, Oak Ridge, TN	
King, Henry C., Clinton, TN	
Kopp, Steven H., Oak Ridge Local Oversight Committee, Knoxville, TN	
Large, Dewey E., Scientific Ecology Group Inc., Knoxville, TN	
Love, Richard A., Oak Ridge, TN	
Macher, Martin S., Oak Ridge, TN	

TABLE 1.3–2.—*Index of Attendance at Public Hearings* [Page 7 of 32]

Public Hearing Attendees	Document Page No.
April 1, 1996—Oak Ridge, Tennessee (continued)	
Evening Session	2–18 to 2–25
Martin, John, B. L., International Brotherhood Electrical Workers, Clinton, TN	
Martin, Roy H., Lake City, TN	
Mee, Clarence E., Pipefitters, Knoxville, TN	
Mee, William T., Rockwood, TN	
Miles, Carlie E., ATLC, Kingston, TN	
Moore, Kathleen D., City of Oak Ridge, Oak Ridge, TN	
Moore, Larry M., Lockheed Martin Energy Systems, Maryville, TN	
Moore, Stephen H., Acorn Properties, Oak Ridge, TN	
Morgan, Ora B., Retired, Oak Ridge, TN	
Morris, James S., Lockheed Martin Energy Systems, Sweetwater, TN	
Morrow, Margaret K., Lockheed Martin Energy Systems, Oak Ridge, TN	
Morrow, Roy W., Lockheed Martin Energy Systems, Oak Ridge, TN	
Myhre, Trygve C., Lockheed Martin Energy Systems, Oak Ridge, TN	
Napier, John M., Oak Ridge, TN	
Nephew, Edmund A., Oak Ridge Reservation Local Oversight Committee, Oak Ridge, TN	
Noritake, Jesse M., ORMA, Oak Ridge, TN	
O'Dell, Charles L., Powell, TN	
Pearl, Scott, Jr., Y-12, Kingston, TN	
Peek, Thomas H., Union-UA Local 718, Knoxville, TN	
Peelle, Robert, Oak Ridge, TN	
Penland, Jackie W., Oak Ridge, TN	
Perry, Walter N., Department of Energy, Knoxville, TN	
Philippone, Richard L., Oak Ridge, TN	
Pride, Jay, Oak Ridge, TN	
Pritchard, Ralph D., Citizens for National Security, Oliver Springs, TN	
Queener, Samuel S., Citizens for National Security, Oliver Springs, TN	
Randles, Wayne A., Lockheed Martin Energy Systems, Knoxville, TN	
Reel, Stanley A., City of Oak Ridge/DRPC CAD, Oak Ridge, TN	
Renne, Richard L., ATI, Harriman, TN	
Richards, Danny W., Citizens for National Security, Knoxville, TN	
Rimel, George M., CND, Jacksboro, TN	
Rivers, Celelia, Powell, TN	
Roberts, Donald E., Lockheed Martin Energy Systems, Oak Ridge, TN	
Ryan, Joe, Citizens for National Security, Oak Ridge, TN	
Saver, Richard P., RPS Associates, Oak Ridge, TN	
Scarbrough, Carl R., Atomic Trades and Labor Council, Clinton, TN	
Schwartz, Howard S., Dimensional Metrology-Retired, Clinton, TN	
Scott, Frank E., International Chemical Workers Union, Clinton, TN	
Shapiro, Theodore, Oak Ridge, TN	
Shoopman, Winfred E., Anderson County Commission, Clinton, TN	
Smith D. R., Lockheed Martin Energy Systems, Oak Ridge, TN	
Smith, Richard L., Knoxville, TN	
Smith, Harwell F., Jr., Oak Ridge, TN	

TABLE 1.3–2.—*Index of Attendance at Public Hearings* [Page 8 of 32]

Public Hearing Attendees	Document Page No.
April 1, 1996—Oak Ridge, Tennessee (continued)	2–18 to 2–25
Evening Session	
Snow, Larry D., Kingston, TN	
Snyder, Thomas S., SEG, Oak Ridge, TN	
Stethen, Steven D., Lockwood Greene Technologies, Knoxville, TN	
Stout, James D., Lockheed Martin Energy Systems Inc., Oak Ridge, TN	
Sumner, Debbie H., Lockheed Martin, Kingston, TN	
Taylor, Ellen, Lawrence Livermore National Laboratory, Germantown, MD	
Thomason, George F., Harriman, TN	
Tilson, Francis V., Knoxville, TN	
Turmer, Carl L., ATLC, Knoxville, TN	
Turner, Barbara J., Citizens for National Security, Kingston, TN	
Underwood, Scott, Jr., Oak Ridge, TN	
Usrey, Elgan H., Tennessee Emergency Management Agency, Nashville, TN	
Valenti, Mark E., Oak Ridge, TN	
Valentine, Charles K., Oak Ridge, TN	
Venkatesan, Padma, TDEC Department of Energy-O, Knoxville, TN	
Viwes, Dallas W., ATLC, Lake City, TN	
Whitley, Garry M., Lockheed Martin Energy Systems, Clinton, TN	
Wilburn, William R., Lockheed Martin Energy Systems, Oak Ridge, TN	
Williams, Carl, Lockheed Martin Energy Systems, Knoxville, TN	
Willshire, Ashley, Molten Metal Technology, Waltham, MA	
Wilson, David E., Citizens for National Security, Knoxville, TN	
Wilson, Rickey R., Citizens for National Security, Oliver Springs, TN	
Wilson, Talmadle C., Knoxville, TN	
Wyrick, Michael T., Knoxville, TN	
Yaggi, William J., Clinton, TN	
April 2, 1996—Oak Ridge, Tennessee	2–25 to 2–29
Morning Session	
Bevard, Bruce, Oak Ridge National Laboratory, Oak Ridge, TN	
Boles, Ronald, Local 3-288 OCAW, Knoxville, TN	
Brandon, Norman, Nuclear Fuel Services Inc., Erwin, TN	
Brooks, Alfred A., Oak Ridge, TN	
Carleton, Teresa, WCS Inc., Oak Ridge, TN	
Chardos, Jim S., Tennessee Valley Authority, Hollywood, AL	
Chesney, Bill, Rogers Group Inc., Oak Ridge, TN	
Devine, Terry, Frankfort, KY	
Deweese, Adam D., Tennessee Department of Environment and Conservation, Oak Ridge, TN	
Gallaher, Rickey, Local 3-288 OCAW, Kingston, TN	
Garber, Sandra L., Knoxville, TN	
Holman, Garry S., Lawrence Livermore National Laboratory, Livermore, CA	
Huffman, Clark, HEI, Oak Ridge, TN	
Iwanski, Myron L., Anderson County Commissioner, Oak Ridge, TN	
Kite, Harvey T., Oak Ridge, TN	
McCullough, William L., Oak Ridge, TN	

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Public Hearing Attendees	Document Page No.
April 2, 1996—Oak Ridge, Tennessee (continued)	
Morning Session	2–25 to 2–29
McDuffie, H. Fritz, Oak Ridge, TN	
McMillan, G. Jarvis, Presbyterian Church, USA, Hendersonville, NC	
Michener, L. R., ERDA, Kingston, TN	
Miles, Ricky C., Tennessee Valley Authority, Hollywood, AL	
Miskelley, Ray, Department of Energy, Oak Ridge, TN	
Monroe, William E., Tennessee Department of Environment and Conservation, Oak Ridge, TN	
Nisley, Steve S., Tennessee Department of Environment and Conservation, Oak Ridge, TN	
Okulczyk, Gail M., Tennessee Department of Environment and Conservation, Oak Ridge, TN	
Ragan, Guy E., SAIC, Oak Ridge, TN	
Rice, Dean P., U.S. Senator Fred Thompson's Office, Knoxville, TN	
Robinson, Charlotte L., Oak Ridge Local Oversight Committee, Oak Ridge, TN	
Schroeder, Charles, Commonwealth Edison Co., Downers Grove, IL	
Sigal, Lorene L., Self, Oak Ridge, TN	
Speller, Wayne, Lockheed Martin Energy Systems, Oak Ridge, TN	
Spellman, Donald, Oak Ridge National Laboratory, Oak Ridge, TN	
Taylor, Ellen, Lawrence Livermore National Laboratory, Germantown, MD	
Trauger, Donald B., Oak Ridge, TN	
Wamp, Zach, U.S. House of Representatives, Washington, DC	
Webb, Jennifer L., Lockheed Martin Energy Systems, Oak Ridge, TN	
Yard, Charles R., Tennessee Department of Environment and Conservation, Oak Ridge, TN	
April 2, 1996—Oak Ridge, Tennessee	
Evening Session	2–28 to 2–29
This public hearing was held specifically to obtain comments on the Storage and Disposition Draft PEIS. For this reason, there is no list of hearing attendees for this session included in this document. Despite the fact that the focus of the hearing was the Storage and Disposition Draft PEIS, notetakers identified eight comments that pertained to the Stockpile Stewardship and Management Program. Those comments are included in Chapter 2.	
April 9, 1996—Kansas City, Missouri	
Afternoon Session	2–29
Black, Peter C., Allied Signal, Lenexa, KS	
Clegg, Karen K., Allied Signal, Kansas City, MO	
Cobb, Alan E., Senator Bob Dole's Office, Kansas City, KS	
Fraser, John W., Grandview, MO	
Fraser, Sharon P., Grandview, MO	
Hoopes, Pat T., Department of Energy, Lee's Summit, MO	
Johnson, Steven S., Kansas City Area Development Council, Kansas City, MO	
Journey, Vincent S., Missouri Department of Natural Resources, Jefferson City, MO	
Rickert, Lori P., Congressman Jan Meyer's Office, Overland Park, KS	
Scaglia, Phillip P., Karen McCarthy's Office, Kansas City, MO	
Swain, Scott, Senator's Kit Bond & John Ashcroft, Kansas City, MO	
Wissbaum, Joan K., General Services Administration, Olathe, KS	

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Evening Session	
Hall, Gary, Overland Park, KS	
Lappin, Mary A., Kansas City Water Services Department, Kansas City, MO	
Ludlow, Bob, Southern Communities, Kansas City, MO	
McGregor, Neal L., United Plant Guard Workers of America, Blue Springs, MO	
Otto, Agnes A., Greater Kansas City Chamber of Commerce, Kansas City, MO	
Roepke, Mike R., IAM & AW, Kansas City, MO	
Taylor, Steve C., Overland Park, KS	
Ward, Larry, IAM & AW, Kansas City, MO	
April 11, 1996—Livermore, California	2–30 to 2–37
Afternoon Session	
Anderson, Carl N., Oakland, CA	
Armantrout, Janet, *The Independent Newspaper*, Livermore, CA	
Beier, Ann, Western States Legal Foundation, Oakland, CA	
Blair, James	
Brechin, Vernon J., Tri-Valley CARES, Mountain View, CA	
Brereton, Sandra J., Lawrence Livermore National Laboratory, Pleasanton, CA	
Brown, David L., Lawrence Livermore National Laboratory Classification, Modesto, CA	
Buchanan, Pat O., Hayward, CA	
Buer, David A., Nevada Desert Experience, Las Vegas, NV	
Cabasso, Jacqueline L., Western States Legal Foundation, Oakland, CA	
Cheung, Terrance, Pleasanton, CA	
Chicca, Jack, Tetra Tech Inc., Pasadena, CA	
Coady, Davida, Berkeley, CA	
Cox, Alice J., San Jose Peace Center, Santa Clara, CA	
Cox, William P., Santa Clara, CA	
Danforth, William W., Tracy, CA	
Eckard, Royce D., Livermore, CA	
Erbele, Carolyn R., Berkeley, CA	
Fryer, Lottie R., San Jose, CA	
Fulk, M. M., Livermore, CA	
Glover, Pat, Hayward, CA	
Goodpasture, Stella Marie, Dominican Sisters Mission, Oakland, CA	
Gurule, John, Castro Valley, CA	
Haendler, Blanca L., Lawrence Livermore National Laboratory, Livermore, CA	
Hearron, Stanley, Department of Energy, Albuquerque, NM	
Hodgkin, Donald, Alameda, CA	
Johnson, Cyntha, Women Strike For Peace, Kensington, CA	
Kelley, Marylia, Tri-Valley CARES, Livermore, CA	
Khan, Hank N., Environmental Protection Division, Livermore, CA	
King, Donald F., Tri-Valley CARES, Livermore, CA	
Kontaxis, George D., Department of Energy, Livermore, CA	
Larsen-Beville, Sherry K., Livermore Conversion Project, San Leandro, CA	

TABLE 1.3–2.—*Index of Attendance at Public Hearings* [Page 11 of 32]

Public Hearing Attendees	Document Page No.
April 11, 1996—Livermore, California (continued)	
Afternoon Session	2–30 to 2–37
Lazaro, Michael A., Argonne National Laboratory, Argonne, IL	
Lee, Dan J., Valley Study Group, Livermore, CA	
Lingenfelter, Allen C., Department of Energy, Manteca, CA	
Luboviski, Barry, Building Trades Council Alameda County, Oakland, CA	
Manrique, Miguel A., Vectra Government Services, San Ramon, CA	
Mayer, Nancy N., *Tri-Valley Herald*, Berkeley, CA	
Mintz, John M., Pleasanton, CA	
Mironova, Natalia, Movement for Nuclear Safety, Chelyabinsk, Russia	
Molinari, Bianca, Alliance for Survival, La Jolla, CA	
Neitz, Deborah J., Livermore, CA	
Nesbitt, Dale, 20/20 Vision, Berkeley, CA	
Nolte, Donald W., Livermore, CA	
Noonan, Micheal P., U.S. House of Representatives, Walnut Creek, CA	
Nurmela, Lillian, Women For Peace, East Bay, Oakland, CA	
O'Donnell, William J., St. Joseph the Worker Church, Berkeley, CA	
Olin, Phyllis R., Western States Legal Foundation, Berkeley, CA	
Parenti, Janis M., Department of Energy, Oakland, CA	
Peifer, Dennis W., Livermore, CA	
Perry, Lloyd G., Peace Action, Oakland, CA	
Perry, Rita B., Peace Action & LEPA, Oakland, CA	
Richardson, Jeffrey C., Lawrence Livermore National Laboratory, Dublin, CA	
Riles, Wilson C., Jr., American Friends Service, Oakland, CA	
Rosenberg, Shirley K., San Jose Peace Center, San Jose, CA	
Rozsnyai, Balazs F., Comp. Physics Research, Livermore, CA	
Salkind, Eleanor, Women for Peace, Oakland, CA	
Scott, Maylie, Berkeley, CA	
Selfridge, Barbara E., Oakland, CA	
Shirley, John, Citizen & Valley Study Group, Livermore, CA	
Smilk, Kathryn, Physicians for Social Responsibility, Lafayette, CA	
Spellman, Sharon K., San Jose Peace Center, Nevada City, CA	
Spellman, Thomas P., San Jose Peace Center, Nevada City, CA	
Steenhoven, Judy, Department of Energy, Livermore, CA	
Taber, William N., Lakewood, CO	
Tacosa, Corliss A., Discovery Museum, Sacramento, CA	
Trapp, Michael A., SEAC, Berkeley, CA	
Turner, Janis K., Livermore, CA	
Wagner, Carol, Mt. Diablo Peace Center, Walnut Creek, CA	
Wildermann, Joan M., San Jose Peace Center, Campbell, CA	
Yatabe, John M., Department of Energy, Pleasanton, CA	
Zahn, Kenneth C., Ph.D., Department of Energy, Tracy, CA	

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April 11, 1996—Livermore, California	2–37 to 2–43
Evening Session	
Adrien, Lolita M., Operating Engineers, Fremont, CA	
Alvarez, Fred J., Operating Engineers Local 342, Hayward, CA	
Aparicio, Antonio F., Steamfitters Local Union 342, Pittsburg, CA	
Aulenti, Donald F., Steamfitters Local 342, San Pablo, CA	
Bachman, Sonny, Labor Union, Livermore, CA	
Biskner, Chris A., Steamfitters Local Union 342, Antioch, CA	
Blackwood, Paul L., Local Union 342, Concord, CA	
Blalock, Burl W., Local Union 342, Concord, CA	
Blevins, Donald L., Steamfitters Local Union 342, Concord, CA	
Bonetti, Gary F., Jr., Labor Union No 342, Dublin, CA	
Boyum, Douglas A., Steamfitters Local Union 342, Oakley, CA	
Bracknet, Brian T., Oakland, CA	
Brechin, Vernon J., Tri-Valley CARES, Mountain View, CA	
Brown, Douglas W., San Ramon, CA	
Brown, Kenneth E., Steamfitters Local 342, Suison City, CA	
Burroughs, John R., Western States Legal Foundation, Oakland, CA	
Campbell, Scott C., Steamfitters Local Union 342, Hayward, CA	
Candell, Marlene A., Livermore Conversion Project, Berkeley, CA	
Carr, Richard J., Pipefitters 342, Benicia, CA	
Cesaretti, Dino L., Local 483, San Ramon, CA	
Chatty, Omar D., San Jose, CA	
Clegg, Roger J., Operating Engineers Local 3, Dublin, CA	
Crofoot, Richard R., Local Union 342, Rodeo, CA	
Devoto, William M., Sheet Metal Worker Local 104, Livermore, CA	
Dixon, Kenneth P., Steamfitters Local 342, Danville, CA	
Dohmann, Chris H., Sheet Metal Worker 104, Livermore, CA	
Downey, Gary M., Benicia, CA	
Downing, Gerald A., Local Union 342, Vallejo, CA	
Dunlap, Michael, Operating Engineers Union 342, Alameda, CA	
Edmonds, Larry A., Steamfitters Local Union 342, Antioch, CA	
Estes, Larry W., Steamfitters Local Union 342, Concord, CA	
Fisk, Calvin R., Labor Union 342, Benicia, CA	
Fisk, Scott R., Labor Union 342, Fairfield, CA	
Freemire, Joanne R., Tri-Valley CARES, Sun Valley, CA	
Freemire, Michael, Tri-Valley CARES, Sun Valley, CA	
Frisch, Joann, Tri-Valley CARES, Fremont, CA	
Fujimoto, Dirk Y., Sr., Local Union 342, Vallejo, CA	
Fulk M. M., Livermore, CA	
Gabellini, David A., Bechtel, Martinez, CA	
Geier, David A., Local Union 342, Livermore, CA	
Goudreau, Pamela S., Livermore, CA	
Gould, Robert M., Physicians for Social Responsibility, San Francisco, CA	

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Public Hearing Attendees	Document Page No.
April 11, 1996—Livermore, California (continued)	
Evening Session	2–37 to 2–43
Greeley, Mike, Local Union 342, Castro Valley, CA	
Green, Hobby K., Steamfitters Local Union 342, Albany, CA	
Green, John G., Steamfitters Local Union 342, Antioch, CA	
Griffith, Donald V., Livermore, CA	
Hamm, Kenneth A., Plumbers & Fitters Local 342, Pleasanton, CA	
Hansen, Robert M., Sheetmetal Workers 104, Vacaville, CA	
Heard, Brandom R., Pipefitters Local Union 342, Antioch, CA	
Higgins, Donald W., Plumbers & Steamfitters Union 342, Pinole, CA	
Hummel, Henry A., Local Union 342, Concord, CA	
Jensen, Erik L., Local Union 342, Vacaville, CA	
Johnston, Robert E., Local Union 342, Tracy, CA	
Jurich, Jay J., Sheet Metal Workers 104, Pleasanton, CA	
Keim, Orville L., Steamfitters Local Union 342, Castro Valley, CA	
Keller, Monika C., Steamfitters Union Local 342, Martinez, CA	
Kelly, Stephen S., Tri-Valley CARES, San Francisco, CA	
Keuper, Alex D., Livermore, CA	
King, Jerry, Steamfitters Local Union 342, Pittsburg, CA	
Kiser, Robert, League of Women Voters, Clear Lake Oaks, CA	
Krantz, Guenter A., Steamfitters Local Union 342, Castro Valley, CA	
Kreiss, Joan H., Concord, CA	
Kumurdjian, Pierre J., CEA, Livermore, CA	
Larkin, Donald K., Berkeley, CA	
Loggins, Thomas V., Livermore Res & Steamfitters Union 342, Livermore, CA	
Lout, Earl E., Plumbers & Steamfitters Union 342, Fremont, CA	
Luboviski, Barry, Building Trades Council Alameda County, Oakland, CA	
Mann, David L., Livermore, CA	
Manning, W. Barlow, Plumbers & Steamfitters Union 342, Hayward, CA	
Massman, Margaret J., Physicians for Social Responsibility, Berkeley, CA	
McDuffie, Patrick N., Local Union 342, Martinez, CA	
McKendrick, Dennis, Bechtel, Martinez, CA	
McNassar, Daniel B., Pax Christi USA, Oakland, CA	
Medeiros, Richardo J., Fremont, CA	
Meyer, Ilse P., Fremont, CA	
Mikieh, Joe B., Steamfitters Local 342, Martinez, CA	
Mikieh, Stephen J., Steamfitters Local 342, Concord, CA	
Mironova, Natalia, Movement for Nuclear Safety, Chelyabinsk, Russia	
Moore, Craig A., Sheet Metal Workers Local 104, Pleasanton, CA	
Moranton, Claude A., Labor Union, Oakley, CA	
Nash, Gene, Steamfitters Union 342, Vallejo, CA	
Nash, Robert L., Local 342, Vallejo, CA	
Noonan, Micheal P., U.S. House of Representatives, Walnut Creek, CA	
Osbon, Roger R., Labor Union 342, Durham, CA	

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April 11, 1996—Livermore, California (continued)	
Evening Session	2–37 to 2–43
Paisner, Jeff A., Lawrence Livermore National Laboratory, Livermore, CA	
Pederson, Myron L., Operating Engineers Local 342, Alameda, CA	
Peoples, William L., Pipefitters Local 342, Oakland, CA	
Perryman, Wayne A., Plumbers & Steamfitters Union 342, Richmond, CA	
Powers, Walt R., Operating Engineers Local 342, Alameda, CA	
Raab, Peter, W. G., Local Union 342, Dublin, CA	
Reynolds, Guy A., Therma, Livermore, CA	
Robbins, Randy W., Vacaville, CA	
Robinson, Farman J., San Ramon, CA	
Sandy, Ronald G., Local Union 342, Vallejo, CA	
Santos, George E., Sheet Metal Workers Local 1104, Union City, CA	
Santos, Russell B., Fremont, CA	
Scholz, Carter, Berkeley, CA	
Shatzen, Marilyn K., San Leandro, CA	
Silber, Mermer W., Local Union 342, Castro Valley, CA	
Silber, Pearl, Local Union 342, Castro Valley, CA	
Simms, Jim P., Steamfitters Local Union 342, Fremont, CA	
Sisneros, John J., Sheet Metal Workers Local 104, Brentwood, CA	
Smyrl, John P., Martinez, CA	
Stephens, Delmar M., Fairfield, CA	
Sutton, Patrice, San Francisco, CA	
Swan, Terry C., Operating Engineers Local 3, Pleasant Hill, CA	
Terusaki, Stanley H., Lawrence Livermore National Laboratory, Livermore, CA	
Torres, Angela M., Labor Union 342, Livermore, CA	
Tripi, Vincent M., Street Metal Workers Union 104, Dublin, CA	
Valsamis, Stergios D., Castro Valley, CA	
Vaton, Steve E., Steamfitters Local Union 342, Fairfield, CA	
Vega, Oscar L., San Ramon, CA	
Watson, Addis F., Labor Union 342, Pleasant Hill, CA	
Webb, Jerry D., Steamfitters Local 342, Vallejo, CA	
Williams, Doyle, Local Union No. 342, Concord, CA	
Word, Bruce W., Pinole, CA	
Wright, Bobby, Plumbers & Steamfitters Union 342, Dublin, CA	
April 17, 1996—Washington, DC	
Afternoon Session	2–43 to 2–44
Alberstein, David, General Atomics, San Diego, CA	
Anniola, Gilbert, Washington, DC	
Barboza, Derek, Washington, DC	
Barr, Paul R., Maryland	
Blakley, John, Jr., Mason & Hanger Pantex, Amarillo, TX	
Blumenthal, Anita, Washington Nuclear Corp., Potomac, MD	
Brailsford, Beatrice, Snake River Alliance, Pocatello, ID	

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April 17, 1996—Washington, DC (continued)	
Afternoon Session	2–43 to 2–44
Bryson, Maurice, Department of Energy, Rockville, MD	
Buchanan, Ronald E., Lynchburg, VA	
Buer, David A., Nevada Desert Experience, Las Vegas, NV	
Burn, Joseph, Washington Power Supply System, Richland, WA	
Campbell, Bruce, Mason & Hanger–Pantex, Amarillo, TX	
Carde, Margaret, Concerned Citizens for Nuclear Safety, Santa Fe, NM	
Cash, Cathy, Nuclear Energy Overview, Washington, DC	
Chander, Jaysi, Physicians for Social Responsibility, San Francisco, CA	
Chung, Justin, Washington, DC	
Coaham, Jay, Concerned Citizens for Nuclear Safety, Santa Fe, NM	
Coffin, Patricia, Washington, DC	
Cullen, Genevieve, Ray F. Weston, Inc., Washington, DC	
Donning, Art, Washington, DC	
Draper, Robert L., Winston & Strawn, Washington, DC	
Ehrlich, Edward, General Electric–Nuclear Energy, San Jose, CA	
Epstein, Arnold M., Department of Energy Defense Programs, Germantown, MD	
Farkham, Pani, Bliss and Associates, Washington, DC	
Faubert, Cheryl, Energy Communities Alliance, Arlington, VA	
Feinrogh, Herb, AECL Technology, Rockville, MD	
Forsythe, Jan, Mission Development Manager, Arlington, VA	
Gattis, Beverly, STAND, Amarillo, TX	
Gay, Corey, Institute for Science and International Security, Washington, DC	
Greenstein, Michele, Physicians For Social Responsibility, Washington, DC	
Gudgel, Dallas J., Snake River Alliance, Boise, ID	
Hanson, Glen T., Battelle, Albuquerque, NM	
Hayes, David, DNFSB, Washington, DC	
Hensl, David, Snake River Alliance, Victor, ID	
Hite, Ronald L., Babcock & Wilcox, Lynchburg, VA	
Hogan, William J., Department of Energy, Livermore, CA	
Holland, Mary, Energy Communities Alliance, Arlington, VA	
Johnson, Frank, LIUNA, Washington, DC	
Juba, Robert, Amarillo Economic Development Corp., Amarillo, TX	
Kelley, Marylia, Tri-Valley CARES, Livermore, CA	
Kennedy, James H., The Bureau of National Affairs, Inc., Washington, DC	
Lanczycky, Kristen, Nuclear Regulatory Commission, Washington, DC	
Marshall, Thomas, Rocky Mountain Peace Center, Boulder, CO	
Massey, Raymon, SRA Technologies, Fairfax, VA	
Metz, Patricia, Nuclear Energy Institute, Washington, DC	
Nathan, Jim, Lawrence Livermore National Laboratory, Livermore, CA	
Negus, Paige, Washington, DC	
Paisner, Jeff A., Lawrence Livermore National Laboratory, Livermore, CA	
Parikh, Linda, Edlow International Co., Washington, DC	

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Ras, Sophie, Washington International Energy Group, Washington, DC	
Rauch, Thomas M., American Friends Service Committee, Denver, CO	
Sauvageau, Marc, Palaverti Nuclear Generating Station, Tonopah, AZ	
Savage, Carter D., Jupiter Corporation, Wheaton, MD	
Schaeffer, Robert A., Military Production Network, Belmont, MA	
Setera, Robert, LIUNA, Washington, DC	
Shapar, Howard, Shaw Pittman, Washington, DC	
Shearer, Velma M., Neighbors in Need, Englewood, OH	
Shultz, Gaylea, Morgan Lewis & Bockius, Washington, DC	
Slater, Alice, Economists Allied for Arms Reduction, New York, NY	
Van Doren, Charles, OGDEN Corporation, Fairfax, VA	
Videgreer, John, The International Center, Washington, DC	
White, William, DNFSB, Washington, DC	
Wilkinson, Corry, Lawrence Livermore National Laboratory, Germantown, MD	
Worthington, Jim, Sheetmetal Workers International, Stanwood, WA	
Wujiciak, Steve, VOLPE National Transportation Center, Cambridge, MA	
Yourish, Karen, Weapons Complex Monitor, Washington, DC	
Zavadowski, Richard A., Nuclear Fuel Service Inc., Washington, DC	
Zerm, Ronald W., Pantex Plant Citizen's Advisory Board, Amarillo, TX	
April 18, 1996—Washington, DC	
Morning Session	2–44 to 2–45
Andrews, Wayne, DNFSB, Washington, DC	
Belivarde, John, Oakland Operations Office, Oakland, CA	
Bengelsdorf, Harold D., Bethesda, MD	
Bergman, Heather S., Numark Associates, Inc., Washington, DC	
Blakley, John, Jr., Mason & Hanger Pantex, Amarillo, TX	
Burn, Joseph, Washington Power Supply System, Richland, WA	
Campbell, Bruce, Mason & Hanger–Pantex, Amarillo, TX	
Clements, Tom, Greenpeace International, Washington, DC	
Curtis, James R., Winston & Strawn, Washington, DC	
Davis, George A., ABB Combustion Engineering Nuclear Systems, Windsor, CT	
DeBlock, Marie-Jose, EURATOM Supply Agency, Washington, DC	
Dollay, Steven, Nuclear Control Institute, Washington, DC	
Dove, Gordon, Systematic Management Services, Germantown, MD	
Draper, Robert L., Winston & Strawn, Washington, DC	
Ehrlich, Edward, General Electric–Nuclear Energy, San Jose, CA	
Fletcher, Michael, AECL Technologies Inc., Rockville, MD	
Guais, Jean-Claude, WSMS-ISA Inc., Paris, France	
Hahn, Dick, Department of Energy Defense Programs-22, Germantown, MD	
Hara, Akihiko, Federation of Electric Power Companies of Japan, Washington, DC	
Heppner, Paul G., Sandia National Laboratories, Arlington, VA	
Hite, Ronald L., Babcock & Wilcox, Lynchburg, VA	

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Morning Session	2–44 to 2–45
Hofer, Gregory G., Raytheon Nuclear Inc., New York, NY	
Horner, Daniel, Nuclear Control Institute, Washington, DC	
Hughes, Allen, Woodbridge, VA	
Hurt, Davis, Defense Nuclear Facilities Safety Board, Washington, DC	
Irwin, Hank, Sandia National Laboratory, Livermore, CA	
Jancik, Lori, Federation of Electric Power Companies of Japan, Washington, DC	
Juba, Robert, Amarillo Economic Development Corp., Amarillo, TX	
Krishna, Paul M., TRW Inc., Washington, DC	
Lyons, Blythe, Energy Resource International, Washington, DC	
Madison, Robin M., Bechtel National Inc., Washington, DC	
Mann, Melissa, Edlow International Company, Washington, DC	
McClary, Richard, United States Navy, Arlington, VA	
McElroy, Bernie, AT/Lockheed Martin Energy Systems, Washington, DC	
McMillen, Matthew, Energetics, Washington, DC	
Meigs, Marilyn F., BNFL Inc., Washington, DC	
Metz, Patricia, Nuclear Energy Institute, Washington, DC	
Miller, Donald, Louisiana Energy Services, Washington, DC	
Mills, Loring, Stevensville, MD	
Moglen, Damon, Greenpeace International, Washington, DC	
Monroe, Robert R., Bechtel National, Inc., Washington, DC	
Naughton, William F., Commonwealth Edison Co., Downers Grove, IL	
Newton, John W., Department of Energy, Germantown, MD	
Sazawal, ViJay, COGEMA/NUMATEC, Bethesda, MD	
Seliger, Kel, City of Amarillo, Amarillo, TX	
Shallo, Frank A., COGEMA, Inc., Bethesda, MD	
Sloan, David, Nukem Inc., Stamford, CT	
Smith, Stephen, Exchange Monitor Publications, Washington, DC	
Todd, Doug, Battelle, Washington, DC	
Wells, Nikita, Defense Conversion Technology Inc., Washington, DC	
Williams, Gary, Argonne National Laboratory, Washington, DC	
Yeager, Jim, Department of Energy, Washington, DC	
Yevsikov, Ph.D., Victor V., Defence Conversion Technologies, Inc., Bethesda, MD	
Zerm, Ronald W., Pantex Plant Citizen's Advisory Board, Amarillo, TX	
April 22, 1996—Amarillo, Texas	
Evening Session	2–45 to 2–50
Alvarez, Juan, Mason & Hanger, Amarillo, TX	
Ball-Kaufman, Audrey, Amarillo, TX	
Bass, Robert L., Amarillo, TX	
Battle, Margaret, Amarillo, TX	
Berman, Herbert S., Mason & Hanger, Amarillo, TX	
Bingham, William B., Mason & Hanger, Amarillo, TX	
Bivins, Teel, State Senator for Texas, Amarillo, TX	

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Bosch, Dianne, City of Amarillo, Texas, Amarillo, TX	
Boydston, Jimmy, Potter County, Amarillo, TX	
Bradshaw, Ray, Amarillo, TX	
Breeding, Paula, Peace Farm, Amarillo, TX	
Bronkema, Daniel P., Department of Interior, Amarillo, TX	
Brungardt, Vickie, Western National Bank, Amarillo, TX	
Bryant, Fred C., Texas Tech University, Lubbock, TX	
Buege, Todd, Amarillo, TX	
Bullock, Robert A., Amarillo, TX	
Calvert, Rita, Dallas Peace Center, Dallas, TX	
Carron, Igor, Amarillo Resource, Amarillo, TX	
Clark, Joseph, Mason & Hanger, Amarillo, TX	
Clayton, Doyle R., Sr., Amarillo, TX	
Coffey, Kelvin, Pantex Mason & Hanger, Amarillo, TX	
Collins, Shane, Department of Energy, Washington, DC	
Crabtree, Bryan, Mason & Hanger, Canyon, TX	
Crenshaw, William T., Southwestern Public Service Company, Amarillo, TX	
Cuckett, Jeannette R., Mason & Hanger, Amarillo, TX	
Dalton, Don & Pat, Amarillo, TX	
Dalton, Pat, Mason & Hanger, Amarillo, TX	
Davis, Elizabeth P., Pantex/IAM, Claude, TX	
Deaver, Boyd E., Texas Natural Resources Conservation Committee, Amarillo, TX	
Deaver, Jolee, Amarillo, TX	
Detten, Danny, Panhandle, TX	
Dewey, Amy E., Senator Teel Bivin's Office, Amarillo, TX	
Dones, Marilyn, Mason & Hanger, Amarillo, TX	
Edmondson, Richard, Texas Division of Emergency Management, Amarillo, TX	
Edwards, Thomas, Texas Attorney General's Office, Austin, TX	
Faubion, Bill D., Mason & Hanger, Amarillo, TX	
Flood, Edward, Ed Flood Oil Co., Amarillo, TX	
Franklin, Kenneth W., Mason & Hanger, Amarillo, TX	
Froemsdorf, Gary L., Texas Department of Health, Austin, TX	
Garett, Lnsean, Mason & Hanger, Amarillo, TX	
Gattis, Beverly, STAND of Amarillo Inc., Amarillo, TX	
George, Pam, Pantex, Amarillo, TX	
George, Frank W., Jr., Metal Trades Council AFL/CIO, Amarillo, TX	
Gleghorn, Ginnie, The Perryman Group, Amarillo, TX	
Graves, Dorothy, Amarillo, TX	
Gray, David L., Mason & Hanger, Amarillo, TX	
Green, Donald L., Plumbers & Pipefitters Local Union 196, Amarillo, TX	
Gustavsor, Thomas C., University of Texas, Austin, TX	
Halliday, Thomas C., Battelle/Pantex, Amarillo, TX	

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Harbour, Jerry, Mason & Hanger, Amarillo, TX	
Harkey, Anna Marie, Dallas Peace Center, Dallas, TX	
Harris, Kittie, Mason & Hanger, Alanreed, TX	
Hartley, Richard L., Amarillo National Resource Center for Plutonium, Amarillo, TX	
Hess, Shadon, Tetra Tech, Amarillo, TX	
Hinz, Curtis, Mason & Hanger, Amarillo, TX	
Hollowell, Betty, Department of Energy, Amarillo, TX	
Holuman, Charles, Amarillo, TX	
Huff, Jewett E., Gene Huff Law Offices, Amarillo, TX	
Icke, Jeff, Senator Tom Haywood's Office, Austin, TX	
Jarnegin, Elizabeth, *Global News*, Amarillo, TX	
Johnson, Charles R., Texas A & M University, College Station, TX	
Johnson, James D., Royal Limo Service & Budget Movers, Amarillo, TX	
Johnson, Wookie, Amarillo, TX	
Jones, Troy E., Mason & Hanger, Amarillo, TX	
Juba, Amy, Merrill Lynch, Amarillo, TX	
Juba, Bob, Amarillo Economic Development Corp., Amarillo, TX	
Kay, Gary, Dean, Amarillo, TX	
Keenan, Kevin, Department of Energy, Golden, CO	
Keith, Jeffery B., Pantex Plant Citizens Advisory Board, Amarillo, TX	
Keller, Dale, Mason & Hanger, Lexington, KY	
Kelley, Walt, Amarillo and Potter/Randall Counties, Amarillo, TX	
Keys, Robert, City of Amarillo, Amarillo, TX	
Kleuskens, Tonya, Pantex Plant Citizens' Advisory Board, Hereford, TX	
Knapp, Kevin P., City of Amarillo, Amarillo, TX	
Lecknder, Russell P., Texas Department of Public Safety, Austin, TX	
Lemming, John F., Amarillo, TX	
Lemming, Sandy, Amarillo, TX	
Lerm, Ron, Mason & Hanger, Amarillo, TX	
Leslie, Tracey, Department of Energy, Germantown, MD	
Long, Kevin, Mason & Hanger, Amarillo, TX	
Martillotti, Joseph A., Texas Department of Health, Austin, TX	
Martin, Harriet, Athens, OH	
Matney, Paul, Amarillo, TX	
Maxie, Donald B., Amarillo, TX	
McBride, Donald D., Battelle/Pantex, Amarillo, TX	
McNerney, Michael, University of Texas, Austin, TX	
Merchant, Barbara & Leonard, Amarillo, TX	
Meyer, Geoffrey, State of Texas Natural Resource Conservation Commission, Austin, TX	
Michaels, David, Amarillo, TX	
Miller-Qtashne, Lola, Amarillo, TX	
Montgomery, Betty, Amarillo, TX	

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Moore, Jason B., Tetra Tech Inc., Albuquerque, NM	
Mulder, Roger, Office of the Governor, Austin, TX	
Murphy, Jim, Amarillo, TX	
Nance, Bonnie Lee, Battelle/Pantex, Amarillo, TX	
Nance, Roger, Mason & Hanger, Amarillo, TX	
Ovenstone, Jean, Chamber of Commerce, Amarillo, TX	
Owen, Robert M., Sr., Amarillo, TX	
Papp, A. G., Battelle/Pantex, Amarillo, TX	
Papp, Karen, AISO, Amarillo, TX	
Paradee, Larry, Department of Energy, Amarillo, TX	
Parker, Don, Mason & Hanger, Amarillo, TX	
Patterson, Ed, Native Texans, Amarillo, TX	
Patterson, Tom R., Chamber of Commerce, Amarillo, TX	
Peddicord, Kenneth, Texas A & M University, College Station, TX	
Powers, Trey G., Senator Tom Haywood's Office, Austin, TX	
Poynor, Emmett D., Amarillo, TX	
Qtashne, Paul, Pantex, Amarillo, TX	
Raef, Mina, Amarillo, TX	
Reed, Vance, Amarillo Economic Development Corporation, Amarillo, TX	
Risley, Lloyd, T & D, Amarillo, TX	
Robinson, Johnnie, Mason & Hanger Silas Mason Co. Inc., Borger, TX	
Rock, James, Texas A & M University, College Station, TX	
Ruddy, Vic, Amarillo, TX	
Sanders, Jan, Peace Action Texas, Dallas, TX	
Scates, Amanda L., Amarillo, TX	
Schaben, Robert, Dyna Pump Inc., Amarillo, TX	
Schuster, J. K., Mason & Hanger, Amarillo, TX	
Seewald, William H., STAND/STAR, Amarillo, TX	
Self, Mark C., Mason & Hanger, Amarillo, TX	
Seliger, Kel, Amarillo, TX	
Sellers, George, Amarillo, TX	
Sesemore, Brent, City of Amarillo, Amarillo, TX	
Shennum, Mary L., Amarillo, TX	
Simmons, Judson, Pantex, Amarillo, TX	
Smith, Cynthia, Randall Co., Canyon, TX	
Smith, Doris B., Panhandle Area Neighbors and Landowners, Panhandle, TX	
Snodgrass, Tamara, Sunray, TX	
Spencer, D. F., Groom, TX	
Stange, Joe M., Boatmans First National Bank, Amarillo, TX	
Stevens, Gary O., Southwestern Bell, Amarillo, TX	
Stevens, James, Mason & Hanger, Amarillo, TX	
Sticksel, Hugh, Amarillo, TX	

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Teichmann, Paul A., Mason & Hanger, Amarillo, TX	
Thomas, Tracy, Pantex IAM, Amarillo, TX	
Tietgens, Bill, Amarillo, TX	
Tucker, Terry, Mason & Hanger, Amarillo, TX	
Underwood, Vinaw, Amarillo, TX	
Van Petten, Marilyn J., Pantex Plant Citizens Advisory Board, Amarillo, TX	
VanArsdall, Clyde J., Mason & Hanger, Amarillo, TX	
Von Eschen, Robert L., Mason & Hanger, Amarillo, TX	
Whicker, Lawrence V., III, Amarillo, TX	
Whicker, Lawrence V., Jr., Mason & Hanger, Amarillo, TX	
Wilcox, Richard A., Mason & Hanger, Amarillo, TX	
Wiley, Roscoe, Amarillo, TX	
Wilhelm, Danny, Mason & Hanger, Amarillo, TX	
Williams C. E., Panhandle Ground Water Conservation District No. 3, White Deer, TX	
Woltermann, Tony, Pantex, Amarillo, TX	
Woychik, Jim D., Amarillo, TX	
Zenor, Becky, Amarillo Chamber of Commerce, Amarillo, TX	
April 23, 1996—Amarillo, Texas	
Morning Session	2–50 to 2–51
Alley, Clyde D., Mason & Hanger, Amarillo, TX	
Bass, Robert L., Amarillo, TX	
Baumgardner, Paul, ANALAB Environmental Laboratory, Amarillo, TX	
Berman, Herbert S., Mason & Hanger, Amarillo, TX	
Bohlander, Cecil "Merle," Amarillo, TX	
Bowes, Ashley, Amarillo National Bank, Amarillo, TX	
Boyle, David, Texas A & M University, College Station, TX	
Burton, Douglas K., Mason & Hanger, Amarillo, TX	
Costa, Rick, Texas Natural, Amarillo, TX	
Dewey, Amy E., Senator Teel Bivin's Office, Amarillo, TX	
Fike, David, Mason & Hanger, Amarillo, TX	
Floyd, Shirley, Amarillo National Resource Center for Plutonium, Amarillo, TX	
Francis, Shaela, Amarillo, TX	
Franklin, Kenneth W., Mason & Hanger, Amarillo, TX	
Gleghorn, Ginnie, The Perryman Group, Amarillo, TX	
Halliday, Thomas C., Battelle/Pantex, Amarillo, TX	
Harris, Bill, Amarillo National Resource Center for Plutonium, Amarillo, TX	
Hollowell, Betty, Department of Energy, Amarillo, TX	
Hooten, David, Mason & Hanger, Amarillo, TX	
Lean, Ronald W., Amarillo, TX	
Miller-Qtashne, Lola, Amarillo, TX	
Ruddy, Karen, Amarillo College, Amarillo, TX	
Sanders, Jan, Peace Action Texas, Dallas, TX	

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April 23, 1996—Amarillo, Texas ***Afternoon Session*** Alley, Clyde D., Mason & Hanger, Amarillo, TX Bailey, Donald W., Mason & Hanger, Amarillo, TX Baumgardner, Paul, ANALAB Environmental Laboratory, Amarillo, TX Berman, Herbert S., Mason & Hanger, Amarillo, TX Bourn, Michael R., City of Amarillo Economic Development, Amarillo, TX Bowes, Ashley, Amarillo National Bank, Amarillo, TX Boyle, David, Texas A & M University, College Station, TX Brown, Michelle F., Battelle/Pantex, Canyon, TX Bullock, Robert A., Amarillo, TX Dewey, Amy E., Senator Teel Bivin's Office, Amarillo, TX Floyd, Shirley, Amarillo National Resource Center for Plutonium, Amarillo, TX Francis, Shaela, Amarillo, TX Franklin, Kenneth W., Mason & Hanger, Amarillo, TX Halliday, Thomas C., Battelle Pantex, Amarillo, TX Harris, Bill, Amarillo National Resource Center for Plutonium, Amarillo, TX Heim, David L., DLH & Associates, Amarillo, TX Herring, Kathleen M., Amarillo, TX Hicks, Burnis G., Amarillo, TX Hollowell, Betty, Department of Energy, Amarillo, TX Hopson, Richard D., Mason & Hanger/Pantex, Canyon, TX Hudson, John, Mason & Hanger, Amarillo, TX Martillotti, Joseph A., Texas Department of Health, Austin, TX McFadden, Greg, KGNC News, Amarillo, TX Miller, Bryan, Amarillo, TX Molberg, Gary, Amarillo National Bank, Amarillo, TX Pharr, Marshall A., Southwestern Public Service Company, Amarillo, TX Reese, Edwin, Mason & Hanger/Pantex, Amarillo, TX Sheth, Raj, Battelle-Pantex, Amarillo, TX Sims, Barry, SCIENTECH/Pantex, Amarillo, TX Sproul, Elizabeth A., Amarillo, TX Teichmann, Paul A., Mason & Hanger, Amarillo, TX Todd, Charles, Amarillo, TX	2–51 to 2–52
April 25, 1996—Santa Fe, New Mexico ***Afternoon Session*** Alena, Barbara, Santa Fe, NM Angle, Karen L., Santa Fe, NM Awclair, William J., Santa Fe, NM	2–52 to 2–58

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Bard, Carolyn J., Santa Fe, NM	
Barnes, Elizabeth A., Santa Fe, NM	
Barton, M., Santa Fe, NM	
Bascom, Samuel F., El Prado, NM	
Baum, Louise A., Santa Fe, NM	
Bethani, Zuleikaa, Santa Fe, NM	
Bice, Amy M., Tesuque, NM	
Bind, Nathilde G., Santa Fe, NM	
Brody, Blanche, Santa Fe, NM	
Brookins, Lura M., Santa Fe Botanical Gardens, Santa Fe, NM	
Brooks, Marcie, Santa Fe, NM	
Brown, Dorothea, Santa Fe, NM	
Buonaiuto, Michael, Santa Fe, NM	
Burton, Mary, Santa Fe, NM	
Chase-Daniel, Matthew Z., Santa Fe, NM	
Clark, Arthur B., Santa Fe, NM	
Clarke, Laura, Concerned Citizens for Nuclear Safety, Santa Fe, NM	
Clarke, Sanford, Santa Fe, NM	
Cristofani, Carolyn S., Tesuque, NM	
Cucchiara, Al, Muscular Development & Rehabilitation Ltd., Los Alamos, NM	
Curry, Ron, Albuquerque, NM	
Dailly, Micaela, Santa Fe, NM	
Danneskiold, James, Santa Fe, NM	
Dasburg, Ann, Concerned Citizens for Nuclear Safety, Santa Fe, NM	
Dellibovi, Eric, Tesuque, NM	
Dooley, William P., Santa Fe, NM	
Doyle, Bill, Santa Fe, NM	
Dumesnil, James H., Santa Fe Department–LELL Tech, Santa Fe, NM	
Dvrnell, Delores, Santa Fe, NM	
Easthouse, Keith E., *The Santa Fe New Mexican*, Santa Fe, NM	
Elkington, Harriet, Santa Fe, NM	
Fiels, Craig, Santa Fe, NM	
Flowers, Sharon, Santa Fe, NM	
Gee, Marie, Santa Fe, NM	
Gold, Shelly S., Santa Fe, NM	
Gonzales, Don Di, Dog & Associates, Santa Fe, NM	
Goodman, Lois A., Concerned Residents Santa Fe North, Santa Fe, NM	
Gould, Bill, Santa Fe, NM	
Grant, Brita W., Santa Fe, NM	
Griego, Juan L., Department of Energy, Los Alamos, NM	
Griggs, Renee M., State of New Mexico, Santa Fe, NM	
Grothus, Edward B., Los Alamos, NM	

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Hargreaves, John, Santa Fe, NM	
Harris, Beth, Santa Fe, NM	
Hebert, Marjo, Human Race, San Juan Pueblo, NM	
Hengst, Christy E., Santa Fe, NM	
Henning, Marcia J., Los Alamos Study Group, Santa Fe, NM	
Higgins, Sharon A., Los Alamos Study Group, Santa Fe, NM	
Hinton, Carol E., San Cristobal, NM	
Hitt, Sam, Santa Fe, NM	
Hobbs, Alfred S., Taos, NM	
Hoff, Marilyn G., Santa Fe, NM	
Horner, Wes P., Santa Fe, NM	
Isberg, Borrke L., Humanity, Santa Fe, NM	
Jednak, John & C'Lu, Galisteo, NM	
Kessler, Michael C., Santa Fe, NM	
Kline, Karen M., Santa Fe, NM	
Ladino, Tony, Department of Energy, Los Alamos, NM	
Lake, Bud, City/Co of Santa Fe, Santa Fe, NM	
Lamunlere, Carolyn P., Santa Fe, NM	
Lamunlere, Jean Marc, Santa Fe, NM	
Lass, Richard J., Green Party of Rio Arriba, Fairview, NM	
Lee, Mark R., Lamy, NM	
Levy, Allen J., Arlington, VA	
Lichtenstein, Marsha, Green Party, Santa Fe, NM	
Lockhart, Milton, Responsible Environmental Action League, Los Alamos, NM	
Long, Philip B., Open Door Communication Associate, Santa Fe, NM	
Lowe, Judith M., Santa Fe, NM	
Lowe, Rosemary, Santa Fe, NM	
Luce, Ralph A., Santa Fe, NM	
Lutz-Schaid, Heide, Santa Fe, NM	
Lysne, James V., Concerned Citizens Nuclear Safety, Santa Fe, NM	
Macfarland, Jean, Santa Fe, NM	
Maestas, Emilio, LEPC, Ojo Caliente, NM	
Maestas, Susan, Rio Arriba County, Ojo Caliente, NM	
Malten, Willem, Santa Fe, NM	
Marble, Katharine G., Santa Fe, NM	
Masler, Daniel E., Santa Fe, NM	
McMullen, Penelope, Sisters of Loretto, Santa Fe, NM	
Meneely, Dorethea, San Jose, NM	
Miller, Katya, Santa Fe, NM	
Moorhead, Marilyn, Santa Fe, NM	
Morales, Gloria, Santa Fe, NM	

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Mosgrave, Kent N., Los Alamos National Laboratory, Los Alamos, NM	
Napier, Jane, Pihcitas, NM	
Nelson, David C., Santa Fe, NM	
Ohning, Dell, Santa Fe, NM	
Otter, John, Santa Fe, NM	
Page, Jean V., Santa Fe, NM	
Pecis, Jacob N., Cochiti Environmental Office, Cochiti, NM	
Potts, Pearl, Cerrillos, NM	
Powers, Edith, Santa Fe, NM	
Powers, Peggy, Los Alamos National Laboratory-ESHZO, Santa Fe, NM	
Raborg, Medora L., Santa Fe, NM	
Rapp, Manfred, Santa Fe, NM	
Rolland, Janna L., Physicians for Social Responsibility/New Mexico, Albuquerque, NM	
Schelander, Linda A., Santa Fe, NM	
Schmidt, D. Raymond, Santa Fe, NM	
Schoech, Dorothy A., Santa Fe, NM	
Sedillo, Sylvia L., Sisters of Loretto, Santa Fe, NM	
Seppanen, Jeffery, Cerrillos, NM	
Seymour, Marion, Green Party, Santa Fe, NM	
Shea, John M., Santa Fe, NM	
Silvers, Arthur H., Green Party, Santa Fe, NM	
Silvers, Taj A., Green Party, Santa Fe, NM	
Singer, Raymond, Santa Fe, NM	
Skinner, Elliott, Santa Fe, NM	
Smith, Kent, Santa Fe, NM	
Sol, Marie, Santa Fe, NM	
Sterling, Ron, Green Party, Santa Fe, NM	
Stratton, William R., Los Alamos, NM	
Swanson, Sonja R., Santa Fe, NM	
Thorne, Karey, Santa Fe, NM	
Treisman, Eric, Santa Fe, NM	
Tufft, Mary R., Santa Fe, NM	
Valdo, Gary M., Cochiti Environmental Protection Office, Cochiti Pueblo, NM	
Valley-Fox, Anne, Project Crossroads, Santa Fe, NM	
Velard, Archie, Espanola, NM	
Waber, Jim T., Santa Fe, NM	
Waterman, Robert D., Santa Fe, NM	
Weser, William J., One Life, Santa Fe, NM	
West, Cynthia, Santa Fe, NM	
White, Terry W., Green Party, Santa Fe, NM	
Yatabe, John M., Department of Energy, Pleasanton, CA	
Young, Kay A., Ribera, NM	

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Adams, James P., Santa Fe, NM	
Aeby, Ian, Espanola, NM	
Altshulen, Deborah L., Santa Fe, NM	
Ariel, Aviva, Santa Fe, NM	
Atkinson, Kass, Santa Fe, NM	
Baerwald, Donna, Skin Care Co., Santa Fe, NM	
Bean, Rose, Flowering Tree Permaculture Inst., Fairview, NM	
Beauvais, Philippine M., Santa Fe, NM	
Beavers, Ruben D., Local 412, Santa Fe, NM	
Bluestein, Martin A., Santa Fe, NM	
Bober, Carole M., Santa Fe, NM	
Boettcher, Carlotta E., Santa Fe, NM	
Bonneau, Bonnie, Legions of Living Light, El Prado, NM	
Briley, Siona, Santa Fe, NM	
Brink, Deborah M., Santa Fe, NM	
Brown, Christina H., Espanola, NM	
Brown, George H., Santa Fe, NM	
Brown, Samantha J., Santa Fe, NM	
Buonaiuto, Michael, Santa Fe, NM	
Buonaiuto, Shelley A., Santa Fe, NM	
Burton, Nina I., Santa Fe, NM	
Callioni, Alan, Santa Fe, NM	
Cameron, David R., Santa Fe, NM	
Carlisle, Galilee, Dixon, NM	
Cartwright, Lee, Santa Fe, NM	
Castor, Pam R., Santa Fe, NM	
Channing, Will, Santa Fe, NM	
Chilos, Windy, Chillicothe, IL	
Collins, Michael T., Green Party, Santa Fe, NM	
Crawford, Amelia, Santa Fe, NM	
Curtis, Susann L., Santa Fe, NM	
Davis, John R., Santa Fe, NM	
Davis, Tammy L., Santa Fe Green Party, Santa Fe, NM	
Dawkins, Cecil, Santa Fe, NM	
De Vito, Deborah, Green Peace, Santa Fe, NM	
Denman, Nelson, People for Peace, Santa Fe, NM	
Diane, Susan, All Peoples Coalition, Santa Fe, NM	
Duckworth, Kevin B., Santa Fe, NM	

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Farris, Victoria, Santa Fe, NM	
Fish, Ted, Philos Learning Center, Santa Fe, NM	
Follingstad, Eric R., Santa Fe, NM	
Franz, Lisa-Marie M., Santa Fe, NM	
French, Patrick	
Garcia, Dolores, Senator Jeff Bingaman's Office, Santa Fe, NM	
Gent, Elise L., LIFE, Santa Fe, NM	
Gent, Huntor L., LIFE, Santa Fe, NM	
Gent, Lucy A., LIFE, Santa Fe, NM	
Goldberg, Ellen, Santa Fe, NM	
Goldkoop, Yocie, Santa Fe Community School, Santa Fe, NM	
Goodwin, Sage, A. L, Santa Fe, NM	
Hages, Yvonne K., People for Peace, Santa Fe, NM	
Hansen, Kristin J., Santa Fe, NM	
Hayes, Alan D., People for Peace, Santa Fe, NM	
Helmer, Donald R., Los Alamos, NM	
Helms, Connie J., Santa Fe, NM	
Herling, Adam S., Kid Works, Santa Fe, NM	
Herring, Kathleen M., Amarillo, TX	
Hesch, Bernadine D., Santa Fe, NM	
Hoopis, Stephen, Santa Fe, NM	
Howard, Deja E., Santa Fe, NM	
Isberg, Borrke L., Humanity, Santa Fe, NM	
Jackie, Whitridge, Tesuque, NM	
Jensen, Mark S., Santa Fe, NM	
Jones, Heloise, Santa Fe, NM	
Kalkstein, Joshua M., Santa Fe, NM	
Kamine, Marjorie, Santa Fe, NM	
Keen, Ben, Santa Fe, NM	
Keen, Betty, Green Party, Santa Fe, NM	
Khalsa, Satpurkha K., Santa Fe, NM	
Klemons, Susan R., Santa Fe, NM	
Klinger, Judy A., Santa Fe, NM	
Kurien, Abraham V., Santa Fe, NM	
Le Clair, Miriam J., Santa Fe, NM	
Leavitt, Stanley R., AARP, Santa Fe, NM	
Levi, Salena, Santa Fe, NM	
Lockhart, Milton, Responsible Environmental Action League, Los Alamos, NM	
Louato, Anhara C., Tesuque, NM	
Lysne, Lee, Concerned Citizens for Nuclear Safety, Santa Fe, NM	
Mack, Craig H., Santa Fe, NM	
Maffey, Frances A., Santa Fe, NM	

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Mattson, John A., RET, Santa Fe, NM	
May, Flo, Santa Fe, NM	
McCarthy, Colleen, Santa Fe, NM	
McIntosh, William B., VA Local Union 412, Santa Fe, NM	
McKenna, Joseph, Santa Fe, NM	
Mechels, Chris I., Santa Fe, NM	
Mello, Greg, Los Alamos Study Group, Santa Fe, NM	
Mercier, Tyler, Santa Fe, NM	
Michels, Nancy S., Santa Fe, NM	
Millard, Elizabeth V., Santa Fe, NM	
Miller, Virginia J., People for Peace, Santa Fe, NM	
Moffat, Eric, Santa Fe, NM	
Moffat, Susan, Santa Fe, NM	
Montano, Charles M., CLER, Los Alamos, NM	
Montano, Elaine F., Los Alamos, NM	
Murphy, John F., Santa Fe, NM	
Naranjo, Fidel, Los Alamos, NM	
Newton, Rachel A., Santa Fe, NM	
Nowakoski, Ruth A., Taos, NM	
Panzeter, Phyllis L., The Sanctuary Foundation, Santa Fe, NM	
Parsons, William M, Department of Energy, Santa Fe, NM	
Pendergrass, Ann, Los Alamos, NM	
Peper, Chuck W., Santa Fe, NM	
Perrine, Audrey S., Santa Fe, NM	
Pineda, Elma N., Santa Fe, NM	
Popkin, Francine H., Santa Fe, NM	
Prince, Margaret L., Santa Fe, NM	
Rice, Linda C., Galisteo, NM	
Rikoon, Rob, Santa Fe, NM	
Rivera, Juan D., Local Union 412, Pecos, NM	
Roddick, Ellen, Santa Fe, NM	
Rolland, T., Santa Fe, NM	
Rose, Jasse, Santa Fe, NM	
Rosenberg, Rosalie, Santa Fe, NM	
Ryan, Rick, Santa Fe, NM	
Sanchez, Benjarin J., Santa Fe, NM	
Schumont, Jim M., Care Construction, Santa Fe, NM	
Seaman, Jane, Santa Fe, NM	
Seese, Linda, Santa Fe, NM	
Serrano, Ramon J., Santa Fe, NM	
Shapolia, Al, Anti-Nuke, Santa Fe, NM	

TABLE 1.3–2.—*Index of Attendance at Public Hearings* [Page 29 of 32]

Public Hearing Attendees	Document Page No.
April 25, 1996—Santa Fe, New Mexico (continued)	
Evening Session	2–58 to 2–67
Shelton, Jay W., Santa Fe, NM	
Shipley, Kathleen E., Santa Fe, NM	
Shulman, Howard R., Santa Fe, NM	
Simpson, Patrick K., Santa Fe, NM	
Sing, Ningay, Santa Fe, NM	
Skardis, Jonas R., Santa Fe, NM	
Smith, Brent S., Santa Fe, NM	
Smith, Lisa D., Santa Fe, NM	
Spidell, Haydon J., Jr., Santa Fe, NM	
Stein, Pamelä N., Santa Fe, NM	
Steinberg, Adam B., Santa Fe, NM	
Steinhoff, Monika, Santa Fe, NM	
Stevens, Judy, MNAFF, Santa Fe, NM	
Stone, Suzanne, World Peace, Santa Fe, NM	
Talberth, Charlotte, Santa Fe, NM	
Thomas, Marilynn S., Santa Fe, NM	
Thomas, Charles C., Jr., Santa Fe, NM	
Thomson, Marylee A., Santa Fe, NM	
Vaill, Holiday H., Santa Fe, NM	
Vaill, Rick, Santa Fe, NM	
Valenzuela, Armando R., Santa Fe, NM	
Vandenheede, Fred A., Santa Fe, NM	
Vasterling, Jeffrey, Santa Fe, NM	
Von Horvath, Irene, Santa Fe, NM	
Walling, Alec T., Santa Fe, NM	
Weaver, Larry, Santa Fe, NM	
Webb, Diana, Los Alamos National Laboratory, Los Alamos, NM	
Whitesides, Audrey E., Santa Fe, NM	
Wilhecm, Carl A., Santa Fe, NM	
Wray, Russell, Santa Fe, NM	
Yanicak, Steve M., Espanola, NM	
Yarnell, Christopher R., Santa Fe, NM	
Yarnell, Christa R., Santa Fe, NM	
Zimmerberg, Jessica M., Santa Fe, NM	
Zimmerberg, Jonah S., Santa Fe, NM	
April 30, 1996—North Augusta, South Carolina	
Morning Session	2–67 to 2–72
Abdallah, Debra, Citizens for Environmental Justice, Savannah, GA	
Abdallah, Mustafah, Citizens for Environmental Justice, Savannah, GA	
Albenze, Mark, Westinghouse Electric Corporation, Aiken, SC	
Arnold, Edward, Physicians for Social Responsibility, Decatur, GA	

TABLE 1.3–2.—*Index of Attendance at Public Hearings* [Page 30 of 32]

Public Hearing Attendees	Document Page No.
April 30, 1996—North Augusta, South Carolina (continued)	2–67 to 2–72
Morning Session	
Attardo, Lewis C., SRRDI, Aiken, SC	
Birt, Gretchen, Tri County Alliance, Barnwell, SC	
Bolen, James, Department of Energy, Aiken, SC	
Bridges, Donald N., Department of Energy, Aiken, SC	
Cadotte, Bruce, Westinghouse Savannah River Company, Aiken, SC	
Clemmens, John P., Stone & Webster Engineering Corp., Aiken, SC	
Costikyan, Thomas W., Citizen Advisory Board, Dataw Island, SC	
Crawford, Todd V., New Ellenton, SC	
Davis, Marion, Teamsters, Bamberg, SC	
Edwards, Dana L., Citizens for Environmental Justice, Savannah, GA	
Ellism, Donald, Westinghouse Savannah River Company, North Augusta, SC	
Geddes, Richard L., North Augusta, SC	
Graf, Eugene L., North Augusta, SC	
Hardeman, Jim, Georgia Department of Natural Resources, Atlanta, GA	
Hawyins, Monte, Westinghouse Savannah River Company, North Augusta, SC	
Hodge, Albert M., Jr., Metro Augusta Chamber of Commerce, Augusta, GA	
Jernigan, Gail F., Westinghouse Savannah River Company, Williston, SC	
Johnson, Thomas, Jr., Department of Energy/Savannah River, North Augusta, SC	
Joly, Ronald, Bechtel, Beech Island, SC	
Juba, Bob, Amarillo Economic Development Corp., Amarillo, TX	
Kirkland, James, Transnuclear Inc., Aiken, SC	
Konte, Asiya DeBorah, CFEJ, Savannah, GA	
Losey, David C., Aiken, SC	
Martin, Donna K., Westinghouse Savannah River Company, Aiken, SC	
Mayson, William P., Jr., Augusta, GA	
McCormick, Matt, Department of Energy/RFFO, Golden, CO	
Miller, Ronald C., Aiken, SC	
Noah, J. Christopher, Sr., Evans, GA	
Overman, Robert F., Aiken, SC	
Poe, William Lee, Aiken, SC	
Rivard, Caroline E., Women's Action for New Directions, Atlanta, GA	
Rogers, F. Wayne, Lower Savannah Council of Governments, Aiken, SC	
Russell, Lawrence, Jr., Hephzibah, GA	
Sanders, Wilburn C., Bechtel Savannah River Site, North Augusta, SC	
Schill, Karin, *The Augusta Chronicle*, Augusta, GA	
Smith, Arthur, Hyde Park & Aragon Park Improvement Committee Inc., Augusta, GA	
Story, Raymond, Asbestos Workers, Ridge Spring, SC	
Utler, Charles N., Hyde Park & Aragon Park Improvement Committee Inc., Augusta, GA	
White, Carolyn, Citizens for Environmental Justice, Savannah, GA	
Wilcox, Rodney C., Westinghouse Savannah River Company, Aiken, SC	
Wilkinson, Corry, Lawrence Livermore National Laboratory, Germantown, MD	
Woefe, Ginny, Westinghouse Savannah River Company, Aiken, SC	

TABLE 1.3–2.—*Index of Attendance at Public Hearings* [Page 31 of 32]

Public Hearing Attendees	Document Page No.
April 30, 1996—North Augusta, South Carolina	
Evening Session	2–72
Abbott, Tom E., Aiken Small Business–Chamber, Aiken, SC	
Abrams, Grady, Bechtel, Martinez, GA	
Ali, Valentis F., VFA Income Tax Service Inc., Augusta, GA	
Benjamin, Richard W., Westinghouse Savannah River Company, North Augusta, SC	
Brown, Lance T., Westinghouse Savannah River Company, Martinez, GA	
Callicots, Will, Westinghouse Savannah River Company, Aiken, SC	
Campbell, Charles, Westinghouse Savannah River Company, Aiken, SC	
Cook, Sybil, Science Applications International Corp., Aiken, SC	
Costikyan, Thomas W., Citizen Advisory Board, Dataw Island, SC	
Dewes, John, American Nuclear Society	
Duane, John, Westinghouse Savannah River Company, Aiken, SC	
Ellism, Donald, Westinghouse Savannah River Company, North Augusta, SC	
Erwin, William D., Westinghouse Savannah River Company, Aiken, SC	
Finklea, Sam, State of South Carolina, Columbia, SC	
Flake, Tim P., Westinghouse Savannah River Company, Clarks Hill, SC	
Floyd, Edward E., LIUNA Local 1137, Augusta, GA	
Gilkison, Joseph, Martinez, GA	
Gschwendner, Robert, North Augusta, SC	
Hardeman, Jim, Georgia Department of Natural Resources, Atlanta, GA	
Hassenfeldt, Joseph, Department of Energy, Washington, DC	
Hills, Warren, LIUNA Local 1137, Augusta, GA	
Hodge, Albert M., Jr., Metro Augusta Chamber of Commerce, Augusta, GA	
Jernigan, Gail F., Westinghouse Savannah River Company, Williston, SC	
Jones, Albert, Westinghouse, Swainsboro, GA	
Jones, Thelonious, Augusta, GA	
Juba, Bob, Amarillo Economic Development Corp., Amarillo, TX	
Lanier, Clayton M., BSRI Construction, Martinez, GA	
Lawler, William, Paine College, Augusta, GA	
Lindholm, Mark A., Westinghouse Savannah River Company, North Augusta, SC	
Liutkus, Tony, Martinez, GA	
Maher, Robert, Westinghouse Savannah River Company, North Augusta, SC	
McClure, Anne, Service First Inc., Athens, GA	
McCormick, Matt, Department of Energy/RFFO, Golden, CO	
McCranie, Gary, Westinghouse Savannah River Company, North Augusta, SC	
McDonell, William R., Westinghouse Savannah River Company, Aiken, SC	
Miller, Ralph S., Evans, GA	
Murff, June, The Aiken Chamber of Commerce, Aiken, SC	
Nason, Maurice, RCS Inc., North Augusta, SC	
O'Brein, Frank, North Augusta, SC	
Partlow, Beth, Office of the Governor, Columbia, SC	
Pedde, Robert A., Augusta, GA	
Rapp, Betty, Aiken, SC	

TABLE 1.3–2.—*Index of Attendance at Public Hearings* [Page 32 of 32]

Public Hearing Attendees	Document Page No.
April 30, 1996—North Augusta, South Carolina (continued)	2–72
Evening Session	
Rapp, Robert E., Westinghouse Savannah River Company, Aiken, SC	
Smith, P. K., SRS, North Augusta, SC	
Sujka, Michael F., Augusta, SC	
Sullivan, Kent, Westinghouse Savannah River Company, North Augusta, SC	
Sumner, Wallace, Westinghouse Savannah River Company, Aiken, SC	
Tansky, Richard R., Westinghouse Savannah River Company, Aiken, SC	
Ward, Clarence, NMSP, Aiken, SC	
Ware, William, Westinghouse Savannah River, Augusta, GA	
Williamson, Charles, CSWE, Belvedere, SC	
Wilson, Steve, Aiken, SC	

TABLE 1.3–3.—*Index of Commentors, Private Individuals* [Page 1 of 9]

Commentor Information	Document Number	Page Number
Aeby, Ian, Espanola, NM	SSM-H-SF-010	2–228
Aftab, Kathy, Berkeley, CA	SSM-M-025	2–271
Allan, Ruary, Oakland, CA	SSM-C-003	2–449
Alley, Clyde, Amarillo, TX	SSM-M-097	2–351
[submitted 2 comment documents]	SSM-M-098	2–353
Allred, Kathy, Perryton, TX	SSM-C-006	2–450
Anderson, William A., Berkeley, CA	SSM-C-003	2–449
Arnold, Ed, Decatur, GA	SSM-H-SRS-002	2–120
Arnold, Jerry, Pampa, TX	SSM-M-002	2–240
[submitted 2 comment documents]	SSM-C-006	2–450
Atkinson, Kass, Santa Fe, NM	SSM-H-SF-016	2–231
Atkinson, Lisa, San Mateo, CA	SSM-C-003	2–449
Avila, Robert, Oakland, CA	SSM-C-003	2–449
Bailey, Nick, Needles, CA	SSM-C-002	2–448
Baillet, Masayo, Berkeley, CA	SSM-C-003	2–449
Bartholomew, Cory, Black Earth, WI	SSM-C-003	2–449
Bartholomew, Ralph, Berkeley, CA	SSM-C-003	2–449
Bass, Robert L., Amarillo, TX	SSM-H-PTX-010	2–215
Beach, Brian, San Francisco, CA	SSM-C-003	2–449
Belenky, Lisa, San Francisco, CA	SSM-C-002	2–448
Belisle, Mavis, Panhandle, TX	SSM-H-PTX-015	2–218
Bell, Michael, Corrales, NM	SSM-C-003	2–449
Bernard, Gene, Berkeley, CA	SSM-C-003	2–449
Berry, Rick, Oklahoma City, OK	SSM-C-006	2–450
Bills, Gretchen, Amarillo, TX	SSM-C-001	2–447
Blue, J. Andrew, St. Helena, CA	SSM-C-003	2–449
Bonneau, Bonnie, El Prado, NM	SSM-M-092	2–345
Bonner, Patrick, South Gate, CA	SSM-C-006	2–450
Bowman, Majorie, El Cerrito, CA	SSM-C-003	2–449
Boyer, Karen, Pleasant Hill, CA	SSM-C-003	2–449
Bradshaw, Susan E., College Station, TX	SSM-C-006	2–450
Brechin, Vernon J., Mountain View, CA	SSM-M-108	2–394
Brewster, Lorraine, Santa Fe, NM	SSM-M-095	2–348
Brignan, John, Amarillo, TX	SSM-C-009	2–453
Brink, Deborah M., Santa Fe, NM	SSM-M-079	2–306
Brinton, Edward, West Chester, VA	SSM-C-002	2–448
Brisbane, Duncan	SSM-M-010	2–253
Brookins, Lura M., Santa Fe, NM	SSM-H-SF-015	2–231
[submitted 2 comment documents]	SSM-M-093	2–346
Brooks, Alfred A., Oak Ridge, TN	SSM-M-013	2–260
Brooks, Marcie, Santa Fe, NM	SSM-H-SF-023	2–236
Brown, Christina, Espanola, NM	SSM-H-SF-002	2–221
Brown, Elizabeth, Kensington, CA	SSM-C-003	2–449
Bruce, Frank, Oak Ridge, TN	SSM-M-014	2–261
[submitted 2 comment documents]	SSM-M-021	2–269

TABLE 1.3–3.—*Index of Commentors, Private Individuals* [Page 2 of 9]

Commentor Information	Document Number	Page Number
Bryson, Maurice, Forrestal, GA	SSM-M-037	2–279
Buchanan, Joann, Dallas, TX	SSM-C-006	2–450
Buck, R. L., Amarillo, TX	SSM-C-006	2–450
Buonaiuto, Shelley A., Santa Fe, NM	SSM-M-057	2–295
Burditt, Robert B., Oak Ridge, TN	SSM-M-125	2–418
Burum, David, San Francisco, CA	SSM-C-003	2–449
Bymes, Ione, Piedmont, CA	SSM-C-003	2–449
Caldemeyer, Michael, Santa Cruz, CA	SSM-C-002	2–448
Campbell, G. G., Amarillo, TX	SSM-C-006	2–450
Campbell, Ron, Canyon, TX	SSM-C-006	2–450
Carlson, Eric, Minneapolis, MN	SSM-M-029	2–274
Cartwright, Lee, Santa Fe, NM	SSM-F-003	2–74
Caseber, Jami, Berkeley, CA	SSM-C-003	2–449
Charless, Addis, Jr., Panhandle, TX	SSM-H-PTX-004	2–208
[submitted 2 comment documents]	SSM-C-006	2–450
Charpentier, Gerard, Clamart, France	SSM-C-003	2–449
Chase-Daniel, Matthew Z., Santa Fe, NM	SSM-H-SF-027	2–238
Chatty, Omar, San Jose, CA	SSM-H-LLNL-021	2–191
Chew, Carolyn A., Santa Fe, NM	SSM-H-SF-024	2–236
Chisholm, William K., Buhl, ID	SSM-C-002	2–448
Clinton, Pat, San Francisco, CA	SSM-C-003	2–449
Clofalo, Sam, Berkeley, CA	SSM-C-003	2–449
Coleman, Michael, Oakland, CA	SSM-C-003	2–449
Cooper, Clovis A., Sunbright, TN	SSM-H-ORR-007	2–196
Cooper, Conrad F., Wartburg, TN	SSM-H-ORR-008	2–197
Cottrell, J. Marc, Meade, Kansas	SSM-C-006	2–450
Cox, Alice and William P.	SSM-M-026	2–272
Courtoy, Michelle, Oakland, CA	SSM-C-003	2–449
Cramer, Kristina, Pleasanton, CA	SSM-C-003	2–449
Cristofani, Carolyn S., Tesuque, NM	SSM-F-008	2–83
Cummings, Peter, Santa Fe, NM	SSM-H-SF-020	2–234
Curtis, Russ, Santa Rosa, CA	SSM-M-028	2–274
Curtis, Susan L., Santa Fe, NM	SSM-M-113	2–409
Darrow, Gordon R., Seattle, WA	SSM-C-006	2–450
Davis, Kathryn, Mountain View, CA	SSM-C-003	2–449
Davis, Raima Isabel, Canyon, TX	SSM-M-117	2–410
Dawdy, Ann, Amarillo, TX	SSM-C-001	2–447
Dawkins, Cecil, Santa Fe, NM	SSM-H-SF-017	2–232
DeLong, Richard, Corpus Christi, TX	SSM-C-006	2–450
Dembowski, Susan, Oakland, CA	SSM-C-003	2–449
Detten, Danny and Bernice, Panhandle, TX	SSM-C-006	2–450
Detter, Delores, Amarillo, TX	SSM-C-010	2–453
Detter, Donald, Amarillo, TX	SSM-C-010	2–453
Diane, Susan	SSM-C-003	2–449
Dorsey, Joseph H., San Pablo, CA	SSM-C-003	2–449

TABLE 1.3–3.—*Index of Commentors, Private Individuals* [Page 3 of 9]

Commentor Information	Document Number	Page Number
Downey, Nate A., Velarde, NM	SSM-H-SF-008	2–227
[submitted 3 comment documents]	SSM-P-007	2–457
	SSM-P-008	2–458
Dudenhoeffer, Mike, Panhandle, TX	SSM-C-006	2–450
Duncan, H., Amarillo, TX	SSM-P-004	2–456
DuPrau, Dolly, Palo Alto, CA	SSM-M-006	2–244
Eaton, Patricia, Pacifica, CA	SSM-C-003	2–449
Eckard, Royce D., Livermore, CA	SSM-H-LLNL-019	2–190
Edmander, Ronald D., Amarillo, TX	SSM-C-009	2–453
Espinet, George, San Francisco, CA	SSM-C-003	2–449
Fabilli, Virginia, Oakland, CA	SSM-M-091	2–344
Farris, Victoria, Santa Fe, NM	SSM-M-082	2–308
Flangas, William G., Las Vegas, NV	SSM-H-NTS-003	2–193
Forti, Maggie, Berkeley, CA	SSM-C-003	2–449
Franklin, James C., Oak Ridge, TN	SSM-H-ORR-020	2–205
Frazer, Julian, Martinez, CA	SSM-C-003	2–449
Frey, Mark, North Newton, KS	SSM-C-006	2–450
Gage, Belle	SSM-H-PTX-013	2–216
Gaillard, Ian, Oakland, CA	SSM-C-003	2–449
Garber, Joel, Farragut, TN	SSM-H-ORR-017	2–201
Garcia, Donna, Amarillo, TX	SSM-C-006	2–450
Geddes, Rick, N. Augusta, SC	SSM-H-SRS-005	2–128
Gleason, Jay, San Mateo, CA	SSM-C-003	2–449
Goebel, Jerry, Amarillo, TX	SSM-M-094	2–347
Goldstein, Nathan, III, Amarillo, TX	SSM-C-006	2–450
Goodburn, Phillip, Amarillo, TX	SSM-C-009	2–453
Goodoll, Richard S., Amarillo, TX	SSM-H-PTX-008	2–212
Gracie, David, Philadelphia, PA	SSM-C-003	2–449
Granville, Elizabeth, El Cerrito, CA	SSM-C-003	2–449
Greenfelder, Claire, Berkeley, CA	SSM-C-003	2–449
Guena, Hale, San Francisco, CA	SSM-C-003	2–449
(last name begining with "H" unknown), Bill, Panhandle, TX	SSM-H-PTX-001	2–205
Halperin, Rosa	SSM-M-023	2–270
Hammett, Mary K., El Paso, TX	SSM-C-006	2–450
Handmacher, Lesli, Point Richmond, CA	SSM-C-003	2–449
Hansen, Kristin J., Santa Fe, NM	SSM-M-088	2–312
Harding, Jim R. and Deborah Jean, Amarillo, TX	SSM-C-006	2–450
Harkey, Anna M., Dallas, TX	SSM-H-PTX-005	2–209
[submitted 2 comment documents]	SSM-C-006	2–450
Helms, Pat, Austin, TX	SSM-C-006	2–450
Hemphill, Sharon J., Amarillo, TX	SSM-F-001	2–73
Henry, Anthony R., Philadelphia, PA	SSM-C-002	2–448
Henschel, David, San Francisco, CA	SSM-C-003	2–449
Herbst, Richard J., Los Alamos, NM	SSM-H-LANL-001	2–130
Herling, Gaile I., Santa Fe, NM	SSM-H-SF-012	2–229

TABLE 1.3–3.—*Index of Commentors, Private Individuals* [Page 4 of 9]

Commentor Information	Document Number	Page Number
Higley, Lorin D., Upland, CA	SSM-M-011	2–254
Hilley, Jeannie, Honolulu, HI	SSM-C-002	2–448
Hodgkin, Donald, CA	SSM-C-003	2–449
Hoeflich, Christine, Los Gatos, CA	SSM-C-003	2–449
Hoeflich, Wolfgang, Los Gatos, CA	SSM-C-003	2–449
Holmes, Rhonda, Oakland, CA	SSM-C-003	2–449
Hooker, Vicki, Amarillo, TX	SSM-C-009	2–453
Isberg, Brooke L., Santa Fe, NM	SSM-H-SF-001	2–221
Jara, Guy, Oakland, CA	SSM-C-003	2–449
Jeffers, Randall C., Amarillo, TX	SSM-C-001	2–447
Johnson, Cynthia, Kensington, CA	SSM-M-030	2–275
Johnson, D.H., Harriman, TN	SSM-H-ORR-019	2–204
Johnson, William Earl, Rockwood, TN	SSM-H-ORR-016	2–201
Katanlon, Mike, Amarillo, TX	SSM-C-006	2–450
Kelly, Sue, Amarillo, TX	SSM-C-006	2–450
Kiser, Bobby J., Clearlake Oaks, CA	SSM-H-LLNL-009	2–178
Kline, Karen M., Santa Fe, NM	SSM-H-SF-028	2–239
Knight, Stacy	SSM-H-PTX-011	2–215
Koa, Kalamaoka'aina-'Ohana, Las Vegas, NV	SSM-M-042	2–282
Kobasa, Stephen, New Haven, CT	SSM-P-001	2–454
Kolman, Isadore, Lafayette, CA	SSM-C-003	2–449
Kramey, James, CA	SSM-C-002	2–448
Larkin, Don, Berkeley, CA	SSM-M-106	2–365
Lebow, Michael G., Amarillo, TX	SSM-C-006	2–450
Lebow, Sherri, Amarillo, TX	SSM-C-007	2–451
Lifshutz, Yvonne S., San Antonio, TX	SSM-C-006	2–450
Livingston, Pete, San Rafael, CA	SSM-C-003	2–449
Loe, Lee, Houston, TX	SSM-M-130	2–442
Losey, David C., Aiken, SC	SSM-M-116	2–410
Lovato, Andrew, Santa Fe, NM	SSM-M-122	2–413
Lovato, Anhara	SSM-M-107	2–370
Lowe, Judith, Santa Fe, NM	SSM-F-005	2–76
Macy, Chris, Berkeley, CA	SSM-C-003	2–449
Maffey, Frances A., Santa Fe, NM	SSM-H-SF-004	2–224
Malone, Robert R.	SSM-P-006	2–457
Manning, Robert L., Oakland, CA	SSM-C-002	2–448
Marland, Peg and Bob, Kansas City, MO	SSM-M-055	2–294
Martin, Bruce, W. Hartford, CT	SSM-C-002	2–448
Martindale, Julie, Amarillo, TX	SSM-C-006	2–450
Masler, Daniel E., Santa Fe, NM	SSM-H-SF-003	2–222
[submitted 2 comment documents]	SSM-H-SF-029	2–239
Matthews, Craig E., Austin, TX	SSM-C-006	2–450
Mattson, John A., Santa Fe, NM	SSM-M-046	2–284
Mauer, Don B., Palo Alto, CA	SSM-C-003	2–449
Mayson, W. Penland, Jr., Augusta, GA	SSM-H-SRS-001	2–119

TABLE 1.3–3.—*Index of Commentors, Private Individuals* [Page 5 of 9]

Commentor Information	Document Number	Page Number
McCaffree, James R., Amarillo, TX	SSM-C-009	2–453
McElwain, Louisa A., Santa Fe, NM	SSM-H-SF-009	2–228
McFarel, Teresa, Amarillo, TX	SSM-C-006	2–450
McKenna, Joseph, Santa Fe, NM	SSM-H-SF-013	2–230
McWalters, Ann, Oakland, CA	SSM-C-003	2–449
Meadows, James R., Amarillo, TX	SSM-C-009	2–453
Mechels, Chris, Santa Fe, NM	SSM-M-004	2–242
[submitted 2 comment documents]	SSM-M-110	2–405
Menard, Robert, Oak Ridge, TN	SSM-H-SRS-004	2–128
Michaels, David L., Amarillo, TX	SSM-H-PTX-003	2–207
Michaels, J., Las Vegas, NV	SSM-H-NTS-001	2–191
Mickelson, Linda, Oakland, CA	SSM-C-003	2–449
Migliore, David, Lindenhurst, NY	SSM-C-003	2–449
Miller, Genevieve O., Dawn, TX	SSM-C-006	2–450
Miller, Helene, Oakland, CA	SSM-C-003	2–449
Miller, Robbie, Santa Fe, NM	SSM-M-121	2–412
Miller, Virginia J., Santa Fe, NM	SSM-M-085	2–310
Mills-Rekdal, Kila	SSM-M-036	2–278
Mills-Rekdal, Sheila	SSM-C-006	2–450
Mink, James A., El Sobrante, CA	SSM-C-003	2–449
Minuce, Sharon, Amarillo, TX	SSM-C-009	2–453
Mitchell, Annette, Amarillo, TX	SSM-C-001	2–447
Mohr, Josephine, Wichita, KS	SSM-C-006	2–450
Morris, Angela, Amarillo, TX	SSM-C-006	2–450
Morris, Henry, Amarillo, TX	SSM-C-006	2–450
Morris, Susan, Amarillo, TX	SSM-C-006	2–450
Murray, Minnie, Amarillo, TX	SSM-C-006	2–450
Myers, Susan E., Santa Fe, NM	SSM-H-ALB-001	2–129
Napier, John M., Oak Ridge, TN	SSM-M-032	2–275
[submitted 8 comment documents]	SSM-M-052	2–291
	SSM-M-063	2–298
	SSM-M-100	2–356
	SSM-M-101	2–357
	SSM-M-102	2–357
	SSM-M-103	2–358
	SSM-M-104	2–358
Navarrite, John, Amarillo, TX	SSM-C-009	2–453
Nesbitt, Dale, Berkeley, CA	SSM-C-003	2–449
Nichols, Jean C., Penasco, NM	SSM-M-087	2–311
Noah, J. Christopher, Ph.D., Evans, GA	SSM-H-SRS-003	2–121
Nobles, G. C., Amarillo, TX	SSM-C-006	2–450
Nolte, Donald W., Livermore, CA	SSM-M-024	2–271
O'Buchanan, Pat, Hayward, CA	SSM-P-009	2–458
Obser, Jeffrey, Oakland, CA	SSM-C-003	2–449
Oden, Nell M., Oak Ridge, TN	SSM-H-ORR-013	2–199

TABLE 1.3–3.—*Index of Commentors, Private Individuals* [Page 6 of 9]

Commentor Information	Document Number	Page Number
Olin, Phyllis, Berkeley, CA	SSM-C-003	2–449
Olin, William, Berkeley, CA	SSM-C-003	2–449
Oppermann, Bobbie J., Amarillo, TX	SSM-C-006	2–450
Orit, Adar, Santa Fe, NM	SSM-H-SF-025	2–237
Osborne, Jeri, Amarillo, TX	SSM-H-PTX-007	2–210
Osborne, Jim and Jeri, Panhandle, TX	SSM-C-006	2–450
Palmer, Marianne L., Los Gatos, CA	SSM-C-003	2–449
Palmer, Robert C., Apton, CA	SSM-C-003	2–449
Partan, Kristin D.	SSM-C-009	2–453
Peelle, R., Oak Ridge, TN	SSM-H-ORR-001	2–193
Perez, Marie, El Cerrito, CA	SSM-C-003	2–449
Perez, Tom, Fremont, CA	SSM-C-003	2–449
Perry, Lloyd and Rita, Oakland, CA	SSM-C-003	2–449
Peru, J. A., Amarillo, TX	SSM-C-006	2–450
Phonta, James N., Haywood, CA	SSM-C-003	2–449
Polk, Myron, Oakland, CA	SSM-C-003	2–449
Pollard, Judy, Alameda, CA	SSM-C-003	2–449
Pongratz, Morris B., Los Alamos, NM	SSM-H-LANL-003	2–131
Pont, Charles, Albany, CA	SSM-C-003	2–449
Powell, Don, Amarillo, TX	SSM-C-001	2–447
Price, Corrine, Oakland, CA	SSM-C-003	2–449
Prince, Peggy, Santa Fe, NM	SSM-C-003	2–449
Proctor, T. Jonathan, Concord, CA	SSM-C-003	2–449
Puarez, Felipe, Amarillo, TX	SSM-P-005	2–456
Rains, Kim, Amarillo, TX	SSM-C-006	2–450
Raison, Thomas L., Livermore, CA	SSM-H-LLNL-018	2–189
Ramirez, Louise F., Manassas Park, VA	SSM-C-002	2–448
Rauch, Thomas M., Denver, CO	SSM-M-043	2–282
Richards, Trudi, San Francisco, CA	SSM-C-003	2–449
Richings, Ken, Novato, CA	SSM-C-003	2–449
Riggs, Teryani, El Cajon, CA	SSM-C-003	2–449
Riles, Wilson C., Jr., Oakland, CA	SSM-C-002	2–448
Riley, Brooke, Berkeley, CA	SSM-C-003	2–449
Riley, Karen, Amarillo, TX	SSM-C-009	2–453
Rivers, Cecelia, Powell, TN	SSM-H-ORR-015	2–200
Roberts, Ruth, Georgetown, TX	SSM-C-006	2–450
Roberts, Stanley L., Clinton, TN	SSM-M-007	2–245
Roddick, Ellen, Santa Fe, NM [submitted 2 comment documents]	SSM-M-039 SSM-M-044	2–280 2–283
Ronald (no first name given)	SSM-C-009	2–453
Rozsnya, Balogh, Livermore, CA	SSM-P-003	2–455
Rudd, Mysti, Amarillo, TX	SSM-C-007	2–451
Rudd, Terry, Amarillo, TX	SSM-C-007	2–451
Rudder, Anita L. Amarillo, TX	SSM-C-009	2–453
Sarzynski, Mike, Amarillo, TX	SSM-C-001	2–447

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Commentor Information	Document Number	Page Number
Sauer, R. P., Oak Ridge, TN	SSM-H-ORR-006	2–196
Schelander, Linda A., Santa Fe, NM	SSM-M-056	2–294
Schrader, Don D., Albuquerque, NM	SSM-M-003	2–242
[submitted 2 comment documents]	SSM-P-002	2–454
Schumacher, Alex C., Dallas, TX	SSM-C-006	2–450
Seese, Linda M., Santa Fe, NM	SSM-M-045	2–283
Seewald, William H., Amarillo, TX	SSM-H-PTX-017	2–219
[submitted 2 comment documents]	SSM-C-006	2–450
Selman, Lucile, Amarillo, TX	SSM-C-009	2–453
Semmelbeck, Bill, Amarillo, TX	SSM-C-009	2–453
Seppanen, Jeffrey R., Cerrillos, NM	SSM-F-016	2–95
Seymour, Marion, Santa Fe, NM	SSM-M-080	2–307
Shapolia, Al, Albuquerque, NM	SSM-M-061	2–297
Shelton, Eva M., Amarillo, TX	SSM-C-001	2–447
Shennum, Mary L., Amarillo, TX	SSM-F-019	2–100
Shirley, John, Livermore, CA	SSM-H-LLNL-011	2–180
Sikora, Judith, Fort Worth, TX	SSM-C-006	2–450
Simpson, Patrick K., Santa Fe, NM	SSM-H-SF-011	2–229
Singleton, Donna, Amarillo, TX	SSM-M-119	2–411
Slater, Alice, New York, NY	SSM-C-003	2–449
Smart, M. Amarillo, TX	SSM-C-009	2–453
Smith, Doris Berg, Amarillo, TX	SSM-H-PTX-018	2–220
[submitted 2 comment documents]	SSM-M-129	2–441
Smith, Ernestine, Amarillo, TX	SSM-C-006	2–450
Smith, Hanwell	SSM-H-ORR-018	2–202
Smith, Harwell F., Jr., Oak Ridge, TN	SSM-M-005	2–243
Smith, Howard H., Palo Alto, CA	SSM-C-003	2–449
Smith, Mark, Panhandle, TX	SSM-C-010	2–453
Smith, Marshall, Denton, TX	SSM-C-006	2–450
Smith, Phillip, Panhandle, TX	SSM-C-006	2–450
SoRelle, Sara, Amarillo, TX	SSM-C-006	2–450
Speprie, Larry	SSM-C-003	2–449
Springer-Froese Mary, Colorado Springs, CO	SSM-C-006	2–450
Steiert, Kerrie and Jim, Hereford, TX	SSM-C-006	2–450
Stein, Janie, Fairfield, IA	SSM-C-006	2–450
Steinbach, John, Manassas Park, VA	SSM-C-002	2–448
Stevenson, Maria, Berkeley, CA	SSM-C-003	2–449
Stevenson, William C., Berkeley, CA	SSM-C-003	2–449
Stokes, Yvonda, Amarillo, TX	SSM-C-001	2–447
Stone, Laural, Oakland, CA	SSM-C-003	2–449
Stone, Suzanne, Santa Fe, NM	SSM-H-SF-026	2–238
Storge, P.	SSM-C-002	2–448
Stuart-Whistler, William, Media, PA	SSM-C-002	2–448
Sullivan, Cathie L., Santa Fe, NM	SSM-M-124	2–417
Sutton, Patrice, San Francisco, CA	SSM-M-027	2–273

TABLE 1.3–3.—*Index of Commentors, Private Individuals* [Page 8 of 9]

Commentor Information	Document Number	Page Number
Swackhamer, Katherine L., Orinda, CA	SSM-C-003	2–449
Tackett, Katherine, Union City, CA	SSM-C-003	2–449
Taylor, Theodore B., Wellsville, NY	SSM-C-003	2–449
Thayer, Richard, Amarillo, TX	SSM-C-006	2–450
Thomas, Janice, Berkeley, CA	SSM-C-003	2–449
Thomas, L.B., Albuquerque, NM	SSM-F-017	2–96
Thorne, Karey, Santa Fe, NM	SSM-H-SF-022	2–235
Thornton, Corine G., Hayward, CA	SSM-C-003	2–449
Todd, Frank, Amarillo, TX	SSM-C-009	2–453
Trauger, Donald B., Oak Ridge, TN	SSM-H-ORR-014	2–200
Tucker, Tracy, Amarillo, TX	SSM-C-006	2–450
Turk, Larry, Missoula, MT	SSM-M-038	2–280
Van Marissing-Mendez, Neeltje, PR	SSM-C-003	2–449
Vaughn, Joanna R., Austin, TX	SSM-C-006	2–450
Walrath, Dorothy J., Oakland, CA	SSM-C-003	2–449
Walrath, Frank L., Oakland, CA	SSM-C-003	2–449
Walter, John K., Jr., Albuquerque, NM	SSM-M-015	2–262
Wancura, Marianne S., Salida, CO	SSM-C-006	2–450
Weaver, Lany, Santa Fe, NM	SSM-H-SF-018	2–233
Wells, Madeleine, Santa Fe, NM	SSM-M-111	2–407
Wendel, Duane A., Newcastle, TX	SSM-C-006	2–450
Wendel, Jeannine P., Newcastle, TX	SSM-C-006	2–450
Wertz, Lori, Concord, CA	SSM-C-003	2–449
West, Lola A., Colorado, CO	SSM-C-002	2–448
White, Jack W. and Betty E., Pampa, TX	SSM-C-006	2–450
Wilcox, Rodney C., Aiken, SC	SSM-H-SRS-006	2–129
[submitted 2 comment documents]	SSM-M-127	2–437
Wilcox, William J., Jr., Oak Ridge, TN	SSM-M-064	2–298
[submitted 15 comment documents]	SSM-M-065	2–299
	SSM-M-066	2–299
	SSM-M-067	2–300
	SSM-M-068	2–300
	SSM-M-069	2–301
	SSM-M-070	2–301
	SSM-M-071	2–302
	SSM-M-072	2–302
	SSM-M-073	2–303
	SSM-M-074	2–303
	SSM-M-075	2–304
	SSM-M-076	2–304
	SSM-M-077	2–305
	SSM-M-078	2–305
Williams, Sally Laidlaw, Oakland, CA	SSM-M-040	2–281
Wink, Anna Marie, Amarillo, TX	SSM-M-120	2–412
Wink, Clarence F., Amarillo, TX	SSM-C-006	2–450

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Commentor Information	Document Number	Page Number
Wink, Frank M., Panhandle, TX	SSM-C-006	2–450
Woodard, Victoria, Berkeley, CA	SSM-M-048	2–288
Yanke, Marilyn, Sunray, TX	SSM-M-131	2–443
Young, Monte K., Austin, TX	SSM-C-006	2–450
Young, Terri, Amarillo, TX	SSM-C-006	2–450
Youst, Bonnie, Tesuque, NM	SSM-H-SF-021	2–235
Zahn, Kenneth C., Ph.D., Tracy, CA	SSM-M-118	2–411
Zenor, Becky	SSM-H-PTX-012	2–216
Zerm, Ronald W., Amarillo, TX	SSM-H-PTX-002	2–206
No Name Submitted	SSM-H-NTS-002	2–192
No Name Submitted	SSM-H-SF-006	2–226
No Name Submitted, Las Vegas, NV	SSM-M-041	2–281

TABLE 1.3–4.—*Index of Commentors, Organizations, and Public Officials* [Page 1 of 7]

TABLE 1.3–4.—*Index of Commentors, Organizations, and Public Officials* [Page 2 of 7]

Commentor Information	Document Number	Document Page Number
Chambliss & Bahner, PLLC, Charles N. Jolly, Chattanooga, TN	SSM-M-018	2–266
Childhood Cancer Research Institute, Seth Tuler	SSM-M-132	2–443
Citizen Alert, Richard A. Nielsen, Executive Director, Las Vegas, NV	SSM-F-011	2–88
[submitted 2 comment documents]	SSM-M-132	2–443
Citizens Advisory Board, James T. Waber, ER/WM Subcommittee, Santa Fe, NM	SSM-M-105	2–359
Citizens Alternative, Catherine M. O'Neill, Albuquerque, NM	SSM-H-SF-005	2–225
Citizens for Alternatives to Radioactive Dumping, Garland Harris	SSM-M-132	2–443
Citizens for National Security, Bill Bibb, President, Oak Ridge, TN	SSM-F-002	2–73
Citizens Opposing a Polluted Environment, Jami Caseber	SSM-M-132	2–443
City of Amarillo, Dianne Bosch, City Commissioner, Amarillo, TX	SSM-H-PTX-009	2–213
City of Amarillo, Kel Seliger, Mayor, Amarillo, TX	SSM-C-001	2–447
City of Livermore, Cathie Brown, Mayor, Livermore, CA	SSM-H-LLNL-001	2–131
City of Oak Ridge, Kathleen D. Moore, Mayor, Oak Ridge, TN	SSM-H-ORR-005	2–195
Coalition for a Test Ban, Francis Chiappa	SSM-M-132	2–443
Coalition for Health Concern, Ron Lamb	SSM-M-132	2–443
Coldwell Banker, Robert E. Garrett, Tom Roller, Amarillo, TX	SSM-C-001	2–447
Committee to Minimize Toxic Waste, Gene Bernardi	SSM-M-132	2–443
Comp. Physics Research Company, Balazs F. Rozsnyai, Livermore, CA	SSM-M-084	2–310
Concerned Citizens for Nuclear Safety, Jay Coghlan, Santa Fe, NM	SSM-M-126	2–421
[submitted 2 comment documents]	SSM-M-132	2–443
County of Anderson, Myron L. Iwanski, Commissioner, Oak Ridge, TN	SSM-M-016	2–264
Dallas Peace Center, Rita Calvert, Director, Dallas, TX	SSM-H-PTX-014	2–217
Desert Citizens Against Pollution, Jane M. Williams	SSM-M-132	2–443
Diocese of Amarillo, Leroy T. Matthiesen, Amarillo, TX	SSM-C-006	2–450
Economists Allied for Arms Reduction, Alice Slater	SSM-M-132	2–443
Economists Allied for Arms Reduction, William J. Weida, Professor, Colorado College, CO	SSM-H-LLNL-002 SSM-H-LLNL-003	2–132 2–133
[submitted 3 comment documents]	SSM-H-LLNL-004	2–135
Ecumenical Peace Institute/Clergy & Laity Concerned, Diane Thomas	SSM-M-132	2–443
Energy Research Foundation, Frances Close	SSM-M-132	2–443
Environmental Action Foundation, Margaret Morgan-Hubbard	SSM-M-132	2–443
Environmental Defense Institute, Chuck Broscious	SSM-M-132	2–443
Forest Guardians, Sam Hitt	SSM-M-132	2–443
Fort Ord Toxics Project, Curt Gandy	SSM-M-132	2–443
Fourth Freedom Forum, David Cortright	SSM-M-132	2–443
Friends Committee on National Legislation, Joe Volk	SSM-M-132	2–443
Friends of Oak Ridge National Laboratory, William Fulkerson, President, Oak Ridge, TN	SSM-M-049	2–289
Government Accountability Project, Tom Carpenter	SSM-M-132	2–443
Grandmothers for Peace International, Barbara Wiedner	SSM-M-132	2–443
Grandmothers for Peace International, California Chapter, Corine Thornton	SSM-M-132	2–443
Grandmothers for Peace International, Northwest Chapter, Jan Provost	SSM-M-132	2–443
Grandmothers for Peace International, Southeast Chapter, Lorraine Krofchok	SSM-M-132	2–443

TABLE 1.3–4.—*Index of Commentors, Organizations, and Public Officials* [Page 3 of 7]

Commentor Information	Document Number	Document Page Number
Gray's Baling, W. T. Gray, Panhandle, TX	SSM-C-006	2–450
Greenpeace USA, Bruce Hall	SSM-M-132	2–443
Greg Lair, Inc., Greg Lair, Canyon, TX	SSM-M-022	2–269
Harrington Regional Medical Center, Stephen H. Gens, President, Amarillo, TX	SSM-C-001	2–447
Hayward Area Peace and Justice Fellowship, Peter Hendley	SSM-M-132	2–443
Institute for Energy and Environmental Research, Arjun Makhijani, Hischam Zerriffi, Takoma Park, MD	SSM-F-007 SSM-M-132	2–77 2–443
Institute for Science and International Security, Tom Zamora-Collina	SSM-M-132	2–443
International Women's Network, Claire Greensfelder	SSM-M-132	2–443
Lane County American Peace Test, Rick Gold	SSM-M-132	2–443
Lawrence Livermore National Laboratory, Jon M. Yatabe, Pleasanton, CA	SSM-H-SF-019	2–233
League of Women Voters, Robert J. Kiser, Clear Lake Oaks, CA	SSM-H-LLNL-009	2–178
Livermore Conversion Project, Sherry Larsen-Beville	SSM-M-132	2–443
Los Alamos County Council, Morris B. Pongratz, Los Alamos, NM	SSM-H-LANL-003	2–131
Los Alamos County Council, Denise Smith, Council Chair, Los Alamos, NM	SSM-H-LANL-002	2–130
Los Alamos Study Group, Greg Mello, Director, Santa Fe, NM [submitted 3 comment documents]	SSM-F-014 SSM-H-LLNL-014 SSM-M-132	2–91 2–181 2–443
Lutheran Peace Fellowship, Earl Johnson	SSM-M-132	2–443
Magdalene House/Catholic Worker, Daniel McNassar	SSM-M-132	2–443
Mason and Hanger-Silas Mason Co., Inc., Amarillo, TX	SSM-M-099	2–355
Miamisburg Residents for Environmental Safety & Health, Sharon Cowdrey	SSM-M-132	2–443
Military Production Network, Maureen Eldredge, Washington, D.C. [submitted 2 comment documents]	SSM-H-LLNL-013 SSM-M-132	2–180 2–443
Mount Diablo Peace Center, Carol Wagner	SSM-M-132	2–443
National American Water Office, George Crocker	SSM-M-132	2–443
National Association of Radiation Survivors, Fred Allingham	SSM-M-132	2–443
Natural Resources Defense Council, Christopher E. Paine, Senior Research Associate, Barbara Finamore, Attorney, Washington, DC	SSM-M-132	2–443
Natural Resources Defense Council, Christopher E. Paine, Senior Research Associate, Thomas B. Cochran, Senior Scientist, Barbara A. Finamore, Attorney, Washington, DC	SSM-M-089	2–313
Nevada Alliance for Defense, Energy and Business, Troy E. Wade, II, Chairman, Las Vegas, NV	SSM-F-013	2–90
Nevada Desert Experience, Brother David Buer	SSM-M-132	2–443
New Mexico Environmental Law Center, Douglas Meiklejohn, Attorney, Santa Fe, NM	SSM-F-012	2–88
Nuclear Age Peace Foundation, David Krieger	SSM-M-132	2–443
Nuclear Control Institute, Paul Leventhal	SSM-M-132	2–443
Nuclear Democracy Network, Mary Beth Brangan	SSM-M-132	2–443
Nuclear Guardianship Project, Francis Harwood, Wendy Oser	SSM-M-132	2–443
Nuclear Information & Resource Service, Michael Mariotte	SSM-M-132	2–443
Oak Ridge City Council, Kathleen D. Moore, Mayor, Oak Ridge, TN	SSM-H-ORR-010	2–198

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Commentor Information	Document Number	Document Page Number
Oak Ridge Environmental Peace Alliance, Oak Ridge, TN	SSM-F-026	2–114
Oak Ridge Environmental Peace Alliance, Ralph Hutchison	SSM-M-132	2–443
Oak Ridge Reservation Local Oversight Committee, Amy S. Fitzgerald, Executive Director, Oak Ridge, TN	SSM-M-050	2–290
Oak Ridge Reservation Local Oversight Committee, Edmund A. Nephew, Chairman, Amy S. Fitzgerald, Executive Director, Oak Ridge, TN	SSM-M-053	2–292
Page & Associates Contractors Inc., Stanley F. Cotgreave, Amarillo, TX	SSM-C-001	2–447
Panhandle 2000, Jerry Johnson, Wales Madden, Jr., Co-Chairs, Amarillo, TX	SSM-M-008	2–245
Panhandle Area Neighbors and Landowners, Doris Smith, Panhandle, TX	SSM-C-006 SSM-M-132	2–450 2–443
Panhandle Plastic Surgery, John C. Kelleher, Jr., Amarillo, TX	SSM-C-001	2–447
Pantex Plant Citizens' Advisory Board, Louise Daniel, Ronald W. Zerm, Co-Chairs, Amarillo, TX	SSM-F-009	2–84
Pax Christi, Pat O. Buchanan, Hayward, CA	SSM-M-012	2–260
Pax Christi, Bay Area Chapter, Daniel McNassar	SSM-M-132	2–443
Pax Christi U.S.A., Nancy Small	SSM-M-132	2–443
Peace Action, International, Judy Lowe	SSM-M-132	2–443
Peace Action, National, Gordon S. Clark	SSM-M-132	2–443
Peace Action, California State-Wide Office, Erica Harrold	SSM-M-132	2–443
Peace Action, East Bay Chapter, Betty Brown	SSM-M-132	2–443
Peace Action, Greater Cleveland Chapter, Frances Chiappa	SSM-M-132	2–443
Peace Action, Nashville Chapter, Janice Tilton	SSM-M-132	2–443
Peace Action, Sacramento/Yolo Chapter, JoAnn Fuller	SSM-M-132	2–443
Peace Action, San Jose Chapter, Alice Cox	SSM-M-132	2–443
Peace Action, Texas, Jan Sanders, Chair, Dallas, TX	SSM-M-009	2–251
Peace Education Action Fund, Karina Wood, Washington, DC	SSM-M-132	2–443
Peace Farm, Mavis Belisle	SSM-M-132	2–443
People for a New Nuclear Policy, Bill Russell	SSM-M-132	2–443
Physicians for Social Responsibility, Daryl Kimball	SSM-M-132	2–443
Physicians for Social Responsibility, Bay Area Chapter, Margaret Mossman	SSM-M-132	2–443
Physicians for Social Responsibility, NYC Chapter, Carol Garman	SSM-M-132	2–443
Physicians for Social Responsibility/New Mexico, Janna Rolland, Executive Director, Santa Fe, NM	SSM-H-SF-007 SSM-M-132	2–226 2–443
Plumbers Steamfitters L.U. 342, Alfred J. Fernandes, San Leandro, CA	SSM-H-LLNL-020	2–190
Plumbers Steamfitters L.U. 342, Earl E. Loot, Fremont, CA	SSM-H-LLNL-017	2–189
Plumbers Steamfitters L.U. 342, W. Barlow Manning, Hayward, CA	SSM-H-LLNL-015	2–188
Plumbers Steamfitters L.U. 342, Angela M. Torres, Livermore, CA	SSM-M-059	2–297
Plumbers Steamfitters L.U. 342, Bobby J. Wright, Dublin, CA	SSM-H-LLNL-016	2–188
Plutonium Challenge, David Culp	SSM-M-132	2–443
Plutonium Free Future, Kaz Tanahashi	SSM-M-132	2–443
Potter County, Manny P. Villasenor, Commissioner, Amarillo, TX [submitted 2 comment documents]	SSM-M-034 SSM-C-001	2–277 2–447
Prairie Island Coalition, Bruce Drew	SSM-M-132	2–443
Proposition One Committee, W. Thomas	SSM-M-132	2–443
Psychologists for Social Responsibility, Ann Anderson, Washington, DC	SSM-M-132	2–443

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Commentor Information	Document Number	Document Page Number
Psychologists for Social Responsibility, California Chapter, Mark Pilisuk	SSM-M-132	2–443
Rio Pueblo Rio Embudo Coalition, Kay Matthews, Penasco, NM	SSM-M-081	2–307
Rocky Flats Cleanup Commission, Inc., James Stone P.E., Technical Advisor, Lakewood, CO	SSM-M-109	2–401
Rocky Mountain Peace & Justice Center, Andrew J. Thurlow	SSM-M-132	2–443
San Jose Peace Center, Aaron Belansky	SSM-M-132	2–443
Seattle Women Act for Peace, Rosemary Brodie	SSM-M-132	2–443
Sell and Griffin, Frederick J. Griffin, Garland D. Sell, Amarillo, TX	SSM-C-001	2–447
Shundahi Network, Matteo Ferreira	SSM-M-132	2–443
Sierra Club, San Francisco Bay Area Chapter, Dave Nesmith	SSM-M-132	2–443
Silicon Valley Toxics Coalition, Ted Smith	SSM-M-132	2–443
Snake River Alliance, Beatrice Brailsford	SSM-M-132	2–443
Southwest Research & Information Center, Don Hancock	SSM-M-132	2–443
Southwestern Bell Telephone, Gary Stevens, Area Manager, Amarillo, TX	SSM-C-001	2–447
Southwestern Public Service Company, William T. Crenshaw, Environmental Issues Analyst, Amarillo, TX	SSM-F-021	2–104
Sprouse, Mozola, Smith & Rowley PC, R. Wayne Moore, Attorney, Amarillo, TX	SSM-C-001	2–447
St. Elizabeth Convent, Stella Marie Goodpasture, Oakland, CA	SSM-H-LLNL-010	2–179
St. Joseph the Worker Church, Father Bill O'Donnell	SSM-M-132	2–443
St. Stephen's Catholic Church, Natalie Russel	SSM-M-132	2–443
STAND of Amarillo, Inc., Beverly Gattis	SSM-M-132	2–443
State of California Resources Agency, Maureen F. Gorsen, Assistant General Counsel, Sacramento, CA	SSM-F-010	2–87
State of Missouri Clearinghouse, Lois Pohl, Coordinator, Jefferson City, MO	SSM-M-001	2–240
State of Missouri House of Representatives, Karen McCarthy, Missouri 5th District, Kansas City, MO	SSM-EH-KCP-001	2–475
State of Nevada Department of Administration, Julie Butler, Coordinator, State Clearinghouse, Carson City, NV	SSM-F-028	2–116
State of New Mexico Environment Department, Gedi Cibas, Ph.D., Environmental Impact Review Coordinator, Santa Fe, NM	SSM-M-123	2–413
State of South Carolina Office of the Governor, Rodney P. Grizzle, Grant Services Supervisor, Columbia, SC	SSM-M-128	2–438
State of Tennessee Department of Environment and Conservation, Justin Wilson, Commissioner, Oak Ridge, TN	SSM-F-022	2–109
State of Texas, Bob Bullock, Lieutenant Governor, Austin, TX	SSM-C-001	2–447
State of Texas, Dan Morales, Attorney General, Austin, TX	SSM-EF-004	2–473
State of Texas, George W. Bush, Governor; Roger Mulder, Pantex Director; Joseph Martillotti, Pantex Special Project Coordinator; Thomas Gustavson, Senior Research Scientist, Austin, TX	SSM-EF-003	2–461
State of Texas House of Representatives, Warren Chisum, Chairman, Austin, TX	SSM-C-001	2–447
State of Texas House of Representatives, David Swinford, State Representative, Austin, TX	SSM-C-001	2–447
State of Texas Senate, Teel Bivins, State Senator, Austin, TX	SSM-ET-PTX-001	2–496
State of Texas Senate, Tom Haywood, State Senator, Austin, TX	SSM-C-001	2–447

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Commentor Information	Document Number	Document Page Number
Texas Alliance for Human Needs, Matt Ley, Austin, TX	SSM-C-006	2–450
Texas Conference of Churches, Mary Berwick, Assistant in Church and Society, Austin, TX	SSM-C-006	2–450
Texas Natural Resource Conservation Commission, Geoffrey Meyer, Federal Facilities Team, TX	SSM-F-015	2–95
Texas Natural Resources Conservation Commission, Office of Air Quality, Ambient Monitoring Section, Joe Panketh, TX	SSM-F-006	2–77
Texas Tech University, Arthur A. Nelson, Dean, Amarillo, TX	SSM-C-001	2–447
Town of Farragut Board of Mayor and Aldermen, W. Edward Ford, III, Mayor, Farragut, TN	SSM-H-ORR-009	2–197
Tri-Valley CAREs, Greg Mello, Livermore, CA	SSM-H-LLNL-005	2–139
[submitted 3 comment documents]	SSM-H-LLNL-006	2–153
	SSM-H-LLNL-007	2–161
Tri-Valley CAREs, Marylia Kelley, Livermore, CA	SSM-H-LLNL-008	2–170
[submitted 4 comment documents]	SSM-H-LLNL-013	2–180
	SSM-H-LLNL-014	2–181
	SSM-M-132	2–443
U.S. Environmental Protection Agency, Richard E. Sanderson, Director, Office of Federal Activities, Washington, DC	SSM-F-024	2–112
U.S. House of Representatives, Bill Baker, U.S. Representative for California, Washington, DC	SSM-EH-LLNL-001	2–478
U.S. House of Representatives, David Coffey, U.S. Representative for Tennessee, Washington, DC	SSM-EH-ORR-002	2–481
U.S. House of Representatives, Larry Combest, U.S. Representative for Texas, Washington, DC	SSM-EM-003	2–487
U.S. House of Representatives, John J. Duncan, Jr., U.S. Representative for Tennessee, Washington, DC	SSM-EH-ORR-001	2–480
U.S. House of Representatives, Charlie Norwood, U.S. Representative for Georgia, Washington, DC	SSM-EF-002	2–460
U.S. House of Representatives, Richard Pombo, U.S. Representative for California, Washington, DC	SSM-EM-002	2–486
U.S. House of Representatives, Mac Thornberry, U.S. Representative for Texas, Washington, DC	SSM-EM-004	2–489
U.S. House of Representatives, Zach Wamp, U.S. Representative for Tennessee	SSM-ET-ORR-001	2–490
U.S. Public Interest Research Group, Anna Aurilio, Washington, DC	SSM-H-LLNL-013	2–180
U.S. Senate, Committee on Armed Services, Washington, DC Kay Bailey Hutchinson, U.S. Senator for Texas, Kit Bond, U.S. Senator for Missouri, Bob Dole, U.S. Senator for Kansas, Bill Frist, U.S. Senator for Tennessee, Dirk Kempthorne, U.S. Senator for Idaho, Bob Smith, U.S. Senator for New Hampshire, Fred Thompson, U.S. Senator for Tennessee, Strom Thurmond, U.S. Senator for South Carolina	SSM-EF-001	2–459
U.S. Senate, Randy McNally, U.S. Senator for Tennessee, Washington, DC	SSM-EH-ORR-002	2–481
Union-UA Local 718, Thomas H. Peek, Knoxville, TN	SSM-M-017	2–265
W. W. Publisher, Stephanie Hedgecoke, New York, NY	SSM-C-006	2–450

TABLE 1.3–4.—*Index of Commentors, Organizations, and Public Officials* [Page 7 of 7]

Commentor Information	Document Number	Document Page Number
Western Physicians for Social Responsibility, Eve H. Burton, Brita L. Clark, Terrance Clark, Polly Cody, Deborah M. Collier, John Cook, Timothy R. Duncan, Edward H. Dunn, John Joemer, John Keever, Dorothy Kirschbaum, Eleanor H. Lloyd, J. Mallett, Albert Mojonmer, Ann Mojonmer, Lewis E. Patrie, Nancy E. Patterson, Ursula Scott, Jane A. Stearns, Ganson Taggart, John Telfair, Jeane Warren, Robert Wilson, Sam L. Zitia, Asheville, NC	SSM-C-008	2–452
Western States Legal Foundation, Oakland, CA	SSM-M-047	2–285
Western States Legal Foundation, John Burroughs, Oakland, CA	SSM-M-132	2–443
Western States Legal Foundation, Jackie Cabasso, Oakland, CA [submitted 2 comment documents]	SSM-H-LLNL-013 SSM-M-132	2–180 2–443
Western States Legal Foundation, Andrew Lichterman, John Burroughs, Jacqueline Cabasso, Oakland, CA	SSM-M-090	2–330
Women Concerned - Utahans United, Deb Sawyer	SSM-M-132	2–443
Women for Peace, Eleanor F. Salkind, Oakland, CA	SSM-M-058	2–296
Women for Peace–East Bay, Lillian Nurmela, Disarmament Committee, Berkeley, CA	SSM-M-054 SSM-M-132	2–293 2–443
Women Strike For Peace, Edith Villastrigo	SSM-M-132	2–443
Women's International League for Peace and Freedom, Jean Gore	SSM-M-132	2–443
Women's International League for Peace and Freedom, Nancy McClintock, Region 1 President	SSM-C-002	2–448
Writing to Reduce Weapons, Susan Baker	SSM-M-132	2–443

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Document Number	Comment Number	Issue Code	Summary Page Number	Comment Document Page Number
SSM-F-001	1	34.17	3–94	2–73
SSM-F-002	1	41.10	3–150	2–73
	2	41.05	3–148	
SSM-F-003	1	40.12	3–104	2–74
	2	11.27	3–50	
SSM-F-004	1	30.01	3–77	2–75
	2	34.01	3–89	
	3	41.03	3–147	
	4	08.24	3–24	
	5	34.10	3–92	
	6	08.25	3–25	
	7	08.26	3–25	
	8	12.07	3–57	
SSM-F-005	1	40.01	3–95	2–76
	2	43.18	3–173	
	3	40.27	3–115	
SSM-F-006	1	03.09	3–8	2–77
SSM-F-007	1	40.60	3–132	2–77
	2	41.18	3–158	
	3	40.34	3–120	
	4	40.07	3–99	
	5	40.37	3–122	
	6	41.12	3–151	
	7	40.33	3–118	
	8	40.05	3–98	
	9	40.22	3–110	
	10	40.36	3–120	
	11	40.41	3–124	
SSM-F-008	1	40.12	3–104	2–83
	2	40.06	3–98	
	3	40.21	3–108	
SSM-F-009	1	30.01	3–77	2–84
	2	04.05	3–10	
SSM-F-010		No Comment Identified		2–87
SSM-F-011	1	40.43	3–125	2–88
	2	40.36	3–120	
SSM-F-012	1	12.08	3–58	2–88
	2	41.03	3–147	
	3	04.06	3–11	
	4	05.01	3–15	
	5	43.18	3–173	
	6	09.02	3–26	

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Document Number	Comment Number	Issue Code	Summary Page Number	Comment Document Page Number
SSM-F-013	1	30.03	3–77	2–90
	2	30.07	3–79	
	3	40.86	3–143	
	4	40.45	3–127	
	5	40.49	3–128	
	6	41.18	3–158	
SSM-F-014	1	40.85	3–141	2–91
	2	40.05	3–98	
	3	40.07	3–99	
	4	41.03	3–147	
	5	41.18	3–158	
	6	40.43	3–125	
	7	40.36	3–120	
	8	41.17	3–153	
SSM-F-015	1	11.35	3–52	2–95
	2	11.41	3–54	
	3	40.61	3–135	
	4	11.36	3–52	
SSM-F-016	1	40.06	3–98	2–95
SSM-F-017	1	40.74	3–138	2–96
	2	40.23	3–113	
	3	40.32	3–118	
	4	40.52	3–128	
	5	10.21	3–38	
	6	10.28	3–39	
	7	10.17	3–36	
	8	10.18	3–36	
	9	11.33	3–51	
	10	30.04	3–78	
	11	11.34	3–52	
	12	10.19	3–37	
	13	40.21	3–108	
	14	43.02	3–169	
	15	10.20	3–37	
	16	40.75	3–139	
	17	30.05	3–78	
	18	10.22	3–38	
	19	03.02	3–4	
	20	41.14	3–152	
SSM-F-018	1	21.06	3–66	2–98
	2	21.18	3–74	
SSM-F-019	1	40.84	3–141	2–100
	2	42.06	3–164	
	3	40.07	3–99	
	4	04.05	3–10	

TABLE 1.3–5.—*Comment Document and Summary Locator* [Page 3 of 20]

Document Number	Comment Number	Issue Code	Summary Page Number	Comment Document Page Number
SSM-F-020	1	10.12	3–34	2–100
	2	09.08	3–29	
	3	08.27	3–25	
	4	04.08	3–12	
	5	11.15	3–46	
SSM-F-021	1	40.11	3–103	2–104
	2	30.01	3–77	
	3	40.52	3–128	
	4	42.10	3–166	
	5	34.01	3–89	
	6	08.25	3–25	
SSM-F-022	1	40.13	3–104	2–109
	2	33.01	3–85	
	3	10.33	3–41	
	4	33.11	3–89	
	5	41.10	3–150	
	6	33.10	3–89	
	7	40.47	3–127	
	8	21.05	3–64	
	9	04.13	3–13	
	10	08.01	3–18	
	11	40.93	3–145	
SSM-F-024	1	11.15	3–46	2–112
	2	11.12	3–46	
	3	11.24	3–49	
	4	11.28	3–50	
	5	12.10	3–58	
	6	43.06	3–170	
	7	22.02	3–76	
	8	41.12	3–151	
SSM-F-026	1	40.07	3–99	2–114
	2	40.27	3–115	
	3	40.60	3–132	
	4	40.24	3–113	
	5	40.36	3–120	
SSM-F-028	1	40.33	3–118	2–116
	2	40.07	3–99	
	3	40.02	3–95	
	4	40.45	3–127	
	5	01.06	3–2	
	6	42.09	3–165	
SSM-H-SRS-001	1	32.06	3–81	2–119
SSM-H-SRS-002	1	41.03	3–147	2–120

TABLE 1.3–5.—*Comment Document and Summary Locator* [Page 4 of 20]

Document Number	Comment Number	Issue Code	Summary Page Number	Comment Document Page Number
SSM-H-SRS-003	1	40.76	3–139	2–121
	2	41.10	3–150	
	3	01.01	3–1	
	4	10.07	3–33	
SSM-H-SRS-004	1	41.05	3–148	2–128
SSM-H-SRS-005	1	32.07	3–82	2–128
	2	40.13	3–104	
SSM-H-SRS-006	1	32.06	3–81	2–129
SSM-H-ALB-001	1	03.01	3–4	2–129
	2	04.11	3–13	
—	3	11.04	3–42	
SSM-H-LANL-001	1	40.04	3–97	2–130
SSM-H-LANL-002	1	40.51	3–128	2–130
SSM-H-LANL-003	1	41.07	3–149	2–131
	2	40.06	3–98	
	3	08.06	3–20	
SSM-H-LLNL-001	1	40.44	3–126	2–131
	2	21.06	3–66	
	3	21.12	3–70	
SSM-H-LLNL-002	1	21.09	3–68	2–132
	2	21.10	3–69	
	3	21.04	3–64	
SSM-H-LLNL-003	1	40.13	3–104	2–133
	2	40.07	3–99	
	3	40.33	3–118	
	4	40.15	3–105	
SSM-H-LLNL-004	1	21.09	3–68	2–135
	2	21.08	3–68	
SSM-H-LLNL-005	1	40.12	3–104	2–139
	2	40.70	3–137	
	3	40.77	3–139	
	4	40.36	3–120	
	5	40.07	3–99	
	6	11.31	3–51	
	7	40.26	3–114	
	8	40.21	3–108	
	9	40.22	3–110	
SSM-H-LLNL-006	1	40.70	3–137	2–153
	2	40.33	3–118	
	3	40.01	3–95	
	4	40.05	3–98	
	5	40.58	3–131	
	6	40.07	3–99	

TABLE 1.3–5.—*Comment Document and Summary Locator* [Page 5 of 20]

Document Number	Comment Number	Issue Code	Summary Page Number	Comment Document Page Number
SSM-H-LLNL-007	1	40.17	3–107	2–161
	2	40.07	3–99	
	3	40.06	3–98	
	4	21.07	3–67	
	5	40.36	3–120	
SSM-H-LLNL-008	1	21.12	3–70	2–170
SSM-H-LLNL-009		No Comment Identified		2–178
SSM-H-LLNL-010	1	40.50	3–128	2–179
	2	40.12	3–104	
	3	21.04	3–64	
SSM-H-LLNL-011	1	21.07	3–67	2–180
SSM-H-LLNL-013	1	21.09	3–68	2–180
	2	21.07	3–67	
	3	21.12	3–70	
SSM-H-LLNL-014	1	40.27	3–115	2–181
SSM-H-LLNL-015	1	21.06	3–66	2–188
SSM-H-LLNL-016	1	21.06	3–66	2–188
SSM-H-LLNL-017	1	21.06	3–66	2–189
SSM-H-LLNL-018	1	21.06	3–66	2–189
SSM-H-LLNL-019	1	21.05	3–64	2–190
SSM-H-LLNL-020	1	21.06	3–66	2–190
SSM-H-LLNL-021	1	40.44	3–126	2–191
	2	21.06	3–66	
	3	12.03	3–57	
SSM-H-NTS-001	1	40.13	3–104	2–191
	2	30.02	3–77	
	3	11.01	3–41	
SSM-H-NTS-002	1	22.01	3–76	2–192
	2	40.02	3–95	
SSM-H-NTS-003	1	41.05	3–148	2–193
	2	40.04	3–97	
SSM-H-ORR-001	1	40.89	3–143	2–193
	2	40.36	3–120	
	3	08.07	3–20	
SSM-H-ORR-004	1	41.06	3–148	2–194
SSM-H-ORR-005	1	40.23	3–113	2–195
	2	40.24	3–113	
	3	08.03	3–18	
	4	41.10	3–150	
	5	41.03	3–147	
SSM-H-ORR-006	1	42.06	3–164	2–196
SSM-H-ORR-007	1	40.42	3–125	2–196
SSM-H-ORR-008	1	10.02	3–31	2–197
SSM-H-ORR-009	1	40.23	3–113	2–197

TABLE 1.3–5.—*Comment Document and Summary Locator* [Page 6 of 20]

Document Number	Comment Number	Issue Code	Summary Page Number	Comment Document Page Number
SSM-H-ORR-010	1	33.01	3–85	2–198
	2	08.03	3–18	
	3	41.10	3–150	
SSM-H-ORR-011	1	41.10	3–150	2–199
SSM-H-ORR-013	1	40.08	3–101	2–199
SSM-H-ORR-014	1	40.23	3–113	2–200
SSM-H-ORR-015	1	08.01	3–18	2–200
SSM-H-ORR-016	1	32.02	3–80	2–201
SSM-H-ORR-017	1	40.24	3–113	2–201
	2	40.13	3–104	
SSM-H-ORR-018	1	40.24	3–113	2–202
SSM-H-ORR-019	1	40.23	3–113	2–204
	2	40.33	3–118	
SSM-H-ORR-020	1	40.33	3–118	2–205
	2	40.29	3–116	
	3	40.24	3–113	
SSM-H-PTX-001	1	40.11	3–103	2–205
	2	40.68	3–136	
	3	43.09	3–171	
	4	08.15	3–22	
SSM-H-PTX-002	1	40.52	3–128	2–206
	2	34.03	3–90	
	3	34.01	3–89	
	4	34.04	3–90	
	5	34.09	3–91	
	6	34.06	3–91	
	7	09.06	3–28	
SSM-H-PTX-003	1	34.01	3–89	2–207
	2	34.05	3–90	
SSM-H-PTX-004	1	04.05	3–10	2–208
	2	11.13	3–46	
SSM-H-PTX-005	1	40.50	3–128	2–209
	2	40.07	3–99	
	3	40.12	3–104	
SSM-H-PTX-006	1	40.52	3–128	2–209
	2	08.15	3–22	
	3	30.01	3–77	
	4	34.01	3–89	
SSM-H-PTX-007	1	11.25	3–49	2–210
	2	11.26	3–49	
	3	34.02	3–89	
SSM-H-PTX-008	1	40.52	3–128	2–212

TABLE 1.3–5.—*Comment Document and Summary Locator* [Page 7 of 20]

Document Number	Comment Number	Issue Code	Summary Page Number	Comment Document Page Number
SSM-H-PTX-009	1	41.05	3–148	2–213
	2	40.21	3–108	
	3	30.01	3–77	
	4	34.01	3–89	
SSM-H-PTX-010	1	34.01	3–89	2–215
	2	40.20	3–108	
SSM-H-PTX-011	1	34.01	3–89	2–215
	2	40.20	3–108	
	3	40.83	3–141	
SSM-H-PTX-012	1	34.01	3–89	2–216
	2	40.20	3–108	
	3	40.83	3–141	
	4	34.13	3–93	
SSM-H-PTX-013	1	34.01	3–89	2–216
	2	40.20	3–108	
	3	34.10	3–92	
	4	34.07	3–91	
SSM-H-PTX-014		No Comment Identified		2–217
SSM-H-PTX-015	1	40.36	3–120	2–218
	2	40.07	3–99	
SSM-H-PTX-017	1	41.10	3–150	2–219
	2	41.05	3–148	
	3	40.27	3–115	
SSM-H-PTX-018	1	40.07	3–99	2–220
	2	40.12	3–104	
	3	10.13	3–35	
	4	43.09	3–170	
	5	04.05	3–10	
SSM-H-SF-001	1	41.03	3–147	2–221
	2	40.50	3–128	
SSM-H-SF-002	1	40.36	3–120	2–221
	2	40.15	3–105	
	3	40.27	3–115	
	4	40.69	3–137	
	5	41.03	3–147	
SSM-H-SF-003	1	10.11	3–34	2–222
	2	40.06	3–98	
	3	43.06	3–170	
	4	40.27	3–115	
SSM-H-SF-004	1	10.30	3–40	2–224
	2	40.07	3–99	
SSM-H-SF-005	1	40.60	3–132	2–225
SSM-H-SF-006	1	41.05	3–148	2–226
SSM-H-SF-007	1	40.07	3–99	2–226
	2	40.02	3–95	

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Document Number	Comment Number	Issue Code	Summary Page Number	Comment Document Page Number
	3	41.18	3–158	
	4	21.04	3–64	
	5	40.36	3–120	
SSM-H-SF-008	1	40.27	3–115	2–227
SSM-H-SF-009	1	40.72	3–138	2–228
SSM-H-SF-010	1	40.34	3–120	2–228
SSM-H-SF-011	1	40.27	3–115	2–229
SSM-H-SF-012	1	10.29	3–40	2–229
	2	40.27	3–115	
SSM-H-SF-013	1	40.06	3–98	2–230
SSM-H-SF-014	1	40.60	3–132	2–230
SSM-H-SF-015	1	40.06	3–98	2–231
	2	11.17	3–47	
SSM-H-SF-016	1	40.06	3–98	2–231
	2	40.27	3–115	
SSM-H-SF-017	1	40.06	3–98	2–232
SSM-H-SF-018	1	10.30	3–40	2–233
	2	40.15	3–105	
SSM-H-SF-019	1	10.31	3–40	2–233
	2	42.01	3–162	
SSM-H-SF-020	1	40.50	3–128	2–234
	2	40.06	3–98	
	3	41.03	3–147	
	4	40.15	3–105	
SSM-H-SF-021	1	40.72	3–138	2–235
SSM-H-SF-022	1	40.07	3–99	2–235
SSM-H-SF-023	1	40.72	3–138	2–236
SSM-H-SF-024	1	41.08	3–149	2–236
SSM-H-SF-025	1	10.30	3–40	2–237
	2	09.11	3–30	
	3	40.06	3–98	
	4	40.27	3–115	
SSM-H-SF-026	1	40.72	3–138	2–238
	2	40.50	3–128	
SSM-H-SF-027	1	40.72	3–138	2–238
SSM-H-SF-028	1	40.06	3–98	2–239
SSM-H-SF-029	1	41.05	3–148	2–239
SSM-M-001		No Comment Identified		2–240
SSM-M-002	1	40.06	3–98	2–240
	2	40.07	3–99	
	3	40.15	3–105	
	4	34.02	3–89	
	5	33.03	3–86	
SSM-M-003	1	40.27	3–115	2–242
SSM-M-004	1	32.03	3–81	2–242

TABLE 1.3–5.—*Comment Document and Summary Locator* [Page 9 of 20]

Document Number	Comment Number	Issue Code	Summary Page Number	Comment Document Page Number
	2	40.30	3–116	
	3	40.21	3–108	
SSM-M-005	1	40.24	3–113	2–243
	2	40.33	3–118	
	3	40.27	3–115	
	4	40.08	3–101	
	5	40.50	3–128	
	6	32.08	3–83	
SSM-M-006	1	40.07	3–99	2–244
	2	40.12	3–104	
SSM-M-007	1	33.01	3–85	2–245
SSM-M-008	1	08.15	3–22	2–245
	2	40.23	3–113	
	3	30.01	3–77	
	4	42.09	3–165	
	5	40.13	3–104	
	6	34.01	3–89	
	7	09.09	3–29	
	8	40.52	3–128	
SSM-M-009	1	41.01	3–146	2–251
	2	40.05	3–98	
	3	40.14	3–105	
	4	40.22	3–110	
	5	40.07	3–99	
	6	04.05	3–10	
	7	08.20	3–24	
	8	40.27	3–115	
	9	41.03	3–147	
	10	40.50	3–128	
	11	42.13	3–167	
	12	40.15	3–105	
	13	40.12	3–104	
	14	40.06	3–98	
	15	40.60	3–132	
	16	43.12	3–171	
SSM-M-010	1	40.12	3–104	2–253
	2	40.07	3–99	
SSM-M-011	1	40.04	3–97	2–254
	2	40.46	3–127	
	3	40.01	3–95	
SSM-M-012	1	40.06	3–98	2–260
	2	40.12	3–104	
SSM-M-013	1	40.40	3–123	2–260
	2	40.53	3–129	
SSM-M-014	1	40.05	3–98	2–261

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Document Number	Comment Number	Issue Code	Summary Page Number	Comment Document Page Number
	2	40.13	3–104	
	3	40.06	3–98	
SSM-M-015	1	41.05	3–148	2–262
	2	40.54	3–130	
	3	41.18	3–158	
	4	21.15	3–72	
	5	40.01	3–95	
	6	42.08	3–165	
	7	40.27	3–115	
	8	40.26	3–114	
SSM-M-016	1	08.19	3–23	2–264
SSM-M-017	1	08.18	3–23	2–265
SSM-M-018	1	41.03	3–147	2–266
	2	41.10	3–150	
	3	41.05	3–148	
	4	41.06	3–148	
SSM-M-019	1	40.52	3–128	2–268
SSM-M-020	1	40.52	3–128	2–268
	2	34.01	3–89	
SSM-M-021	1	40.27	3–115	2–269
SSM-M-022	1	30.01	3–77	2–269
	2	34.01	3–89	
	3	40.52	3–128	
SSM-M-023	1	40.27	3–115	2–270
SSM-M-024	1	21.06	3–66	2–271
SSM-M-025	1	21.04	3–64	2–271
	2	21.16	3–73	
	3	21.17	3–73	
SSM-M-026	1	40.07	3–99	2–272
	2	40.06	3–98	
SSM-M-027	1	40.12	3–104	2–273
	2	40.06	3–98	
SSM-M-028	1	40.12	3–104	2–274
SSM-M-029	1	40.07	3–99	2–274
SSM-M-030	1	40.06	3–98	2–275
SSM-M-032	1	10.14	3–35	2–275
SSM-M-033	1	40.52	3–128	2–276
SSM-M-034	1	40.52	3–128	2–277
	2	30.01	3–77	
	3	34.01	3–89	
SSM-M-036	1	40.50	3–128	2–278
SSM-M-037	1	41.05	3–148	2–279
SSM-M-038	1	40.60	3–132	2–280
	2	40.26	3–114	
	3	21.17	3–73	

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Document Number	Comment Number	Issue Code	Summary Page Number	Comment Document Page Number
SSM-M-039	1	43.18	3–173	2–280
SSM-M-040	1	40.06	3–98	2–281
	2	40.15	3–105	
SSM-M-041	1	40.14	3–105	2–281
SSM-M-042	1	40.06	3–98	2–282
	2	07.02	3–17	
SSM-M-043	1	40.60	3–132	2–282
SSM-M-044	1	09.02	3–26	2–283
SSM-M-045	1	40.12	3–104	2–283
SSM-M-046	1	40.32	3–118	2–284
	2	32.03	3–81	
	3	40.72	3–138	
SSM-M-047	1	40.07	3–99	2–285
	2	10.11	3–34	
	3	40.60	3–132	
	4	40.12	3–104	
SSM-M-048	1	40.06	3–98	2–288
	2	40.27	3–115	
	3	07.02	3–17	
	4	40.21	3–108	
	5	42.12	3–166	
	6	10.15	3–36	
SSM-M-049	1	33.01	3–85	2–289
SSM-M-050	1	41.10	3–150	2–290
	2	40.53	3–129	
	3	40.40	3–123	
	4	40.13	3–104	
	5	40.27	3–115	
	6	40.23	3–113	
	7	08.21	3–24	
SSM-M-052	1	04.02	3–9	2–291
SSM-M-053	1	41.10	3–150	2–292
	2	40.87	3–143	
	3	40.13	3–104	
	4	13.01	3–59	
SSM-M-054	1	41.08	3–149	2–293
	2	40.12	3–104	
SSM-M-055	1	40.07	3–99	2–294
SSM-M-056	1	09.11	3–30	2–294
SSM-M-057	1	40.06	3–98	2–295
	2	40.08	3–101	
	3	40.21	3–108	
SSM-M-058	1	40.07	3–99	2–296
	2	40.12	3–104	
	3	41.05	3–148	

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Document Number	Comment Number	Issue Code	Summary Page Number	Comment Document Page Number
	4	40.15	3–105	
SSM-M-059	1	21.06	3–66	2–297
SSM-M-061	1	40.12	3–104	2–297
	2	40.69	3–137	
SSM-M-063	1	04.13	3–13	2–298
SSM-M-064	1	40.24	3–113	2–298
SSM-M-065	1	40.24	3–113	2–299
SSM-M-066	1	40.24	3–113	2–299
SSM-M-067	1	40.24	3–113	2–300
SSM-M-068	1	40.24	3–113	2–300
SSM-M-069	1	33.10	3–89	2–301
	2	40.24	3–113	
SSM-M-070	1	08.13	3–22	2–301
SSM-M-071	1	40.33	3–118	2–302
SSM-M-072	1	40.24	3–113	2–302
	2	40.33	3–118	
SSM-M-073	1	33.01	3–85	2–303
SSM-M-074	1	08.13	3–22	2–303
SSM-M-075	1	33.05	3–87	2–304
SSM-M-076	1	08.17	3–23	2–304
	2	08.18	3–23	
SSM-M-077	1	40.23	3–113	2–305
SSM-M-078	1	40.23	3–113	2–305
	2	33.05	3–87	
SSM-M-079	1	40.19	3–107	2–306
	2	40.78	3–139	
SSM-M-080	1	11.06	3–43	2–307
	2	40.15	3–105	
SSM-M-081	1	40.07	3–99	2–307
	2	40.15	3–105	
	3	10.10	3–34	
SSM-M-082	1	04.06	3–11	2–308
SSM-M-083	1	40.50	3–128	2–309
SSM-M-084	1	40.44	3–126	2–310
	2	21.07	3–67	
SSM-M-085	1	40.06	3–98	2–310
	2	40.15	3–105	
SSM-M-087	1	40.07	3–99	2–311
	2	40.12	3–104	
	3	40.36	3–120	
	4	40.33	3–118	
	5	43.18	3–173	
	6	40.50	3–128	
SSM-M-088	1	40.42	3–125	2–312
SSM-M-089	1	40.85	3–141	2–313

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Document Number	Comment Number	Issue Code	Summary Page Number	Comment Document Page Number
	2	41.17	3–153	
	3	40.56	3–130	
	4	41.18	3–158	
	5	40.02	3–95	
	6	21.05	3–64	
	7	40.87	3–143	
	8	21.01	3–61	
	9	21.07	3–67	
	10	21.17	3–73	
	11	21.12	3–70	
SSM-M-090	1	40.60	3–132	2–330
	2	40.34	3–120	
	3	40.07	3–99	
	4	40.31	3–117	
	5	40.03	3–97	
	6	40.27	3–115	
	7	40.36	3–120	
	8	40.22	3–110	
	9	40.26	3–114	
	10	11.16	3–47	
	11	40.19	3–107	
	12	32.18	3–85	
	13	32.07	3–82	
	14	40.90	3–144	
	15	40.56	3–130	
	16	41.17	3–153	
	17	40.58	3–131	
	18	11.32	3–51	
	19	42.12	3–166	
	20	41.16	3–152	
	21	10.03	3–32	
	22	13.04	3–59	
	23	13.05	3–60	
	24	13.06	3–60	
	25	40.15	3–105	
	26	21.05	3–64	
	27	21.17	3–73	
SSM-M-091	1	40.12	3–104	2–344
	2	40.06	3–98	
SSM-M-092	1	40.06	3–98	2–345
	2	41.03	3–147	
	3	43.18	3–173	
	4	40.21	3–108	
	5	41.04	3–147	
	6	40.07	3–99	

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Document Number	Comment Number	Issue Code	Summary Page Number	Comment Document Page Number
SSM-M-093	1	41.03	3–147	2–346
	2	43.18	3–173	
SSM-M-094	1	40.52	3–128	2–347
	2	08.15	3–22	
SSM-M-095	1	40.07	3–99	2–348
	2	40.72	3–138	
SSM-M-096	1	40.60	3–132	2–349
	2	40.22	3–110	
	3	40.85	3–141	
	4	40.36	3–120	
–	5	40.50	3–128	
	6	40.15	3–105	
	7	40.12	3–104	
	8	40.14	3–105	
	9	40.87	3–143	
SSM-M-097	1	34.13	3–93	2–351
	2	40.23	3–112	
	3	09.06	3–28	
	4	40.13	3–104	
	5	08.24	3–24	
SSM-M-098	1	40.83	3–141	2–353
	2	40.23	3–112	
	3	40.21	3–108	
	4	08.25	3–25	
	5	12.07	3–57	
	6	08.22	3–24	
SSM-M-099	1	04.15	3–14	2–355
	2	34.11	3–92	
	3	01.03	3–1	
	4	09.06	3–28	
SSM-M-100	1	03.03	3–5	2–356
SSM-M-101	1	02.02	3–4	2–357
SSM-M-102	1	04.10	3–12	2–357
SSM-M-103	1	02.01	3–3	2–358
SSM-M-104	1	33.09	3–88	2–358
SSM-M-105	1	40.04	3–97	2–359
	2	32.01	3–80	
	3	40.11	3–103	
	4	40.07	3–99	
	5	40.05	3–98	
SSM-M-106	1	40.07	3–99	2–365
	2	40.85	3–141	
	3	40.60	3–132	
	4	40.32	3–118	
	5	21.17	3–73	

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Document Number	Comment Number	Issue Code	Summary Page Number	Comment Document Page Number
	6	40.36	3–120	
	7	21.01	3–61	
	8	21.15	3–72	
SSM-M-107	1	40.72	3–138	2–370
	2	40.50	3–128	
	3	43.18	3–173	
	4	40.15	3–105	
	5	40.07	3–99	
	6	40.12	3–104	
	7	40.69	3–137	
SSM-M-108	1	40.87	3–143	2–394
	2	40.13	3–104	
	3	40.15	3–105	
	4	40.08	3–101	
	5	30.02	3–77	
	6	41.18	3–158	
	7	01.02	3–1	
	8	40.41	3–124	
	9	05.04	3–16	
	10	40.02	3–95	
	11	01.04	3–2	
	12	04.07	3–11	
	13	11.37	3–53	
	14	04.09	3–12	
	15	10.23	3–38	
	16	01.05	3–2	
	17	42.08	3–165	
SSM-M-109	1	42.18	3–168	2–401
SSM-M-110	1	34.16	3–94	2–405
	2	03.05	3–6	
	3	33.09	3–88	
	4	02.01	3–3	
	5	33.05	3–87	
SSM-M-111	1	41.03	3–147	2–407
SSM-M-112	1	40.54	3–130	2–407
	2	40.07	3–99	
	3	10.11	3–34	
	4	41.17	3–153	
	5	40.12	3–104	
SSM-M-113	1	41.05	3–148	2–409
	2	40.72	3–138	
SSM-M-116	1	40.35	3–120	2–410
	2	40.32	3–118	
SSM-M-117	1	04.05	3–10	2–410
SSM-M-118	1	21.14	3–72	2–411

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Document Number	Comment Number	Issue Code	Summary Page Number	Comment Document Page Number
SSM-M-119	1	40.07	3–99	2–411
SSM-M-120	1	40.15	3–105	2–412
	2	04.05	3–10	
SSM-M-121	1	42.15	3–168	2–412
	2	43.18	3–173	
SSM-M-122	1	40.50	3–128	2–413
SSM-M-123	1	03.04	3–5	2–413
	2	03.06	3–6	
	3	11.38	3–53	
	4	11.39	3–53	
	5	11.40	3–54	
	6	11.07	3–43	
	7	11.42	3–54	
	8	11.43	3–55	
	9	40.51	3–128	
	10	03.08	3–7	
	11	03.07	3–6	
	12	40.15	3–105	
	13	11.44	3–55	
	14	11.45	3–55	
	15	03.10	3–8	
	16	03.11	3–8	
	17	11.46	3–56	
	18	11.47	3–56	
SSM-M-124	1	40.21	3–108	2–417
	2	40.72	3–138	
	3	40.69	3–137	
	4	40.07	3–99	
	5	40.27	3–115	
SSM-M-125	1	40.11	3–103	2–418
	2	40.13	3–104	
	3	40.24	3–113	
	4	40.33	3–118	
	5	40.23	3–113	
	6	08.10	3–21	
	7	08.09	3–21	
	8	11.09	3–45	
	9	08.01	3–18	
	10	40.68	3–136	
	11	42.11	3–166	
	12	40.82	3–141	
	13	40.63	3–135	
	14	40.36	3–120	
	15	40.64	3–135	
	16	40.65	3–136	

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Document Number	Comment Number	Issue Code	Summary Page Number	Comment Document Page Number
	17	40.80	3–140	
	18	08.28	3–26	
	19	08.23	3–24	
	20	08.12	3–21	
	21	04.03	3–9	
	22	11.02	3–42	
	23	11.29	3–50	
	24	11.30	3–50	
	25	10.02	3–31	
	26	33.06	3–87	
	27	40.40	3–123	
	28	08.11	3–21	
	29	33.08	3–88	
	30	33.07	3–87	
	31	32.16	3–84	
	32	32.13	3–84	
SSM-M-126	1	40.60	3–132	2–421
	2	40.07	3–99	
	3	41.19	3–160	
	4	32.12	3–84	
	5	32.01	3–80	
	6	40.02	3–95	
	7	40.22	3–110	
	8	40.33	3–118	
	9	40.39	3–123	
	10	42.12	3–166	
	11	42.05	3–163	
	12	42.10	3–166	
	13	42.01	3–162	
	14	40.90	3–144	
	15	41.16	3–152	
	16	40.36	3–120	
	17	40.56	3–130	
	18	41.17	3–153	
	19	40.41	3–124	
	20	41.18	3–158	
	21	41.20	3–161	
	22	40.78	3–139	
	23	43.18	3–173	
	24	03.04	3–5	
	25	04.16	3–14	
	26	04.17	3–14	
	27	04.18	3–15	
	28	06.02	3–16	
	29	11.06	3–43	

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Document Number	Comment Number	Issue Code	Summary Page Number	Comment Document Page Number
	30	40.21	3–108	
	31	40.57	3–131	
	32	43.19	3–173	
	33	10.34	3–41	
	34	22.03	3–76	
	35	11.45	3–55	
	36	40.55	3–130	
	37	03.12	3–9	
SSM-M-127	1	40.76	3–139	2–437
SSM-M-128		No Comment Identified		2–438
SSM-M-129	1	40.05	3–98	2–441
	2	40.12	3–104	
	3	40.15	3–105	
	4	40.36	3–120	
	5	34.14	3–93	
SSM-M-130	1	42.06	3–164	2–442
	2	40.36	3–120	
SSM-M-131	1	40.26	3–114	2–443
	2	04.05	3–10	
SSM-M-132	1	40.85	3–141	2–443
	2	41.17	3–153	
	3	41.18	3–158	
	4	40.60	3–132	
SSM-C-001	1	40.52	3–128	2–447
	2	30.01	3–77	
	3	40.13	3–104	
	4	34.01	3–89	
SSM-C-002	1	40.06	3–98	2–448
SSM-C-003	1	40.06	3–98	2–449
SSM-C-004	1	30.01	3–77	2–449
SSM-C-005	1	42.06	3–164	2–450
SSM-C-006	1	40.05	3–98	2–450
	2	40.12	3–104	
	3	40.15	3–105	
	4	40.36	3–120	
SSM-C-007	1	40.07	3–99	2–451
	2	40.12	3–104	
	3	10.11	3–34	
	4	40.36	3–120	
SSM-C-008	1	40.36	3–120	2–452
	2	40.12	3–104	
	3	40.07	3–99	
SSM-C-009	1	40.52	3–128	2–453
SSM-C-010	1	40.52	3–128	2–453
SSM-P-001	1	40.06	3–98	2–454

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Document Number	Comment Number	Issue Code	Summary Page Number	Comment Document Page Number
SSM-P-002	1	40.27	3–115	2–454
SSM-P-003	1	40.24	3–113	2–455
SSM-P-004	1	40.52	3–128	2–456
SSM-P-005	1	40.52	3–128	2–456
SSM-P-006	1	40.52	3–128	2–457
SSM-P-007	1	10.16	3–36	2–457
SSM-P-008	1	40.06	3–98	2–458
SSM-P-009	1	21.12	3–70	2–458
	2	40.07	3–99	
SSM-EF-001	1	40.62	3–135	2–459
	2	40.18	3–107	
	3	40.17	3–107	
SSM-EF-002	1	40.76	3–139	2–460
SSM-EF-003	1	40.52	3–128	2–461
	2	41.14	3–152	
	3	30.01	3–77	
	4	34.01	3–89	
	5	40.20	3–108	
	6	09.06	3–28	
	7	04.15	3–14	
	8	01.03	3–1	
	9	40.51	3–128	
	10	34.11	3–92	
	11	34.12	3–93	
	12	34.15	3–93	
	13	11.01	3–41	
	14	05.02	3–15	
	15	04.14	3–13	
	16	01.02	3–1	
	17	04.05	3–10	
	18	05.03	3–16	
	19	05.05	3–16	
SSM-EF-004	1	40.73	3–138	2–473
SSM-EF-005	1	40.52	3–128	2–474
	2	40.66	3–136	
	3	34.01	3–89	
	4	40.20	3–108	
SSM-EH-KCP-001	1	31.01	3–79	2–475
SSM-EH-LLNL-001	1	21.06	3–66	2–478
	2	21.09	3–68	
SSM-EH-ORR-001	1	40.13	3–104	2–480
	2	08.01	3–18	
SSM-EH-ORR-002	1	33.01	3–85	2–481
	2	41.10	3–150	

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Document Number	Comment Number	Issue Code	Summary Page Number	Comment Document Page Number
SSM-EH-PTX-001	1	40.52	3–128	2–482
	2	40.44	3–126	
	3	40.23	3–113	
	4	34.01	3–89	
SSM-EM-001	1	30.01	3–77	2–484
	2	40.52	3–128	
	3	34.01	3–89	
SSM-EM-002	1	21.06	3–66	2–486
SSM-EM-003	1	40.52	3–128	2–487
	2	40.04	3–97	
—	3	30.01	3–77	
	4	34.01	3–89	
SSM-EM-004	1	40.18	3–107	2–489
	2	40.62	3–135	
	3	34.01	3–89	
	4	40.48	3–128	
SSM-ET-ORR-001	1	40.18	3–107	2–490
	2	41.03	3–147	
	3	41.06	3–148	
	4	40.04	3–97	
	5	40.13	3–104	
	6	40.18	3–107	
	7	40.08	3–101	
SSM-ET-PTX-001	1	41.10	3–150	2–496
	2	30.01	3–77	
	3	40.52	3–128	
	4	34.01	3–89	

TABLE 1.3–6.—*Comments Sorted by Summary Code* [Page 1 of 11]

Summary Code	Summary Page Number	Document Page Number
		Land Resources
01.01	3–1	2–68, 121
01.02	3–1	2–32, 397, 471
01.03	3–1	2–355, 466
01.04	3–2	2–399
01.05	3–2	2–400
01.06	3–2	2-117
		Site Infrastructure
02.01	3–3	2–22, 358, 406
02.02	3–4	2–357
		Air Quality
03.01	3–4	2–129
03.02	3–4	2–98
03.03	3–5	2–356
03.04	3–5	2–413, 433
03.05	3–6	2–405
03.06	3–6	2–414
03.07	3–6	2–415
03.08	3–7	2–415
03.09	3–8	2–77
03.10	3–8	2–416
03.11	3–8	2–416
03.12	3–9	2-435
		Water Resources
04.01	3–9	2–13
04.02	3–9	2–23, 291
04.03	3–9	2–24, 420
04.04	3–10	2–40
04.05	3–10	2–47, 48, 49, 86, 100, 208, 220, 252, 410, 412, 443, 471
04.06	3–11	2–58, 67, 89, 308
04.07	3–11	2–15, 399
04.08	3–12	2–103
04.09	3–12	2–400
04.10	3–12	2–357
04.11	3–13	2–8, 129
04.12	3–13	2–47
04.13	3–13	2–111, 298
04.14	3–13	2–471
04.15	3–14	2–355, 465
04.16	3–14	2–433
04.17	3–14	2–434
04.18	3–15	2-434

TABLE 1.3–6.—*Comments Sorted by Summary Code* [Page 2 of 11]

Summary Code	Summary Page Number	Document Page Number
		Geology and Soils
05.01	3–15	2–89
05.02	3–15	2–47, 471
05.03	3–16	2–471
05.04	3–16	2–398
05.05	3–16	2–471
		Biotic Resources
06.01	3–16	2–70
06.02	3–16	2–434
		Cultural and Paleontological Resources
07.01	3–17	2–11
07.02	3–17	2–13, 56, 282, 288
		Socioeconomics
08.01	3–18	2–23, 24, 26, 28, 111, 200, 420, 480
08.02	3–18	2–48
08.03	3–18	2–19, 22, 195, 198
08.04	3–19	2–29, 30
08.05	3–19	2–7
08.06	3–20	2–6, 131
08.07	3–20	2–19, 22, 27, 194
08.08	3–20	2–7, 8
08.09	3–21	2–419
08.10	3–21	2–419
08.11	3–21	2–25, 26, 421
08.12	3–21	2–420
08.13	3–22	2–22, 28, 301, 303
08.14	3–22	2–46
08.15	3–22	2–45, 46, 51, 206, 210, 245, 347
08.16	3–22	2–22
08.17	3–23	2–25, 304
08.18	3–23	2–27, 265, 304
08.19	3–23	2–264
08.20	3–24	2–69, 252
08.21	3–24	2–290
08.22	3–24	2–354
08.23	3–24	2–420
08.24	3–24	2–46, 75, 352
08.25	3–25	2–46, 75, 107, 354
08.26	3–25	2–75
08.27	3–25	2–103
08.28	3–26	2–420

TABLE 1.3–6.—*Comments Sorted by Summary Code* [Page 3 of 11]

Summary Code	Summary Page Number	Document Page Number
		Intersite Transportation
09.01	3–26	2–14, 17, 59, 62
09.02	3–26	2–8, 10, 14, 17, 55, 89, 283
09.03	3–27	2–17
09.04	3–27	2–12
09.05	3–28	2–3
09.06	3–28	2–207, 352, 356, 465
09.07	3–28	2–71
09.08	3–29	2–101
09.09	3–29	2–55, 247
09.10	3–29	2–16, 53, 55
09.11	3–30	2–58, 237, 294
09.12	3–30	2–59, 60, 62
09.13	3–30	2–55
		Waste Management
10.01	3–31	2–2, 10, 11, 55
10.02	3–31	2–197, 420
10.03	3–32	2–4, 10, 30, 33, 38, 341
10.04	3–32	2–19, 22
10.05	3–32	2–9
10.06	3–32	2–10
10.07	3–33	2–10, 11, 17, 121
10.08	3–33	2–33
10.09	3–34	2–33
10.10	3–34	2–307
10.11	3–34	2–222, 286, 408, 451
10.12	3–34	2–16, 100
10.13	3–35	2–48, 220
10.14	3–35	2–275
10.15	3–36	2–289
10.16	3–36	2–61, 457
10.17	3–36	2–96
10.18	3–36	2–97
10.19	3–37	2–97
10.20	3–37	2–97
10.21	3–38	2–96
10.22	3–38	2–98
10.23	3–38	2–400
10.24	3–39	2–52
10.25	3–39	2–56
10.26	3–39	2–57
10.27	3–39	2–57
10.28	3–39	2–96
10.29	3–40	2–229

TABLE 1.3–6.—*Comments Sorted by Summary Code* [Page 4 of 11]

Summary Code	Summary Page Number	Document Page Number
10.30	3–40	2–225, 233, 237
10.31	3–40	2–233
10.32	3–40	2–62
10.33	3–41	2–110
10.34	3–41	2–434
	Radiation and Hazardous Chemicals	
11.01	3–41	2–191, 470
11.02	3–42	2–420
11.03	3–42	2–16
11.04	3–42	2–8, 129
11.05	3–42	2–9
11.06	3–43	2–10, 11, 55, 59, 307, 434
11.07	3–43	2–2, 3, 414
11.08	3–44	2–3
11.09	3–45	2–20, 419
11.10	3–45	2–23
11.11	3–45	2–30, 33, 40, 41
11.12	3–46	2–113
11.13	3–46	2–208
11.14	3–46	2–33
11.15	3–46	2–4, 103, 112
11.16	3–47	2–338
11.17	3–47	2–11, 69, 231
11.18	3–47	2–69
11.19	3–47	2–69
11.20	3–48	2–71
11.21	3–48	2–71
11.22	3–48	2–71
11.23	3–48	2–55, 69
11.24	3–49	2–113
11.25	3–49	2–47, 210
11.26	3–49	2–47, 211
11.27	3–50	2–4, 10, 53, 67, 74
11.28	3–50	2–113
11.29	3–50	2–420
11.30	3–50	2–420
11.31	3–51	2–140
11.32	3–51	2–341
11.33	3–51	2–97
11.34	3–52	2–97
11.35	3–52	2–95
11.36	3–52	2–95
11.37	3–53	2–399
11.38	3–53	2–414

TABLE 1.3–6.—*Comments Sorted by Summary Code* [Page 5 of 11]

Summary Code	Summary Page Number	Document Page Number
11.39	3–53	2–414
11.40	3–54	2–414
11.41	3–54	2–95
11.42	3–54	2–414
11.43	3–55	2–414
11.44	3–55	2–416
11.45	3–55	2–416, 434
11.46	3–56	2–416
11.47	3–56	2–416
		Environmental Justice
12.01	3–56	2–8
12.02	3–56	2–13
12.03	3–57	2–68, 191
12.04	3–57	2–69
12.05	3–57	2–70
12.06	3–57	2–71
12.07	3–57	2–14, 75, 354
12.08	3–58	2–88
12.09	3–58	2–40, 51
12.10	3–58	2–113
		Cumulative Impacts
13.01	3–59	2–16, 292
13.02	3–59	2–51
13.03	3–59	2–48
13.04	3–59	2–342
13.05	3–60	2–342
13.06	3–60	2–342
		Stewardship–Contained Firing Facility
20.01	3–61	2–14
		Stewardship–National Ignition Facility
21.01	3–61	2–1, 3, 20, 24, 42, 44, 325, 368
21.02	3–62	2–38
21.03	3–63	2–69
21.04	3–64	2–13, 14, 37, 39, 132, 179, 227, 271
21.05	3–64	2–13, 39, 111, 190, 325, 343
21.06	3–66	2–31, 35, 36, 37, 38, 39, 40, 41, 99, 131, 188, 189, 190, 191, 271, 297, 478, 486
21.07	3–67	2–31, 36, 38, 166, 180, 310, 326
21.08	3–68	2–137
21.09	3–68	2–41, 132, 135, 180, 479
21.10	3–69	2–35, 37, 39, 132
21.11	3–70	2–39
21.12	3–70	2–30, 38, 43, 132, 170, 180, 328, 458
21.13	3–71	2–14

TABLE 1.3–6.—*Comments Sorted by Summary Code* [Page 6 of 11]

Summary Code	Summary Page Number	Document Page Number
21.14	3–72	2–411
21.15	3–72	2–14, 33, 36, 43, 263, 369
21.16	3–73	2–271
21.17	3–73	2–36, 37, 45, 271, 280, 327, 343, 366
21.18	3–74	2–99
21.19	3–74	2–41
21.20	3–75	2–27, 35, 65
		Stewardship–Atlas Facility
22.01	3–76	2–192
22.02	3–76	2–114
22.03	3–76	2–434
		Management–Weapons Assembly/Disassembly
30.01	3–77	2–49, 75, 85, 105, 210, 213, 246, 269, 277, 447, 449, 462, 484, 488, 497
30.02	3–77	2–191, 396
30.03	3–77	2–10, 17, 18, 90
30.04	3–78	2–97
30.05	3–78	2–97
30.06	3–78	2–59
30.07	3–79	2–90
30.08	3–79	2–50
		Management–Nonnuclear Components
31.01	3–79	2–29, 476
		Management–Pits
32.01	3–80	2–1, 2, 12, 58, 61, 63, 67, 361, 424
32.02	3–80	2–1, 5, 22, 201
32.03	3–81	2–62, 64, 65, 67, 242, 284
32.04	3–81	2–11
32.05	3–81	2–2
32.06	3–81	2–2, 69, 70, 72, 119, 129
32.07	3–82	2–128, 339
32.08	3–83	2–244
32.09	3–83	2–70, 71
32.10	3–83	2–4
32.11	3–83	2–6
32.12	3–84	2–2, 424
32.13	3–84	2–421
32.14	3–84	2–64
32.15	3–84	2–59
32.16	3–84	2–421
32.17	3–85	2–59
32.18	3–85	2–338

TABLE 1.3–6.—*Comments Sorted by Summary Code* [Page 7 of 11]

Summary Code	Summary Page Number	Document Page Number
		Management–Secondaries and Cases
33.01	3–85	2–20, 21, 22, 24, 26, 27, 109, 198, 245, 289, 303, 481
33.02	3–86	2–18
33.03	3–86	2–241
33.04	3–86	2–69
33.05	3–87	2–19, 304, 305, 406
33.06	3–87	2–420
33.07	3–87	2–421
33.08	3–88	2–26, 421
33.09	3–88	2–64, 358, 406
33.10	3–89	2–20, 111, 301
33.11	3–89	2–110
		Management–High Explosives Components
34.01	3–89	2–45, 46, 49, 50, 75, 106, 206, 207, 210, 213, 215, 216, 246, 268, 269, 277, 448, 463, 475, 483, 485, 489, 490, 497
34.02	3–89	2–7, 47, 211, 241
34.03	3–90	2–206
34.04	3–90	2–207
34.05	3–90	2–207
34.06	3–91	2–207
34.07	3–91	2–216
34.08	3–91	2–69
34.09	3–91	2–207
34.10	3–92	2–75, 216
34.11	3–92	2–355, 468
34.12	3–93	2–468
34.13	3–93	2–1, 2, 58, 69, 216, 351
34.14	3–93	2–441
34.15	3–93	2–470
34.16	3–94	2–63, 405
34.17	3–94	2–73
		Nuclear Weapons Policies
40.01	3–95	2–1, 4, 23, 25, 76, 154, 257, 263
40.02	3–95	2–6, 14, 37, 43, 44, 66, 117, 192, 226, 322, 398, 424
40.03	3–97	2–1, 3, 4, 20, 28, 337
40.04	3–97	2–10, 15, 28, 31, 41, 54, 66, 130, 193, 254, 361, 488, 494
40.05	3–98	2–3, 12, 30, 33, 34, 36, 40, 44, 48, 56, 66, 78, 91, 154, 252, 261, 365, 441, 450
40.06	3–98	2–9, 10, 11, 30, 33, 34, 37, 39, 40, 41, 42, 46, 48, 49, 52, 53, 54, 56, 57, 58, 59, 60, 61, 62, 63, 65, 66, 67, 83, 95, 131, 165, 222, 230, 231, 232, 234, 237, 239, 240, 253, 260, 261, 272, 273, 275, 281, 282, 288, 295, 310, 344, 345, 448, 449, 454, 458

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Summary Code	Summary Page Number	Document Page Number
40.07	3–99	2–3, 5, 6, 7, 9, 11, 12, 14, 20, 28, 29, 30, 32, 35, 36, 37, 38, 39, 41, 42, 43, 44, 48, 54, 57, 60, 62, 63, 65, 66, 67, 70, 78, 92, 100, 115, 117, 134, 139, 159, 161, 209, 218, 220, 225, 226, 235, 240, 244, 252, 253, 272, 274, 285, 294, 296, 307, 311, 332, 345, 348, 364, 365, 371, 407, 411, 418, 422, 451, 452, 458
40.08	3–101	2–3, 4, 5, 7, 11, 12, 18, 19, 23, 46, 55, 56, 66, 199, 243, 295, 396, 495
40.09	3–103	2–21
40.10	3–103	2–13
40.11	3–103	2–1, 2, 19, 23, 40, 51, 65, 105, 205, 363, 418
40.12	3–104	2–9, 12, 30, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41, 44, 49, 52, 54, 56, 57, 61, 62, 66, 67, 74, 83, 139, 179, 209, 220, 244, 253, 260, 273, 274, 283, 286, 293, 296, 297, 311, 344, 350, 374, 408, 441, 450, 451, 452
40.13	3–104	2–8, 9, 13, 16, 21, 23, 26, 28, 31, 32, 33, 46, 50, 65, 69, 109, 128, 133, 191, 202, 246, 261, 290, 292, 352, 395, 418, 448, 480, 495
40.14	3–105	2–3, 29, 36, 40, 46, 54, 252, 281, 350
40.15	3–105	2–9, 10, 12, 15, 17, 21, 29, 32, 33, 35, 36, 37, 41, 53, 56, 61, 63, 134, 221, 233, 234, 240, 252, 281, 296, 307, 310, 342, 350, 371, 395, 412, 415, 441, 450
40.16	3–106	2–29
40.17	3–107	2–161, 459
40.18	3–107	2–459, 489, 491, 495
40.19	3–107	2–8, 11, 306, 338
40.20	3–108	2–215, 216, 463, 475
40.21	3–108	2–1, 5, 6, 7, 10, 50, 54, 57, 63, 64, 84, 97, 142, 213, 243, 289, 295, 345, 353, 417, 434
40.22	3–110	2–2, 3, 4, 8, 12, 60, 61, 62, 65, 79, 145, 252, 338, 349, 425
40.23	3–113	2–18, 19, 21, 24, 27, 28, 45, 66, 96, 195, 197, 200, 204, 246, 290, 305, 351, 353, 419, 482
40.24	3–113	2–18, 20, 23, 24, 25, 28, 54, 116, 195, 201, 203, 205, 243, 298, 299, 300, 301, 302, 418, 455
40.25	3–114	2–3, 19, 25, 31, 43
40.26	3–114	2–140, 263, 280, 338, 443
40.27	3–115	2–11, 27, 38, 48, 50, 53, 60, 61, 69, 76, 115, 181, 219, 221, 223, 227, 229, 231, 237, 242, 243, 252, 263, 269, 270, 288, 290, 337, 418, 454
40.28	3–116	2–25
40.29	3–116	2–11, 56, 69, 205
40.30	3–116	2–7, 242
40.31	3–117	2–6, 8, 31, 34, 35, 44, 336
40.32	3–118	2–16, 96, 284, 366, 410
40.33	3–118	2–9, 16, 19, 21, 23, 66, 78, 117, 134, 154, 204, 205, 243, 302, 312, 419, 426
40.34	3–120	2–9, 26, 32, 44, 77, 228, 332
40.35	3–120	2–2, 3, 4, 6, 18, 45, 61, 64, 70, 410
40.36	3–120	2–3, 12, 21, 25, 31, 40, 43, 45, 48, 56, 61, 62, 66, 81, 88, 93, 116, 139, 167, 193, 218, 221, 227, 311, 338, 350, 366, 420, 428, 441, 442, 450, 451, 452
40.37	3–122	2–7, 34, 78
40.38	3–122	2–7, 8, 11, 23
40.39	3–123	2–36, 427

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Summary Code	Summary Page Number	Document Page Number
40.40	3–123	2–7, 18, 19, 45, 46, 48, 260, 290, 420
40.41	3–124	2–4, 30, 38, 82, 398, 429
40.42	3–125	2–196, 312
40.43	3–125	2–88, 93
40.44	3–126	2–7, 31, 36, 37, 65, 131, 191, 310, 482
40.45	3–127	2–16, 90, 117
40.46	3–127	2–256
40.47	3–127	2–22, 111
40.48	3–128	2–490
40.49	3–128	2–91
40.50	3–128	2–33, 34, 35, 36, 48, 52, 55, 60, 179, 209, 221, 234, 238, 244, 252, 278, 309, 312, 350, 370, 413
40.51	3–128	2–6, 58, 62, 65, 67, 130, 415, 467
40.52	3–128	2–45, 46, 49, 96, 105, 206, 209, 212, 247, 268, 269, 276, 277, 347, 447, 453, 456, 457, 461, 474, 482, 484, 488, 497
40.53	3–129	2–260, 290
40.54	3–130	2–262, 407
40.55	3–130	2–435
40.56	3–130	2–13, 317, 339, 429
40.57	3–131	2–434
40.58	3–131	2–159, 340
40.59	3–132	2–72
40.60	3–132	2–13, 26, 34, 35, 39, 41, 43, 49, 55, 77, 115, 225, 230, 253, 280, 282, 286, 331, 349, 365, 422, 444
40.61	3–135	2–95
40.62	3–135	2–459, 490
40.63	3–135	2–420
40.64	3–135	2–420
40.65	3–136	2–420
40.66	3–136	2–474
40.67	3–136	2–50, 51
40.68	3–136	2–51, 205, 420
40.69	3–137	2–3, 9, 55, 67, 222, 297, 376, 418
40.70	3–137	2–139, 154
40.71	3–137	2–61
40.72	3–138	2–53, 56, 63, 228, 235, 236, 238, 284, 349, 370, 409, 417
40.73	3–138	2–48, 49, 473
40.74	3–138	2–96
40.75	3–139	2–97
40.76	3–139	2–68, 121, 437, 460
40.77	3–139	2–139
40.78	3–139	2–306, 433
40.79	3–140	2–48
40.80	3–140	2–21, 420
40.81	3–140	2–71

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Summary Code	Summary Page Number	Document Page Number
40.82	3–141	2–420
40.83	3–141	2–215, 216, 353
40.84	3–141	2–100
40.85	3–141	2–29, 32, 91, 313, 350, 365, 444
40.86	3–143	2–90
40.87	3–143	2–292, 325, 350, 394
40.88	3–143	2–69
40.89	3–143	2–193
40.90	3–144	2–339, 428
40.91	3–145	2–19
40.92	3–145	2–22
40.93	3–145	2–111
Regulatory Compliance		
41.01	3–146	2–9, 12, 13, 15, 49, 57, 65, 68, 71, 72, 252
41.02	3–146	2–53, 60
41.03	3–147	2–4, 12, 15, 16, 22, 25, 31, 37, 47, 49, 53, 57, 58, 59, 60, 63, 67, 69, 70, 75, 88, 92, 120, 195, 221, 222, 234, 252, 266, 345, 346, 407, 493
41.04	3–147	2–22, 345
41.05	3–148	2–2, 6, 28, 30, 37, 42, 43, 47, 48, 50, 52, 53, 56, 70, 74, 128, 193, 213, 219, 226, 239, 262, 267, 279, 296, 409
41.06	3–148	2–24, 194, 267, 493
41.07	3–149	2–5, 6, 9, 70, 131
41.08	3–149	2–12, 13, 52, 54, 57, 236, 293
41.09	3–150	2–13, 22, 48
41.10	3–150	2–16, 22, 25, 27, 44, 47, 49, 70, 71, 73, 110, 121, 195, 198, 199, 219, 266, 290, 292, 481, 497
41.11	3–151	2–34
41.12	3–151	2–34, 36, 43, 50, 78, 114
41.13	3–151	2–30, 41, 54
41.14	3–152	2–68, 98, 461
41.15	3–152	2–68
41.16	3–152	2–341, 428
41.17	3–153	2–43, 94, 317, 340, 408, 429, 444
41.18	3–158	2–4, 7, 11, 29, 32, 39, 61, 77, 91, 93, 226, 263, 321, 397, 430, 444
41.19	3–160	2–423
41.20	3–161	2–430
Relationship to Other DOE Programs/Activities		
42.01	3–162	2–14, 17, 27, 68, 72, 233, 428
42.02	3–162	2–6, 68
42.03	3–163	2–32
42.04	3–163	2–32
42.05	3–163	2–427
42.06	3–164	2–18, 100, 196, 442, 450
42.07	3–164	2–38

TABLE 1.3–6.—*Comments Sorted by Summary Code* [Page 11 of 11]

Summary Code	Summary Page Number	Document Page Number
42.08	3–165	2–263, 400
42.09	3–165	2–50, 118, 246
42.10	3–166	2–53, 105, 427
42.11	3–166	2–420
42.12	3–166	2–289, 341, 427
42.13	3–167	2–252
42.14	3–167	2–44
42.15	3–168	2–53, 412
42.16	3–168	2–26
42.17	3–168	2–26
42.18	3–168	2–401
	General/Miscellaneous Environmental	
43.01	3–169	2–15
43.02	3–169	2–97
43.03	3–169	2–60
43.04	3–170	2–57
43.05	3–170	2–57
43.06	3–170	2–8, 56, 57, 58, 59, 60, 114, 223
43.07	3–170	2–58
43.08	3–170	2–34
43.09	3–171	2–51, 206, 220
43.10	3–171	2–5, 56
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COMMENT DOCUMENTS

Comment
Documents

CHAPTER 2: COMMENT DOCUMENTS

This chapter is a compilation of all the documents that the Department of Energy received during the public comment period on the **Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management.** *The documents are keyed by number to table 1.3–3, Index of Commentors. The documents are presented by type in the order in which they were received. On each document the first number represents the comment number within that document and the second number represents the issue summary code assigned to this comment. This number can be used to locate the summary and response relating to this comment. Section 1.3 further describes the organization of this Comment Response Document and discusses the tables provided in chapter 1 to assist readers.*

PUBLIC HEARING—LOS ALAMOS, NEW MEXICO

MARCH 26, 1996—AFTERNOON SESSION

1/40.03 The commentor asks what procedure would be followed if the director of Los Alamos National Laboratory (LANL) judged the stockpile unreliable.

2/43.15 The commentor believes that the history discussion in chapter 2 of the *Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management* (Draft PEIS) should go back further than the beginning of the Cold War in order to provide a better perspective on nuclear weapons issues.

3/40.03 The commentor asks if the Draft PEIS analyzed the pressures that would be put on the laboratory director while making the reliability decision.

4/40.21 The commentor believes that the safety record of the past 50 years is evidence of the competence of the people who create, manage, and control nuclear weapons.

5/40.11 The commentor believes that a thorough understanding of the weapons needs to be maintained at the laboratories, especially in light of the Comprehensive Test Ban Treaty (CTBT).

6/40.01 The commentor believes that the ban on underground nuclear testing is a mistake. The commentor advises the Nation to continue underground nuclear testing to ensure the reliability of nuclear weapons.

7/21.01 The commentor states that the National Ignition Facility (NIF) may be able to conduct interesting experiments, but the facility will provide very little information on the reliability of nuclear weapons.

8/34.13 The commentor asks when a decision will be made on the preferred alternative for high explosives (HE) fabrication.

9/32.01 The commentor wants to know the difference between pit remanufacturing and pit refurbishing (whether it is a one-to-one process). The commentor asks if the pit fabrication facility will have the capability to make smaller pits for different applications in addition to remanufacturing.

10/32.02 The commentor asks if the fissile materials will be melted and purified before being remanufactured.

11/11.07 The commentor states that the radiation sources are not carefully stated and asks if linear extrapolation was used to determine the doses to the workers at LANL and the Savannah River Site (SRS) in section 5.4.1. The commentor believes that these are overestimates of what would happen to the workers.

12/40.11 The commentor believes that the document should consider the possibility of non-ratification of the Strategic Arms Reduction Talks (START) II protocol and CTBT when considering the stockpile size.

13/40.35 The commentor asks how the President gets information regarding the Nuclear Weapons Complex (Complex).

14/11.07 The commentor asks how the radiation doses to workers calculated in the PEIS for pit fabrication at LANL compare to the doses that were observed at Rocky Flats when pit fabrication was performed there.

15/10.01 The commentor asks what kind of waste will be put into the expanded Area G and what safety measures will be used at the facility.

16/32.05 The commentor asks what economic impacts would be associated with pit production at LANL. The commentor also asks what is the annual budget for the pit fabrication facility.

MARCH 26, 1996—EVENING SESSION

1/41.05 The commentor believes that the format used in the scoping meetings was better because some people may hesitate to approach a microphone during the public comment meetings.

2/41.05 The commentor believes that the Department of Energy (DOE) is not telling the truth and that the public meetings are only for public relations purposes.

3/32.01 The commentor asks if there will be pit production at the Pantex Plant (Pantex) or at other facilities.

4/32.01 The commentor wants to know what the pit production level was at the height of the Cold War.

5/40.22 The commentor wants to know if the plutonium pits have had any problems over the past three years (since the moratorium) that required repair or replacement to get a sense of how the number of 50 pits was arrived at. The commentor also wants to know how many pits were destroyed.

6/32.12 The commentor wants to know if the pit production capacity at Technical Area (TA) -55 is still classified and the definition of inherent and full capacity. The commentor wants to know the pit production capacity at TA-55 (plutonium handler area) in LANL. The commentor also wants to know how easily the pit production capacity at TA-55 could be expanded and what would be the three-shift capacity.

7/32.06 The commentor wants to know if the pit production facility at SRS will be dismantled.

8/34.13 The commentor asks if DOE has decided to leave the HE fabrication mission at Pantex or move it to LANL.

9/11.08 The commentor asks what DOE considers an accident and if there is enough historical data to constitute a fair analysis of accidents. The commentor asks if the analysis examines risks more to the public than to the workers in the workplace. The commentor also asks if the accident modeling included real accidents at TA-55 reported to the Occurrence Reporting System.

10/11.07 The commentor asks if LANL ever had pit production capacity and if data on worker safety, accidents, and contamination was used in the PEIS.

11/09.05 The commentor questions the safety record of nuclear shipments in the LANL area. The commentor has heard conflicting reports concerning the number of accidents from Los Alamos to the thruway and requests clarification.

12/09.05 The commentor cites a safe secure trailer truck turnover in Colorado about five years ago as proof that there have been accidents with nuclear cargo.

13/40.36 The commentor asks DOE to justify the need for the Stockpile Stewardship and Management Program by citing specific examples of problems that have been found in the stockpile that could not be solved with existing technology.

14/40.22 The commentor wants to know how old the weapons in the stockpile are and how long they will be maintained in the stockpile.

15/40.03 The commentor asks if underground nuclear testing would resume based on the recommendations of the laboratory directors that adequate simulation or testing capacity is not available.

16/40.25 The commentor is of the opinion that stockpile management has been better analyzed than stockpile stewardship, which in the words of the commentor is still very weak. The commentor believes that the stewardship part of the Program has muddled science with politics in developing the preferred alternative in stockpile stewardship. The commentor believes that more stewardship alternatives should be analyzed including simpler and less grandiose alternatives.

17/40.35 The commentor questions the ability of the proposed program to get the job done.

18/21.01 The commentor believes the technical justification for NIF is poor and is not cogent.

19/40.14 The commentor questions the need for the Nevada Test Site (NTS) at such an enormous cost.

20/40.08 The commentor questions the peer review system of the stockpile stewardship plan. The commentor believes that the peer review system should be carefully considered because it is fraught with conflict of interest problems.

21/40.69 The commentor believes that DOE should address the historical record of lies and deceptions in the nuclear program.

22/40.05 The commentor states that the goals of the Stockpile Stewardship and Management Program are not clear. The commentor wants to know if the Program will maintain the capability to design new weapons.

23/40.07 The commentor believes that the nonproliferation aspects of the Program have not been properly addressed except in the case of NIF.

24/40.41 The commentor requests an open discussion on the role of plutonium-242 in the Program. The commentor points out that plutonium-242 has been linked to serious environmental problems at SRS.

25/41.18 The commentor wants to see a comprehensive discussion in a programmatic context of: hydrotesting, Dual Axis Radiographic Hydrodynamic Test (DARHT), the Contained Firing Facility (CFF) at the Pulsed High Energy Radiation Machine Emitting X-Rays (PHERMEX) Facility, the Big Explosives Experimental Facility (BEEF), and the Lyner facility.

26/10.03 The commentor notes that page 11 of the summary in the Waste Management Draft PEIS shows a large amount of waste generation related to stockpile stewardship and management.

27/11.15 The commentor believes that the accident analysis tends to trivialize accidents for stockpile stewardship. The commentor notes that very low probability events that have very catastrophic consequences are difficult for the decisionmaking process.

28/11.27 The commentor believes that even the risk of an accident carries certain costs. The commentor believes that the mere perception that an accident is possible could damage the tourist industry of New Mexico.

29/41.03 The commentor believes that there should be a national referendum to find out in which direction the Stockpile Stewardship and Management Program should go.

30/40.01 The commentor notes that the *National Defense Authorization Act* requires NTS to maintain a ready state to do underground nuclear testing if an emergency was declared.

31/40.03 The commentor points out that there is a range of options besides nuclear testing that would allow a director to recertify the reliability of the stockpile once it is declared unreliable.

32/40.22 The commentor asks if there are currently weapons in the stockpile that are beyond their design life. The commentor also notes that an ultra enhanced surveillance program may be needed in the future if we continue to have weapons in the stockpile.

33/32.10 The commentor notes that the environmental impacts per pit produced would be reduced by using advancements such as new welding techniques, dry machining, and the reduction of oils and organic solvent usage. The commentor also points out that the actual environmental impacts may be less than the impacts outlined in the document since conservative estimates were used in the analysis of the impacts.

34/40.08 The commentor believes that the focus should be on national security not politics. The commentor believes that the country is lucky to have LANL.

35/40.08 The commentor believes that the politicians making the decisions on the stockpile stewardship mission do not have a firm grasp on weapons issues and could be influenced by self-serving advisors in the weapons program.

36/40.35 The commentor questions the ability of the Program to catch problems in the stockpile. The commentor also asks what yardstick the President, Congress, and DOE used when judging the potential success of the alternatives in the PEIS.

37/40.35 The commentor believes that DOE is gambling by depending on the Program to replace underground testing.

38/40.08 The commentor believes that political leaders are not making decisions with good information and that the wrong decision has been made in this case, but the commentor believes the plan for stewardship is tolerable and that DOE should proceed.

39/32.02 The commentor asks if DOE currently has facilities in place to change the plutonium alloy mix if a problem developed in the future or would different plutonium handling methods be required from what currently exists at LANL. The commentor also asks if DOE would replace the pits with a different alloy or use the same alloy if a pit metal problem developed.

40/43.10 The commentor is concerned that the Federal Government is expanding nuclear programs in the State of New Mexico without investing any money in the state. The commentor asks how much money is being committed to New Mexico compared to how much is being committed for high energy physics programs. The commentor believes that DOE has no commitment to public health surveillance in the state despite a rapid large-scale expansion of nuclear programs.

41/40.08 The commentor is concerned about the conflict of interest that can result from having the directors of large bureaucratic institutions responsible for major national issues. The commentor believes that the politicians have no option but to accept these recommendations despite the conflict of interest.

42/40.21 The commentor points out the conflict of calling for increased environmental monitoring and more studies from a DOE that they do not trust.

43/40.21 The commentor believes that DOE has not fulfilled the requirements of the Tiger Team. The commentor states that people involved with tracking the Tiger Team findings were all laid off and cites the Martinez electrocution accident report as proof that the findings were never addressed. The commentor further states that citizens should be involved in deciding if the Tiger Team findings should be discarded or not. The commentor also wants to know what happened to the lessons learned program that resulted from the Tiger Team in 1991.

44/40.21 The commentor believes that there have been issues of classification that obscure safety problems at the laboratory.

45/40.21 The commentor believes that intimidation and fear of losing jobs has prevented people from raising safety concerns at LANL. The commentor believes that a separate reporting structure for safety concerns should be developed before nuclear materials handling is expanded at LANL.

46/41.07 The commentor points out that the Defense Facility Nuclear Safety Board was created by Congress to review and identify problems in DOE. The commentor notes that the board does an annual report and that they work extensively at the facilities.

47/40.07 The commentor believes that the PEIS fails to mention that the Stockpile Stewardship and Management Program will be used to maintain the expertise of weapons development, research, design, testing, prototyping, and certification. The commentor believes the PEIS should consider a future treaty that may require DOE to disclose whether or not the Program does weapon designing. The commentor believes that DOE should separate the advancement of the science of nuclear weapons from the maintenance work.

48/40.07 The commentor believes that if DOE continues to pursue the advancement of nuclear science, it will make it easier for someone to design a nuclear weapon in the future.

49/40.07 The commentor believes that the long- and short-term nonproliferation impacts have not been fully analyzed.

50/40.02 The commentor questions the timing, purpose, and need for the subcritical test planned for June 18, 1996 at NTS. The commentor wants the PEIS to address the issue and how it may affect the Russian elections and CTBT.

51/41.05 The commentor is glad that DOE is conducting the public comment meetings and hopes that DOE will continue to have public meetings.

52/40.51 The commentor is thankful for DOE and LANL and believes that LANL is capable of continuing its mission because it has the proper technology and scientific knowledge needed to protect our way of life.

53/41.07 The commentor points out that the Citizens Advisory Board is not accountable to the citizens of Los Alamos and does not speak for the citizens of Los Alamos, specifically with respect to safety concerns.

54/32.11 The commentor asks if the need for pit production outweighs the additional risks to the citizens of Los Alamos. The commentor asks what the citizens of Los Alamos will gain from bringing pit production to LANL.

55/08.06 The commentor believes that any additional work that would come to Los Alamos from pit production should be contracted out to a private taxpaying company instead of going to the University of California which does not pay taxes to the state or the community.

56/40.31 The commentor believes that information available to the public is increasingly being taken out of the public record. The commentor cites the Operating Experience Summary Report which was recently taken offline, presumably to hide the number of troublesome incidents at TA-55.

57/40.21 The commentor feels the workers at LANL are eminently competent to monitor their own safety and environmental concerns.

58/41.07 The commentor points out that there is an advisory committee that has recommended that the Environmental Protection Agency (EPA) and Occupational Safety and Health Administration (OSHA) be allowed to oversee DOE facilities.

59/42.02 The commentor would like to see additional nonweapons work at LANL and recommends that the *Los Alamos Site-Wide Environmental Impact Statement* (EIS) look at the enhancement of nonweapons work.

60/41.05 The commentor asks if the *National Environmental Policy Act* (NEPA) process allows DOE to lie in the PEIS. The commentor also asks if DOE is required to respond to comments from the public.

61/40.35 The commentor believes that the gamble that DOE is taking is inherent in all research and development (R&D) projects.

62/41.05 The commentor believes that the public meetings are a valuable forum for the public.

63/40.21 The commentor believes that safety has deteriorated at LANL because the responsibility for safety has been shifted from the workers to the bureaucrats.

64/40.08 The commentor does not believe that the laboratories are guilty of collusion with respect to peer review because, as far as the commentor has seen, the three laboratories do not work well together.

65/40.44 The commentor believes that the science-based stewardship program is very important because it will maintain the competence of the people and the tools needed to answer questions that arise.

66/40.30 The commentor believes that LANL laid off employees at the plutonium facility in TA-55 even though they knew that TA-55 was probably going to expand.

67/08.05 The commentor believes that the socioeconomic analysis does not consider the social and economic impact to the people who were laid off at the plutonium facility. The commentor believes that the socioeconomic analysis needs to look at the integrity of the people running the facility. The commentor also believes that the 22 people laid off at the plutonium facility should be interviewed for the socioeconomic analysis.

68/40.30 The commentor believes that a constant fear exists at the plutonium facility that if an employee is critical of how the facility is managed then that employee will be replaced immediately.

69/34.02 The commentor believes that the HE mission should be brought to LANL because a synergism can be created through the R&D mission and the production of HE.

70/40.38 The commentor points out that the disarmament community wants to maintain competence in the stockpile, but they are also concerned about how many people and what skills are needed, what work will be performed, and who will be trusted to establish the transparency that the Stockpile Stewardship and Management Program needs.

71/40.07 The commentor suggests international oversight of the stockpile stewardship part of the Program to help solve nonproliferation concerns.

72/40.30 The commentor points out that TA-55 may be vulnerable to sabotage if the constant threat of lay-offs exists.

73/40.21 The commentor believes that LANL could avoid more accidents in the future by making safety a part of the workers' culture.

PUBLIC HEARING—ALBUQUERQUE, NEW MEXICO

MARCH 28, 1996—EVENING SESSION

1/40.40 The commentors ask about the current nuclear weapon stockpile size, including pits and warheads, and the amount of damage one nuclear warhead can do.

2/08.08 The commentor asks for a definition of environmental justice.

3/40.37 The commentor believes that DOE has been inconsistent when talking about the timeframe covered in the PEIS. DOE has not been clear on whether the PEIS covers a 25-year timeframe or an indefinite timeframe.

4/41.18 The commentor asks why DARHT is not in the Draft PEIS even though it was discussed at the scoping meeting for stockpile stewardship and management.

5/12.01	The commentor believes that DOE has unfairly placed their nuclear facilities in low income areas. The commentor notes that New Mexico, "the home of the bomb," has a low per capita income and a high minority population.
6/12.01	The commentor believes that the minority population maps for LANL and Sandia National Laboratories (SNL) have errors in them.
7/08.08	The commentor asks about the difference between socioeconomics and environmental justice.
8/04.11	The commentor would like to know where hydrology is discussed in the PEIS.
9/40.22	The commentor asks why the 160 problems found in the nuclear packages, HE, and secondaries in the 1950s were included in the three-laboratory study of weapons aging, but were not included in the Sandia Stockpile Study. The commentor also asks if all of the 160 problems are in the enduring stockpile and for a breakdown of the number of problems found in the nuclear components versus HE.
10/40.13	The commentors ask what is the past, present, and future budget of the stockpile program and, in particular, the surveillance budget at SNL.
11/40.38	The commentor asks if a three-laboratory stockpile evaluation program has been organized and which DOE office has the responsibility for the program.
12/43.06	The commentor recommends that a section for the catastrophic environmental impacts of the past weapons program should be included in the summary of environmental impacts section. The commentor cites Rocky Flats as an example of how DOE activities have catastrophically affected the public and the environment.
13/11.04	The commentor believes that a 100-mile (mi) radius would be more appropriate for the analysis of radiation health affects to the public.
14/09.02	The commentor notes that there are no evacuation plans for the people of Santa Fe and Albuquerque in case of a transportation accident involving nuclear materials.
15/40.19	The commentor believes that DOE is using the reestablishment of pit manufacture at LANL as an opportunity to redesign nuclear weapons. In particular, the commentor is concerned that DOE will make "mini-nukes" out of the pits that are melted down at LANL.
16/08.08	The commentor states that environmental justice does not just deal with socioeconomics. The commentor suggests DOE is supposed to do an environmental justice analysis for each of the other possible impacts. For example, DOE should conduct an environmental justice analysis of the air pollution to see if the air pollutants are falling in neighborhoods of concentrations of minority and low income people. Then DOE should do the same thing for water and soils, and geology and socioeconomics. According to the commentor, environmental justice is really an umbrella under which you are supposed to evaluate all of the other impacts.
17/40.19	The commentors question why DOE needs to produce more plutonium pits when they have thousands of dismantled pits at Pantex.
18/40.31	The commentor cites the new bomb designs that were on the Internet as proof that DOE is still working on new bomb designs.

19/40.07 The commentors believe that the reconfiguration program is a ploy which DOE will use to design new weapons in violation of the treaties.

20/11.05 The commentor asks if the PEIS considers multigenerational problems in the analysis of cancer fatalities. The commentor also asks if the cancer statistics and studies from Chernobyl and Nagasaki are taken into consideration in the calculation of the cancer fatality numbers.

21/41.01 The commentor believes that DOE has been very candid and open when answering questions from the public.

22/40.13 The commentor asks how much money will be saved by rightsizing the weapons complex.

23/40.13 The commentor questions how much money is being spent on the enhanced experimental program.

24/10.05 The commentor wants to know what portion of the DOE budget is going towards site cleanup and solution of the nuclear waste problem. The commentor believes that new solutions need to be developed to handle the terrible problem of nuclear waste because the current practices are not working.

25/40.15 The commentor believes that we are fouling the earth by increasing the amount of nuclear waste throughout the years.

26/40.06 The commentors believe that the United States should not manufacture any more nuclear weapons and should move towards denuclearization.

27/41.07 The commentor believes that a civilian review board should be set up to oversee DOE.

28/40.69 The commentor believes a war crime tribunal should be established to review past mistakes of DOE in order to charge them with first-degree murder and hang them.

29/41.01 The commentors believe that the public was not given adequate notice for public comment meetings.

30/40.07 The commentor believes that the Program violates the Nonproliferation Treaty (NPT) by continuing the research and design of new nuclear weapons. The commentor cites pit production at LANL and NIF as specific examples of nonproliferation violations.

31/40.33 The commentor cites a physicist at the Lawrence Livermore National Laboratory (LLNL), Mr. Dewitt, who says that the stockpile can be maintained through direct remanufacture. Furthermore, the commentor believes that DOE will try to improve nuclear weapons every time a warhead is decommissioned.

32/40.12 The commentor believes that enormous amounts of taxpayer money is being wasted on militarily unusable weapons. The commentor believes that the money should be spent on more useful programs such as medical care and daycare. The commentor also believes that the Program is a pork-barrel project for the nuclear military industrial complex and the corporations that serve the Complex.

33/40.34 The commentor believes that DOE uses the word "reliability" incorrectly. The commentor believes that DOE is really talking about explosion radius and the number of people that would be killed when they talk about the reliability of a weapon.

34/40.06 The commentor states that nuclear weapons are no longer a deterrence in today's world.

35/10.03 One commentor notes that the Waste Management Draft PEIS predicts a 1,370,000 cubic meter (m^3) increase in waste over the next 20 years. The commentor believes DOE has not changed directions from the past practices of producing massive quantities of nuclear waste.

36/10.06 The commentors state that New Mexico is contaminated in many places and that DOE should not dump anymore nuclear waste in the State of New Mexico.

37/11.06 The commentor believes that DOE downplays the dangers of radiation. The commentor states that DOE should investigate the elevated levels of thyroid and breast cancer in Los Alamos, Bernalillo County, and surrounding towns.

38/11.06 The commentor believes that DOE should initiate a series of health studies to determine the extent of contamination in the State of New Mexico. The commentor believes that these studies have not been carried out because it would be bad.

39/40.15 The commentor states that the Chemistry and Metallurgy Research building should be cleaned up before any new projects are brought to LANL.

40/40.21 The commentor believes that the current system within DOE to shelter whistleblowers is not effective in protecting the whistleblowers.

41/11.27 The commentor states that one nuclear accident would destroy the tourist, manufacturing, and agrarian industries in the State of New Mexico.

42/10.01 The commentor states that DOE plans to continue the production of nuclear waste but does not talk about what they plan to do with the waste. The proposed expansion of Area G at LANL is unacceptable to the commentor.

43/09.02 The commentor states that the emergency response personnel along the transportation routes are not properly trained and equipped to handle an accident involving nuclear materials.

44/43.19 The commentor states we cannot undiscover plutonium.

45/11.06 The commentor believes that the cancer rates in Los Alamos are in line with the cancer rates expected from a town located at an elevation of 8,000 feet (ft). The commentor notes that dosimetry readings and air monitoring data on the Internet prove that the area is safe.

46/40.04 The commentor believes that the fact that the United States has nuclear weapons as a deterrent allows the nonproliferation process to work. The commentor believes that the country needs to keep nuclear weapons because countries like China will still have weapons even if we stopped making weapons.

47/40.21 The commentor believes that the people laid off at LANL were not laid off because they were whistleblowers.

48/30.03 The commentor points to Nevada and its thriving tourist industry as proof that a state can be both a nuclear-weapons state and a tourist state.

49/10.07 The commentor believes that nuclear waste should be centralized into a repository to provide better safety monitoring for the material. The commentor does not believe that there would be significant risk in transporting nuclear materials to a repository.

50/10.01 The commentor believes that the expansion of Area G would not have any adverse affects on the area.

51/10.07 The commentor believes that consolidating waste at one site would lead to increased risks due to the risks involved with transportation of the nuclear materials.

52/40.07 The commentor states that the rationale for designing new weapons to keep the scientists from getting rusty is not enough to warrant continued design of weapons. The commentor also states that we do not need to alter the designs to meet new challenges from countries like Iran and Iraq because the current weapons are already so powerful.

53/11.06 The commentor believes that her two-year old sister, who died of brain cancer, was exposed to radiation from bomb tests over the Pacific.

54/11.17 The commentors believe that New Mexico has received a disproportional amount of the nuclear weapons industry work, and do not want any new DOE work in the state.

55/40.07 The commentor states that DOE is working with the University of New Mexico on new weapons designs.

56/40.06 The commentor cites the successful disarmament of mustard gas, nerve gas, and antipersonnel weapons as examples for the nuclear weapons industry to follow.

57/40.08 The commentors believe that the Stockpile Stewardship and Management Program is driven by scientists and contractors who have personal interests in mind as opposed to larger human goals.

58/40.27 The commentor wants all DOE facilities in New Mexico converted for civilian use.

59/40.29 The commentor believes that right-sizing the Complex is a good idea, but the commentor does not see the reductions reflected in the document.

60/40.38 The commentor asks if a study was done to determine how many active DOE scientists would be needed to reactivate the weapons program (the enhanced experimental programs) if this was needed in the future.

61/07.01 The commentor asks what the cultural and paleontological analysis involved.

62/40.19 The commentor suggests using the same old weapon designs so that the pits at Pantex could be used as replacement pits.

63/32.04 The commentor asks how often a flaw in a pit applies to an entire weapon type.

64/40.06 The commentor believes the continued testing of nuclear weapons violates the spirit of the NPT.

65/41.18 The commentor believes that DARHT, BEEF, and the low-yield explosion facility should have all been a part of the Draft PEIS. The commentor believes these facilities are related to stewardship and should not have been allowed to go ahead without including them in the Draft PEIS.

66/40.12 The commentor is concerned that enormous amounts of taxpayer money have been spent on nuclear weapons in the name of national security when national security is really about having a well-educated, nonviolent, clean, and safe community.

67/41.03 The commentor feels shut-out of the decisionmaking process as it relates to defense spending.

68/40.15 The commentor believes that the country cannot afford to maintain anything other than a minimal stockpile when faced with the immense cost of cleaning up the environmental problems caused by the nuclear weapons industry.

69/40.07 The commentor believes the country is giving impetus to other countries to develop nuclear weapons.

70/09.04 The commentor believes that the PEIS should consider the risks of hijacking when looking at the intersite transport of nuclear materials.

71/41.01 The commentor appreciates the effort that was put into writing the document and holding the public comment meetings.

72/41.08 The commentors believe that the threat of using nuclear weapons and the environmental impacts that result from using the weapons are impacts that should be analyzed in the PEIS.

73/40.07 The commentor is concerned that the Program will increase the risk of the use of nuclear weapons in the future. The commentor believes that advancing the technology of nuclear weapons will make it easier for other countries and terrorists to design a nuclear weapon.

74/40.05 The commentors believe that DOE is assuming a nuclear war fighting posture instead of a deterrence posture. Two commentors believe that the safety of the weapons is not in question and that DOE is orienting the Stockpile Stewardship and Management Program toward examining the explosive yield of the weapons. One commentor states that the deterrence would be just as effective with a lower-yield weapon.

75/40.07 The commentor believes that the Program would make commitments that would indicate to the rest of the world that the country is moving forward with a robust nuclear weapons program.

76/40.08 The commentor believes that a conflict of interest exists within DOE because elected officials are advised by the people who would benefit from the Program the most. The commentor believes that since DOE scientists have exclusive possession of the classified scientific knowledge that is needed to steer the Program, a danger exists that the scientists might act in their own self interest.

77/40.22 The commentor asks why information from the Sandia Stockpile Study was left out of the PEIS. In particular, information stating that weapons defects decrease over time and the statement that nuclear weapons do age but do not wear out and are not allowed to degrade.

78/32.01 The commentor is concerned that establishing pit production at LANL may open the door for increased future production. The commentor wants to know the maximum number of pits that could be produced at the proposed facility.

79/40.36 The commentor believes that DOE should consider the problem-centered stockpile stewardship approach as an alternative. The commentor believes that new facilities should only be built to solve specific problems that are found in the stockpile.

80/41.09 The commentor asks how much money has been spent on the Stockpile Stewardship and Management PEIS.

81/41.08 One commentor is of the opinion that the PEIS should state that any of the stockpile sizes analyzed could obliterate the planet.

82/40.60 The commentor believes that the PEIS should analyze the environmental impacts for a very low stockpile size of 0 to 100 weapons. The commentor feels that the PEIS will be legally deficient until the 0 to 100 stockpile size is analyzed. The commentor notes that the NPT states that we should move towards total disarmament, therefore a 0 to 100 stockpile is a reasonably foreseeable situation.

83/21.05 The commentor believes that NIF is a shiny new bomb factory that should not be discussed in the PEIS. The commentor believes that a separate NEPA analysis is needed for NIF.

84/04.01 The commentor believes that the construction of NIF and other upgrades at Sandia would not comply with the city of Albuquerque water use and discharge policies. The commentor believes that water conservation issues in Albuquerque should be discussed in the document.

85/40.13 The commentor asks for a cost comparison between the proposed surveillance program and a program for replacing components on a periodic basis. The commentor questions the need to have a surveillance program on a very small stockpile.

86/40.60 The commentor believes that an independent agency should decide if the 0 to 100 stockpile is a reasonable alternative for the PEIS.

87/41.01 The commentor asked for at least a month of notice before the public hearings.

PUBLIC HEARING—LAS VEGAS, NEVADA

MARCH 28, 1996—EVENING PLENARY SESSION

1/43.15 The commentor asks DOE how they differentiate with certainty between the phraseology post-Cold War and neo-Cold War. The commentor states that we still have a cold war—it is just a question of who and when.

2/07.02 The commentor states that DOE is taking and has taken land from the Western Shoshones. The commentor claims that DOE has ignored the native peoples who own the land at NTS and Yucca Mountain through treaties.

3/12.02 The commentor states that DOE has polluted Western Shoshone land and that, as a result, cancer rates are high in the area. The commentor urges moving activities elsewhere.

4/21.04 The commentor asks why we must spend $4.4 billion on NIF if we are not developing new weapons.

5/40.10 The commentor would like DOE to consider site location (proximity to population centers) in the decisionmaking and siting process and urges DOE to perform their missions somewhere else.

6/40.56 The commentor asks if there is a No Action alternative for stockpile stewardship and management.

MARCH 28, 1996—EVENING SESSION

1/12.07 The commentor would like to know if social and environmental comments are going to be considered in the *Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management* (Final PEIS), or just scientific and technical ones.

2/43.15 The commentor asks what the dominating, identifying characteristic of the Cold War was.

3/40.07 The commentor questions the fundamental assumptions behind the Program and states that nuclear deterrence should not be a cornerstone of our defense policy. The Program should be based on Article VI of the NPT and consistent with other international treaties such as the CTBT. The commentor states that the following are not consistent with international treaties: 1) NIF and the other new, proposed facilities; 2) the next generation facilities; 3) subcritical testing; 4) reestablishing pit fabrication capability; and 5) new designs for weapons.

4/42.01 – The commentor would like DOE to elaborate on the issue of the Pantex Site-Wide Draft EIS and how it relates to the Stockpile Stewardship and Management Draft PEIS and the Storage and Disposition Draft PEIS.

5/09.01 The commentor states that DOE must consult with local governments regarding the routing of shipments (nuclear waste or otherwise hazardous materials) and must notify interested parties.

6/09.02 The commentor states that the town of Pahrump and Nye County in Nevada have been ignored by DOE, even though transportation routes go through there. DOE needs to provide better oversight and notification regarding shipments through Pahrump and Nye County. Specifically, emergency preparedness must be improved through the addition of trained workers. According to the commentor, Pahrump does not have, demographically-speaking, the population to be trained.

7/09.01 The commentor states that DOE must consult with local governments and citizens along the transportation routes in order to educate them about hazardous shipments and the risks associated with such shipments.

8/21.13 The commentor asks how much NIF is going to cost, and states that whatever the estimate, the actual life-cycle cost will probably end up greater than the estimate.

9/20.01 The commentor asks how much CFF will cost.

10/21.04 The commentor questions the value of NIF in support of stockpile stewardship and states that it costs too much.

11/21.15 The commentor claims that the real purpose of NIF is nuclear weapons research, development, and testing (RD&T), not fusion research.

12/40.02 The commentor questions the rationale for subcritical tests. The commentor explicitly mentions the tests planned for June 18, 1996, at NTS. Specifically, the commentor wonders why the tests are necessary given that the stockpile has been certified to be safe and reliable as recently as November 1995.

13/21.13 The commentor asks if the PEIS calls for a total systems life-cycle cost process for NIF. The commentor states that a "total systems life-cycle cost" study should be performed, and updated every few years, for NIF. This would be similar to what is required of the Yucca Mountain project under the *Nuclear Waste Policy Act*.

14/41.03 The commentor notes that money has already been allocated for NIF in DOE's budget for fiscal year 1997. The commentor asks if it is usual to budget a facility before a NEPA decision. The commentor wonders what would happen if No Action is selected. The commentor states that this gives the perception that DOE has already decided to proceed with construction and operation of NIF, even though the NEPA analysis is not finished. This is not a good perception for the public to have, according to the commentor.

15/40.04 The commentor asks what our security would be if we unilaterally went away from our deterrence and placed our security in the hands of others. The commentor states that the United States should not drop its nuclear deterrence policy, seeing as we have based our security on it. The commentor asks if the impact statement ever relates to the reliability of our cold nuclear powers. The commentor asks if we have ever arrived at a position where we trust either identified opponents, or covert or overt opponents. The commentor asks what it would take to totally dissolve these kinds of efforts. The commentor states that his comments are in response to the concern over cost. Costs can be eliminated by strictly adopting a unilateral disarmament and saying we are going to put our security in the good will and good faith of our friends and enemies.

16/41.01 The commentor states that at the first meeting in Washington, DC for the PEIS, he was told the public education budget for the Stockpile Stewardship and Management Program was $49 million. The commentor states that DOE has not conducted an effective public education program regarding the Stockpile Stewardship and Management Program and other nuclear issues. The commentor urges more outreach and public involvement in the decisionmaking process. Specific recommendations include visiting schools and universities and better advertisement. The commentor claims that DOE has not even planned for a big meeting, as evidenced by the room size.

17/41.01 The commentor states that there was plenty of notice for the meeting and that the number present at the meeting is a reflection of the interest people have.

18/43.19 The commentor states that in the General Accounting Office reports, there were 55 million gallons of highly radioactive waste stored in 177 underground tanks at Hanford. The commentor asks what would happen if the plutonium and uranium were to go critical. The commentor states that this mess has been going on for 50 years and the Federal Government has been characterizing it for 10 years. The taxpayers, the commentor notes, might have to pay $36 billion to clean up this mess. The commentor states that the public has been lied to about Hanford and that the waste there could go critical. The commentor asks when DOE is going to remove the radioactive waste from NTS and ship it to Idaho and other places.

19/40.15 The commentor states that DOE has not cleaned up past contamination and yet feels free to propose another program. The public attitude, according to the commentor, is that there is no hope regarding nuclear waste and contamination. According to the commentor, the public has been beaten down by 50 years of being threatened with extinction. To change this indifferent attitude, DOE must redouble efforts to educate the public and provide necessary resources (trained emergency response workers) to the areas around the sites.

20/43.01 The commentor feels that science has been totally neglected. At the last DOE meeting of the Yucca Mountain board, the commentor asked about colloidal studies. The Federal national laboratory did colloidal studies, according to the commentor, and the commentor now wants to know why the studies were not commercialized upon.

21/04.07 The commentor is fearful that her water will be totally poisoned by all of DOE's activities. The commentor states that radionuclides have been found in the water in Las Vegas.

22/10.12 The commentor mentions the nuclear waste that DOE potentially is going to be bringing from the various laboratories to NTS. The commentor is talking about the temporary storage at NTS that Congress was just debating and that DOE would be in charge of. The commentor asks if costs will increase if this comes to Nevada. The commentor wonders why DOE would bring it to Nevada.

23/40.33 The commentor states that the remanufacturing alternative should not be dismissed and should be analyzed in greater detail.

MARCH 28, 1996—EVENING SUMMARY SESSION

1/43.12 The commentor sees the nuclear issue as an issue for the rest of human time. We are the last generation, according to the commentor, that will have the opportunity to address this issue in a responsible manner simply because we are responsible for it. The commentor also stresses the need to have the best scientists working in the nuclear arena.

MARCH 29, 1996—MORNING SESSION

1/41.03 The commentor notes that DOE states in its handouts that a more informed public leads to better decisions. This line is disingenuous and misleading, according to the commentor, since DOE gets its direction from Congress and the President only, and pays the public little heed. If DOE were to pursue this philosophy of Government decisions are best when they are in agreement with the public, Yucca Mountain would be shut down.

2/40.32 The commentor states that the security at NTS leaves a lot to be desired.

3/41.10 The commentor sees the combined meetings as a step forward. DOE is recognizing that there are some overlaps among programs.

4/13.01 The commentor is concerned about the cumulative impact of different programs on local communities. The commentor urges DOE to adopt a "local community" perspective and create a document which would detail the cumulative impacts (in transportation and waste management, for instance) of different programs. DOE would present this document to the public to increase their awareness of the overall impact of DOE activities.

5/11.03 The commentor believes that DOE uses different risk standards for different programs (specifically Yucca Mountain versus other programs) and that the public does not understand the risks associated with DOE activities. The commentor voices concern over the 300 million curies (Ci) at NTS. The commentor urges DOE to use one risk standard in its analyses and educate the public about the risk numbers and what they mean.

6/09.10 The commentor states that the transportation risk numbers are terrifying.

7/40.45 The commentor states that NTS has been part of any number of programs that could possibly come to NTS, but yet those programs end up going to LANL and LLNL and asks if there is any possibility that NIF may come to NTS.

8/40.13 The commentor states that the Stockpile Stewardship and Management Program should take into account life-cycle costs for waste management since the Program could continue indefinitely.

9/43.19 The commentor asks about the operation at Hanford and the building of another sludge facility at SRS.

10/09.03 Commentors state that there is local concern about the transportation of nuclear weapons parts and materials on the highways of Nevada in general and Clark County in particular. The commentors do not want these types of materials to go through Clark County and urge implementation of a rail system through low-population areas. The rail system could serve a multitude of purposes (e.g., mining) in addition to DOE transportation, and would eliminate the danger of highway transportation. The commentors urge a study of this alternative and state that the rail system would provide equity to the people of Nevada.

11/09.02 The commentor contends that DOE has not provided equal treatment to local communities in regards to transportation issues such as emergency response and preparedness. In particular, the commentor claims that DOE has funded counties in the past, but not tribes, for emergency preparation and response. The commentor urges DOE to reach out to all local communities and inform them of important transportation issues.

12/09.01 The commentor states that it is insufficient to provide only risk numbers to the public. DOE needs a translator for lay people, someone to provide structure and meaning to the analysis and numbers, to make it clear what it means to a person, group, or locality. The commentor would like to comment on the methodology used by DOE to choose transportation routes, parking areas, and the overall transportation plan. This openness would lead to better acceptance by the people who may be affected by transportation issues. The commentor states that people at the local level want to know about the immediate effects of transportation such as the effect of additional truck shipments on traffic patterns and the effect of shipments on property value along the routes. The commentor would like DOE to expand the region of influence beyond 50 mi since these people could be affected by transportation issues as well. The commentor states that DOE should have discussed these issues with the public during the scoping process.

13/09.01 The commentor states that DOE must coordinate with local communities now, before decisions are made, regarding each community's transportation needs (the need for additional roads, for example) and each community's role in the transportation system.

14/40.15 The commentor cites problems with the PEIS process. Specifically, the commentor believes that DOE has not addressed adequately the cleanup of the 300 million Ci at NTS or the fact that the NTS region is becoming a highly populated area. DOE should have addressed these issues earlier in the process, before the preparation of the Draft PEIS.

15/43.17 The commentor applauds DOE's efforts and the fact that we do have a Nation that is willing to put things together, and consolidate nuclear waste and/or enriched uranium and plutonium.

16/30.03 The commentor lists reasons why NTS should continue to receive DOE work: 928 devices were detonated at NTS and tourism did not fall off; Nevada is the seventh largest state; existing infrastructure; and a skilled workforce. The only problem that the commentor sees is transportation.

17/10.07 Commentors state that Yucca Mountain does affect the local communities, but DOE does not want to talk about it. The commentors also note that the NTS Site-Wide EIS omits discussion of Yucca Mountain and suggest that DOE is trying to segregate the issue.

18/42.01 The commentor urges better integration and timing of the NTS Site-Wide EIS, the Stockpile Stewardship and Management Draft PEIS, and the Storage and Disposition Draft PEIS. The commentor states that site-wide decisions will be made before programmatic decisions and that this will limit public involvement and full analysis of the alternatives. The commentor wonders why site-wide decisions will be made before programmatic decisions, especially since the programmatic decisions will have an impact at the site.

19/43.19 The commentor states that the NTS Site-Wide EIS says that there will be one tortoise alive.

20/40.40 The commentor asks what the nuclear arsenal is at now and what DOE is doing to reduce it.

21/43.19 The commentor would like to know, other than plutonium, if there are any other fissionable materials to be stored at NTS.

22/43.19 The commentor asks if plutonium storage would be at the Devise Assembly Facility.

23/30.03 The commentor states reasons to bring programs to NTS: established infrastructure, ideal location, trained workforce, and opportunity to utilize a great national resource.

24/42.06 The commentor asks what kind of capacity level Pantex is at right now and how close they are to reaching that capacity level.

PUBLIC HEARING—OAK RIDGE, TENNESSEE

APRIL 1, 1996—EVENING SESSION

1/40.24 The commentor states that the PEIS has cost millions of dollars, has little value, and lots of errors. The commentor believes that the wrong people came up with the data: the non-knowledgeable, non-production western laboratories, R&D folks. In addition, the commentor states that if DOE is going to talk about highly enriched uranium (HEU), they should start with the Y-12 Plant (Y-12), Oak Ridge Reservation (ORR). The commentor states that the workers at Y-12 ask for a level playing field with accurate data from knowledgeable folks that can and have done the work and can back it up with true facts.

2/40.35 The commentor is concerned with some of the actions to be taken from both an economic and national security standpoint, and feels they may jeopardize the defense posture of the country.

3/40.08 The commentor believes that the study represents a small segment of the nuclear weapons business, and does not represent the wide spectrum of activities and expertise available to do an accurate study. The commentor states that there are hundreds of retired experts, scientists, and craftsmen that are available to participate in such a study, and to focus it on the weapons design laboratories was a mistake.

4/40.23 The commentor states that there has never been a place for stewardship in the nuclear production business and the manufacturing business as there is in the design laboratories. The commentor also states that the quality, configuration management, and integrity of today's stockpile is a result of the production people.

5/40.24 The commentor would like the PEIS to address what DOE intends to do with respect to its explicit responsibility for assurance of continued competence in the Y-12 manufacturing technology.

6/33.02 The commentor would like the PEIS to provide specific examples of the HEU recycling purification or processing technology as well as lithium processing technology that exists to a comparable extent with either of the design agencies as well as Y-12.

7/40.40 The commentor would like to see an analysis of what the limiting factors are in each of the various areas, secondaries, pit production, and HE, and what is the true surge capability and has the Department of Defense (DOD) bought off on the capability.

8/40.33 The commentor questions the assumption in the PEIS that remanufacturing is unacceptable.

9/40.11 The commentor is concerned about our optimism of world peace in the future, and that we are not protecting the option that the world might revert to a more hostile place. The commentor would like the Draft PEIS to discuss the possibility that we may need levels higher than START I Treaty.

10/40.25 The commentor states that an enormous amount of time has been spent analyzing stockpile management and that, in order to have a balanced plan, stockpile stewardship should receive the same level of analysis.

11/40.23 The commentor states that there has been no independent review of the laboratory stewardship plan. According to the commentor, this is important because we are proposing a new way from the way we have done it for 50 years. The commentor believes that before we launch in a new direction, we better study it thoroughly.

12/40.91 The commentor states that the Stone and Webster document referenced in the PEIS should be made available to the public.

13/08.03 The commentor asks what the community is going to do with the used-up workers that have been at Oak Ridge National Laboratory (ORNL) for 20 to 25 years.

14/33.05 The commentor asks how many indirect jobs would be necessary to support the 870 direct jobs. The commentor states that the number of indirect jobs is not found in the summary. The commentor states that Los Alamos would be able to pick up the work of Y-12 workers with only 321 direct and no indirect jobs. In addition, the commentor states that LLNL says they can pick up the work with only 290 direct and 722 indirect jobs. The commentor suggests that these sites have underestimated the work needed. The commentor states that based on these inaccuracies, you have to question the abilities of the people at LANL and LLNL who made the estimates that they really do understand all of the various processes at Y-12 well enough that they can make estimates that are accurate.

15/08.07 The commentor states that there is no detailed breakdown of the job structure and how the waste job structures at Y-12 will be moved to Los Alamos and how many people for each function will be at all three of the sites. In addition, the commentor states there is no description on the function by function basis of how the fabrication process can be implemented at another site, and this oversight of a detailed functional breakdown allows wildly unrealistic estimates at the other sites.

16/10.04 The commentor questions the sites estimates of waste streams. The commentor states that other sites claim theirs is going to be a 102,000 m^3 of sanitary waste and that they will be able to handle these huge volumes of waste with no changes whatsoever.

17/40.08 One commentor states that the Preferred Alternatives Report dated February 1996, pages 5 and 6, detail DOE's decision to give "explicit responsibility for oversight of surveillance" and "for assurance of continued competence in weapons technology to the weapons laboratory." The commentor is concerned about the increased responsibility given to the design laboratories and believes that this would result in duplication of staffs and facilities.

18/33.10 The commentor asks what is the intention of DOE in downsizing of the process development function which is a vital part of the production team.

19/33.01 The commentor is concerned with the transfer of troubleshooting and problem solving from experienced workers at Y-12 to the inexperienced laboratories and believes this would be a duplication of staff and facilities. The commentors ask that DOE not throw away 50-plus years of expertise upon a trash heap in exchange for an unknown quantity and unknown quality.

20/40.24 The commentor contends that the laboratories cannot learn manufacturing anymore than Y-12 can learn the research business. The commentor states that there is insufficient recognition that simply beginning with core competencies is not enough. The commentor goes on to state that no effort finding the workload to continually do the necessary exercising of the production capability, regardless of where it is, is evident. The commentor questions whether this aspect is being examined seriously and states that we have got to have work to keep this competency no matter where it is.

21/40.24 The commentor suggests that DOE should get together with DOD to arrange some work at Y-12 on a routine basis that keeps production capacity exercised.

22/40.24 The commentor is particularly concerned about the laboratories potential role in the weapons component and subassembly testing and inspection.

23/40.07 The commentor believes that the PEIS presumes an enduring stockpile, and that the PEIS undermines our commitment to nonproliferation and destroys our credibility in the international community. In addition, the commentor states that we cannot plan to maintain a stockpile of thousands of nuclear weapons and expect to persuade other countries not to pursue their own capability.

24/33.01 The commentor states that dismantling weapons secondaries, and processing and storing HEU is Y-12's future mission and that Y-12 has the best people to do it. In addition, the commentor believes that part of Y-12's mission is cleaning up and that mission would provide good jobs for the next generation of workforce.

25/21.01 The commentor contends that NIF will only benefit an elite few who pay for it.

26/40.03 The commentor would like clarification on a statement made at the meeting that the United States may sometimes see fit to step out of the CTBT to test underground.

27/11.09 The commentor questions the exposure limits for non-involved and involved workers in table 4.2.3.9–2. The commentor is concerned that the exposure limits for non-involved workers is higher than for involved workers. The commentor wants to know where the decontamination and decommissioning (D&D) workers are in the table. In addition, the commentor is concerned with the quality of estimates to the general public.

28/43.13 The commentor states that in the last couple of years, LANL has rebuilt and installed a number of major capital facilities and hired extensively scientific personnel. The commentor finds it hard to believe that there is enough money in the system as a taxpayer to support extensive R&D work in manufacturing activities at both sites. The commentor believes that the preferred option in the PEIS is extensive and continuous R&D at the design laboratories. The commentor states that NIF and Atlas Facility could only be accomplished by massive capital and operational investments.

29/40.33 The commentor questions why we need to stewardship facilities when it is inherently cheaper and easier to remanufacture the weapons that we have in our present stockpile. This commentor also states that remanufacturing maintains the extensive ties and maintains the capability of the extensive craftsmen that have been in place for some time in the stockpile.

30/40.13 The commentor asks what is the annual cost of the proposed Program for the next decade and how does this cost compare to the cost of a conventional surveillance program, such as the one that has been used successfully for the last 50 years.

31/40.33 Regarding the inadequacy of using remanufacturing, the commentor claims the explanation is superficial and that the public deserves enough information about these things to be able to understand it.

32/40.36 The commentor states that meeting the challenge of stockpile stewardship will be neither inexpensive nor without risk. The commentor would like an explanation as to why the public should be expected to feel good about a plan that appears to be very, very costly and gives us less, not more nuclear deterrent.

33/40.36 The commentor asks why a non-science-based approach to maintain the stockpile was eliminated from the PEIS.

34/40.33 The commentor would like DOE to identify any example and components that Y-12 makes that cannot be remanufactured.

35/40.23 The commentor does not understand why DOE wants to tighten the relationship between the laboratories and the plants. The commentor believes that the laboratories and plants have worked well independently of each other.

36/40.33 This commentor suggests the United States should reconstitute the stockpile like the British by remanufacturing. The commentor states that the benefits of remanufacturing is that it will keep the stockpile young, never out of date, and always certified. In addition, this commentor would like a cost comparison of the approach of replenishing the stockpile by remanufacturing as opposed to science-based cost.

37/40.80 The commentor asks where fabrication of enriched uranium primaries will be assigned.

38/33.01 The commentor states that the loss of experienced staff at Y-12 cannot simply be replaced at the laboratories by increasing their staff with non-experienced personnel. The commentor believes that this does not make economic sense.

39/40.23 The commentor states that research and manufacturing are almost antagonistic in culture, and that combining these two functions runs counter to established methodology in both industry and government.

40/40.15 The commentor is concerned about the planning that is currently taking place that would move facilities and activities over to the DOE Office of the Assistant Secretary for Environmental Management (EM) and what funds are going to be available to take care of it.

41/40.09 The commentor referred to an article in the *New York Times* in February 1996 that stated that DOE was having trouble verifying that sources of weapons grade materials in Russia were actually coming from weapons of dismantlement. The commentor suggests that DOE not only look at downsizing, but what they are going to do in terms of verifying sources of weapons grade materials in Russia.

42/41.10 The commentors state that the public was bombarded with materials related to DOE activities and feel that the public was not given ample time to review these important decisions. Therefore, DOE has not met the challenge to involve local citizens as partners in this process.

43/41.04 The commentor states that the public cannot continue to make decisions in bits and pieces and that they need to be looking at the whole picture.

44/33.01 The commentor believes that the mission should remain at Y-12 because of the existing infrastructure and that if money is to be spent, it should be spent on upgrading the infrastructure at Y-12.

45/10.04 The commentor does not believe that other sites have adequate infrastructure to handle waste without having to build new facilities. The commentor states that ORR has available infrastructure in the private sector that are outstanding and a model for the world.

46/41.03 The commentor believes that the decisions to be made in the PEIS were predetermined.

47/08.16 The commentor states that the PEIS does not address the social impacts that go beyond the direct number of jobs, such as unnecessary infrastructure and empty schools.

48/32.02 The commentor states that Rocky Flats spent 10 years and tens of millions of dollars on the near-net shape casting without success due to the complex metallurgical phase structure of the plutonium system. The commentor asks why we think that better computer modeling will change the problem.

49/08.13 The commentor contends that there are inconsistencies between the PEIS (figure 4.2.3.8–1) and the Preferred Alternative Report (page 39) regarding manning levels. The commentor would like to know where the numbers on these pages came from. In addition, the commentor asks if the public is to judge DOE's viability on the basis of downsizing to 870 in 2003 and then holding steady, like it is put in the Preferred Alternatives Report, or are they supposed to believe that there is going to be a continual decline in the Y-12 level for the next 35 years.

50/08.03 The commentor is concerned about the database used for the socioeconomic study and the financial impact studies which show so little impact on the ORR region.

51/40.92 The commentor refers to table 3.7.1 and asks if anyone has placed these numbers into a common reference frame. According to the commentor, the LANL direct numbers, utility requirements, and some of the discharge numbers do not make sense.

52/02.01 The commentor referred to tables 3.4.4.2–2 and 3.4.4.3–2 and pointed out that there is an order of magnitude difference in the estimates for the power requirements for Y-12 and LANL to do the same job. The commentor does not understand why Y-12 would use 1.5 billion liters (L) of water and LANL only 55 million.

53/08.07 The commentor did not see addressed in the PEIS the number of indirect people needed to support secondary and case workers.

54/40.47 The commentor would like to know if the sites followed any standards when submitting numbers for the PEIS.

55/41.09 The commentor is concerned with the cost of the PEIS and would like DOE to spend taxpayer money more frugally.

56/08.01 The commentor states that numbers in table 3.7.1–5 imply that people required for D&D would provide an immediate amelioration of the socioeconomic impacts. The commentor is concerned about when the D&D work is budgeted for. The commentor states that the D&D on building 9201-4 has been scheduled for 15 years and does not seem to be a priority. The commentor is also concerned about who will be scheduled to do the D&D work (Lockheed-Martin people or contract workers), and how soon it would have to be scheduled in order for Lockheed-Martin workers to be kept on the payroll.

57/40.08 The commentor states that the PEIS attempts to justify the stewardship facilities which will primarily benefit the western laboratories.

58/40.01 The commentor states that this justification is presumptive in that it assumes that these facilities will work perfectly and will preclude the need for test devices at NTS. The commentor is skeptical about using new and unproven facilities and is concerned for the future safety and reliability of the Nation's stockpile.

59/40.11 The commentor believes that a deficiency in the PEIS is that it assumes that START treaties will be honored. In addition, the commentor believes that the PEIS should include plans to support a larger stockpile.

60/40.24 The commentor believes that DOE needs to bring in more nonnuclear work to Y-12 to keep the arms program strong.

61/40.13 The commentor states that costs shown at the meeting do not show a very good correlation between cumulative costs and annual costs. The annual costs were decreasing markedly for the Program, but the cumulative costs showed only a marginal decrease in the overall cost of the Program over a period of years which did not seem consistent.

62/40.08 The commentor would like know how DOE would equate the statement raised at the Armed Forces Subcommittee last month by DOE's spokesperson, Mr. Smith, where he says, "Today we do not have the capability to manufacture replacements for warheads that comprise our existing stockpile." The commentor would also like to know if DOE concurs with the proposed slashing of production capabilities in order to build up further the duplicated and larger weapons laboratories basic programs.

63/40.38 The commentor would like to know what DOE has done to downsize the laboratories consistent with the smaller stockpiles and with the loss of the new weapons design and testing missions.

64/04.02 The commentor states that section 4.6.2.4 shows that LANL water resources will be used up by the year 2000, and wonders how LANL can produce weapons such as Y-12 has done without a water supply.

65/11.10 The commentor questions the accident history given in section 4.2.2.9, Accident History, which states that the most noteworthy accident at Y-12 resulted in temporary radiation for a few ORR employees. The commentor would like to know whether the employees involved in this accident view its effects as temporary radiation sickness.

66/40.33 The commentor states that the way to assure that remanufacturing does not work is to let design engineers do it.

57/40.13 The commentor would like the PEIS to address the difference in worker experience between Y-12 and the laboratories and the cost of having to train a new work force.

68/33.01 The commentor states that the PEIS gives the impression that one reason for involving the laboratories much more in production work is because production facilities are old and use old processes. The commentor states that the manufacturing skills at Y-12 are state of the art and facilities have been regularly upgraded.

69/33.01 The commentor believes that the people at Y-12 are unique craftsman and that dismantling Y-12 would be doing away with a natural resource.

70/41.06 The commentor believes that the proceeding is procedurally defective. The commentor states that by putting the pen in the hands of one of the locations we have created an environment where there is a lack of credibility in the entire report process and the conclusions made, especially when there are perceived advantages which go to the locations where that authorship takes place. In addition, the commentor suggests that DOE obtain competent independent evaluations, not location centered, but more broadly centered, using the expertise of people attending the meeting and elsewhere in the Nation.

71/04.03 The commentor questions section 4.2.3.4 and would like to know what the increased operating requirements of existing secondary and case fabrication facilities are in the No Action alternative.

72/40.23 The commentor suggests that efforts should be directed towards understanding the processes that we are using and devote all of our efforts to a thorough understanding of what we are doing rather than driving our program by things that are no longer relevant.

73/21.01 The commentor would like to know if DOE can identify a single past safety or liability issue that NIF would provide the ability to evaluate.

74/40.23 The commentor believes that design experts have little appreciation for what is involved with producing weapons parts. The commentor states that certification of weapons parts requires a world of expertise. In addition, the commentor believes that DOE should move carefully when making a decision.

75/08.01 The commentor states that Summary section S.4.1 says impact of the Y-12 downsizing will be mitigated by the creation of approximately 1,308 new D&D jobs and 1,830 new indirect D&D jobs. The commentor would like to know specifically what jobs are going to be created and if Washington agrees that these new jobs are going to be funded. If they do intend on funding the new D&D jobs, how many years can the level of expenditure continue once it starts. In addition, the commentor would like to know if the cost estimates reflect the cost of putting the buildings at Y-12 into the D&D program.

76/40.23 The commentor believes that combining the laboratories and production plants is unwise. The commentor states that the mission of a laboratory is to seek improvement and change, and that of manufacturing is to produce a reliable and saleable product. The commentor does not recommend placing a manufacturing facility in either LANL or ORNL. The commentor believes that the missions are too different.

77/40.24 The commentor states that the PEIS has put an emphasis on the design side. The commentor believes that there must be a continued emphasis on manufacturing technology and that cutting back on manufacturing technology in order to add more to R&D efforts is asking for trouble in the long term.

78/43.13 The commentor states that Los Alamos has been billed as "the little Oak Ridge" for quite some time and it looks like a $600 million project. The commentor would like the PEIS to discuss whether Los Alamos has received $600 million for a capital project.

79/40.24 The commentor states that if money is going to be spent that DOE should spend money on upgrading buildings at Y-12 with better heating and air conditioning systems and the like.

APRIL 2, 1996—MORNING SESSION

1/41.10 The commentor would like to know when DOE will make a decision on whether more time and funding will be made available for independent review of the Draft PEIS.

2/41.10 The commentor does not believe that the combined meetings reduced the burden on the public. The commentor states that there was a meeting at the high school going on at the same time as the public meeting that many people would have liked to have attended.

3/40.36 The commentor would like more discussion about why there is a need for improvement in the current process for a Complex that is not going to be building new weapons.

4/40.01 The commentor states that every time changes have been made in the process, we have only been able to verify that change using underground testing. The commentor questions whether designers will be happy with anything less than underground testing to satisfy them to all the new processes that are being developed.

5/40.25 The commentor feels the analysis of the stewardship facilities is inadequate and that the schedule will not allow for more time to be spent on the stewardship side of the PEIS.

6/08.11 The commentor is confused about the difference between direct and indirect jobs.

7/40.28 The commentor would like to know what plan the PEIS is based on and whether it is still the Stockpile Stewardship and Management Program plan, dated May 1995, and whether this plan has undergone significant revisions.

8/41.03 The commentor referred to a document issued by the White House titled, *National Security Science and Technology Strategy*, which says, "The nuclear weapons laboratories will assume more responsibility for production and remanufacture capability in addition to their responsibility to scientific understanding." The commentor states that the PEIS refers to the White House as the source of DOE guidance and does that mean that DOE or the White House has already made decisions on how the Complex shall operate. The commentor believes that decisions on the Stockpile Stewardship and Management PEIS have already been made (predecisional) and that this is a violation of NEPA.

9/40.24 The commentor asks what assurance they have that the number of employees estimated for the downsized Y-12 mission represents enough capability for DOE to do its job.

10/41.10 The commentor is concerned that the PEIS process is driven by pressure and schedule.

11/08.17 The commentor questions the sentence in section 4.3.2.8, Socioeconomics; "Operation of the downsized facility at Y-12 in the case surge mode will require 870 direct jobs and 2,448 support jobs" and the figure 4.2.3.8–1. The commentor states that figure 4.2.3.8–1 shows 2,250 Y-12 and support jobs in the year 2003. The commentor asks if this number is supposed to be 870.

The commentor would like to know if the erroneous data in figure 4.2.3.8–1 was the basis for the financial and socioeconomic analysis.

12/08.01 The commentor would like DOE to provide a simple table in the PEIS that would summarize the socioeconomic impacts and would begin in the year 1996 and go to 2030. In addition, the commentor would like the table to show direct, indirect, and support jobs and any funding that would support these jobs. The commentor would like this table before the comment period ends.

13/08.11 The commentor would like definitions of direct, indirect, and support jobs in the glossary of the PEIS.

14/40.34 The commentor suggests that we need to look at DOD and DOE policy in regard to what we really mean by stockpile reliability at this point in time. The commentor believes our definition of reliability dates back to when we had thousands more weapons.

15/33.08 Regarding the proposal to pre-produce enough uranium components and lithium hydride components to last for 100 years, the commentor refers to the time when it was decided to pre-produce separated lithium and put facilities on standby. The commentor states that a few years later the technology was completely lost, and that this may be a consequence of pre-producing uranium and lithium components.

16/40.60 The commentor refers to a statement in the PEIS that there is no stockpile size at which the size of the stewardship facilities could be made smaller. The commentor states that this is an illogical statement because it implies that any nation that has any size of stockpile would require the same size facility as we have. The commentor states that if some time in the future the number of weapons is going down to thousands or hundreds, at some point that statement is no longer going to be true. The commentor states that the public can only accept the PEIS as representing the range of between 1,000 to 6,000 weapons, and that any other level would require a reexamination of policies.

17/40.13 The commentor is concerned with how DOE is allocating its resources. Specifically, the commentor refers to the LANL budget of up to $1 billion over several years that would go towards facilities that already exist. The commentor suggests that this duplication should be looked at by the General Accounting Office.

18/42.17 The commentor asks if DOE at this time assumes that as material is transferred on the books from strategic into surplus, that it is then covered by the current EIS on surplus HEU or will there be additional need for documentation to look at the additional material as it gets transferred over.

19/33.01 The commentor questions the dismantlement process and how much of it is going on at Y-12. The commentor would like to know how much real dismantlement we have going on, and how much material we have and in what forms that potentially pose different kinds of risks, such as proliferation risks, worker risks, or public health and safety risks.

20/42.16 The commentor states that the Storage and Disposition Draft PEIS and Stockpile Stewardship and Management Draft PEIS contradict each other in that the Storage and Disposition Draft PEIS indicates that ORR is considered for plutonium, but the Stockpile Stewardship and Management Draft PEIS states that plutonium would not be located anywhere it is not already located. Conversely, continues the commentor, one of the sites that was not mentioned at all was LANL. The commentor wants to know why LANL was not included in the Storage and Disposition Draft PEIS.

21/40.27 The commentor refers to the Notice of Intent for the Stockpile Stewardship and Management PEIS and states that descriptions of LANL and LLNL were identical. The commentor states that this suggests there is a duplication of effort and raises the question of whether the existence of two laboratories is necessary. The commentor would like to know how DOE can justify the continued operation of both LANL and LLNL.

22/21.20 The commentor is concerned that the decision to locate NIF at LLNL is a political decision. The commentor does not support NIF, a $1 billion plus facility, and does not support the existence of LANL and LLNL. The commentor feels these facilities are a waste of money.

23/40.23 The commentor states that the manufacturing expertise lies at the production plants. The commentor is concerned with transferring manufacturing to the laboratories where the expertise does not exist.

24/08.18 The commentor would like to know the composition or breakdown of the 870 direct jobs under the downsized Y-12 mission including: the breakdown of skills for the 131 crafts workers, how many of the 870 people will be involved with quality and certification, and how many people will be involved with process development.

25/33.01 The commentor would like Congressman Wamp's speech emphasized in the PEIS, particularly the comment that Secretary O'Leary made to him. When responding to Congressman Wamp's concern over the threat of relocating Y-12's production capabilities, Secretary O'Leary stated that it was a "no brainer," that we should leave the weapons production capabilities at Y-12 and downsize in place. The commentor also states that the PEIS is misleading and would like that corrected.

26/41.10 The commentor states that getting a copy of the Draft PEIS was difficult and that they did not have enough time to adequately review the document.

27/42.01 The commentor states that the PEIS is extremely difficult to interpret, and suggests that in the future documents are simplified so that there is not repetitive information from one section of the document to another which are sometimes contradictory to each other.

28/33.01 The commentor states that although the PEIS designates Y-12 as the preferred alternative for secondary and case fabrication, DOE reserves the right to change for the Record of Decision (ROD) and this creates doubt.

29/40.23 The commentor is concerned about the quality of the stockpile if the manufacturing capabilities are transferred to the laboratories.

30/40.23 The commentor states that the PEIS leads you to believe that laboratory people would be located at Y-12 and would direct development work. The commentor would like to go back to the old way of doing business, and does not want the laboratories telling them how to do their job. The commentor states that if you let them do that, it will screw things up.

31/08.07 The commentor would like to know how LANL and LLNL propose to pick up the people to take over the secondary and case fabrication mission. The commentor states that manufacturing these weapons is a very difficult job and that you cannot hire machinists off the street to do this type of work.

32/41.10 The commentor would like to know if DOE has ever considered using an independent panel of retired designers to get an unbiased look at the Program and issues of safety and reliability.

33/08.01 The commentor believes that the discussion about D&D jobs should be taken out of the PEIS because it may be 10 to 15 years before these jobs are available to the unemployed.

34/40.23 The commentor feels that Y-12 should be given work to maintain their capabilities.

35/40.04 The commentor believes that we should have the ability to upsize if our national security is threatened.

36/40.03 The commentor asks if he is to understand that there will be no weapons testing except under dire circumstances and that there would be no new weapons designs.

37/40.23 The commentor suggests that the problem we face is not to let the weapons become different than the weapons database. The commentor states that this requires that we thoroughly understand the manufacturing process in a way that is better than we have in the past when we could test so that we can maintain specifications without testing. The commentor suggests that there is a need in the manufacturing process for a new effort; namely to stabilize production so that those weapons perform as they were intended in spite of the inadvertent changes in manufacturing processes which occur along the way. The commentor states that we do not need to worry about the weapons database. The commentor states that DOE needs to be concerned about the stability of the production process.

38/41.05 The commentor stated that the axis of one of the charts that was handed out at the meeting was not labeled. The commentor states that this makes it difficult to compare numbers in reports.

39/08.13 The commentor is confused about the number of employees required for the downsized Y-12 under single shift and three shift, and at which level will funding be available.

40/08.01 The commentor refers to Admiral Gustavson's testimony to the Senate Armed Forces Subcommittee that one of the plans to mitigate downsizing is to move people from the K-25 site (K-25) at ORR. The commentor is concerned that people from K-25 are included in the D&D that is planned for Y-12. The commentor is concerned that we are moving people and money and then losing it somewhere else.

41/40.24 The commentor states that there are a number of components in the weapons of which the functional aspects are sometimes specified by the design agencies and for which Y-12 proposed the materials, developed the processes, and developed the certification processes even when some of the certification processes proposed by design agencies were not functional. The commentor doubts that there is expertise with these materials elsewhere.

April 2, 1996—Evening Session

1/40.13 Several commentors are concerned with the cost of the stockpile stewardship facilities, and wonder if current facilities could be used.

2/40.13 The commentor is concerned that with the current cutbacks in the Federal budget, spending money on new facilities is counterproductive.

3/40.07 The commentor states that the stewardship facilities are irreconcilable with the stated goals of the NPT of the United States. The commentor believes that the development of these experimental facilities creates a potential for a new breed of competition among the nuclear weapons states.

4/40.15 The commentor states that stockpile stewardship would add extra environmental burdens. The commentor states that both environmental burdens and health impacts of the Oak Ridge community from past activities have not been adequately addressed.

5/40.85 The commentor states that the scope of the PEIS is too narrow and that it did not consider the full range of facilities actually being proposed and built into the guides of the stockpile stewardship.

6/41.18 The commentor states that the explosive experimental facilities at NTS and DARHT at LANL were not addressed in the draft. The commentor also states that DOE should justify each new and existing facility in light of the end of the Cold War and the true national security needs that we are facing.

7/40.14 The commentor states that the PEIS did not address the need for underground testing at NTS. The commentor believes there is no technical justification to keep the underground part of NTS open. The commentor states that closing the test site will help prevent the spread of nuclear weapons by demonstrating U.S. resolve to end its weapons-development program. In addition, the commentor believes that it would be fiscally prudent.

8/40.07 The commentor questions whether DOE is proposing to enhance the plutonium pit manufacturing capability at LANL. According to the commentor this would go against NPT goals.

PUBLIC HEARING—KANSAS CITY, MISSOURI

APRIL 9, 1996—AFTERNOON SESSION

1/08.04 The commentor recognizes that downsizing the nonnuclear fabrication mission will result in a loss of jobs over time. The commentor points out that there is also the possibility of additional work coming in. The commentor wants to know if it is possible to maintain a higher rate of employment in the Kansas City area.

APRIL 9, 1996—EVENING SESSION

1/31.01 The commentor is concerned about the loss of expertise and skill base as a result of downsizing at the Kansas City Plant (KCP).

2/31.01 Commentors state that KCP should become a benchmark for other sites within the Complex on labor management.

3/31.01 The commentor wants to know what level of flexibility is built into decisions should things change in the future.

4/31.01 Commentors support the Secretary of Energy's decision to downsize the nonnuclear fabrication mission at KCP rather than transfer this mission to an alternative site.

5/40.16 The commentor recognizes the significance of downsizing and wants to know if the PEIS discusses a transition finding similar to that at the Mound Plant. For example, reuse of plants, refitting, revised missions, and the like that could possibly give futures to some displaced workers.

6/08.04 The commentor is aware that with downsizing at KCP there will be a possible loss of 300 to 900 jobs. The commentor wants to know what can be done, what resources can be utilized, and how the business community can help to lessen the number of jobs lost.

PUBLIC HEARING—LIVERMORE, CALIFORNIA

APRIL 11, 1996—AFTERNOON SESSION

1/40.41 The commentor wonders why a classified appendix supporting the need for plutonium-242, which the commentor suspects will be stabilized at SRS for future weapons R&D, was referenced.

2/41.05 The commentor states that DOE should have had a meeting in Oakland, in addition to Livermore, for similar reasons Santa Fe hosted a public meeting.

3/21.12 The commentor states that DOE's description of NIF as a nonnuclear facility may be misleading since there will be a deuterium-tritium reaction in this facility which is a nuclear reaction.

4/41.13 The commentor is interested in knowing DOE's definition of the term "minimal" with respect to environmental impacts.

5/40.06 The commentor states that NIF will cost approximately $40 to $50 billion. The commentor states that 90 percent of people polled favored worldwide cuts in nuclear weapons, 82 percent prefer the elimination of most or all nuclear weapons, and 82 percent would prefer to have no nuclear tests at all (including aboveground and oceanic testing).

6/10.03 The commentor feels the amount of nuclear waste generated from the nuclear weapons program is a much greater problem. The commentor states that the Waste Management Draft PEIS states that over 1,370,000 metric tons of low-level waste (LLW) and 144,000 metric tons of mixed LLW will be produced as a result of the Program. The commentor notes that the figures for these waste values are not consistent between the Stockpile Stewardship and Management Draft PEIS and Waste Management Draft PEIS.

7/40.12 The commentor feels the money that would be spent on the Program, specifically the $40 billion allocated for NIF, should be spent on schools, housing, infrastructure, conservation, renewable energy, environmental cleanup, and the like.

8/40.05 The commentor feels the United States should not act as a "national security state" which threatens the rest of the world by continuing nuclear weapons programs.

9/40.06 The commentor feels the United States should concentrate on dismantling all nuclear weapons.

10/40.07 The commentor states that experts have said the stockpile is safe and reliable and may exist as it exists today. The commentor feels the proposed facilities may encourage proliferation by providing new weapons designs and does not abide by the NPT.

11/11.11 The commentor states that workers at LLNL are 400 percent more likely to develop malignant melanoma, a skin cancer, than the general public. The commentor contends that the children of Livermore are six times more likely to develop skin cancer as a result of activities at LLNL. The commentor states that these figures were obtained from the Department of Health Services.

12/40.12 The commentor points to the former Soviet Union's experience in Chernobyl as an example of why the United States should discontinue nuclear weapons research. The commentor suggests the money should be spent to research renewable, nonpolluting energy sources.

13/21.06 The commentor feels NIF at LLNL will not result in adverse impacts. The commentor believes the expensive costs justify the need to eliminate underground nuclear testing and develop enhanced future fusion projects.

14/40.13 The commentor expresses confusion regarding the period of time during which the $40 billion expense would be incurred.

15/21.06 The commentor notes that the yearly cost of the NIF project is a reasonable expenditure.

16/40.04 The commentor states that for 25 to 30 years, critics denounced the research activities of LANL and LLNL fearing a nuclear "holocaust." The commentor states that the Soviet collapse occurred as a result of their inability to keep up with U.S. technological advances, especially the advances at LANL and LLNL. The commentor believes that nuclear weapons designers contributed 10 times more to peace than all of the nuclear critic groups put together.

17/41.03 The commentor expresses disappointment that DOE did not consider comments and suggestions from the scoping meeting.

18/40.36 The commentor believes there is no new need for weapons design and that a "passive" program may maintain the stockpile safely.

19/40.25 The commentor expresses disappointment that DOE has published an *Analysis of Stockpile Management Alternatives* report and a *Stockpile Management Preferred Alternatives Report* but has not completed a comparable analysis for stockpile stewardship. The commentor states that DOE should complete a parallel document regarding stockpile stewardship.

20/40.31 The commentor states that a document posted on DOE's World Wide Web Defense Programs (DP) Home Page from the Office of Research and Inertial Fusion on January 31, 1996 implied that the United States will continue to introduce emerging technologies into weapons application, develop new designs, and modernize existing weapons for "deterrence" purposes. The commentor states a specific example of current development, the B-61 Modification 11 "earth-penetrator" is currently under development, demonstrating the United States is actually developing new weapons.

21/43.16 The commentor feels that a weapons program is needed to ensure national security.

22/40.44 The commentor believes that the NPT and CTBT depend on the Stockpile Stewardship and Management Program, especially NIF.

23/21.07 The commentor feels NIF is justified for the potential of future fusion energy projects, considering there may a lack of natural resources in the near future.

24/21.06 The commentor states there is broad support for the PEIS, especially the NIF project.

25/40.34 The commentor states that there are 8,500 strategic weapons which need a condition of safety but reliability issues are only relevant if the United States actually plans on using these weapons.

26/40.13 The commentor feels that DOE could continue with past and present stockpile management procedures for cost efficiency purposes.

27/40.07 The commentor feels the Program is a dangerous and ambitious plan since it promotes new weapons design and, therefore, contradicts the CTBT. The commentor believes the United States is legally committed to disarmament since it has signed the NPT.

28/42.03 The commentor expresses concern that new programs such as bringing spent nuclear fuel rods from other countries and wastes produced from new programs will contribute to waste management problems since there is no place to dispose of this waste.

29/40.15 The commentor believes there are other more important issues such as the disposition of waste and spent nuclear fuel that the scientists should help resolve.

30/40.13 The commentor feels the United States should let the stockpile exist as it currently exists, spending several orders of magnitude less money.

31/41.18 The commentor believes DOE "arrogantly" decided which alternatives are reasonable and does not agree with the justification for the No Action (Summary, section S-4) alternative as an unreasonable alternative.

32/40.85 The commentor points out that DOE apparently considers an expansion of experimental facilities as the only reasonable alternative as evidenced from Summary table 3.6.1 which only presents the capabilities of the enhanced facilities.

33/42.04 The commentor also notes that the Lyner facility remains classified so that the "enemy" cannot determine the equation of state information yet there is no way to determine the environmental impacts of this project.

34/40.15 The commentor states that environmental cleanup expenditures are being delayed due to classification of projects which hinders the analysis of environmental impacts.

35/01.02 The commentor also notes that the maps of the NTS site presented in the document need to depict Area 51.

36/40.34 The commentor feels that the document presents several misused terms and euphemisms which are intended to deceive the public. The commentor feels the following terms should be changed or decoupled so that there would be less acceptance of the proposed program: 1) "safety and reliability"—the commentor feels this phrase translates into the expected blast of a nuclear weapon must be greater than 90-percent yield. The commentor feels reliable weapons are not required and that the stockpile may be maintained with existing technology. The commentor feels that greater unreliability may in fact discourage proliferation. 2) "flexibility"—the commentor feels this term translates into continued development of new nuclear weapons. 3) "modification"—the commentor feels this term applies to the construction of new nuclear weapons. 4) "national security"—the commentor believes this euphemism destructs "true" national security which is the environment. The commentor feels that the Nation is less secure because the money proposed for the Program may be used for poverty, education, and waste management.

37/10.08 The commentor wonders if the PEIS includes an analysis of the overall waste management plans at LLNL for the next 20 years.

38/10.09 The commentor notes that in addition to waste created from the Program, there is a proposal to construct an incinerator to handle mixed nuclear waste at Site 300.

39/40.12 The commentor feels millions of dollars are spent needlessly and that this money would be better spent on health care, education, renewable energy programs, and solar energy.

40/40.06 The commentor feels the document should have a broader view of evaluating environmental impacts and should assess these impacts to the country and the rest of the world.

41/40.06 The commentor believes that the United States should consider disarmament by the end of this century and the United States currently does not display the appropriate sense of urgency to the rest of the world.

42/40.15 The commentor would like the United States to use its best minds to focus on cleaning up existing nuclear waste.

43/43.19 The commentor suggests DOE remove the atomic symbol from the official seal.

44/40.50 The commentor disapproves of the Stockpile Stewardship and Management Program.

45/21.15 The commentor states NIF will continue weapons development and expresses opposition for that reason.

46/11.14 The commentor would like the PEIS to address the impacts which would result from a nuclear explosion, including the resulting deaths, the cancers created, and the spread of radioactivity.

47/10.03 The commentor is concerned about the nuclear waste that will be generated by this Program and the increased risk of waste production.

48/11.11 The commentor states that the breast cancer rate in Livermore is the highest in the nation.

49/40.13 The commentor believes the Program is driven by U.S. greed and fear that it may not be a leader and dominate economic markets. The commentor feels the United States should invest in peace, trust, and equality.

50/40.05 The commentor states the underlying planning for the Program is the Nuclear Posture Review (NPR) which is based on the first strike capability of U.S. nuclear weapons and that is why these weapons require "reliability."

51/40.50 The commentor urges DOE to consider the morality of the threat and use of nuclear bombs that kill.

52/40.06 The commentor feels that the United States could strengthen its national security by cooperating with Russia and discontinuing to rely on nuclear weapons and energy. The commentor feels U.S. reliance on nuclear weapons and energy is contradictory to the Nation's public health and economic concerns.

53/40.50 The commentor feels that the Program, including NIF, is dangerous and morally wrong. The commentor feels it is a waste to use "human genius" in this manner since that same genius could be used to solve the growing problem of inequality in the world. The commentor believes the

United States is misinforming people by saying the United States will not be producing and testing nuclear weapons.

54/40.12 The commentor points out that the Program is more costly than Star Wars while helpful social programs are being cut. The commentor states that from 1985 to 1995 there was an increase of chronically hungry children from 500 million to 800 million and that the money for the Program could be spent on these children.

55/40.06 The commentor states that a document just issued on political responsibility reports an active commitment by the United States to worldwide disarmament for moral reasons.

56/43.08 The commentor suggests that the United States take a leadership role in the elimination of anti-personnel mines but realizes U.S. economic motivation of the production of mines may make this difficult.

57/40.50 The commentor feels the Program should be discontinued.

58/41.12 The commentor feels DOE has prepared a "minimum" PEIS by rejecting many of the alternatives proposed by the public in the scoping process.

59/40.31 The commentor points out that the United States claims that it has halted new testing but a lot of public information defies this. The commentor points out that in addition to DOE's World Wide Web site, other documents, including *FY '97 Conceptual Design and Assessment: Exploration of Concepts and Technologies that Offer Potential Options for Meeting Future National Security Requirements and Missions*, detail U.S. plans to continue prototyping, experimentation, and conceptual designs.

60/40.37 The commentor feels today's weapons policies are not the only important factor to consider, especially since the Program extends approximately 30 to 40 years into the future.

61/40.37 The commentor feels since policy may change over the next 40 years the PEIS should analyze the capabilities of the proposed facilities and the possible effects this may have on international proliferation.

62/41.12 The commentor feels the NEPA process requires by law a range of reasonable alternatives so the public may evaluate an evenhanded analysis which includes many analyzed alternatives and their ramifications on the environment and international policy.

63/41.11 The commentor feels the PEIS represents a sequence of site-specific reviews which is not an adequate EIS.

64/40.05 The commentor believes the U.S. policy is a policy which relies on violence, evident by a large military expenditure and the continued development of nuclear weapons.

65/40.06 The commentor recommends worldwide disarmament.

66/40.06 The commentor believes the United States lacks the courage to work at a concrete time-frame with other nations to get rid of nuclear weapons.

67/40.60 The commentor wonders whether the PEIS evaluates a stockpile level which is less than the START II levels.

68/43.19 The commentor wonders whether the neutron source that is part of modern warhead design is the tritium boosting or yet another source of neutrons.

69/40.15 The commentor notes that approximately $320 billion is required for cleanup costs within the Complex and that the $40 billion required for the Program will subtract from funds allocated for cleanup.

70/40.60 The commentor suggests evaluating the following alternative which is more reflective of the minimum destructive power required for deterrence: approximately 100 strategic warheads multiplied 10 times to factor in overkill for a total of 1,000 weapons and completely eliminating theater and tactical warheads. The commentor proposes the stockpile would not require new facilities or weapons designs rather a record of detailed designs of the existing weapons would suffice. The commentor states that there would be no need for weapons effects testing and a less stringent reliability requirement. The commentor notes that continued assembly and disassembly (A/D), secondary case components, and nonnuclear components operations would be necessary because of potential aging effects. The commentor points out that there would be no intrusive pit reuse and minimal nonintrusive pit reuse and tritium recycling only.

71/40.31 The commentor states that advanced technology as a substitute for underground testing is not the solution to maintaining national security. The commentor notes that the document found on DOE's network confirms DOE has had plans for at least 15 years to develop substitutes for underground testing while continuing the arms race. The commentor feels that this is the wrong approach for security and humanity.

72/40.60 The commentor feels DOE should evaluate a zero-level stockpile.

73/40.07 The commentor notes that the United States has committed the nation to disarmament by agreeing to the NPT, yet current national nuclear weapons policy contradicts the goals and morals of the NPT.

74/21.20 The commentor feels troubled that elected officials lobby for NIF at LLNL on the basis of jobs and economics.

75/40.50 The commentor feels people should look at the global implications and morality of the Program.

76/40.12 The commentor feels the United States is spending an inordinate amount of money on the development of nuclear weapons and that the money could be devoted for "positive" uses.

77/40.07 The commentor notes that despite the disappearance of a Soviet threat, the United States continues to maintain a dangerous policy of maintaining adequate nuclear force.

78/21.10 The commentor feels NIF at LLNL will not result in prosperity, jobs, and increased national security like some members of the public believe.

79/40.07 The commentor notes that the original idea of the CTBT was to eliminate nuclear weapons and nuclear weapons research but the United States is instead undertaking a policy which continues the nuclear weapons testing.

80/21.06 The commentor supports NIF and describes the need for NIF as the result of an evolutionary process towards how the world will deal with nuclear weapons in this era. The commentor feels NIF represents a gradual realization of a slow process which will lead to the eventual cessation of nuclear weapons production.

81/21.17 The commentor states that discussions to determine the impacts of NIF on proliferation have occurred. The commentor also indicates support for NIF.

82/40.44 The commentor feels although this process is slowly moving towards peace, that the United States is moving in the right and responsible direction.

83/21.07 The commentor feels NIF affords many scientific benefits in addition to weapons research.

84/21.06 The commentor feels that since NIF does not contribute to proliferation, secondary benefits such as economics are just an added bonus.

85/40.50 The commentor feels nuclear weapons are the greatest public health hazard.

86/21.15 The commentor likens NIF to a "super-oven" and is opposed to locating the facility at LLNL.

87/40.12 The commentor feels a fraction of the funds allocated for NIF would be better spent on health care and education.

88/40.14 The commentor notes that on the eve of the CTBT, instead of closing NTS, DOE hired Bechtel to run and operate NTS for $1.5 billion over 5 years and Secretary O'Leary authorized 6 subcritical tests.

89/40.39 The commentor feels the zero-level stockpile is a reasonable alternative.

90/21.07 The commentor feels the purpose of NIF is to advance nuclear weapons science and that DOE would like the public to believe that it is a civilian program. The commentor notes that if NIF is to be used for civilian purposes like DOE claims, then let private companies compete for the funding of this civilian program.

91/40.07 The commentor points out that DOE cleverly decoupled the terms "design" and "development," and "nonproliferation" and "disarmament." The commentor feels the United States says there are no plans to produce and deploy new weapons but design activities are occurring to some extent.

92/40.07 The commentor feels DOE, at the very least, intends to make weapons modifications.

93/40.07 The commentor states that the United States is basically sending a message to the international community that implies the United States may maintain nuclear weapons forever while the rest of the world cannot. The commentor points out that Article VI of the NPT specifically mandates worldwide disarmament.

94/40.05 The commentor notes that DOE has coupled the terms "deterrence" and "first-use," diminishing the difference between nuclear deterrence and first-strike capability since this Program will maintain those types of weapons.

95/41.12 The commentor states displeasure with the comment process and would like DOE to respond to and evaluate all reasonable alternatives.

96/40.15 The commentor states stewardship implies the United States is caring for the world. The commentor feels the scientists at LLNL should resolve nuclear waste issues since the scientists created it.

97/40.15 The commentor notes that the United States is allocating more money for this Program but they should resolve waste issues.

98/40.12 The commentor states that the jobs created for the Program could be created for projects such as constructing schools and hospitals.

99/40.02 The commentor feels DOE is not honest while presenting programs such as subcritical tests to the public.

100/40.06 The commentor feels the abolition of nuclear weapons is a reasonable alternative.

101/21.04 The commentor feels the Program is not the policy direction the United States should undertake and that the public should inform public officials that NIF is not necessary.

102/21.17 The commentor feels the Program, especially NIF, will actually lead to a less secure nation.

103/41.03 The commentor states DOE will proceed with the Program despite public comments.

104/43.16 The commentor feels national security will result from people working towards peace and justice.

APRIL 11, 1996—EVENING SESSION

1/21.06 The commentor notes that the issue of nonproliferation was discussed among union members and they support NIF's impacts and purpose.

2/21.06 The commentor expresses support for the assessment that concluded NIF's role in promoting world peace. The commentor notes the unions support the finding that NIF will not destabilize world peace.

3/40.44 The commentor feels the Program is a responsible and necessary program for the U.S. stockpile of nuclear weapons.

4/21.06 The commentor feels NIF is part of a process of disarmament and supports this project.

5/41.05 The commentor notes that the discussion on impacts to peace have already occurred and feels the public meeting should focus on environmental impacts.

6/40.44 The commentor states that the unions welcome jobs and feel the jobs should not come at the expense of security to families and instability to world peace.

7/21.10 The commentor feels the construction workers are an important part of the infrastructure and that NIF is a responsible project which would not be trivial work and should not be minimized.

8/40.07 The commentor feels NIF will contribute to proliferation.

9/21.10 The commentor notes that the Alameda County Building and Construction Trades support NIF at LLNL.

10/40.02 The commentor feels nuclear testing should end and the scientists who designed them should ensure the remaining weapons are reliable and safe. The commentor notes that the scientists should be equipped with the "best tools available" to ensure the reliability and safety of the remaining stockpile.

11/21.06 The commentor notes that NIF is required to keep weapons scientists knowledgeable and ensure the security of the United States.

12/21.07 The commentor states NIF will help advance scientific research in areas such as new energy sources without damaging the environment.

13/21.12 The commentor expresses confidence that NIF is a safe facility which is not hazardous to the environment.

14/21.06 The commentor points out that despite the statements of critics, the construction and operation of NIF at LLNL will create 3,320 and 890 jobs, respectively. The commentor states that these figures do not include the potential economic benefits which may result from any resulting technological inventions.

15/40.12 The commentor states that money allocated for NIF should be used for socially beneficial construction jobs, such as "clean" cars and waste management, which improve lives and do not continue the nuclear weapons race.

16/40.41 The commentor wonders why there exists a reference to a classified appendix which may regard the use of reprocessed plutonium-242 for the Program.

17/10.03 The commentor notes that the waste volumes for LLW, mixed LLW, and transuranic (TRU) waste differ between the Stockpile Stewardship and Management Draft PEIS and the Waste Management Draft PEIS.

18/40.07 The commentor notes the Stockpile Stewardship and Management Draft PEIS states there will be no new weapons designs. The commentor disagrees since new materials will require new designs and NIF will help contribute to new designs. The commentor wonders what will be the difference between the era of the 1960-80s, when nuclear weapon designs occurred, and today.

19/21.02 The commentor notes that with respect to environmental impacts, the public should be skeptical of the statement, "... there will be no significant impacts." The commentor notes that LLNL's environmental report claims "no significant impact" yet over a million Ci of radiation has been released into the air. The commentor states that 120 cancers and 60 cancer deaths resulted from the top 10 accidents that occurred at LLNL. The commentor points out that tritium levels in rainwater and drinking water in Livermore has been measured to be over seven times the acceptable level. The commentor also points out that plutonium-contaminated soil was discovered at a local playground.

20/21.12 The commentor feels NIF will incrementally add to the amount of tritium and other toxic chemicals which will be released into the environment.

21/42.07 The commentor expresses concern regarding the Waste Management Draft PEIS proposed alternative for LLNL's Site 300, which is already on the EPA's Superfund List, as a regional facility for mixed LLW.

22/40.27 The commentor believes LLNL should be converted from a hazardous nuclear weapons R&D site to safe civilian missions site. The commentor states that an alternative study was prepared outlining methods for the conversion of LLNL's missions which demonstrates the "green" use of LLNL may create more jobs.

23/40.12 The commentor states that cleanup programs and their workers are losing funds as a result of NIF and other defense programs.

24/21.10 The commentor feels the conversions of LLNL into a civilian facility will create more jobs per dollar and would benefit the country and community. The commentor feels it is too costly to create laboratory-related jobs for NIF and that the capital and equipment costs are expensive.

25/40.06 The commentor would like a companion study for stockpile management which would evaluate the denuclearization, maintenance, and remanufacturing alternatives.

26/21.04 The commentor does not support the NIF facility.

27/21.11 The commentor feels the construction of NIF will be delayed because the decision regarding NIF will drag on for the next few years.

28/21.06 The commentor notes DOE has been candid about NIF's role as a nuclear weapons design and research facility and has not emphasized its potential for energy research.

29/21.05 The commentor states that an analysis of NIF within the PEIS will not be sufficient and a specific EIS will need to be completed.

30/40.60 The commentor feels the document is not adequate because it does not evaluate a stockpile size of less than 1,000 weapons and does not consider the NPT. The commentor feels approximately 1 to 100 weapons would suffice for deterrence purposes.

31/40.60 The commentor feels DOE employed irrational reasoning for not evaluating a stockpile of less than 1,000 weapons because DOE claims treaties take too long to reach smaller stockpile levels. The commentor states DOE cannot rely on the inability to set a precise time-line for not evaluating smaller stockpile levels and suggests DOE seek advice from the Control and Disarmament Agency. The commentor suggests DOE chooses a reasonable timeline for this evaluation which could vary between 25 to 50 years for the complete global elimination of nuclear weapons.

32/40.60 The commentor points out that a zero-level stockpile alternative must be analyzed in the document because this may result in a vastly differently complex which may not require the proposed experimental facilities.

33/41.18 The commentor notes that the No Action alternative should represent a scenario which would not involve any of the facilities. The commentor points out the No Action alternative for the Stockpile Stewardship and Management Draft PEIS represents a complex of current facilities already involved in weapons design and testing.

34/21.06 The commentor states that NIF is understood to function primarily as a fusion defense facility. The commentor also notes that NIF represents a facility required for the reduction of the arms race and may create many employment opportunities in the region as a result of new fusion technology.

35/40.07 The commentor feels the nuclear scientists are taking advantage of new ideas, similar to the supposedly "cleaner" breeder reactor, to promote nuclear technologies. The commentor states that NIF is connected to the cycle of nuclear weapons production, which is continuing the arms race. The commentor feels the United States and Russia need to reconsider continuing nuclear development.

36/40.11 The commentor states that while United States and Russia continue downsizing, France and China are not. The commentor also expresses support for NIF.

37/21.06 The commentor points out that there is an existing stockpile that needs to be maintained and NIF is necessary for this purpose.

38/40.14 The commentor compares the Program to Safeguard C, an atmospheric testing readiness capability measure in the early 1960s which cost $1.6 billion to maintain facilities on Johnson Atoll to permit the resumption of atmospheric testing. The commentor notes that Congress promptly discontinued funding when they learned of the Program. The commentor sees the Stockpile Stewardship and Management Program as a similar program contending that although DOE is proposing NIF, NTS will remain operational as a tacit option for resumed underground nuclear testing.

39/40.14 The commentor believes the environmental impacts of underground testing are unavoidable and contaminates land forever. The commentor believes land is sacred and that DOE should not receive funds to maintain NTS.

40/21.06 The commentor supports NIF and inertial confinement fusion at LLNL and feels mitigation measures are sufficient to minimize the impacts. The commentor believes these technological advancements afford more job opportunities, which is good for the community and the United States.

41/12.09 The commentor expresses concern regarding an analysis of people and their families in the environmental justice sections.

42/40.12 The commentor states the funds allocated for this Program could be better spent to rebuild a public health infrastructure.

43/40.06 The commentor feels the denuclearization alternative is reasonable and should not be dismissed from the evaluation.

44/40.05 The commentor feels replacing underground nuclear testing with an expanded laboratory infrastructure is an attempt to legitimatize nuclear weapons and demonstrates renewed U.S. commitment to the nuclear arms race. The commentor feels aggressive maintenance of nuclear weapons research and design may restart the nuclear arms race and hinder nonproliferation. The commentor notes that despite the public's suggestion to abolish nuclear weapons, DOE will maintain nuclear weapons capability. The commentor feels denuclearization is the only alternative consistent with the NPT and CTBT.

45/40.36 The commentor wonders why the U.S. nuclear weapons arsenal must remain reliable.

46/04.04 The commentor states a contaminated water plume is drifting offsite at LLNL yet budget cuts may not allow for the cleanup.

47/11.11 The commentor states that activities at LLNL have created plutonium pollution at nearby parks, tritium contamination of the water, and onsite contamination from leaking drums. The commentor states that facilities to store these wastes do not exist and taxpayers should not have to support new programs.

48/40.36 The commentor states that a stewardship program is unnecessary and a maintenance program would not require a facility such as NIF.

49/40.15 The commentor feels the degradation of the environment in the past should be an important factor in the decision.

50/40.06 The commentor feels a denuclearization alternative should be considered for two reasons: 1) a recent speech by Warren Christopher suggests environmental policy issues should be linked with foreign policy issues, therefore, waste impacts as a result of stockpile stewardship and management will impact other countries as well; and 2) the United States should meet the treaty obligations of the NPT.

51/21.19 The commentor feels LLNL is not accurately reporting tritium contamination in the yearly environmental report and the values presented are underestimated. The commentor feels the tritium released from NIF will probably not be reported accurately as well. The commentor states tritium in the valley is approaching 1 million Ci and is a major problem. The commentor points out that the problem exists because the values reported represent contaminated water only. The commentor notes that tritium organically bound in organic surroundings, such as grass, and tritiated water are not being measured and they represent a hazard which is approximately 25,000 to 2,500,000 times more toxic than tritium gas.

52/11.11 The commentor states that despite submitting written reports documenting health hazards at LLNL, such as inaccurate reporting of tritium levels, at the suggestion of DOE, these concerns were not adequately addressed.

53/40.07 The commentor feels it is hypocritical of the United States to build NIF and other stockpile stewardship and management projects while discouraging other countries in their nuclear pursuits. The commentor wonders why the United States would continue the arms race while there is no clear division of the world.

54/40.06 The commentor feels that unless the United States initiates dismantlement, weapons proliferation will continue. The commentor expresses displeasure with DOE's short-term vision to settle with rapid changes. The commentor feels DOE should have the "political will" to evaluate a Complex without weapons and experimental facilities.

55/40.12 The commentor notes that the local unions will not benefit from these projects and feels there are greater benefits to constructing hospitals and schools.

56/21.06 The commentor states NIF is required for peace.

57/41.13 The commentor feels statements such as "none," "minimal," "within regulatory statutes and guidelines," "manageable," and "amenable" are not credible when describing environmental impacts.

58/21.09 The commentor states there are several varying estimates regarding the number of jobs which will be created by NIF.

59/40.60 The commentor feels DOE should consider and evaluate a zero-level stockpile.

60/40.06 The commentor feels that a nuclear weapons program is not necessary.

61/40.04 The commentor states support for downsizing but abolishing the stockpile is not realistic because the United States cannot control other nations' policies. The commentor believes DOE can increase waste management efforts but adds the United States is initiating "positive" policy by discontinuing the manufacture of new weapons.

62/40.06 The commentor feels the United States may take a leadership role in the downsizing of nuclear weapons worldwide.

63/40.07 The commentor believes supporters of the Program, particularly NIF, feel this Program represents downsizing and maintaining weapon reliability and safety. The commentor states that the Program will actually allow DOE to accomplish further developments and advances in weapons research, resulting in an unsafe world. The commentor notes that in Summary section S.2.5, Nonproliferation, the PEIS states that the United States has "halted the development and production of new design nuclear weapons." The commentor also notes that the meaning for the term "new weapons designs" has changed over the years yet new weapons designs are ongoing. The commentor also feels that this is a policy matter which may or may not change in the future. The commentor feels that in the meantime facilities such as NIF and DARHT, combined with historical data and computer modeling, will enable DOE scientists to develop advanced nuclear weapon designs. The commentor states that NIF will isolate fusion experiments without the "noise" of an underground explosion while DAHRT will provide detailed three-dimensional "pictures" of a nuclear explosion. The commentor feels the scientists will advance weapons scientists with these tools which will further experiments, prototypes, and designs, which may used to develop a new weapon. The commentor believes that if a shift in policy to revert back to nuclear weapons production were to occur, the United States will justify this with the exorbitant amount of money and personnel that was spent on these projects that probably will have proved the United States is capable of building advanced nuclear weapons to replace outdated weapons. The commentor feels these facilities represent an advancement from previous research and will promote proliferation.

64/40.07 The commentor states that new weapons design is occurring, noting that the B-53 is slated to be replaced by the B-61 Modification 11, which has earth-penetrating capability. The commentor states that this is an example of new nuclear design but DOE will not announce this as a new nuclear design. The commentor notes that according to DOE "nuclear development" and "nuclear design" have different meanings yet it seems nuclear designs will occur as a result of nuclear developments. The commentor states NIF, as a nuclear development, will enable scientists to develop new designs. The commentor feels the certification of nuclear weapons without testing is a "big jump" but it has happened in the past and these facilities will lead to a "nuclear weapons science."

65/40.07 The commentor feels DOE plans concept studies and development of prototypes which, when combined with potential changes to future policies (i.e., such as disregarding the objectives of the CTBT) and a drive to certify these new weapons, create a tremendous proliferation risk.

66/40.07 The commentor believes the United States will not be able to protect the spread of information from the Program to other countries with an industrial capacity.

67/21.01 The commentor feels new facilities, like NIF, are not needed for maintenance of the stockpile.

68/40.07 The commentor states that other nations evaluate U.S. intent and capability of these programs and they are unable to assess the nuclear weapons program, therefore, other nations may feel the need to undertake similar programs. Therefore, the commentor believes a nonproliferation analysis of the Program, including the entire Inertial Confinement Fusion Program, should be included in the document.

69/41.05 The commentor feels the public meeting did not contain a discussion regarding the environmental impacts of the Program.

70/41.12 The commentor feels DOE did not evaluate all reasonable alternatives required by NEPA and did not provide an adequate basis of comparison.

71/21.12 The commentor states that DOE cannot state the radiological health threat of NIF is small with certainty from a threshold exposure basis.

72/40.60 The commentor states individuals advocating downsizing lobby on a global basis. The commentor feels global downsizing may occur if the United States reduces to at least 1,000 weapons as a first step and then negotiates an abolition treaty, which would eliminate all nuclear weapons and the bases which employ them. The commentor feels the proposed facilities are not necessary for maintenance and DOE should not eliminate alternatives which use existing facilities for remanufacturing and maintenance. The commentor notes that the U.S. Ambassador to the Geneva Test Ban Treaty negotiations recently confirmed a belief in worldwide disarmament and the need for the CTBT and discontinuing development. The commentor notes that there is a broader scope of discussion regarding the legality of the use of nuclear weapons on an international level which will most likely determine there is a need to meet NPT obligations and find nuclear weapons illegal. The commentor believes the zero-level alternative should be considered. The commentor feels the Program is a U.S. effort to maintain the capability to design and develop nuclear weapons.

73/21.15 The commentor states that NIF, being an experimental fusion facility, may or may not lead to fusion nuclear weapons but will lead to new nuclear weapon designs.

PUBLIC HEARING—WASHINGTON, DC

April 17, 1996—Afternoon Session

1/41.05 The commentor believes that there was a breakdown in communication between the military and production network groups and DOE regarding the April 17, 1996, Washington, DC, public meeting format. The commentor thought the session was to be an informal meeting with no opening presentations. Consequently, many of the group did not pre-sign.

2/40.36 The commentor believes that the capability to be maintained in the Stockpile Stewardship and Management alternatives and the Preferred Alternatives Report is still a bit overblown.

3/40.25 The commentor compliments DOE for the analysis of stockpile management alternatives in the PEIS. However, the commentor believes that the PEIS does not contain a parallel analysis of stockpile stewardship.

4/41.17 The commentor believes that by eliminating from detailed study the non-science-based alternatives for stockpile stewardship found in Summary section S.3.2 of the Stockpile Stewardship and Management Draft PEIS has not met the minimum requirements of NEPA.

5/40.07 The commentor suggests an overall proliferation analysis in the PEIS.

6/40.02 The commentor notes that inertial confinement fusion in NIF, the upcoming subcritical tests, and other testing technologies have come under fire internationally. The commentor believes that underground subcritical tests will be seen internationally as a nuclear test and wants DOE to cancel these tests.

7/21.01 The commentor believes that NIF is the least relevant alternative as far as safety and reliability, and believes that the stockpile can be maintained without it.

8/42.14 The commentor is shocked that the amount of waste to be produced over the next 20 years by the stockpile stewardship and related nuclear research programs as presented in the Waste Management Draft PEIS is much more than what is currently in storage.

9/42.14 The commentor states that the waste figures presented in the Waste Management Draft PEIS are not consistent with those in the Stockpile Stewardship and Management PEIS.

10/40.12 The commentor states that the Program will take $40 billion in tax dollars and in return will generate more radioactive and mixed waste. The commentor believes the money would be better spent on environmental restoration, for civilian programs, and for a sensible curatorship program to maintain the existing arsenal safely as it awaits dismantlement.

11/40.34 The commentor does not understand what "safety and reliability" means and asks for clarification.

12/40.31 The commentor saw a DOE document and now believes that DOE is designing new weapons as part of the Stockpile Stewardship and Management Program.

13/40.07 The commentor says that the Secretary of Energy stated at a recent arms control committee hearing that the PEIS is a proxy for underground nuclear testing. The commentor asks how this can be reconciled with CTBT.

14/40.07 The commentor believes that NIF might be perceived as skirting international treaties and commitments.

APRIL 18, 1996—MORNING SESSION

1/41.10 The commentor has significant concerns about the Stockpile Stewardship and Management PEIS and Storage and Disposition PEIS combined public hearings. The commentor believes that since the PEISs are long and contain complex issues, the integration of issues is more difficult. The commentor wonders if this new format is aiding the process and being more substantive or not.

2/40.31 The commentor believes that the United States is moving forward on new nuclear weapons designs and points to a Defense Programs document viewed on the Internet that DOE later took offline as evidence.

3/40.31 The commentor requests that the Internet document believed to address new weapons designs be made available to the public.

4/40.05 If it is true that the option to design new weapons must remain open, the commentor believes that the impacts of this should be addressed in the PEIS.

5/40.02 The commentor does not believe that the upcoming subcritical tests are included in the PEIS. The commentor asks if there is a plan to include next year's test in the Final PEIS. The commentor believes that the two tests scheduled this year at NTS should be postponed so they may be included in the PEIS.

6/40.02 The commentor asks if subcritical tests are included in the NTS Site-Wide EIS.

7/21.17 The commentor is concerned about proliferation impacts of sharing technology with foreign countries, such as with NIF, and asks if the PEIS addresses this. The commentor points to an April 17, 1996 *Washington Times* op-ed piece that questions this.

PUBLIC HEARING—AMARILLO, TEXAS

APRIL 22, 1996—EVENING OPENING SESSION

1/40.40 The commentor wants to know the size of the stewardship stockpile.

2/40.52 The commentor states that any new work at Pantex must be done in an environmentally safe manner.

3/08.15 The commentor states that there are not enough words to say how important Pantex is to the job situation in Amarillo. Using a multiplier index, the commentor states that the 3,500 jobs at Pantex create an additional 13,500 in the community.

APRIL 22, 1996—EVENING BREAKOUT SESSION

1/34.01 The commentor states that if the HE mission moves to the laboratories, HE production capability will be lost and our nuclear deterrent will be in jeopardy.

2/40.23 The commentor states that 1,300 HE units will be needed sometime around 2010. The commentor doubts that the laboratories will have adequate capacity for this quantity.

3/34.01 The commentor notes that the core capability for HE is largest at Pantex. The commentor questions the need to move HE to the laboratories in order to "maintain core capabilities."

4/34.01 The commentor offers other options for the HE mission. The commentor would like DOE to consider a sharing of the mission or the possibility of laboratory personnel performing HE work at Pantex.

5/40.52 The commentor makes the point that the HE costs at Pantex in the near-term, for which DOE can be most certain, are cheaper than the HE costs at the laboratories.

6/40.36 The commentor asks about extending the life of the weapons through an evaluation program. This is a program whereby the life of a weapons system is extended by upgrades to the weapon program, which are based on evaluation activities.

7/34.01 The commentor asks if the cost studies included the transportation of the HE to and from the laboratories.

8/40.35 The commentor asks how the decision criteria (that were given to the sites in developing the alternatives) were applied in formulating the preferred alternatives. Also, the commentor indicates that Pantex scored highest for most, if not all, of these decision criteria.

9/40.23 The commentor wants to know how the laboratories are maintaining their core competency in HE work today and how this relates to HE manufacturing in the future. The commentor states that there is a manufacturing risk at the laboratories.

10/40.40 The commentor refers to the lowest case stockpile size (1,000 weapons) and asks what influence this had on the choice of preferred alternatives.

11/40.52 The commentor notes that, despite uncertainty in the out years for HE costs, Pantex is consistently cheaper, year after year, than any other alternative.

12/40.52 The commentor states that cost is affected by the quality of the workforce and the work ethic. The commentor urges DOE to consider the quality (excellent in this case) of the Pantex workforce in its cost estimates.

13/40.13 The commentor asks if the A/D and HE costs include the cost of facilities operation in the out years. The commentor notes that older HE facilities at the laboratories may incur additional costs due to upgrades.

14/08.15 The commentor states that in the summary section for the PEIS, job losses number 3,500 for Pantex. The commentor doubts that this amounts to only a 1-percent effect.

15/08.14 The commentor states that the 1,100 employees that have been added to the Pantex workforce in the past few years are mostly environmental, safety, and health (ES&H) workers, not A/D workers.

16/08.25 The commentor wants to know why the Pantex Site-Wide Draft EIS and the Stockpile Stewardship and Management Draft PEIS use different economic multipliers.

17/40.08 The commentor suggests politics, and not a NEPA analysis, will have the greatest influence regarding decisions for such a program.

18/40.06 The commentor would like DOE to consider denuclearization. The NPT calls for denuclearization, according to the commentor.

19/34.01 The commentor states that the cost of moving HE to the laboratories is $40 to $50 million and that this is a fact worth considering in the decisionmaking process. The commentor also notes that Pantex scores 100 for all decision criteria, the highest score among all alternatives. The commentor urges DOE to move more HE work to Pantex to maintain this capability.

20/34.01 The commentor would like to know why DOE would consider the HE laboratory alternative when such a decision would result in higher costs to the taxpayer and less capacity (therefore less flexibility) for the Complex.

21/08.24 The commentor states that DOE should not consider 33 HE jobs insignificant. In both human and economic terms, these jobs are significant.

22/34.01 The commentor is concerned that political considerations will overshadow the decision criteria which position Pantex as the logical choice for HE work. The commentor wonders if these decision criteria even matter.

23/40.06 The commentor states that cost and environmental impact would be less if a smaller stockpile were maintained.

24/40.14 The commentor does not want NTS to maintain a test-readiness posture.

APRIL 22, 1996—EVENING FORMAL COMMENT PERIOD

1/41.05 The commentor states that it was never the intention of the citizens groups at Pantex that DOE would not be able to respond to comments in the formal comment room.

2/41.03 The commentor believes that DOE is putting on a show of gathering public comments and that they are withholding important information from the public.

3/11.26 The commentor notes that there are no results of long-term health exposure studies of the current mission at Pantex.

4/11.26 The commentor cites several fires and explosions that have occurred at Pantex and expresses concern that additional problems may arise because there is a lack of scientific study used in the document.

5/34.02 The commentor believes that moving all of the HE activities of the Complex to Pantex is not in the best interest of the community.

6/04.05 The commentor believes that there is not enough water in the Pantex area for the proposed DOE projects. The commentor notes that Pantex has pumped one and a half times their allotment for the past six years and that water use restrictions may be instituted this summer in Amarillo. The commentor also notes that the city has unsuccessfully attempted to find more water by developing new well fields and refurbishing old well fields.

7/04.05 The commentor calls on DOE to release reports on the contamination problems at Pantex to the public. The commentor believes that the damage reports will allow the public to make more informed comments by providing an accurate picture of the present situation at Pantex. The commentor specifically asks for the release of the Zone 12 Groundwater Assessment.

8/43.19 The commentor believes that the United States has failed to recognize the sacrifices made by unknowing men, women, and children during the Cold War. The commentor believes that it is unpatriotic to not recognize the casualties that resulted from the contamination of the Cold War.

9/05.02 The commentor notes that Pantex is located on a geologic fault that has been active enough in the last century to cause damage to farm buildings.

10/04.12 The commentor is concerned about the quality of the drinking water. The commentor notes that Pantex is monitored for 160 contaminants, the majority of which ended up being discharged to groundwater. The commentor wants a broader spectrum of contaminant analysis for the drinking water.

11/11.25 The commentor wants more information on the open air experiments performed at Pantex. Specifically, the commentor is concerned about releases of strontium-90 and deuterium.

12/41.05 The commentor appreciates the formal hearing format option in Amarillo. The commentor believes that the formal hearing room option allows more people to comment and is more comfortable than the workshops.

13/41.10 Commentors believe that combining three documents into a single opportunity for public input is unreasonable and does not do justice to the NEPA process. The commentors believe that more time is needed for public review of the documents.

14/41.05 The commentor believes that the workshop format public hearings do not meet the Government's responsibility to the public as envisioned by NEPA. The commentor also believes that DOE can control the output of the meetings using the workshop format.

15/13.03 The commentor believes that DOE should look at the cumulative impact of all three of these programs.

16/40.27 The commentor believes that stockpile stewardship and management is an attempt by the Government to justify the continued operation of all three of the weapons laboratories. The commentor believes that the redundant laboratory capacity is an obscene abuse of taxpayer money.

17/40.79 The commentor believes that the PEIS does not make a realistic distinction between strategic and surplus plutonium. The commentor believes that the effort to maintain two-thirds of the plutonium is evidence that the United States is not serious about disarmament and also gives rise to the suspicion that some effort is being made towards using plutonium for commerce.

18/40.73 The commentor does not want Pantex to become the next Rocky Flats where the only jobs are for nuclear waste handlers and regulators. The commentor believes that Pantex is the wrong place for plutonium storage.

19/41.09 The commentor believes that a lot of taxpayer money was spent to produce a PEIS that is flawed in many ways.

20/40.36 Commentors believe that the alternatives in the PEIS are too expensive and are not prudent in light of recent budget cuts and downsizing.

21/40.06 The commentors believe that DOE should not build new RD&T facilities at a time when the rest of the world is looking to the United States for leadership in extending the NPT and CTBT.

22/40.05 The commentor asks if DOE is trying to keep war and war games going in the pretense of building peace and achieving economic development in rural America.

23/10.13 The commentor is concerned that more waste will be produced when there are no licensed facilities to handle the waste.

24/08.02 The commentor wants to know where the impacts to the agricultural economy were analyzed in the PEIS.

25/04.05 Commentors express concern about the water in the Pantex area. One commentor believes that the PEIS failed to address the issue that Pantex is located above the Ogallala aquifer.

26/40.50 The commentor believes that the basic issue of morals has not been addressed. The commentor contends that underneath all of the complex issues, the questions are what kind of country do we want to be, what kind of security do we want to provide, and do we want to have the capability to destroy the planet.

27/40.40 The commentor wants to know the number of nuclear warheads in the stockpile.

28/40.07 The commentor believes that the purpose behind the PEIS proposals is to develop nuclear weapons.

29/41.03 The commentor believes that DOE has made a mockery of asking for citizen input.

30/41.01 The commentor notes that it was very difficult to make plane reservations to get to the meetings at Pantex because the meeting times kept changing. The commentor also was not aware of the meetings in the afternoon and would have changed flight plans to attend the meetings if possible.

31/40.12 According to the commentor, the costly expansion of the nuclear weapons program is alarming in light of proposed cuts that will affect children and the elderly.

32/40.06 The commentor believes that the United States should destroy nuclear weapons and rely on a nonviolent means of conflict resolution.

33/40.60 The commentor wants to know why DOE has decided that long-term storage in Zone 4 is unsafe.

34/40.73 The commentor does not want plutonium stored at Pantex and believes that plutonium is too dangerous to transport.

35/30.01 The commentor supports the selection of Pantex for weapons A/D functions.

36/34.01 The commentor favors the continuation of the HE mission at Pantex.

37/40.52 The commentor believes that Pantex should be selected for additional environmentally sound stewardship and management functions.

38/40.52 The commentor points out that the community has been overwhelmingly supportive of Pantex and is in favor of bringing new environmentally sound missions to Pantex.

39/40.52 The commentor believes that most people are supportive of most of the work that is done at Pantex.

40/40.52 The commentors believe that the outstanding work ethic and dedication of the employees at Pantex make it the best site for stewardship and management alternatives.

41/04.05 The commentor believes that opponents to Pantex have no factual basis to support their fears. The commentor believes that opponents fear all things nuclear and cites their fears of contaminating the Ogallala aquifer as an example.

42/40.52 The commentor supports the operations/mission at Pantex and further states that there has never been a time when any one of the generations of her family has feared for their safety because of activity at Pantex.

43/04.05 The commentor believes that concerns about the Ogallala aquifer are unfounded.

44/40.52 The commentor believes that DOE should remember that the workers of Pantex have an excellent place to live, Amarillo.

April 22, 1996—Evening Closing Session

1/41.10 The commentor states that the public has not had adequate time to review all three EISs.

2/41.05 The commentor would like to know how the public can comment on the cost studies for stockpile stewardship and management.

APRIL 23, 1996—MORNING SESSION

1/41.12 The commentor believes that the lack of preferred alternatives in the documents under discussion prevents full participation and thorough analysis by the public.

2/42.09 The commentor urges collocation of the strategic reserve and the surplus material. This would minimize transportation risks and costs, according to the commentor.

3/34.01 The commentor states that if HE moves to the laboratories, the manufacturing capability will be lost. The commentor would like to know if DOE considered moving HE design to Pantex. If not, the commentor would like to have an explanation.

4/40.27 The commentor would like to know why LANL and LLNL were not consolidated.

5/34.01 The commentor would like to know how the laboratories maintain their core competencies (especially in HE) in the absence of any new design work. Also, the commentor states that the laboratories come to Pantex for production experience since their capability in this area is minimal.

6/34.01 The commentor states that HE production will be necessary in the future in order to extend a weapon's life or to refurbish a weapon. The commentor states that DOE should maintain the core competency of HE production at Pantex in order to meet this requirement and fund R&D for HE either at the laboratories or Pantex. This way, according to the commentor, both a design and a manufacturing capability would be preserved.

7/40.21 The commentor states that the recent increase in employment at Pantex is due mostly to an enhanced safety culture. The commentor believes that the PEIS baseline does not consider the level of work necessary for an adequate safety culture.

8/40.67 The commentor states that, according to his information, the workload at Pantex will be increasing in 1997 and 1998. The commentor would like to know why, then, the budget for Pantex is decreasing, along with employment levels, for 1997 and 1998.

9/34.01 The commentor states that facility operating costs and overhead are lower in the Pantex region than in the Albuquerque and Livermore regions. Accordingly, the commentor does not understand why operating costs in the net present value graphs are assumed to be equal for these regions.

10/40.21 The commentor states that the facilities at LANL and LLNL do not meet DOE personnel explosive safety requirements.

11/30.08 Referencing page 7-17 of the *Stockpile Management Alternatives Report*, the commentor believes a stockpile of 1,000 weapons was analyzed in order to increase the chance that production work would be moved to the laboratories. The 1,000 level favors lower production capability at the laboratories and makes Pantex look extremely large in cost, according to the commentor.

12/40.13 The commentor states that there is a $50 million difference in operational costs per year between downsizing Pantex and transferring to the laboratories. The commentor would like DOE to comment on this fact.

13/40.11 The commentor, in response to the justification for a sub-START II stockpile analysis, states that there are others who argue in the opposite direction, for an even greater stockpile. The commentor urges analysis of such a stockpile level.

APRIL 23, 1996—AFTERNOON SESSION

1/40.11 The commentor states that, in light of French and Chinese testing, it is foolish to be thinking of reducing the stockpile.

2/43.09 The commentor states that no consideration is given to all the chemicals that are poisoning the human body by allowing the chemical companies to put all of their chemicals into food supplies which will harm all humanity in the United States. The commentor asks which is worse: the pollutants that go out by Pantex that affect the local population, or all the chemicals that go into our food supplies affecting the whole Nation.

3/08.15 The commentor states that it will hurt the economy of the city to have another payroll eliminated. The commentor is against cutting the payroll of the city any further.

4/40.67 The commentor states that the fiscal year 1997 budget as proposed will lead to a reduction in force at Pantex. The commentor notes that the Preferred Alternatives Report reveals that Pantex, but not Y-12 or KCP, will undergo this decrease in budget. The commentor would like to know why Pantex is suffering budget cuts if the workload is constant and the other production facilities are not suffering budget cuts.

5/12.09 The commentor states that in the environmental justice sections of the PEIS, human health is covered but no socioeconomic analysis is done.

6/40.67 The commentor would like DOE to reconcile a declining budget at Pantex with a constant workload.

7/40.67 The commentor refers to the Preferred Alternatives Report, pages 33, 36, and 39, regarding the projections of annual cost at KCP, Y-12, and Pantex. The commentor states that the annual cost is fixed at Y-12 and KCP for the succeeding four years. At Pantex, however, there is a decrease. The commentor states that this furthermore suggests that although the Pantex alternative in terms of definition of costs against the stockpile management was designed within the assumptions, and those assumptions were laid forth to provide common basis of comparison across sites, that those have now been translated into a budget planning document. The commentor states that this is not what NEPA is for.

8/40.68 The commentor states that the enduring stockpile was built from the late 1970s to the early 1990s, approximately a 12-year period. Assuming the stockpile has 8,400 weapons in it and that the life of a weapon is about 30 years, in 2008 we would have to replace the stockpile at a rate of 700 units per year. DOE is sizing the Complex to handle about 300 units per year. The commentor would like DOE to explain this disconnect and what DOE proposes to do about it.

APRIL 23, 1996—CLOSING SESSION

1/13.02 The commentor quotes from the cumulative impact section of the Council on Environmental Quality (CEQ) regulations and asks why past socioeconomic actions (that led to reductions in employment and that are still felt today) are not discussed in the cumulative impact section of the PEIS. Specifically, the commentor mentions the cancellation in 1988 of the DOE program of a mine geologic repository for spent nuclear fuel and high-level radioactive waste in Deaf Smith County and the more recent announcement of the Department of Interior's Bureau of Mines Helium Operation.

PUBLIC HEARING—SANTA FE, NEW MEXICO

APRIL 25, 1996—AFTERNOON SESSION

1/41.05 The commentor questions why the comments collected through these meetings do not go through an impartial agency rather than to the reading rooms.

2/40.06 Commentors support total nuclear disarmament. The commentors feel that nuclear weapons kill innocent citizens and the radiation from nuclear explosions harms many innocent people; therefore, the use of nuclear weapons is immoral and cannot be justified.

3/40.06 The commentor feels that U.S. possession of nuclear weapons encourages rather than discourages other nations to develop and use nuclear weapons, possibly on us, making us less secure rather than more secure.

4/41.08 Commentors state that the American people cannot trust that our nuclear weapons, if they exist, will not be used on civilians again. The commentors cite the dropping of the atomic bomb on Japanese cities, stating that it could have been demonstrated in a nonpopulated area to show U.S. capability.

5/40.06 Commentors state that even if the weapons are never used again, every stage of their production, from mining to waste disposal, is hazardous to the workers involved, to our environment, and to future American citizens. It is not logical to harm our own people in the name of defending ourselves. Even some LANL employees do not want to build nuclear weapons.

6/40.06 Commentors nationwide call for a permanent moratorium on the production of any nuclear weapons. In addition, the commentors do not want LANL or anyone else to maintain and manage the existing stockpile of nuclear weapons. Instead, they seek the dismantling of all nuclear weapons.

7/10.24 Commentors ask that waste be stored where it happens to be, not shipped from all around the country to further endanger American citizens.

8/40.50 Commentors urge that the Government use this Nation's great minds and resources to resolve our conflicts with other nations in ways that do not involve killing people.

9/40.12 Commentors suggest that the main thrust of our brain and brawn and money should be immediately directed to implementing and developing alternative ecological renewable technologies and energies, such as solar power, hydrogen, and electric engines. The commentors believe we must free ourselves from a petroleum-based world economy which is polluting our air, water, and soil.

10/40.06 The commentor states that nuclear energy is not a solution for the short- or long-term, and it is dastardly dangerous, basically stupid, and non-biofriendly.

11/40.15 The commentor advocates immediate downscaling of nuclear facilities except for the cleanup of numerous contamination sites.

12/40.72 The commentor believes that the track record of LANL's emission violations is immoral and criminal. Creating more nuclear radioactive waste materials is not acceptable.

13/11.27 The commentor states that Santa Fe is the capital of New Mexico with an increasing populace and the area surrounding LANL is in very near proximity. The commentor feels possible contamination of the water, groundwater, and the radioactive accident or sabotage, if they would occur, would make Santa Fe and the surrounding area uninhabitable.

14/40.27 The commentor states that there is no question LANL should be shut down immediately as a nuclear development facility and immediately turned into an "ecological alternative technology think tank" and implement new nonlethal systems. If this were done, the commentor believes Los Alamos would be a shining city of innovative light for mankind, not as its present title implies "Ciudad de la Muerte," city of death.

15/40.06 The commentor states that nuclear security is an illusion. In the commentors' opinion, the nuclear genie is loose and proliferation is rampant, so the immediate shutdown and dismantling of nuclear devices is warranted.

16/40.27 The commentor states that everyone he knows is against the nuclear establishment's plans for Northern New Mexico. In the commentor's estimation, with the end of the cold war it makes no sense to continue this huge militarization with just as much money going into the military now as ever before. The commentor states that the people of Santa Fe do not want LANL to be the "plutonium capital of the world." The commentor believes that Complex decisions are merely a debate over political power and not environmental issues, and that with 5 electoral votes, New Mexico is short on the political power end of the debate and high on the environmental impacts.

17/41.05 Commentors believe that DOE officials do not listen to the public and DOE does what it wants regardless of what the public expresses, since the public has no power.

18/41.05 The commentor states that she heard a DOE official confess that these hearings bore him silly since we lay people go on about our feelings. This commentor further notes that only people with Ph.D.s can tell DOE not to make LANL the pit fabrication facility.

19/42.15 The commentor expresses opposition to building the DAHRT and its so-called subcritical detonations of plutonium.

20/42.10 The commentor expresses opposition to building a tritium facility.

21/09.10 Commentors express opposition to the transportation of nuclear waste and other deadly toxins.

22/41.02 The commentor believes that NEPA just delays actions; it does not change them. The commentor noted that NEPA only requires EISs and public hearings; it does not mandate that anyone choose the least destructive course of action.

23/41.03 Commentors question whether the decision to implement the Stockpile Stewardship and Management Program has already been made, whether the Secretary of Energy is solely responsible for that decision, whether the Secretary of Energy gets records of all the comments made at the meetings, and whether the Secretary's decision is revocable.

24/40.04 The commentor states that regardless of what is being said at this small meeting, the majority of Americans do want the protection of nuclear weapons. The commentor adds that it is important to keep the stockpile safe and reliable and supports the need for stockpile stewardship and management and the ability to resume underground nuclear testing if in the Nation's best interest.

25/40.24 The commentor states that a critical requirement for the Stockpile Stewardship and Management is the availability of trained people to investigate weapons components and design solutions for problems if problems are found or suspected. The Program will flounder unless a way is implemented to replace retiring and expiring employees in DOE and its contractors.

26/40.14 Commentors state that they do not want pit fabrication in New Mexico or anywhere else.

27/40.21 The commentor states that she would not feel safe if there was expansion going on at LANL.

28/41.08 Commentors feel that there is no way to be aware of all the possible effects of nuclear weapons at this time. Commentors believe that there is technically too much that is unknown, and that the world needs to obtain a better understanding of the impacts of nuclear materials.

29/40.07 The commentor feels that the Complex's decisions are driven by socioeconomics. The commentor suggests that if the United States can pay farmers not to grow crops, then they can pay engineers not to build bombs. The commentor feels that having nuclear weapon production facilities in the area essentially devastates it economically.

30/40.07 The commentor questions the credibility of the United States who simultaneously signs nonproliferation treaties while creating more new nuclear weapons.

31/40.12 The commentor resents paying to support LANL considering the work being done there and feels that it sacrifices the beautiful State of New Mexico. In addition, the commentor states that DOE scientists could be putting their abilities into alternative energy, medicine, and other positive work.

32/41.13 The commentor states that there are measurable environmental impacts as a result of the activities at LANL including the following: the fish downriver have measurable amounts of nuclear transuranic stuff in them; the water up in Los Alamos has tested positive for tritium and probably a few other things that they have not told us about; a rather large cluster of brain cancer in Los Alamos; and the sacred canyons of the Anasazi Indians that are now off limits because of waste that has been buried there.

33/41.08 The commentor feels that DOE should consider in the PEIS the global consequences of an accident like Chernobyl would cause; its effects were greater than the 50-mi radius the PEIS models for.

34/40.04 The commentor states that there is a lot of paranoia about nuclear weapons. The commentor feels that people in the United States should feel safer than anyone in the world. Growing up in Israel, the commentor said bombs were dropping on her head and the commentor does not understand why people in America are fearful. The commentor states that people should recognize that it is not realistic to reduce the stockpile down to zero; the United States must always have a way to protect itself.

35/40.06 The commentor states that mining uranium and converting it to plutonium, the transporting of it, and its use in weapons and energy sources are the links in a chain of death; we know this and we know that we have taken from the earth more fossil fuel than she in all her generosity can spare. The commentor calls for the irrevocable ban on all nuclear weapons and energy, and production, the return to full employment at LANL to detoxify, cleanup, and properly store the existing toxic waste.

36/10.01 The commentor states that waste should be kept where it was created and stored above-ground where it can be monitored.

37/09.02 Commentors state that the local areas are not prepared to handle an emergency response such as the type involved with nuclear weapons; local fire departments and hospitals do not have the proper protective clothing and equipment. DOE should provide money, equipment, and expertise in decontamination and emergency response. One commentor also adds that her county does not have a hazardous materials team, and it would take the closest hazardous materials team approximately two hours to respond.

38/09.13 Commentors are concerned about the transportation and safety of LLW on commercial carriers and inquire about the security.

39/09.10 The commentor asks who handles a radioactive waste accident on pueblo lands.

40/09.09 The commentor asks if it would violate security to tell us how many shipments of radioactive material are going through Santa Fe at this time.

41/09.09 The commentor expresses the need for evacuation plans for all towns en route from Pantex to LANL.

42/09.09 The commentor notes that if a spill occurred in Santa Fe, it would take 4 years and millions of dollars to clean up.

43/40.08 The commentor states that nuclear war is outright insanity. The commentor also believes that LANL is just lining their pockets, while it is the welfare of the people that should count.

44/40.69 The commentors urge scientists to be more responsible for their actions/inventions; they have a moral obligation to inform the public of all consequences known. The secrecy at LANL and within DOE is disturbing; it is also the reason people do not trust DOE.

45/11.23 The commentor believes that the PEIS's risk analysis is one-dimensional and not accurate. It cannot take into account the future legacy of radioactivity, the future health and genetic consequences, or the environmental impacts, according to the commentor.

46/40.08 The commentor feels that New Mexico was chosen for the mission of producing pits, testing and retrofitting of the existing stockpile and design of the next generation of weapons like the earth penetrator because the powerful nuclear and military interests in Washington have realized that New Mexico is sparsely populated, it is rapidly impoverishing, and it is perceived to be depoliticized and a house divided.

47/40.50 The commentor expresses opposition to the proposal, saying that she is for peace and sanity instead.

48/40.60 Commentors question why we need 36,000 nuclear weapons.

49/11.06 The commentor wonders why there is such a high rate of cancer in northern New Mexico.

50/40.29	The commentor urges DOE to make the Complex smarter and smaller not bigger, greedier, and filthier.
51/41.05	The commentor believes that DOE does not listen to the public.
52/40.15	The commentor believes that DOE has spent vast amounts of money resulting in contaminated air, water, land, and people, causing deaths by accidents and proximate living, all of this producing nuclear waste to kill without solutions as to its poisonous presence.
53/10.25	The commentor feels that DOE should focus massive attention on the subject of transmutation; it is critical that we learn how to neutralize nuclear waste onsite.
54/40.05	The commentor feels that DOE should develop skills of mediation to be used nationally and universally, instead of threats of weapons and military might, where everyone loses and nobody wins. The commentor feels that we need to wage a war of peace and have a Department of Peace in this country.
55/40.36	The commentor believes that expensive new facilities are not needed.
56/40.15	The commentor states that the United States does not need more waste.
57/40.12	The commentor feels programs proposed at LANL are just one big huge "pork-barrel boondoggle." The commentor feels that money should not be wasted on laboratories and weapons but instead should go to education, clean water, health care, endangered species, and saving forests.
58/40.72	The commentor wants all nuclear facilities and production and storage at LANL to be reduced and phased-out and efforts turned to D&D.
59/07.02	The commentor states that DOE should keep its word and return these Indian lands cleaned up to their rightful owners.
60/40.08	The commentor believes that the Program is essentially a pay-off from Bill Clinton to the employees at LANL in exchange for passing the CTBT.
61/40.36	The commentor believes that the new test facilities are "dinosaurs." The commentor believes that these machines are obsolete by the time they are built because actual ground testing, now the major nuclear powers of the world have agreed, is totally obsolete.
62/43.10	The commentor feels that the people of New Mexico are the big losers with the mountain of radioactivity in their backyards. The commentor feels that they are politically impotent, impoverished, and they are paying for it as well.
63/40.06	The commentor feels that the right decision is the one the French president took, which is to abolish the testing laboratories and totally decommission all their nuclear weapons.
64/40.12	The commentor believes that the PEIS is economically elitist, financially grossly inflated, militarily unnecessary, politically corrupt, environmentally dangerous, socially unacceptable, and morally idiotic.
65/43.06	The commentor after viewing the "Front Line" program on Rocky Flats, wants to know if DOE has better ideas now to ensure that the contamination problems they had there will not happen at LANL.

66/43.06 The commentor asks what kind of help is available for people who have been poisoned at Rocky Flats or LANL.

67/41.03 The commentor states that pit fabrication at LANL was being planned in 1993.

68/40.07 Commentors question whether the Nation's stockpile needs repair and maintenance to the degree that the PEIS proposes. The commentor references two DOE documents, a 1993 SNL Report and the Stockpile Surveillance Report, which both conclude that the Complex anticipates having one to two defects requiring corrective activity in the foreseeable future. The commentor believes that stockpile stewardship and management is a fig leaf for continuing design and production capabilities.

69/43.05 The commentor does not support the new armory being proposed for Taos, NM.

70/10.26 The commentor urges DOE to figure out a way to dispose of plutonium onsite.

71/41.08 The commentor believes that LANL is a bomb designer's dream come true and that the United States will use these weapons if it wants to. The commentor believes this because of a quote from DOD attorney John McNeil stating "nuclear weapons can be targeted in ways that either increase or decrease resulting incidental civilian injury and collateral damage, and their use may be lawful or not depending upon the enemy's conduct." The commentor does not agree with these views, especially the idea of incidental civilian injuries considering the fact that there were 210,000 dead within months of the bombing of Hiroshima and Nagasaki and 300,000 survivors suffering slow deaths and painful lives over 50 years.

72/41.01 The commentor believes that there has been a virtual press blackout of the hearing because the United States wants these weapons to be declared legal so that it can use them if it wants to, and if new public opinion would be opposed to this, since the World Court judges all come from nuclear arms super powers, it is unlikely that they will make a decision opposing the legality of these weapons.

73/40.12 The commentor states that in 1994 alone, the United States delivered $6.7 billion worth of weapons to underdeveloped countries, 85 percent of which were nondemocratic nations. The Government spends $75 million each and every day to prepare to fight a nuclear war. In 1995, the United States spent $27 billion preparing for nuclear war; it seems to the commentor to be more cost- and life-effective to give most of that $27 billion a year to whomever the Government perceives as the enemy of the day with all kinds of humane action strings attached so it goes to upgrade the quality of life of the citizens of the so-called enemy country and save a few billion to give our scientists to get on with the job of cleaning up radioactive waste.

74/43.04 The commentor believes that with the recent anniversary of the Chernobyl accident and uncovering of much higher human deaths and illnesses caused by that accident should make us all question why our Government insists that it needs to create more radioactive material with the potential for disaster even if the weapons are never used.

75/10.27 The commentor feels that efforts should be concentrated towards D&D.

76/40.06 The commentor feels that the United States should help other countries simultaneously move towards goals of nonproliferation and D&D.

77/40.21 The commentor admits that she is scared that she and other kids might only live to be 17 or 18 years old and not have a grown-up future to make decisions they want to make.

78/40.06 The commentor opposes the production and use and deployment of nuclear weapons.

79/43.07 The commentor states that LANL needs competitive bidding for the management contract; the laboratory needs New Mexican oversight.

80/32.01 The commentor does not want plutonium pits transferred from Rocky Flats to LANL.

81/09.11 The commentor does not want high-level waste trucked to LANL or on New Mexico highways. The commentor states that Federal Emergency Management Agency does not even have a protocol for dealing with a collision spill.

82/04.06 The commentor states that the public does not want LANL wandering up Cerrillos Road, two blocks up beyond the old Ramada Inn, pumping radioactive waste into the Santa Fe water table.

83/43.14 The commentor states that the Government could save $18 million of the laboratory's $40 million travel budget if top brass drove from Albuquerque airport instead of chartering it.

84/41.03 The commentor feels that if this is a democracy and majority rules, then the public should be allowed to vote.

85/40.51 The commentor feels that the mission of LANL must be changed; there is no reason to shut it down. The commentor feels that there is wisdom in having the talented and highly trained scientists of LANL do whatever they want, whatever their interest. We could have some Nobel Prize winners up there if we turn these people loose.

86/40.06 The commentor believes the myth that nuclear bombs have kept peace for 50 years is contradicted by the fact that tens of thousands died in Korea and Vietnam and Desert Storm and more recently in Bosnia; none of these people were intimidated by the bomb.

87/32.01 The commentor states that LANL produces 50 pits per year, pits that cannot be used.

88/43.06 The commentor feels that LANL, over a longer time frame, will become as contaminated as the now-closed Rocky Flats.

89/40.06 The commentor feels that a disaster will occur if one of the bombs accidentally goes off. According to the commentor, one bomb is too many, no matter who owns it.

90/43.11 The commentor asks all the employees of all the laboratories, all the way up to Hazel O'Leary, if there is a solid foundation in nonweapons production, then wouldn't that be real job security when the balanced budget axecutters come after you. The commentor states that global competition for the U.S. businesses could be affected tremendously. The commentor believes that the scientists in Japan and Germany are helping their businesses design products to be sold around the world. The commentor states that we are doing great in weapons production, but in everything else, we seem to be falling apart.

APRIL 25, 1996—EVENING SESSION

1/34.13 The commentor points out that since DOE does not have a preferred alternative for HE fabrication it makes it difficult to comment on the possible location(s). The commentor wants to know if LANL is a candidate site for HE fabrication and what would be involved in HE fabrication at LANL.

2/09.12 The commentor is concerned about the number of pits that would be transferred between Santa Fe and Pantex, and asks if there would be trucks going through Santa Fe with Hiroshima-size nuclear potentials on them.

3/30.06 The commentor would like to know what DOE means by stating they would like to keep the stockpile as young as possible, and asks if there is going to be some A/D going on to keep the stockpile fresh. In addition, the commentor asks what happens to those pits that come out of the disassembled weapons.

4/32.15 The commentor wants to know if there will be waste management associated with the pit fabrication mission at LANL.

5/11.06 The commentor wants to know difference per year in fatalities if the Stockpile Stewardship and Management Program was initiated at LANL versus if the Program was not and if brain and breast cancers and leukemias would be included in that estimate.

6/40.06 Regarding weapons production, the commentor asks if DOE sees no acceptable alternative to remaining on a global suicide course.

7/41.03 The commentor states that if the public meetings are to inform the public and the Government proceed with the Program whether the public agrees with it or not, the public has as much freedom as the civilian population of Hiroshima and Nagasaki. In addition, the commentor asks if DOE has already made their decision or of they are waiting for the public's consent.

8/40.06 The commentor points out that it is unfortunate that nuclear weapons exist but we are getting rid of them and we must continue to do so.

9/09.01 The commentor wants to know what assurances DOE and the Department of Transportation (DOT) can provide to the citizens of Santa Fe that in transporting nuclear components every precaution will be taken to prevent the possibility of an accident and that the risks will be minimized.

10/40.06 The commentor states that we are part of the future and we do not want the world to be in major bombing and violence. The commentor states that it is bad enough the way it is, and the last thing we need are bombs.

11/40.06 The commentor does not care whether there are 2 or 100 nuclear weapons in the stockpile. The commentor wants an end to all nuclear weapons.

12/40.06 The commentor wants an end to all nuclear weapons. The commentor realizes that this may ruin jobs but will accept this consequence as long as it does not ruin us.

13/32.17 The commentor wants to know, for the pit production mission at LANL, if DOE will focus its attention on the greater hazards of processing and handling of plutonium and the eventual disposal of the waste or on simply the shipment of the finished product.

14/43.06 The commentor points out that part of the problem at Rocky Flats was not so much the technology as it was the unwillingness on the part of leadership to acknowledge when there were problems. The commentor wants to know if the corporate culture that led to the disaster at Rocky Flats has changed.

15/41.02 The commentor does not understand the recent decision on DAHRT, where the judge claims that it is only required that an environmental study be completed, not that it would be found to not have negative effects.

16/40.22 The commentor points out that DOE has determined that the risks involved with the proposal at LANL would be minimal. The commentor believes that this assessment is a lie.

17/40.06 The commentor is of the opinion that nuclear power is actually a breach of national defense and national security and should not be used as a rationale for jobs.

18/40.06 The commentor states that a favorite argument of DOE and the pro-nuclear faction is that the nuclear weapons industry creates jobs.

19/43.03 The commentor is of the opinion that denial is a major roadblock to making progress towards peace in the United States because the people working in armaments are deep in denial about how their work is affecting the society and the public's health.

20/40.07 The commentor states that LANL is simulating nuclear tests of plutonium at the very moment when negotiations are going on in Geneva to reach a CTBT. The commentor feels that these plutonium tests are undermining the negotiations and sending the message to the world that the United States does not mean what it says. The commentors believes that these tests should not take place.

21/43.06 The commentor wants to know what happened at Rocky Flats and why it had to be shutdown, how much of the area around Colorado was contaminated, and what is DOE's long-range plan for dealing with the waste at Rocky Flats.

22/43.06 The commentor asks why DOE is bringing waste from Rocky Flats to LANL.

23/09.12 The commentor asks if there are trucks right now on the highway that are transporting waste between Pantex and LANL.

24/40.50 The commentor believes that the United States must revise its objectives and should be focusing more on educating the youths of society and finding a cure for cancer. The commentor does not believe the numbers associated with downsizing.

25/40.50 The commentor points out that the public knows the truth from a lie, and the lie is the production and expansion of destructive weapons in the society.

26/41.03 The commentor points out that the public meeting is not about NEPA but that NEPA is simply the excuse that the public has once in awhile to be hosted by DOE. The commentor feels that the public meetings are the only means available to speak to DOE and suggests that other ways be found.

27/40.06 The commentor opposes nuclear weapons and will not allow the production of nuclear weapons to continue. The commentor vehemently opposes the pit production mission coming to LANL and plans to prevent there ever being a plutonium pit produced at LANL.

28/40.27 The commentor feels that the New Mexico is being forced to bear the brunt of most nuclear weapons manufacturing and testing and this is too much to ask of the people of New Mexico.

29/40.06 The commentor suggests that we honor our treaties by not producing any more nuclear weapons and continuing to downsize.

30/32.01 The commentor wants to know why outside nuclear dangers exist if DOE and the Government are looking after our self interests and acting in a beneficial and benevolent way. The commentor wants to know how is pit production in the public's interest or in any way safe after what happened at Rocky Flats.

31/40.27 The commentor is of the opinion that the nuclear power structure is not feasible. The commentor also believes that we could be using LANL to solve some of our problems such as alternative and cleaner sources of energy and to develop technologies to clean up the environment.

32/40.06 The commentor feels that there should be a disarmament alternative in the PEIS.

33/40.35 The commentor asks when the mission of DOE was last considered.

34/40.15 The commentor is of the opinion that there is no management of nuclear materials and there has been no ability to manage these materials since the inception of the nuclear industry, and yet, more weapons are continuing to be produced.

35/10.16 The commentor asserts that the reason DOE wants to move all the wastes to Waste Isolation Pilot Plant (WIPP) is so that they can continue plutonium production.

36/32.01 The commentor opposes continued production of plutonium pits and is of the opinion that the nuclear industry is the greatest threat to life on this planet.

37/40.12 The commentor thinks that we do not have the money to continue making nuclear weapons.

38/40.06 The commentor wants to understand the rationale for continued production of nuclear weapons.

39/40.36 The commentor wants to know the rationale for the new proposed facilities and the expenditures on these facilities.

40/41.18 The commentor wants to know what are the reasonable alternatives to the items on the list entitled "DOE stockpile stewardship costs" and for anything that DOE does.

41/40.22 The commentor points out that according to a 1993 laboratory study, DOE does not allow nuclear weapons to wear out or degrade. Based on that information, the commentor asks what defects in the nuclear stockpile justifies the need to spend billions of dollars on—about $30 billion in the next 10 to 20 years.

42/10.16 The commentor states that WIPP must not be opened without meeting environmental standards.

43/40.71 The commentor asks what are the environmental, social, cultural, and spiritual impacts of having stockpile stewardship including DARHT, on all the communities near LANL, the people, the air, the flora, the fauna, aquifers, livestock, agriculture, rivers, streams, businesses, and tourism of the states of New Mexico, Texas, Arizona, Colorado, and Utah, and in the Nation.

44/40.27 The commentor was of the opinion that LANL was a research facility not a bomb factory. The commentor urges LANL be converted to peaceful and beneficial purposes.

45/40.22 The commentor wants to know the true rationale for the Program because the experts agree safety is not an issue. The commentor states that if DOE insists that safety is the real concern then DOE should produce hard data supporting this position.

46/40.36 The commentor wants to know what is wrong with our current weapons and why we need to continue researching weapons design. The commentor asks what type of improvements DOE is seeking and what will be gained through continuing research.

47/40.07 The commentor asks what are the ramifications of the Program on the NPT and the proposed CTBT and does the Program undermine the goals of the CTBT which seeks to halt nuclear weapons development. The commentor is of the opinion that the United States reaffirmed the NPT in 1995. The commentor believes if the United States behaves as a hypocrite, its actions will cause other nations to either continue or begin to accumulate their own nuclear weapons.

48/10.32 The commentor wants to know where the nuclear waste from the pit fabrication mission at LANL will be stored, how much it will cost, and where will the money come from.

49/09.12 The commentor wants to know the extent of transportation (e.g., number of trucks, routes, safety precautions, accident mitigation) of all nuclear materials along New Mexico's roads and the extent to which this will increase once the pit fabrication mission is implemented at LANL.

50/40.12 The commentor questions why funding for many worthwhile projects (i.e., environmental cleanup and technology transfer) are being cut while at the same time billions of taxpayers dollars will be used for maintaining and potentially improving U.S. nuclear capacity. The commentor wants to know where the money for the Stockpile Stewardship and Management Program is coming from and why the Government is spending so much money on weapons projects when the wastes generated by previous defense programs has not been dealt with. The commentor states that this Program will only contribute to the waste problem; and programs which seem to infinitely more important and necessary for society are being cut and eliminated.

51/32.03 The commentor oppose the pit fabrication mission at LANL because the people of New Mexico would be living with illness and environmental degradation. The commentor is of the opinion that what DOE is doing is continuing to make war.

52/09.01 The commentor urges DOE, in transporting nuclear materials and in processing plutonium, to use every safeguard possible to insure that the public is not at risk.

53/40.06 The commentor believes that there should be a national commitment to reduce nuclear weapons and a global commitment to reduce the threat of nuclear weapons. The commentor suggests a mutual build-down of nuclear weapons by the nuclear states to assure security from a nuclear threat by other nations.

54/40.51 The commentor points out that stockpile stewardship is only a small part of what goes on at Los Alamos and only addresses the maintenance of safety and reliability of the stockpile with downsizing. According to the commentor, LANL has a major role in the Program.

55/40.51 According to the commentor, LANL is developing the technology for recycling, storage, and disposal of plutonium and enriched uranium; and the technologies to reclaim contaminated sites and safely dispose of waste. LANL is also said to have programs that transfer technology to the Soviet Union and monitor and analyze the storage of nuclear components. The commentor also points out that LANL has and is developing the technology to detect clandestine nuclear tests and is the only place where this technology exists. The commentor is of the opinion that given the state of affairs in the world today with respect to nuclear weapons, if LANL did not exist, it would have to be invented because this Nation and the world needs LANL and the technologies that it can provide.

56/40.06 The commentor opposes the enriching of more plutonium, the building of more nuclear weaponry, and the nuclear industry because the United States does not have the technology to keep it under control.

57/40.21 The commentor points out that DOE has stated that all safety measures will be taken with regard to the Program. In light of this, the commentor asks why funding for the satellite air monitoring system (NuNet) and the state environmental agency are threatened to be cut.

58/40.06 The commentor sees stockpile stewardship as one more event in the chain of extinguishing life on earth. According to the commentor, the dangers of the Program are obvious to those downwind and globally with continued productive capability. The commentor states that the Program is oversized in terms of money and what it plans to achieve. The commentor is of the opinion deterrence can be achieved without the dimensions of the Program. The commentor believes stockpile stewardship is closing the window of opportunity we have in the world today which is delegitimizing weapons.

59/32.01 The commentor is of the opinion that the problem is not the plutonium pit production technology but the people because the current technology is better than the technology used at Rocky Flats. According to the commentor, the corporate culture that exists at LANL is rooted in secrecy and denial.

60/40.72 The commentor expresses opposition to the Program because they do not want LANL to become another Rocky Flats; the commentor does not want an increase in the amount of nuclear material that is being transported through Santa Fe.

61/40.07 The commentor does not want tax dollars spent to contravene the nuclear proliferation ban by enabling development of deadlier weapons.

62/41.03 The commentor states that they have no faith in the NEPA process and believes that the hearing is insincere. The commentor contends that it was conceived that DARHT would exist and go forward long before now, and that the words of the public are sort of moot.

63/40.15 The commentor opposes the Program and wants DOE to turn the laboratories into institutions that engage in research to clean up the wastes that has been generated.

64/40.21 The commentor alleges that LANL is trying to get rid of the Tiger Team because the laboratory has never met its obligations concerning safety, health, and the environment. The commentor wants the Tiger Team dealt with in an open public process. The commentor states that LANL's past record does not give him much confidence in bringing the plutonium pit mission there.

65/34.16 The commentor points out that there is a disparity in the air emissions data being presented for sites conducting the same missions. According to the commentor, for the HE fabrication mission, Pantex, LLNL, and LANL propose to emit 413, 1,315, and 4,530 kilograms per year (kg/yr) of carbon monoxide; 122, 45, and 4,540 kg/yr of organics; 1,560, 349, and 22,700 kg/yr of nitrous oxides; and 0.02, 4.5, and 454 kg/yr of ammonia, respectively. In addition, the amount of HE powder required is different at each site. The commentor does not understand the reason for the disparity in both inputs and emissions for the same mission at different sites and wants to know where the numbers are coming from.

66/32.14 The commentor points out a disparity in the amount chemicals being used for fabricating pits at LANL and SRS. According to the commentor, SRS proposes to use 3,420 kg and LANL 32,886 kg—a difference of a factor of about 10.

67/33.09 The commentor points out the differences in the amounts of chemicals being used for the same mission at different sites. According to the commentor, for the secondary fabrication mission, Y-12, LLNL, and LANL propose to 1,000, 300, and 20,000 kg/yr of nitric acid and 0, 0, and 20,000 kg/yr of sulfuric acid, respectively. The commentor points out that the number 20,000 shows up on nitric/sulfuric acid for LANL.

68/33.09 The commentor is concerned about the disparity in the air releases and the amounts of chemicals being used for the same mission. The commentor is of the opinion that the chemicals used have no basis in reality and, therefore, the emissions has no basis in reality. The commentor thinks that the PEIS is a disgrace.

69/40.21 The commentor states that LANL is out of compliance with air quality and does not seem to feel any need to get into compliance. The commentor contends that DOE has not provided the funding required to achieve compliance and points out that with the DARHT facility Los Alamos will be emitting toxic materials such as beryllium and mercury into the air. The commentor is of the opinion that issues regarding ES&H are not a priority at LANL and will not be a priority if the stockpile stewardship and management alternatives for LANL are implemented.

70/40.21 The commentor points out that in the mid-1980s there were peaks in breast, ovarian, prostate, thyroid, leukemia, brain, and nervous system cancers, and non-Hodgkins sarcoma. The commentor states that it is obvious that something was occurring in the 1980s and does not want the Stockpile Stewardship and Management Program at LANL for fear it may cause these peaks to reoccur.

71/40.21 The commentor does not understand why DOE would bring more nuclear weapons work to Los Alamos when the laboratory has had a horrible health and safety record. The commentor wants the laboratory to improve its health and safety record; come into compliance with all of the environmental, air quality, and water quality regulations; and work toward zero release and then ask about increasing nuclear weapons work at LANL.

72/32.03 The commentor is of the opinion that pit fabrication mission at LANL is not a great opportunity for jobs but for further contamination of workers, children, and the surrounding population for more birth defects, more cancers, more sterility, and more fertility problems.

73/32.03 The commentor is of the opinion that the pit fabrication mission proposed for LANL is a done deal. The commentor suggests that the public focus less on talks of peace and love and instead insist that DOE do what is necessary and safe to get the public's vote of confidence on pit fabrication work. The commentor is of the opinion that this can be achieved by people who are professionals in the fields, not using people from groups who produced the bombs. The commentor states that if the laboratory does not conduct the pit fabrication mission correctly, LANL will become another Rocky Flats.

74/40.35 The commentor states that things change a lot in science and that today's estimates about safety may be accurate according to current knowledge but there is no guarantee that this is the actual condition and how things will be assessed in 10 years from now. The commentor is not confident in the information and the science and is not comfortable charging ahead with something so dangerous under these conditions. The commentor does not want a plutonium plant in his backyard.

75/40.44 The commentor states that given the requirement for a safe and reliable stockpile, the ban on underground testing and the shrinking size of the stockpile, downsizing the overall DOE Complex while building new facilities is reasonable. The commentor supports the new facilities proposed because they are necessary to provide missing data for computer modeling which cannot be supplied by underground nuclear testing and can validate fixes for defects discovered during surveillance and testing.

76/40.13 The commentor states that the alternative and related environmental impacts presented in the PEIS are reasonable with the following two exceptions: one, the incremental costs of new and relocated operations at each location and the offsetting savings at old locations are not presented and the PEIS is not clear on how DOE will maintain the core intellectual and technical competencies needed for stockpile stewardship and management. The commentor wants DOE to state the strategy to solve the intellectual and technical competency problem.

77/32.03 The commentor supports the preferred alternative of relocating pit fabrication at LANL. The commentor also supports the mission at LANL because it is closer to the assembly and pit storage at Pantex. The commentor is of the opinion that using an existing modern facility is more effective solution than building new facilities.

78/21.20 The commentor suggests that NIF should be located in LANL to create the basis for future nonweapons work at LANL.

79/40.22 The commentor strongly supports more funds for environmental studies and surveillance by an independent monitor. The commentor contends that DOE critics do not believe DOE and LANL statistics, and an independent monitor lends credibility to studies and measurements.

80/41.01 The commentor applauds DOE for a job well done on a complicated topic in this PEIS.

81/40.51 The commentor suggests that the most prudent approach for DOE is to consolidate a minuscule of weapons production capability at LANL.

82/40.06 The commentor contends that given a choice of having the weapons complex with 25 or 5 percent of the size of our historical capability that there would be no hesitation on choosing the latter because the commentor thinks it is important for our national security and for world peace to diminish the process of weapons production.

83/40.07 The commentor states that the Program is not minuscule but is in fact an increase over what we currently have and is more than twice what the United States was spending on nuclear weapons in 1975 in the middle of the Cold War when we were testing, designing, and producing weapons.

84/40.11 The commentor is of the opinion that START II is far from being a done deal. The commentor states that there is a lot of language written into law that the United States would certainly not take its arsenal down to the START II level, which means START II plus hedge unless Russia ratifies START II and carries out the dismantlements. The commentor contends that the actual equilibrium stockpile size of the United States is somewhere above 8,500 and probably close to 10,000.

85/40.07 The commentor believes that the Program is meant to substitute for nuclear testing. The commentor states that the United States does not have a test ban and in fact, the Program is a serious impediment and causing international problems for a comprehensive test ban. The commentor contends that the United States is adamantly opposed to any kind of commitment on vertical proliferation in the test ban because of LANL. The commentor is of the opinion that the United States will not get the strong nonproliferation that is needed in the world if we cannot follow the procedure that we are asking other nations to follow.

86/40.04 The commentor states that the United States said it would consider taking out the capability of another country, mainly Libya, to produce weapons of mass destruction. The commentor points out that the United States is making nuclear threats based on the capability of another country and intends to use a weapon not currently in the stockpile. The commentor is of the opinion that with the lack of an opposing superpower, the number, frequency, and intensity of nuclear threats from the United States will increase.

87/40.36 The commentor states that the safety questions that the Program aims to answer are nowhere near what one would think. The commentor believes that there have only been two safety problems in the weapons that are intended to remain in the stockpile, one having to do with the parachute system and the other, the tritium system. The commentor is of the opinion that there are no expected safety problems that would warrant DOE doing this country a disservice by throwing these phrases around for the purpose of selling stockpile stewardship.

88/40.05 The commentor contends that there have not been so many reliability problems as DOE has recently maintained in the tri-laboratory study. The commentor believes that the study is "cooked" and that production errors have been blended in with design and aging error to push the numbers up. The commentor states that reliability is a concern for those who wish to continue with a credible war threat and is not nearly a concern if you are interested only in providing a nuclear deterrent.

89/40.33 The commentor suggests that the Program lacks any coherent technical basis and should be dropped and replaced with a much simpler curatorship and if necessary, remanufacturing program. However, the commentor believes that there is no rush to remanufacture because the weapons are not that old.

90/40.12 The commentor is of the opinion that there is an unnecessary momentum being given to the Program because it is driven by budget cycles and bureaucratic inertia. The commentor suggests that we use the money for the Program to pay for Russian weapons dismantlement, to put the "E" back in DOE, and to implement programs the country really needs and which contribute to national security to a greater extent.

91/40.08 The commentor is concerned that the laboratories will use the Program together with Safeguard F, which gives the laboratory directors the power to certify a weapon as safe and reliable, to influence the Nation's sense of confidence in its nuclear deterrent and hence over the budget process.

92/40.23 The commentor contends that the two-laboratory DOE peer review process has never worked and it is dangerous to leave it in place.

93/40.02 The commentor states that modifying and changing nuclear weapons is not necessary. According to the commentor, the JASONs in chapter 10 of their 1994 study made the same recommendation to DOE. The commentor is fearful if DOE changes the weapons, changes will occur and will move away from the fount of confidence and may necessitate underground testing.

94/40.06 The commentor states that continued legitimization of nuclear weapons exerts a constant corrosive effect on our democratic institutions.

95/40.69 The commentor believes that we are engaged willy-nilly in a process of internationalizing stockpile stewardship. The commentor states that great dangers exist and do not think that LANL can address these dangers adequately by working in secrecy.

96/40.06 The commentor says no to nuclear weapons. According to the commentor, we should address the dangers of nuclear weapons now because it is acute.

97/11.27 The commentor states that the United States does not need more nuclear weapons and that residents of Santa Fe do not want nuclear weapons in their backyard. The commentor points out that Santa Fe is a city that thrives on tourism and contends that tourists will not come to a place that is polluted and where there is a possibility of getting cancer from breathing plutonium in the air.

98/04.06 The commentor suggests that the nuclear laundry in Santa Fe be closed and that the jobs should be transferred to LANL.

99/40.12 The commentor states that the new facilities will cost billions of dollars for computers, capital, and associated costs and feels that the money could be used on beneficial and productive things that are really needed and which could provide us with national security. The commentor points out that the projection are to maintain these facilities far into the future and try to reduce and dismantle the nuclear weapons stockpile. The commentor believes that there is an obvious contradiction in the Program and that DOE is headed in two directions which undermines U.S. commitment and trustworthiness.

100/40.07 The commentor states that the public is being sold a bill of goods about the necessity of maintaining and also the productivity and manufacturing and development of nuclear weapons under the guise of maintenance and surveillance of existing weapons what is really production of new weapons. The commentor opposes nuclear weapons because he believes we do not need and cannot afford them.

101/32.03 The commentor states that most of the resident of Santa Fe opposes the pit fabrication mission proposed at LANL. The commentor vows not to perpetuate the tyranny of nuclear weapons and the Program.

102/41.03 The commentor perceives DOE's position on national security policy as being a policy of so much complexity that it is well beyond the grasp of the public. In the commentor's opinion, there is no such thing as national security in a world where one state can reduce another to ashes.

103/41.03 The commentor is of the opinion that DOE has made the decision on placing the pit fabrication mission at LANL. The commentor wants to know who gets to make the final decision and whether the input of the public is being heard.

104/32.01 The commentor states that the majority of the residents of Santa Fe are against the plutonium proposals for LANL.

105/40.51 The commentor supports the need for the preferred alternative at LANL.

PUBLIC HEARING—NORTH AUGUSTA, SOUTH CAROLINA

APRIL 30, 1996—MORNING SESSION

1/41.14 The commentor asks if the comment period will be extended.

2/42.01 The commentor asks if there will be an attempt to produce a simplified document suitable for the general public to understand, showing the relationship between the three documents (i.e., Stockpile Stewardship and Management PEIS, Storage and Disposition PEIS, and Pantex Site-Wide EIS).

3/41.14 The commentor asks if there will be another public comment period after the Final PEIS.

4/41.15 The commentor believes that NEPA mandates an analysis of economic impacts on future generations. The commentor also believes that costs, timing, and consumption of non renewable resources should together drive the PEIS. The commentor wants a complete environmental impact assessment which includes the impact on future generations. The commentor points out that the words "future generations" are not stated in the document. The commentor questions why these items are missing.

5/40.76 From an economic development standpoint, commentor encourages DOE to consolidate processes at SRS and to use the existing intellectually capable work force and physical infrastructure.

6/12.03 The commentor wants to know exactly what was analyzed under environmental justice in the three documents.

7/40.76 The commentor believes that preservation of core intellectual and technical competencies in the SRS area (i.e., South Carolina and Georgia) is important. The commentor believes that in order to accomplish this, SRS needs continued missions.

8/01.01 The commentor is concerned that other DOE sites do not have a future use plan like SRS. The commentor also states that the SRS future use plan restricts future development to areas with prior development. The commentor wants this to become a DOE-wide policy.

9/40.76 The commentor would like to see the recommendations implemented at SRS, believing it would be in the best interest of the Nation and the local area. The commentor cites the following as support: SRS is an integral part of the community, is a good neighbor, and is well and contentiously run; existing SRS facilities and land area are available for utilization; core experiences and technologies would be maintained; and existing manpower and expertise would be utilized.

10/41.01 The commentor notes the lack of diversity in public hearing participants and wonders what weakness of DOE outreach strategy does not facilitate diversity.

11/01.01 The commentor proposed a land-use concept of multiple use for SRS. Primary uses would be located within the center and environmental uses would occur within the surrounding buffer area.

12/42.02 The commentor thinks it ironic that the PEIS proposes an upgrade of pit production at LANL while the Storage and Disposition PEIS is concerned about what to do with these pits.

13/34.13 The commentor asks what is the preferred alternative for HE.

14/34.08 In regard to HE fabrication, the commentor asks if the primary work is in the development program as opposed to fabrication.

15/40.27 The commentor asks if maintaining the two laboratories will be part of the Stockpile Stewardship and Management PEIS decision.

16/21.03 The commentor wants to know what the key factors were in the NIF preferred alternative decision and if the timetable for NIF is the same as the PEIS.

17/08.20 The commentor believes that the main issue at SRS is jobs.

18/40.29 The commentor wants to know if DOE avoids closing the plants.

19/40.88 Due to its focus away from consolidation, the commentor believes that the Program is very different from Complex 21.

20/33.04 The commentor wonders what will happen to the buildings and infrastructure if downsizing of Y-12 occurs and asks if there is a future uses study addressing this.

21/41.03 The commentor is fascinated that DOE is making its most significant policy decisions through EISs.

22/40.13 The commentor asks what is DOE's plan for releasing cost data on the alternatives.

23/32.06 The commentor believes SRS should get pit fabrication, not LANL. The commentor believes that locating pit fabrication at LANL will consume most of the capability at TA-55 and that existing operations would need to be relocated during construction. The commentor also wants to know if upgrade of the Chemistry and Metallurgy Research facility is part of the cost estimate.

24/11.23 The commentor wants to know the impact of radiation as a result of the Program on children, particularly with regard to causing birth defects.

25/11.17 The commentor views the reservations near LANL as a "dump" (i.e., nuclear waste and radiation) and believes the populations are affected.

26/12.04 The commentor asks if it is a Government policy to view certain demographic groups as less valuable or more expendable than institutions like SRS.

27/32.06 The commentor wants SRS to be a viable technical facility but at the same time, wants SRS to be good stewards and to conduct research to protect the environment. The commentor believes that to say that the issue at SRS is just jobs is not the whole story.

28/11.18 The commentor wants to know to what extent the analysis of cancer risk factors in different schools of thought. The commentor notes that Dr. Alice Stewart has a different view on exposure to radiation and its effects. The commentor wants a balanced view in the PEIS.

29/41.03 When the commentor asked elementary questions in the breakout sessions, the commentor felt disrespected by others with more technical knowledge or differing views.

30/11.19 The commentor asks if the PEIS projects what would be considered a safe dose of radiation in the future. The commentor notes that what we may have considered safe 25 years ago is much different based on today's knowledge.

31/40.07 The commentor is concerned about proliferation issues, specifically, the source of the decision to have weapons of destruction and what to do with the materials from weapons dismantlement.

32/41.03 The commentor believes that the public should have input from the beginning. The commentor feels that input at the public hearing is backtracking and that policy decisions will continue to be made behind the public's back.

33/41.03 The commentor is skeptical that public input counts, believing that the decisions are already made.

34/32.06 The commentor asks if DOE has a preferred site and is that site SRS. The commentor also asks what the preferred site is for pit fabrication.

35/32.09 The commentor wonders if there is an effective way for citizens to close down SRS and help DOE to focus on another DOE site.

36/12.05 The commentor believes that African-Americans and low-income populations are being affected by SRS activities.

37/06.01 The commentor is concerned that SRS is destroying the natural habitat along the Savannah River.

38/41.03 The commentor believes a brochure titled "DOE is Interested in Your Comments" is misleading and should be clarified because it appears that SRS is the preferred alternative for all program activities and facilities (Stockpile Stewardship and Management Draft PEIS, Storage and Disposition Draft PEIS, and Pantex Site-Wide Draft EIS).

39/41.03 If the Draft PEIS does not have DOE's preferred site and alternative decision, the commentor then wonders if another EIS would be prepared after the decision if made.

40/40.35 The commentor asks by what process does DOE weigh strategic concerns against potential negative impacts to local populations.

41/41.07 The commentor asks if DOE engages an independent peer review of the PEIS analysis.

42/41.10 The commentor believes that DOE should fund citizen groups so they may hire an independent reviewer of the PEIS. That way, citizen groups and DOE can equally sit at a round table.

43/41.03 The commentor points out that the preferred alternative is not always the final choice.

44/41.03 The commentor asks if there is a mechanism for citizens to get the ROD changed.

45/41.03 The commentor wants to know the procedure for challenging the ROD, not necessarily changing it.

46/41.05 The commentor notes that a PEIS viewgraph presented by DOE during the public hearing graphically makes it appear that the public has no direct input in decisionmaking.

47/41.05 The commentor believes that laypeople do not understand a lot of the statements made at the public hearing because the PEIS is so large and complicated.

48/32.06 The commentor asks if it is final that SRS is no longer under consideration for new mission, activities, and programs.

49/11.20 The commentor states that Savannah, GA is known to be a cancer site. The commentor asks if the PEIS contains statistics on the amount of radiation that flows through Savannah via SRS plus the existing high cancer rate.

50/11.21 The commentor wants to know how old the epidemiological studies are that were used in the PEIS.

51/11.22 The commentor is concerned that a direct link cannot be identified between SRS radiation releases and latent cancer. The commentor also states that at the same time, it cannot be proven scientifically that radiation from Federal facilities does not cause cancer.

52/09.07 The commentor asks how reliable the PEIS transportation computer modeling is.

53/41.01 The commentor believes that current DOE outreach methods are not enough and that DOE needs to make a special effort to involve minority, downstream, and rural communities into public involvement. Additionally, the commentor believes that DOE should promote a strategic initiative to train these communities so they may contribute substantial comments.

54/12.06 The commentor wants the impact analyses to include the combined exposure of not only SRS, but other non-DOE industrial uses on low-income and affected communities.

55/41.01 The commentor states that a substantial turnout of the black community should occur at SRS public hearings, otherwise, the requirements of NEPA would not be met.

56/41.01 The commentor states that NEPA mandates the involvement of local elected officials in the process. The commentor believes that DOE should try to involve Georgia government officials. The commentor notes that since SRS is in South Carolina, Georgia seems to ignore it. The commentor believes this does not make sense since waterways flow to Georgia and many SRS workers live in Georgia.

57/41.10 The commentor believes it is almost a disservice to regular people to ask them to wade through three large documents. The commentor believes that DOE must take into consideration that the SRS area has a third-grade reading level and therefore DOE must prepare laypeople to intelligently understand and comment on these documents.

58/41.10 The commentor wants DOE to also provide citizens with facts from reputable, independent scientists that may be trusted.

59/41.01 The commentor believes that people of color need more input in public hearings since they are the ones who must live with the decisions made.

60/41.01 The commentor believes that SRS employees are an under-represented group at the public hearing and that DOE needs to find a way to involve their own employees and contractors.

61/32.09 The commentor asks what kind of impact a large number of persons calling or writing DOE to oppose new facilities at SRS or to close SRS altogether would have on decisionmaking.

62/32.09 The commentor believes that SRS should close down and operations be transferred to another DOE site, preferably ORR or Pantex.

63/40.81 The commentor does not want decisions concerning the location of operations and activities to fall into the "not in my back yard" syndrome. The commentor believes that risk should be minimized to all workers, families, and communities; and to the environment.

APRIL 30, 1996—EVENING SESSION

1/32.06 The commentor believes that area chambers of commerce are united together in wanting future missions, especially defense missions, at SRS.

2/32.06 The commentor looks forward to future missions at SRS.

3/41.01 The commentor wants to know how to receive copies of the Stockpile Stewardship and Management PEIS.

4/40.59 The commentor asks if DOE has integrated the PEIS with DOD mission.

5/42.01 The commentor believes that DOE's track record in program integration is not good and is therefore concerned about the interrelationship between the Stockpile Stewardship and Management PEIS, Storage and Disposition PEIS, and Pantex Site-Wide EIS. The commentor believes there should be an integrated program to find the most cost-effective solution.

SSM-F-001
COMMENT LETTER

PAGE 1 OF 1

To: USDOE Office of Reconfiguration
Fax #: (703) 931-9222
Subject: PEIS For Stockpile Stewardship and Management
:
Date: March 12, 1996
Pages: 1, including this cover sheet.

COMMENTS:

The following comment is submitted in response to the Draft PEIS for Stockpile Stewardship and Management (DOE/EIS-0236):

1/34.17 Concerning the HE Fabrication mission and associated options, what consideration has been given to the potential increase in risk of accidental explosions that might result should weapons assembly/disassembly work at Pantex no longer have the benefits of the safety expertise/culture generated by the HE Fab mission? The safety of the weapons A/D mission at Pantex has always relied on and benefited from the HE Fab mission at the Plant. The HE Fab mission is the on-site source of a cadre of explosives experts who can provide knowledge, assessment, and immediate assistance with potential safety concerns, plus the HE mission also provides a continuing source of highly trained production technicians with excellent hands on experience of handling/processing explosives. It is my understanding that the HE Fab mission at Pantex is the roots of the excellent safety record at Pantex, and separating the two missions will destroy these synergistic safety-significant benefits. Because of the extraordinary high level of safety required for the weapons mission, I urge you to keep these two missions together.

Respectfully,

Sharon J. Hemphill

From the desk of...
Sharon J. Hemphill
1513 Hacienda
Amarillo, TX 79111
[illegible]
Fax [illegible]

SSM-F-002
COMMENT LETTER

PAGE 1 OF 2

CITIZENS FOR NATIONAL SECURITY

P.O. Box 4941
Oak Ridge, TN 37831-4941

March 11, 1996

The Honorable Hazel R. O'Leary
Secretary of Energy
1000 Independence Avenue, SW
Washington, DC 20585-1000

Dear Secretary O'Leary,

1/41.10 The Department of Energy is restricting the opportunity for public review and comment on the draft Stockpile Stewardship and Management Programmatic Environmental Impact Statement and the draft Storage and Disposition of Weapons - Usable Fissile Materials Programmatic Environmental Impact Statement.

Both of these voluminous draft documents cover significant federal actions directly affecting the future of the nation's nuclear weapons program and deserve careful and thorough review. By issuing both documents simultaneously and by requiring the comment periods to be concurrent, the Department of Energy is placing an unnecessary and unreasonable burden on the public. Rather than attempting to restrict public review, the Department of Energy should be soliciting the widest possible involvement consistent with the intent of the National Environmental Policy Act.

In announcing the release of these two draft environmental impact statements, you stated, "Today, we are preparing the nation for nuclear challenges of the 21st Century." The Department of Energy should also prepare for independent review and comment on nuclear plans by technical experts no longer associated with the government or its contractors.

The Citizens for National Security is committed to providing unbiased review, analysis, and comment on proposed actions by the Department of Energy that may impact the safety and reliability of the nuclear weapons stockpile. A substantial number of our members are retired nuclear weapons experts capable of providing an entirely different perspective from that of the Department of Energy's contractors. Other members of our organization are retired research scientists, engineers, and representatives of all craft skills whose professional lives were devoted to the nation.

SSM-F-002
COMMENT LETTER

PAGE 2 OF 2

H. O'Leary
March 11, 1996
Page 2

Our organization was formed following the July 25, 1995, Public Scoping Meeting in Oak Ridge, Tennessee, on the Stockpile Stewardship and Management Programmatic Environmental Impact Statement.

2/41.05 Currently, we are analyzing the draft Stockpile Stewardship and Management Programmatic Environmental Impact Statement for the public hearing dedicated to this voluminous document on April 1, 1996. The Department of Energy has allocated only four hours in one of the smallest meeting rooms in Oak Ridge. Nevertheless, we intend to attend and provide extensive technical comments. Unlike the Public Scoping meeting, we suggest that the Department of Energy transcribe all comments for written response in the final Stockpile Stewardship and Management Environmental Impact Statement. We are especially sensitive to the tendency of program officials to modify their verbal responses from site to site. Written responses are available for review by a larger audience and carry a commitment not present with verbal responses.

1/41.10 continued The Citizens for National Security cannot provide the same depth of review of the draft Storage and Disposition of Weapons - Usable Fissile Materials Programmatic Environmental Impact Statement as for the Stockpile Stewardship and Management document. The decision by the Department of Energy to place the burden of concurrent review of these two major federal actions on the public can only impact the ultimate implementation of the Storage and Disposition of Weapons - Usable Fissile Materials.

Sincerely,

Bill Bibb

Bill Bibb
President

cc: Board of Directors

SSM-F-003
COMMENT LETTER

PAGE 1 OF 1

FROM : URSULA HOFER PHONE NO. : 505 984 1719 Apr. 30 1996 09:24PM P1

Department of Energy
Stockpile Stewardship and Management Proposal

To Whom it May Concern:

1/40.12 I attended the Santa Fe public hearing on the environmental impact statement on Thursday, April 25, but had to leave after 2 hours. My feedback is (as a teacher of business) that I feel it is completely inappropriate to expand the work at Los Alamos Labs as you have planned - the country simply has far higher priorities than your proposal given our budget constraints. I feel the current warhead management program is more than effective. Any program (such as you have recommended) that will both phenomenally increase costs in a time of budget crisis and will also phenomenally increase nuclear waste generation when there is no acceptable disposal method on the table is unacceptable. Further,

2/11.27 any nuclear accident (however small) would destroy the fragile tourist economy of the State of New Mexico.

Thank you for considering my input.

Sincerely,

Lee Cartwright

Lee Cartwright
Box 10C
Old Arroyo Chamiso Rd.
Santa Fe, New Mexico
87505

SSM-F-004
COMMENT LETTER PAGE 1 OF 2

Amarillo Economic Development Corporation

April 8, 1996

U.S. Department of Energy
Office of Reconfiguration
P.O. Box 3417
Alexandria VA, 22302

By facsimile to: 703/881-8822

RE: Comments and questions regarding the Stockpile Stewardship and Management (SSM) Programmatic Environmental Impact Statement (PEIS)

Dear Sir or Madam:

Thank you for the chance to comment on the SSM PEIS, a document that is of great importance to the Pantex Plant, and consequently to the economic vitality of Amarillo and the Texas panhandle.

1/30.01 In addition to my gratitude at the opportunity to comment on the PEIS, I appreciate DOE's commitment to operating in an environmentally sound fashion at Pantex. The continuation of environmentally sound operating and management principles at Pantex is essential to the continued operation of the plant and paramount to all further comments about current or contemplated missions being performed at Pantex.

2/34.01 I do agree with the conclusions drawn in the SSM PEIS that Pantex is the best site for the continued assembly/disassembly missions required by the DOE. I also urge DOE to abandon any plan to remove the High Explosive fabrication mission from Pantex. Pantex offers the best site for continuation of HE work from the perspective of cost and manufacturing expertise and experience. Additionally, should production demand increase in the future, the HE facilities at Pantex are already appropriately sized for greater production capability. It is in the best economic, safety and defense interests of the nation to retain the production capability in HE fabrication that exists by continuing that mission at Pantex.

After having studied the Draft SSM PEIS documents, I offer the following comments(•) and questions(o) to the DOE for inclusion in the comment summary document:

3/41.03
- To what extent was public support (or lack thereof) at the various candidate sites considered in the PEIS process?

4/08.24
- Please describe the statistical rationale for your statement in the SSMPEIS that direct and indirect jobs lost (from the transfer of the HE manufacturing mission to the Labs) would create no observable change to the Pantex regional economic area unemployment rate, housing/rental vacancies and public finance expenditures/revenues.

[illegible]

SSM-F-004
COMMENT LETTER PAGE 2 OF 2

2/34.01 continued
- In the draft SSMPEIS report you state that the criteria to be used for evaluating the alternatives and ultimately arriving at the most suitable Record of Decision (ROD) are environmental impact, cost and technical feasibility.
  - o Please explain how these criteria have been applied to the alternatives for HE manufacturing.

5/34.10
- o Please explain how DOE can justify the cost of 432 people at the weapons labs to manufacture explosive components when Pantex has identified about 50 to perform the operation.

6/08.25
- The socioeconomic analyses of the three EISs are not consistent. The SWEIS (p.5-17) assumes 1.66 indirect jobs in the region for every job at Pantex. The SSMPEIS (p.8-32) assumes 1.16 and the S&DPEIS (p.4-205) assumes 3.51.
  - o Please explain these differences.

7/08.26
- The Amarillo Economic Development Commission (AEDC) analysis, based on local knowledge of the area and a regional impact study performed by Dr. Ray Perryman of Southern Methodist University, gives a ratio of 2.87 additional jobs in the region to every one Pantex job (for a total job multiplier of 3.87).
  - o Why didn't the DOE consult with the AEDC and/or the City of Amarillo and use the expert analysis that local taxpayers had already paid for?

8/12.07
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, and President Clinton's February 11, 1994, Memorandum for the Heads of all Departments and Agencies requires an analysis of environmental effects on low-income and minority populations to include human health, social, and economic effects.
  - o Why do the draft Pantex SWEIS, SSMPEIS, and S&DPEIS analyze only human health effects of the proposed actions and not the social and economic effects, as required?

Thank you for your attention to these comments and questions.

Sincerely,

Bob Jabs
Pantex Retention and Expansion Coordinator

cc: Hon. Mac Thornberry
Hon. Kel Seliger

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: JUDITH M.I.: H Last Name: LOWE
Street Address: 351 VERANO LOOP
Street Address 2:
City: SANTA FE State: NM Zip Code: 87505-
Organization:
Telephone: 505-466-8071 Fax:

Comments:

1/40.01 I am deeply concerned about continued nuclear testing + development at Los Alamos.

2/43.18 The recent fire brought home the very real potential for a major disaster. Why don't you pursue other safe means of energy supply such as solar etc. etc.

Our planet can not absorb the toxins anymore - everything is so out of balance + the Lab is a major contributor to the death + destruction of our planet. Please stop before it is too late.

3/40.27 With all the brilliant minds employed at Los Alamos - why use them on nuclear development? Put them to use with developing safe + non-toxic ways to generate energy. I feel helpless

Please continue on the other side if you wish to use additional space. THANK YOU for your comments and your interest in us.

Date of Receipt: Receiver's Initials:

Comments (cont'd):

3/40.27 continued because nobody listens to the people - everyone I know is against nuclear power + waste. This is not a democracy in the real sense. The people in power are pursuing this path totally for money + greed. Please use the lab for disease research, safe + non-toxic energy + development of new technology.

SSM-F-006
COMMENT LETTER
PAGE 1 OF 1

REVIEW COMMENTS
STOCKPILE STEWARDSHIP AND MANAGEMENT
DRAFT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT (EIS)
Texas Natural Resource Conservation Commission (TNRCC)
Office of Air Quality
April 30, 1996

This review is on the section on air quality impacts in Section 4.5.3.3. of Volume 1 and Appendix B, table B.1.3.5-1 of the above-referenced EIS.

1/03.09
- The emission rates reports in Appendix B and the estimated pollutant concentrations listed in table 4.5.3.3-1 are the same as discussed in the Storage and Disposition of Fissile Materials EIS. Therefore, comments regarding the discrepancy between estimated concentrations and TNRCC monitored concentrations of particulate matter holds true for this EIS.
- The conclusion that the No Action alternative and the Downsize Assembly/Disassembly and High Explosive Fabrication alternative will not produce air pollutant concentrations exceeding Federal and State regulations and guidelines is acceptable.

If you have any questions regarding the above comments, please contact Mr. Joe Panbach, Office of Air Quality, Ambient Monitoring Section, at (512) 239-1656.

SSM-F-007
COMMENT LETTER
PAGE 1 OF 12

ieer

INSTITUTE FOR ENERGY AND ENVIRONMENTAL RESEARCH

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Comments of the Institute for Energy and Environmental Research on the Department of Energy's Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management (DOE/EIS-0236)

Hisham Zerriffi and Arjun Makhijani

May 6, 1996

The Institute for Energy and Environmental Research (IEER) submits the following comments on the Department of Energy's (DOE's) draft Programmatic Environmental Impact Statement (DPEIS) for the Stockpile Stewardship and Management program (SSM). Generally, these comments are based upon IEER's review of the environmental, safety, reliability, and non-proliferation issues of the SSM.

Overview

The DPEIS is fundamentally deficient on several counts:

1/40.60
1. It does not consider a reasonable range of alternatives for the size of the stockpile. For instance, it excludes the views of many analysts who have concluded that deep reductions far below 1,000 warheads are desirable for U.S. and global security, even though analysts with extensive military-related experience are among the people who hold such views.

2/41.18
2. It excludes a cumulative environmental analysis of the entire SSM program, including existing facilities such as Lyner in Nevada, and facilities under construction such as DARHT at Los Alamos, and does not consider programmatic alternatives with different cumulative environmental impacts. For instance, it does not consider alternatives to uncontained underground subcritical tests, even though such tests are possible.

3/40.34
3. It does not separate out safety and reliability in its analysis of the need for the program, even though they have very different environmental implications. Safety issues involving the primaries of nuclear warheads could result in severe environmental damage in the event of an accidental detonation, but there is no risk of accidental

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detonation (and therefore no possible environmental damage) from reliability problems.

4/40.07

4. It does not consider the instabilities in the non-proliferation regime that could be triggered by the program and the large security and environmental consequences of resuming the arms race in the event of such instabilities.

5/40.37

5. It has an internally contradictory definition of "reasonably foreseeable future." This is defined as 2003 for the purposes of reference stockpile size. At the same time, the DOE is confident that it requires new facilities which will not even begin full operation until after that date and projects that such needs will exist for several decades. This is used as a justification for building the new facilities. If the DOE can reasonably foresee the need for such facilities, it should also consider possible related events in a several-decade timeframe. Otherwise it ought to abandon new facilities that will not come into full operation until 2003 or after.

6/41.12

6. The technical decisions on SSM seem to be coming from policy decisions. This is the reverse of normal NEPA requirements in which technical alternatives that can fulfill larger social goals (whether in the realm of security or economics) but have differing environmental impacts, are compared. The DOE has not compared differing ways of achieving overall security goals, but rather simply defined away the problem by assuming it to be coterminous with existing policy. This has allowed DOE to dismiss all major programmatic alternatives to the course it has already chosen, even though these alternatives have widely differing environmental impacts.

These basic deficiencies mean that the DPEIS is seriously lacking in its consideration of the environmental impact of alternative means of achieving security goals and meeting existing treaty commitments, including commitments under the NPT.

7/40.33

The DPEIS does not fulfill the mandate of NEPA even at a minimally acceptable level because it does not provide a reasonable set of alternatives for the public to consider and comment upon. Our main recommendation is that DOE re-issue the Draft PEIS and, at a minimum, include the following options in addition to the ones considered:

- Remanufacturing weapons to original specifications.
- Maintenance of weapons through enhanced surveillance and then solving problems either through remanufacture or "fixes."
- Entirely phasing out nuclear weapons over the same period that the SBSS program facilities are projected to be operational(about three decades).
- Maintaining or constructing facilities needed to support a deterrence strategy based on keeping the following numbers of warheads in the U.S. nuclear arsenal for the long-term: 10 and 100.
- The SBSS program, carried out as presently envisioned, except with permanent closure of the Nevada Test Site, moving the planned underground subcritical tests to contained facilities at Los Alamos and/or Livermore.

1/40.60
continued

For each option the DOE should consider whether the SBSS program described would be required and what types of facilities would be used or eliminated.

8/40.05

In addition, the DOE should separate consideration of safety and reliability throughout the document. Specifically, it should take into account the differences between SBSS facilities required under a nuclear weapons strategy based only on retaliation to nuclear attack compared to those required for options that include (i) a possible first strike, especially a counterforce strike, against a nuclear armed adversary or (ii) use of nuclear weapons against a non-nuclear-armed adversary. Finally, DOE should amend the PEIS to take into account the other specific criticisms discussed below.

Safety and Reliability

The separation of safety and reliability issues is basic to consideration of the environmental impacts of the SSM program. This is because some safety defects, notably with primaries, can cause severe environmental impacts, while reliability defects relate only to the performance of the warhead when it is detonated.

The two paragraph discussion of the stockpile data summary (p 2-6) is wholly inadequate and misleading since there is no separate discussion of safety and reliability. These data form the technical basis for the DOE's purpose and need for the SSM program. We have analyzed this data and on this basis find the following specific problems in the DPEIS:

3/40.34
continued

1. When safety and reliability issues as separated, our analysis of the data on actionable defect types indicates that:
   a) Seventy-four percent of actionable defect types have affected the reliability, rather than the safety, of the warhead.
   b) Eighty-one percent of reliability problem types affect non-nuclear components, not the primaries and secondaries on which the stockpile stewardship program focuses.
   c) Secondaries exhibit very few problems. Only two safety and eight reliability problem types have been found with secondaries out of a total of 186 reliability problem types.
   d) The vast majority of safety problem types found with primaries were found with warheads that were produced around the time of the 1958-1961 moratorium. This time period of warhead development and production has been linked by Dr. Ray Kidder to rushed design and production work.

2. There is no discussion of the source of problems found with the stockpile. The majority of Actionable Findings are due to design, production or causes other than aging. Our analysis of the data revealed that:
   a) Aging accounts for only twelve percent of safety problem types (Figure 1) and twenty-four percent of reliability problem types (Figure 2).
   b) Primaries have exhibited no aging-related safety problems since the surveillance program began in 1958 (Figure 3). All problems have been the result of design of the warhead. As a result, eighty percent of safety problem types affecting primaries were found within the first four years of production.

3/40.34 continued

c) Only eight aging-related safety problem types have been found since 1958. Only two of these have been found with warheads scheduled to remain in the arsenal and these affected the parachute system and the gas transfer system.

3. The DPEIS does not discuss the effect of reliability problems on the potential wartime performance of the arsenal. If the DOE assumes wartime use of nuclear weapons, this is absolutely necessary in order to analyze the need for the SSM program. Data provided elsewhere by the DOE show that:
a) Sixty-eight percent of reliability problem types result in a reduction to the reliability of less than one percent. Only five percent reduce reliability by more than ten percent (Table 1).
b) Overall, only thirty-three percent of problem types require a retrofit or major design change. The rest can be solved without changes to the warhead.

Table 1: Reliability Reductions

Percent Reduction in Reliability	Number of Defect Types	Percentage of Defect Types
zero to one percent	112 defect types	68%
one percent to five percent	37 defect types	23%
five percent to ten percent	6 defect types	4%
over ten percent	9 defect types	5%

9/40.22

None of the preceding information was presented in the DPEIS despite its relevance to the purpose and need for the SSM program. The DOE has provided this information only in the Tri-laboratory report (reference SNL 1996a in the DPEIS), which is grossly inadequate for proper analysis of the data.

First, data which is vitally important for establishing the need for the program should be analyzed carefully in the DPEIS. Second, the SNL 1996a report is deficient in its analysis of the data, and is therefore an inadequate basis for conclusions in the DPEIS. The SNL report does not systematically separate safety and reliability and often uses total figures (with safety and reliability numbers added) in its charts. The report also fails to distinguish clearly between aging problems and other problems. The report does not show how aging affects important components such as the primary. Our review of the data indicates that these methods of presenting the data are inadequate and misleading. (See also further comments on reliability below.)

Further, the Analysis of Historical Stockpile Data places too large an emphasis on the role of nuclear testing. According to the DPEIS, the surveillance and non-nuclear testing of production and stockpiled weapons through the Stockpile Evaluation Program has "detected about 75 percent of all problems ultimately detected, and it has been the principal mechanism for discovering defects and initiating subsequent repairs and replacements." (DPEIS, p.2-5) The Stockpile Evaluation Program merits only one paragraph in the DPEIS while underground nuclear testing is discussed for five

9/40.22 continued

paragraphs. Underground testing has played a relatively small role in detecting problems and maintaining existing weapons.

Additionally, the DPEIS fails to consider the analysis of Dr. Kidder of Lawrence Livermore National Laboratory in 1987 which stated that nuclear testing after production was only necessary in solving problems with warheads in the sixties and eighties because these warheads were not properly designed and tested in the first place.[1]

5/40.37 continued

Non-proliferation and time frame issues
In discussing the Nuclear Nonproliferation Treaty (DPEIS, p. 2-2) the DPEIS states that "[F]or the Stockpile Stewardship and Management DPEIS, speculation on the terms and conditions of a 'zero level' U.S. stockpile with international verification, as some have suggested during the scoping meetings, goes beyond the bounds of a reasonably foreseeable future." In this context, the DOE indicates that the most useful definition of the term "reasonably foreseeable future" is 2003, the time frame for achieving all START II mandated reductions (p. 2-1). At the same time, the DOE is predicting that it will need new facilities because it is highly unlikely that the U.S. and other nuclear powers will arrive at a specific disarmament agreement

1/40.60 continued

The DOE cannot assume that arms reductions will stop at 1,000 (the low case considered in the DPEIS). A number of analysts, including the first director of Lawrence Livermore National Laboratory, Herbert York, have concluded that far smaller arsenals (100 warheads or even less), would suffice for deterrence. These views cannot be dismissed out of hand as DOE has done in the DPEIS, because the environmental and security impacts of maintaining large arsenals (roughly 1,000 to several thousand warheads) would be considerably different than those of a stockpile of 100 warheads or less.

4/40.07 continued

Finally, the U.S. has an explicit commitment under the NPT, which is the law of the United States, to negotiate in good faith towards nuclear disarmament. By ignoring the disarmament option for the foreseeable future, DOE is basing its DPEIS on the assumption that the U.S. will not give up nuclear weapons under any circumstances. If a general in the Strategic Air Command (General Horner) could see advantages in nuclear disarmament for the U.S., we fail to see why the DOE does not consider it even as one option among many. Instead of examining carefully the fulfillment of the solemn treaty commitments of the U.S. under the NPT, the DPEIS actually subverts the intent of the NPT and seems to confirm the critics' views of U.S. policy in the current CTBT negotiations. Specifically, the DPEIS claims that because there is no time frame for disarmament in the NPT, the U.S. should have a large SSM program. To use the lack of a timetable to create an infrastructure designed to perpetuate a large nuclear arsenal is, in our view, a violation of the spirit of the "good faith" requirement of Article VI of the NPT.

[1] R. E. Kidder. *Maintaining the U.S. Stockpile of Nuclear Weapons During a Low-Threshold or Comprehensive Test Ban*. UCRL-53820. Lawrence Livermore National Laboratory. October 1987. pp. 4-5

4/40.07 continued

The discussion of the non-proliferation impacts of the SSM program (pp. 2-11 to 2-12) is inadequate and based on flawed assumptions. Specifically:

- There is no analysis of the non-proliferation impacts of the SBSS program. A comprehensive review of the vertical and horizontal proliferation risks of the SBSS program should be conducted. In contrast, this section of the DPEIS does not even refer to potential proliferation risks. It simply states that "[O]ne benefit of science-based stockpile stewardship is to demonstrate the U.S. commitment to NPT goals." There is disagreement over this issue and it should be addressed in the DPEIS. While one view is that the SBSS program furthers non-proliferation goals by enabling the U.S. government to advocate a "zero yield" CTBT, other views regard the SBSS program as provocative and as an instrument that could undermine the NPT. The SBSS program could pose both a vertical proliferation risk by maintaining weapons designers and expanding design capabilities, and a horizontal proliferation risk by destabilizing the non-proliferation regime. For instance, it could create pressures for the U.S. to withdraw from the CTB in order to test weapons modifications. Or it could spur weapons research and design in other countries and hence cause the U.S. to escalate its own work in these areas. In view of the wide range of opinion on this subject, it is simply unacceptable for the DPEIS to state without analysis that the "[p]roliferation drivers for other states would remain unchanged" (p. 2-11) regardless of whether the U.S. implemented an SBSS program.

3/40.34 continued

- The argument on incentives for other countries with the capability to produce nuclear weapons mixes the technical and political aspects of nuclear weapon reliability. The DPEIS states that "The loss of confidence in the safety or reliability of the weapons in the U.S. stockpile could result in a corresponding loss of credibility of the U.S. nuclear deterrent and could provide an incentive to other nations to develop their own nuclear weapons programs." (2-11) If U.S. nuclear strategy is truly based on deterrence, then technical reliability issues are not significant. Only a small number of potential reliability problems have a significant impact on reliability (see Table 1 above). Moreover, the DOE defines reliability in a very restrictive way. Reliability is defined by the DOE as the probability that a warhead will detonate at the rated yield or higher. Any defect that decreases this probability is considered one that affects reliability. This is true even if the yield reduction is minimal. The effects of nuclear weapons are so severe that a small chance that it will not provide at least the rated yield should not have an effect on retaliatory deterrence. DOE should explicitly discuss the comparative need for the SBSS program if a strategy of retaliatory deterrence is adopted as distinct from a strategy that includes the possibility of a first use of nuclear weapons, especially counterforce strategies.

4/40.07 continued

- The assumptions made about proliferation drivers such as "international competition or the desire to deter conventional armed forces" (2-11) fail to address the potential proliferation effects of the U.S. maintaining a nuclear weapons design and production infrastructure.
- The DPEIS ignores the spirit, if not the letter, of Article VI of the NPT which calls for good faith negotiations on nuclear disarmament. In contrast the DPEIS states that the "treaty does not mandate stockpile reductions by nuclear states, and it does not

4/40.07 continued

address actions of nuclear states in maintaining their stockpiles." Good faith negotiating precludes *plans to indefinitely maintain* a nuclear weapons arsenal. Additionally, maintaining the ability to design new nuclear weapons does not show good faith. DOE should define an option for the DPEIS that includes a reduction of the U.S. nuclear arsenal over a several decade period comparable to the operating life of the SBSS facilities. The option should include a phase out of SBSS facilities as they become unnecessary for the remaining arsenal DOE should define the need for operating each facility explicitly in relation to safety criteria and reliability criteria, which should each be considered separately.

Other Issues Related to Program Alternatives:

The DOE has omitted alternatives without giving them due careful consideration.

7/40.33 continued

1. Remanufacturing: The DOE states that precise replication is not always possible and therefore remanufacturing is not a reasonable alternative. Additionally, the DPEIS states that the emphasis is on "nuclear components which can no longer be functionally evaluated by nuclear tests." The elimination of this option fails to take into account several key points:
   a) A number of experts, including former nuclear weapons designers, such as Ray Kidder, J. Carson Mark, and Richard Garwin, have stated that remanufacture is a reasonable method to maintain the nuclear arsenal after a Comprehensive Test Ban.[3]
   b) The failure to consider systematic ways to deal with safety and reliability issues arising from non-nuclear components is an egregious omission. Nuclear components exhibit fewer problem types than non-nuclear components. For instance, the primaries, which are nuclear components, have exhibited no aging-related safety problems, but non-nuclear components have had such defects.
   c) The DPEIS does not consider the implications of a recommendation that "fixes" to the primary should be avoided, even if meant as "improvements." Kidder, Mark, and Garwin, among others, have stated that changes to the "physics package" of warheads should be avoided since they can introduce unnecessary uncertainties.
2. Maintenance: This approach is the most similar to the proposed SBSS program. The major difference seems to be that new experimental facilities would not be constructed, while surveillance of weapons would be enhanced. Existing experimental facilities would continue to be used. Eliminating this option makes it clear that this DPEIS is biased towards one outcome. The maintenance option, like the remanufacturing option, is reasonable and should have been included. It would have allowed both the DOE and the public to compare the environmental impacts more clearly. Furthermore, the DPEIS states that current facilities would be inadequate to make the technical judgments necessary for remanufacturing or "fixes" where nuclear testing played a role. Only by including this alternative can the DOE truly judge whether existing facilities are inadequate. For the DOE to begin with the premise that proposed facilities are absolutely necessary is prejudicial. Further, by beginning with this premise and not

[3] Ibid. pp. 6-9, 27-29 and Richard L. Garwin, "Atoms do not age." *The Bulletin of the Atomic Scientists*, Vol. 49 No. 8 (October 1993), pp. 10-11.

7/40.33 continued

providing the public with the opportunity to make its own judgment on the issue, DOE violates the intent of NEPA.

1/40.60 continued

By eliminating reasonable alternatives, such as the ones mentioned above, the DOE has made it impossible to conduct a true comparative analysis of the SBSS program. It has biased the DPEIS towards the SBSS program. The DOE has also failed to provide adequate rationale for eliminating the above alternatives. In this respect DOE is not in compliance with the spirit of NEPA which requires all reasonable alternatives to be considered.

2/41.18 continued

The DOE's program alternatives are also incomplete because the entire program is not analyzed. The DOE has conducted a separate EIS for the DARHT facility. This facility is an integral part of the DOE's SBSS program. For this DPEIS to have been truly Programmatic, DARHT should have been analyzed as a component of the program. A facility-specific EIS for DARHT should have been conducted only after the SSM DPEIS was completed. As it stands, DARHT is considered part of the No Action alternative. This is unacceptable, especially since DARHT is under construction and both axes are not projected to be in operation for over five years.

Further, by subsuming DARHT's environmental impacts under the No Action alternative, the DPEIS does not present a clear assessment of the cumulative environmental impacts of the all the new facilities it proposes under the SSM program.

Issues related to the SBSS Facilities

In presenting arguments in favor of the three proposed SBSS facilities (NIF, CFF, and Atlas) the DPEIS simply compares their operating parameters to previous facilities and states that information from these facilities would be used to modify computer codes that model nuclear weapons. While it is clear that the new facilities operate at higher temperatures, volumes, etc. this does not necessarily provide justification for constructing them.

10/40.36

The DOE must justify any new facilities by making a clear case for their need in relation to specific safety or reliability issues. In such an analysis the DOE must be very precise and clear on whether these facilities will aid in maintaining safety or reliability, whether the problems being discussed are due to aging, and exactly how the facility would be of help. The DPEIS must also state what specific deficiencies existing facilities have and whether existing facilities can perform the task adequately. These analyses must take into account comments made above regarding the use of data from the Stockpile Evaluation Program.

The DOE must also explain how it will resolve the issue of scaling information from these facilities to the volumes, pressures, temperatures, and energies of nuclear explosions. The DOE has not adequately explained how it will deal with the fact that these facilities can only study isolated phenomena and not the complex interaction of phenomena occurring in nuclear weapons. An explanation of how these difficulties would be overcome must be

provided for the public and the DOE to determine if these facilities are relevant to maintaining either the safety or reliability of the existing arsenal. Of particular concern is the possibility that modifications to computer codes based on information from these facilities would reduce the relevance of the codes to *existing* warheads.

10/40.36 continued

The DOE has also failed to prioritize facilities according to need. The DPEIS states that since the facilities perform separate functions, "they are complementary in nature and not alternatives to one another." (DPEIS, p. 2-10) However, this fails to take into account that while these facilities do not perform the same function, they may not all be necessary. Are facilities that focus on secondary performance as necessary as facilities that focus on primary safety? Are any new facilities necessary to ensure safety of nuclear components? Primaries, secondaries, and non-nuclear components all present different problems and some are more likely than others to exhibit problems. Therefore, it is only reasonable to assume that facilities dedicated to studying certain components would differ in importance. If the DOE and the public are to make judgments concerning the need to construct facilities and the cost versus benefit of individual facilities as part of an overall program, it is necessary to have a clear idea in a PEIS of the relative importance and role of various facilities.

4/40.07 continued

The DOE has not discussed the possible weapons design use of these facilities. This is necessary if the public is to adequately assess the impacts of the program. Existing experimental facilities have been an integral part of the weapons design process in the past. As stated in the Environmental Impact Statement for DARHT, this facility was originally proposed in the eighties as part of the weapons design program. This programmatic impact statement should address the weapons design potential of each facility, as well as the change in weapons design capabilities of the laboratories as a whole if these facilities are constructed.

In the NIF Non-Proliferation Study, one of the arguments put forth by the DOE to prove NIF was not contributing to vertical proliferation was to state that the United States was no longer developing warheads of new design. This argument, also presented as fact in this DPEIS, has three fundamental flaws:

- What is at issue is weapon design *capabilities*. Even if the DOE is not developing new design weapons currently, this does not imply that new facilities would not aid in future weapons design work if the policy were to change.
- This does not actually prevent the laboratories from *designing* new warheads, even if they are not developed or produced. These designs could be rapidly developed if the United States so desired.
- Halting the development of "new" design weapons does not prevent the DOE from making militarily significant modifications of existing designs. The current example would be the modification of the B61 mod 7 into a B61 mod 11 in order to replace the aging B53. The modification is not being done for either safety or reliability. The modification is intended to change the military characteristics of the warhead. Recent

statements by Dr. Harold Smith, of the Pentagon, indicates that the U.S. plans to not just to develop the warhead, but actually to deploy it.[3]

Plutonium-242

11/40.41 The cover sheet to the DPEIS states that a classified appendix presents the "purpose of and need for the plutonium-242 to be stabilized at SRS for use in future weapons complex research and development activities." Unclassified portions of this appendix should be provided as part of the DPEIS. Further, the note on the appendix should have been prominently presented in the body of the DPEIS, rather than at the end of the cover sheet.

The non-proliferation implications of separating Pu-242 and its environmental impacts should be explicitly discussed in the context of this PEIS, even though these may be covered in facility-specific statements.

Disclosure of information

8/40.05 continued The DOE has not provided data sufficient to determine whether the programs described would be required under a nuclear weapons strategy based only on retaliation to nuclear attack compared to ones that include (i) an option of first strike against a nuclear armed adversary or (ii) an option of use against a non-nuclear-armed adversary. Such data should be published as part of the PEIS.

[3] Robert Burns, "U.S. Said to Have No Non-Nuclear Way to Destroy Suspect Libyan Plant." *Associated Press*, April 23 1996.

Figure 1

Number and Cause of Safety Related Actionable Defect Types Found Versus Year After First Production Unit (FPU)

Figure 2

Number and Cause of Reliability and Operation Related Actionable Defect Types

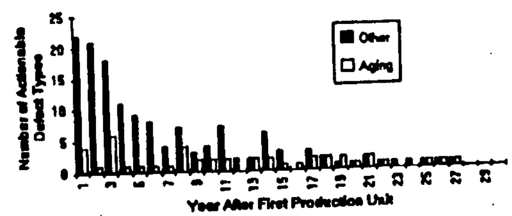

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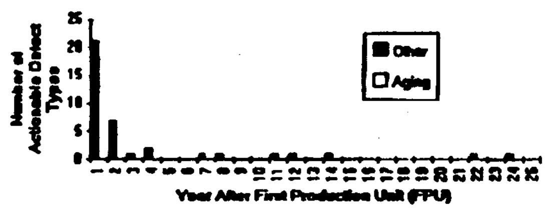
Figure 3

The Number and Cause of Actionable Defect Types Affecting Safety and the Year After FPU (For Primaries Only)



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PAGE 1 OF 2

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: CAROLYN M.I.: S Last Name: CRISTOFANI

Street Address: PO BOX 478

Street Address 2:

City: TESUQUE State: NM Zip Code: 87574 -

Organization:

Telephone: - - Fax:

Comments:

1/40.12 I AM WRITING TO EMPHATICALLY STATE MY OBJECTIONS TO THE PROPOSED STOCKPILE STEWARDSHIP + MANAGEMENT PLAN FOR LOS ALAMOS NAT'L LAB. NOW THAT WE ARE POST COLD WAR, I CANNOT UNDERSTAND WHY THE DOE + DOD'S RESPECTIVE BUDGETS ARE NOT BEING DRAMATICALLY SLASHED. THE PROPOSED BUDGET FOR STOCKPILE STEWARDSHIP + MANAGEMENT IS BEYOND OBSCENE! 2/40.06 OUR COUNTRY IS WORKING TOWARDS SIGNING THE CTBT, AND HAS AGREED TO NON PROLIFERATION TREATIES. THE COMPLETE PLAN FOR LOS ALAMOS NAT'L LAB IS NOT IN ACCORDANCE WITH THESE TREATIES. YOU ARE ENTIRELY IGNORING THE "SPIRIT" OF THESE AGREEMENTS. I DON'T UNDERSTAND WHY. TO SAVE DOE + DOD JOBS? I'M CERTAIN THAT'S PART OF IT. THIS MONEY, YOUR EMPLOYEES ENERGY WOULD BE USED SO MUCH MORE PRODUCTIVE

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

Receiver's Initials: ______

Comments (cont'd):

LY ELSEWHERE.

OTHER ETHICAL OBJECTIONS, ASIDE FROM HORRIBLE WASTE OF MONEY + HUMAN RESOURCES, IS HUMAN HEALTH. THYROID CANCERS IN THE LOS ALAMOS AREA HAVE QUADRUPLED IN THE PAST DECADE. THERE IS IN QUESTION THE CAPABILITY OF UNIVERSITY OF CALIFORNIA TO MANAGE THE LAB WITH ITS PRESENT RESPONSIBILITIES.

3/40.21 I CHALLENGE THAT NEITHER THE UNIVERSITY, NOR ANYONE ELSE, ANY OTHER GROUP, COULD TRULY MANAGE THE LAB AS IT IS PROPOSED TO RUN UNDER THE STOCKPILE STEWARDSHIP + MNGMNT PLAN - MANAGE IT IN A WAY THAT IS ENTIRELY SAFE FOR EMPLOYEES AND THE PUBLIC.

WHEN LOS ALAMOS + SANDIA NAT'L LABS WERE FIRST BUILT, YOU ALL THOUGHT YOU HAD IT MADE, A SPARSELY POPULATED UNDEREDUCATED BACKWARDS STATE. THE POPULATION HAS EXPLODED HERE, WITH INTELLIGENT, EDUCATED, + THOUGHTFUL PEOPLE. WE ARE NOT GOING TO LET YOU DO THIS HERE, AND I DON'T THINK THE AMERICAN PUBLIC WILL LET YOU DO IT ANYWHERE.

U.S. Department of Energy
PO Box 3417
Alexandria, VA 22302

Pantex Plant Citizens' Advisory Board

A U.S. Department of Energy Site-Specific Advisory Board

May 3, 1996

Hazel R. O'Leary
Secretary of Energy
1000 Independence S.W.
Washington D.C. 20585

Dear Secretary O'Leary:

On November 14, 1995, the Pantex Plant Citizens' Advisory Board commented on the proposed Stockpile Stewardship and Management PEIS

A reply, dated December 15, 1995, was received from Thomas P. Seitz. It provided background information and general statements, but there were no specific replies to the issues raised. The Department of Energy said it would respond to the concerns during the hearings.

However, the specific issues outlined in the December 14 letter were not addressed at the meetings in Amarillo on April 22 and 23; therefore, the PPCAB is reissuing the advice.

We would appreciate receiving specific responses to the issues raised.

Sincerely yours,

Louise Daniel
Co-Chair

Ronald W. Zarm

cc: Thomas P. Seitz
Gerald W. Johnson

704 S. Polk, Suite 202 Amarillo, Texas 79101; Phone 806/372-3311; FAX 806/372-3989

Pantex Plant Citizens' Advisory Board

A U.S. Department of Energy Site-Specific Advisory Board

14 November 95

Hazel R. O'Leary
Secretary of Energy
1000 Independence S.W.
Washington, D.C. 20585

RE: Preferred Alternatives for the Weapons Complex
Stockpile Stewardship and Management EIS

Dear Secretary O'Leary

As you consider the reconfiguration alternatives of the weapons complex in the Stockpile Stewardship and Management Programmatic Environmental Impact Statement, we want to emphasize the value which the Pantex Plant Citizens' Advisory Board places on a fair and equitable evaluation of existing facilities and sites necessary to fulfill the long-term needs of the future nuclear weapons complex. If long-term stockpile stewardship and management requirements call for a major assembly/disassembly/maintenance site as well as a major High Explosive (HE) manufacturing site, we believe Pantex has existing facilities and capabilities which must be given careful consideration. Advantages of Pantex as the Explosive Fabrication Facility are

1/30.01

1) Existing Facilities

We believe that DOE must fully evaluate the more maintenance free, cost-effective HE operations which Pantex could contribute. Since 1980, DOE has been upgrading Pantex facilities, which currently include modern HE fabrication facilities. Pantex now has a new Explosives Machining facility (12-121), an Explosive Analysis Laboratory (11-51), a Developmental Machining

facility (11-50) to which the HE formulation will be relocated, and an HE Synthesis Facility currently under construction (11-55). The PPCAB expects the DOE to conduct a detailed investigation for location of HE operations and to be held accountable for the resulting decision.

1/30.01 continued

2) Manufacturing Experience

A prime concern of this community is the safe processing of explosive materials. Pantex has been producing explosive materials and weapons for over 40 years. During this time, Pantex employees have gained valuable manufacturing experience and technical skills. This level of expertise is unique to the workforce at Pantex and is an important asset to the DOE. During the past five years, Pantex has been working to formalize its operation and train its workforce in the philosophy of Conduct of Operations. Added assets include the Voluntary Protection Program and the Metal Trades Council Safety Officer Program.

3) Benefits of Collocation and Maintenance of Core Competency

HE fabrication and assembly/disassembly operations currently share facilities and support operations at Pantex. The potential adverse impact of separating these two operations must be taken into consideration. unnecessary costs due to duplicating the infrastructure necessary to support HE fabrication at the new sites(s), transporting machined HE components between HE fabrication and assembly/disassembly operation sites; and increased numbers of component inspections prior- and post- transportation. Risks to the public, the workers, and the integrity of the HE components due to handling and transport, must be fully evaluated also.

Safer, more environmentally sound, and cost-effective operations are important reasons to consider maintaining the HE core competency in association with the nation's nuclear assembly/disassembly facility.

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4) Operating Costs

1/30.01 continued

Based on the information the PPCAB has sought, the estimated incremental operating costs for HE manufacturing at Pantex is just over three million dollars annually; this is approximately half that of the other site alternatives. There has been some misunderstanding in assessing the current HE fabrication operating costs at Pantex. It appears the DOE is comparing the incremental costs for HE fabrication at the two laboratories with the stand-alone costs of HE fabrication at Pantex which distorts the cost comparison. During these times of budget cutting, the DOE must not irrationally compromise the reliability, effectiveness, experience, and knowledge at Pantex. For the sake of clarity, all basic assumptions and methods of comparison and evaluation must be fully disclosed.

5) Environmental Issues

The new Pantex facilities designed for HE machining address many environmental concerns for the continuing HE operations. Should HE operations be relocated to another site, we feel strongly that operations should not compromise the environment at those sites, creating additional future restoration problems. Pantex is actively exploring alternatives to open air burning of HE, is seeking to eliminate effluents containing trace concentrations of HE to unlined ditches within the next year, and is committed to the goals set by Clean Texas 2000. Our support for retaining continuing HE operations is contingent upon a satisfactory completion of these initiatives, adequate sampling of Pantex site agricultural products to ensure product viability, and an assumption that there will be no increase in emissions resulting from HE disposal at the Burning Grounds. The continuation of HE work should also be contingent on the ability to meet RCRA/CERCLA standards for HE at inactive firing sites and an in-depth analysis of active firing sites to determine environmental risks.

In light of current openness initiatives within the bounds of national security, citizens should be provided with information on the anticipated range of volumes of HE needed to meet expected nuclear arsenal requirements.

2/04.05

The major water source for the High Plains of Texas is the Ogallala Aquifer underlying Pantex. This aquifer is the source for agriculture in this semi-arid

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2/04.05 continued

region and is an essential source for human consumption. Products grown in this area are shipped all over the world. Any possibility of contamination to area agricultural products could destroy that industry which has been the keystone to economic stability in this region. Continuation of current monitoring programs at Pantex, with upgrades as new technologies emerge, are vital to safeguarding this area.

We appreciate your commitment to community involvement and know our comments will be considered in the evaluation and recommendation for the future of High Explosive Fabrication.

Sincerely,

[signature]

The Pantex Plant Citizens' Advisory Board
Louise Daniel
Co-Chair

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The Resources Agency

Pete Wilson
Governor

of California

Douglas P. Wheeler
Secretary

May 7, 1996

Mr. Jay Rose
Office of Reconfiguration
U. S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Dear Mr. Rose:

The State has reviewed the Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management (DOE/EIS-0236), affecting Lawrence Livermore National Laboratory, Alameda and San Joaquin Counties, submitted through the Office of Planning and Research.

We coordinated review of this document with the Regional Water Quality Control Board; the Energy and State Lands Commissions; and the Departments of Fish and Game, Health Services, and Transportation. The Department of Transportation states "If there is any transportation of nuclear material, please contact the appropriate CALTRANS District office. For Alameda County contact Phillip Badal at (510) 286-5505 and for San Joaquin County contact Dana Cowell at (209) 948-7906." The California Energy Commission has indicated that they will reply directly to you.

Thank you for providing an opportunity to review this project.

Sincerely,

Maureen F. Gorsen
Assistant General Counsel

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cc: Office of Planning and Research
1400 Tenth Street
Sacramento, CA 95814
SCH 96034005

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COMMENT LETTER

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CITIZEN ALERT

BOARD

STAFF

May 6, 1996

Mr. Jay Rose
Office of Reconfiguration
U.S. Department of Energy
PO Box 3417
Alexandria, VA 22302

RE: COMMENTS ON THE DRAFT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT FOR STOCKPILE STEWARDSHIP AND MANAGEMENT

1/40.43 We are writing to express our concern regarding the lack of credible alternatives considered under the Stockpile Stewardship program.

2/40.36 After review of the SSM/DPEIS we have come to the conclusion that the document is fatally flawed in that it proposes new "enhanced experimental capabilities," at an enormous cost, to accomplish what is essentially the downsizing of the US nuclear weapons arsenal. The DPEIS also fails to establish the need for any of the new facilities proposed within it in the context of ongoing international arms reductions. We are of the opinion that after conducting well over 1000 nuclear tests, the fundamental understanding of nuclear weapons mechanics should be sufficient to maintain and downsize the existing arsenal in a safe reliable manner. Therefore, we recommend in the strongest terms, that the SSM/DPEIS be withdrawn, rewritten and reissued, to include sensible alternatives which will not cost the U.S. taxpayers billions of unnecessary dollars.

Thank you for an opportunity to comment. Please allow our comments to be reflected in the record.

Submitted by:

Richard A. Nielsen
Executive Director
Citizen Alert
PO Box 1681
Las Vegas, NV 89125

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COMMENT LETTER

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NEW MEXICO
ENVIRONMENTAL LAW CENTER

May 7, 1996

Office of Reconfiguration
U S Department of Energy
P.O. Box 3417
Alexandria, Virginia 22302

By mail and facsimile
(703) 931-9222

Re: Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management

Dear Sir or Madam:

I write for the Pueblo of San Ildefonso (the Pueblo) to comment on the U.S. Department of Energy's (DOE) Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management (PEIS). The Pueblo appreciates the opportunity to comment on the draft PEIS, and looks forward to working with DOE on it.

Introduction

1/12.08 The Pueblo is concerned about the DOE stockpile stewardship and management program because of the impacts that Los Alamos National Laboratory (LANL), which is one of the facilities involved in the stockpile stewardship and management program, has had and will continue to have on the Pueblo. The Pueblo and LANL share a boundary, and LANL is built on land that originally belonged to the Pueblo. In addition, that land includes many sites that are sacred to members of the Pueblo, and LANL's use and disposal of radioactive and other materials during the past 50 years has caused serious contamination of the Pueblo's air, soil, and water. The DOE's continued operation of LANL threatens the Pueblo with further contamination and with the destruction of more sites sacred to Pueblo members. LANL also has had and threatens to continue to have disproportionate impacts on the Pueblo, impacts that raise issues of environmental justice.

2/41.03 The Pueblo has two specific concerns about the PEIS. First, the PEIS was developed without the involvement of the Pueblo, and the Pueblo is being asked to comment on a completed document. Second, although the Pueblo does not have the resources with which to analyze the PEIS in detail, there are certain technical matters of concern to the Pueblo that are not adequately addressed in the PEIS.

1. The DOE should have involved the Pueblo in preparation of the PEIS.

The Pueblo was not involved in the preparation of the

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2/41.03 continued

PEIS. Rather, the Pueblo was given a copy of the three volume PEIS and was briefed on it only after it was completed. That does not provide the Pueblo with an opportunity for meaningful input into the PEIS. Moreover, the Pueblo does not now have an adequate staff with which to analyze those three volumes and to comment on them within the 60 day comment period. That is not appropriate.

The Pueblo is a federally recognized Indian Tribe, and President Clinton has directed the heads of federal agencies to operate on a government to government basis with all such Tribes, and to consult those Tribes and take into account their concerns prior to taking actions that affect them. In addition, DOE Secretary O'Leary has directed all elements of DOE to deal with Tribes on that government to government basis, and to follow the DOE American Indian Policy. It specifically provides that DOE shall treat Tribes as governments in accordance with their status and DOE's trust responsibility towards them, and that DOE shall consult and involve Tribes in decisions that affect them. Finally, DOE has entered into an Accord with the Pueblo and has witnessed a Cooperative Agreement between LANL and the Pueblo. Each of those documents also provides that the Pueblo will be given a role in decisions concerning LANL that affect the Pueblo.

The United States, DOE, and LANL therefore have each made a commitment to involve the Pueblo in decisions concerning LANL that affect the Pueblo, its members, and their environment. Despite that, the DOE prepared the PEIS without consulting the Pueblo, and has effectively precluded the Pueblo from having the role in development of the PEIS that is required by the directives of both President Clinton and Secretary O'Leary, and by the accord between DOE and the Pueblo. This problem is exacerbated by the importance of the activities discussed in the PEIS to the Pueblo, and by the failure of the PEIS to analyze adequately the environmental impacts of the stockpile stewardship and management program.

2. The PEIS does not adequately analyze issues that are of concern to the Pueblo.

3/04.06

The PEIS's characterization of the existing environment at LANL is not adequate. For example, the section on groundwater (page 4-242) is quite misleading. The subsection on groundwater quality implies that there are no groundwater problems. Table 4.6.2.4-2 shows data from 1992 and indicates that all levels of contaminants are below regulatory levels of concern. In fact, however, levels have fluctuated over the years, and there is evidence that contaminants are

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3/04.06 continued

reaching the deeper aquifer from surface discharges and shallower more contaminated areas. Considerable mobility of contaminants in the subsurface at Mortendad canyon has been discovered, even though this is an area in which contaminants were initially predicted to be relatively immobile. Moreover, this is an area into which LANL currently discharges a significant portion of its liquid radioactive wastes.

This section on groundwater contamination therefore is misleading because it glosses over the shallow and deeper aquifer contamination problems that have only recently been

4/05.01

recognized. Similarly, contamination in soils is omitted almost entirely in the discussion of the current environment. (Page 4-234)

5/43.18

The PEIS does not address the effects of forest fires in the LANL area. As the residents of the Pueblo know, that is a major issue in northern New Mexico in this hot dry summer of 1996. A recent fire in the Los Alamos and Bandelier area came within two miles of LANL before it was brought under control, and any discussion of the current environment at LANL must include consideration of such fires.

6/09.02

The PEIS also does not adequately analyze the impacts of accidents at LANL on the Pueblo and its members. The impacts of accidents are assessed for populations within 80 km (see table 4.6.3.9-3, for example). More to the point, and more important from an environmental justice perspective, are the risks to the Native American populations living immediately adjacent to LANL.

The main road that leads into LANL passes through the Pueblo's lands, and the Pueblo has no resources with which to deal with any accident involving radioactive or hazardous materials that occurs on the reservation. The Pueblo has one policeman and a totally volunteer fire department, and its personnel are not adequately trained to deal with radioactive or hazardous materials. Moreover, there has been no determination by the Pueblo, the Department, and the State of New Mexico about which entity or entities would have jurisdiction or responsibility to deal with such an accident or how those entities would coordinate their responses. In addition, the Pueblo's population is so limited (less that 1,500 people) that any excess cancer deaths would have a much more severe impact on the Pueblo than on another, larger community. The PEIS therefore should analyze separately accidents on the reservation.

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1/12.08 continued

Finally, the PEIS should take into account specific risks from accidents to Native American populations. The GENII code used to compute risks does not include pathways specific to the land use of the Native Americans who live near LANL, and the estimated risks therefore are not valid. Such Native American specific pathways include, for example, use of medicinal plants, smoking of herbs, and making of pottery with contaminated clays. Furthermore, it is not clear in the PEIS which assumptions and pathways were used for specific sites (such as LANL) when applying the GENII code. The PEIS states that not all pathways were available at each site (volume II, page B-9), but it is not clear which pathways were not used for the analysis involving LANL. As an example, the Pueblo's members consume downstream waters in the canyons in and around LANL, but DOE analyses have usually ignored this use.

The PEIS's analysis of accidents therefore is inadequate for protection of the Pueblo and its members. This raises questions of environmental justice, which also is not given adequate attention in the PEIS. This is exacerbated by the failure of DOE to involve the Pueblo in the preparation of the PEIS.

Conclusion

The Pueblo requests that these and other deficiencies in the PEIS be corrected before it or a final EIS is used as the basis for a decision on the stockpile stewardship and management program. The Pueblo also requests that DOE involve the Pueblo in the preparation of the final EIS in a manner appropriate to the Pueblo's status as a sovereign government and in accordance with the directives of President Clinton and Secretary O'Leary and the DOE/Pueblo accords.

Thank you for your attention to these issues.

Yours truly,

Douglas Meiklejohn
Attorney

Peter C. Chestnut
Attorney at Law

pc: The Honorable Elmer C. Torres
Governor
Pueblo of San Ildefonso

Gaurav Rajen
STAR Associates

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Comment Letter

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NEVADA ALLIANCE FOR DEFENSE, ENERGY AND BUSINESS

May 7, 1996

Board of Directors

Troy E. Wade, Chairman
Wade Associates

Ed Richardson, Secretary
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William Hardman
Parsons Brinckerhoff

U. S. Department of Energy
Office of Reconfiguration
P. O. Box 3417
Alexandria, VA 22302

COMMENTS ON THE DRAFT PEIS FOR STOCKPILE STEWARDSHIP AND MANAGEMENT (DOE/EIS 0236)

The Nevada Alliance for Defense, Energy and Business is a trade group that represents those contractors that are currently performing work at the Nevada Test Site (NTS), as well as those industrial firms either serving as providers to the NTS or that might have an interest in the future of the NTS. The Alliance has reviewed the Draft PEIS for Stockpile Stewardship and Management and have the following comments

General Comment

1/30.03

Throughout the draft, references to the possible contribution of the NTS and its facilities to the Stockpile Stewardship requirements are summarily dismissed by very arbitrary statements. Examples of these statements are found in Section 11 of the Weapons Assembly/Disassembly Report. In the second paragraph of the section entitled "Effects of Workload on Alternatives," there is a statement that says, "It should be noted that in the high case workload there are an estimated 5.6 cells required to support operations, however, there are only five cells currently at the NTS." That statement is representative of the treatment of NTS throughout the entire report. Anyone familiar with either Pantex or the DAF facility at NTS knows that the difference between 5.6 or 5.0 is not measurable in the context of the disassembly requirements. To arbitrarily eliminate a $100M facility because it lacks four percent of the capability to support the "high case" is inventing a reason to eliminate the inclusion of the NTS. Similarly, throughout the

2/30.07

report, there is no recognition that the DAF is a backup to Pantex that could be critical to the successful implementation of treaty requirements, as well as a backup facility should Pantex be shut down as a result of a natural disaster, such as a tornado, or shut down as a result of a perceived safety violation, such as has just resulted in the shutdown of the Y-12 plant at Oak Ridge for over a year. It is clear that the PEIS process has analyzed two options: the first being to keep assembly and disassembly operations at Pantex; and the second to transfer those assembly and disassembly operations to NTS. Completely disregarded is the option to combine assembly and disassembly operations in a way that more completely protects the national options of the President

Specific Comments

3/40.86

Table 3.2.9-1, page 3-14, Volume 1 should be modified. Subcritical tests should be added for completeness, as well as references to High Explosive and dynamic experiments. Testing of nuclear weapons should be mentioned, as well as the testing of weapon effects.

4/40.45

Table 3.3-1, page 3-18, Volume 1 should acknowledge the expertise at the NTS in the experimental primaries and secondaries. The same table should also recognize the NTS as a potential site for the siting of large experimental facilities to do weapons simulation and effects tests

P.O. Box 97775 • Las Vegas, Nevada 89193 • (703) 895-1442 • Fax (702) 895-1547

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U. S. Department of Energy
Office of Reconfiguration
Alexandria, VA 22302
COMMENTS ON THE DRAFT PEIS FOR STOCKPILE STEWARDSHIP AND MANAGEMENT
(DOE/EIS 0236)
Page 2

5/40.49 Section 3.3.6, page 3-28 of the Summary should list the NTS as an alternate site for all of the large experimental physics machines that are contemplated.

6/41.18 On page 3-20 is a description of the NTS that describes the current NTS mission as "maintaining the capability to test." Ongoing operation of experimental facilities such as Lyner and BEEF should be recognized.

NTS should be recognized as a technically viable location for the storage of plutonium in the form of oxides, metal, or fabricated pits. Both the DAF facility and the large tunnels already constructed provide cost effective solutions to the storage of strategic reserves of plutonium, as well as possible locations for back-up manufacturing and reuse facilities.

1/30.03 continued Finally, we believe the remoteness of the NTS, which affords a place to do hazardous operations with essentially zero risk to the general public, coupled with the existence of a viable infrastructure that consists of facilities and personnel, makes the NTS a viable candidate for primary and alternate use in almost any stockpile stewardship scenario. We request that the NTS be properly represented and described in the final draft of the proposed EIS.

The Nevada Alliance for Defense, Energy and Business stands ready to assist the Department of Energy in ensuring that long term national defense objectives are met in the most cost effective manner, which involves the NTS in almost every category. The Alliance requests consideration of our comments and looks forward to working with the Department of Energy in this most important matter.

Very truly yours,

[signature]
Troy E. Wade II
Chairman

TEW:bc
cc: Senator Harry Reid
Senator Richard Bryan
Terry Vaeth, Manager, DOE/NV
E. Chris Hagan, Bechtel Nevada

SSM-F-014
COMMENT LETTER **PAGE 1 OF 7**

Los Alamos Study Group

May 7, 1996

Mr. Steve Sohinki, Director
U.S. DOE Office of Reconfiguration
P.O. Box 3417
Alexandria, VA 22302

Re: Comments on the draft Stockpile Stewardship and Management Programmatic Environmental Impact Statement (SS&M PEIS, or simply PEIS)

Dear Mr. Sohinki:

The following comments supplement those made orally in Los Alamos on March 26 and in Santa Fe on April 25.

1/40.85 Illness abridges these comments. They are confined to some of the programmatic issues. Their conclusion is simple: the draft PEIS is so fatally and fundamentally flawed that a more in-depth analysis by the DOE along the lines established in the draft PEIS is neither possible nor desirable. The flaws cannot be corrected simply by issuing a better final PEIS.

Instead, the Department of Energy (DOE), if it wishes to comply with its own regulations implementing the National Environmental Policy Act (NEPA), needs to withdraw the current draft PEIS and enter once again into the scoping process. The reasons for this follow. Page numbers without other document citations refer to the draft SS&M PEIS.

1. <u>The purpose and need for the SS program has not been established.</u>

2/40.05 The PEIS says that no new weapons production is occurring or will occur (1-1, paragraphs 3 and 4, and 2-11). This is a deceptive oversimplification at best. As revealed by Dr. Harold Smith in a Pentagon press briefing on April 23, the first B61 mod 11 will be deployed by the end of 1996, and production activities will continue in FY1997 (DOE Congressional Budget Request Vol. I [CBR], p. 209). This weapon is only the first in a category or series of earth-penetrating modifications of nuclear weapons (Kenneth Bacon, DOD Press Conference, 4/23/96). Vic Reis spoke of four near-term stockpile modifications underway or completed (W76, W88, B61-11, W87) (written testimony, 4/16/96, Senate Appropriations Subcommittee on Energy and Water Development). The FY1997 CBR mentions as well "upgrades" to the B83 (p. 213).

I go into this detail because this is nothing more than implementation of the Nuclear Posture Review (NPR), embraced by the DOE as a policy driver on p. 2-1, which "requires" DOE to indefinitely retain the capability to design, certify, and produce new nuclear weapons. It is in fact this new-design "requirement," rather than requirements to maintain safety and reliability of existing weapons, that drives the shape of the SS program.

I have written on the subjects of safety and reliability at length and will not repeat those facts

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2/40.05 continued

here. The recent release of historic stockpile surveillance data has only further confirmed those earlier conclusions that 1) safety is not a driving issue for nuclear physics package stewardship, and 2) reliability is a problem which can be economically solved with yesterday's technology. All this is only what Norris Bradbury, Carson Mark, Hans Bethe, Richard Garwin, Andre Sakharov, and others were already saying in the 1970s. The proposed stockpile stewardship program is not needed to maintain the safety and reliability of the present U.S. arsenal.

Perhaps this will bear a little more emphasis and elucidation.

U.S. nuclear explosives are based on very sophisticated analysis and thorough testing. But they are very robust, and not very complicated, devices. As noted above, just about 5% of the parts in the weapon are contained in the explosive device itself. While there have been several serious design errors--errors which destroy confidence in the two-lab peer review system that is a central goal of the DOE's proposed SS program--extensive stockpile surveillance data shows that nuclear weapons have been kept in a highly reliable condition with a very small effort from the two design labs.[1] Once a weapon was fully tested, nuclear testing played essentially no role in maintaining the stockpile, and hence no giant new program is needed to replace it.

Within the weapon as a whole, the nuclear explosives themselves have accounted for a very small fraction of the problems encountered in routine surveillance, and a small proportion of the number of these problems that required fixes. The upshot is that the modern weapons selected to remain in the U.S. stockpile into the next century are extremely safe[2] and reliable, and the explosive parts of those weapons are in fact the most reliable parts of them.

What has caused serious problems in the past, and can be expected to do so in the future, is the substitution of untested designs for the fully-tested ones now present in the stockpile. As an independent panel of nuclear scientists warned DOE in 1995:

> However greatest care in the form of self-discipline will be required to avoid system modifications, even if aimed at "improvements," which may compromise reliability.[3]

---

[1]Reliability in this context means the probability, after exposure to the stockpile-to-target sequence of conditions, that a nuclear weapon will explode within the certified yield range. For further information see Mello, 1995, "No Serious Problems, Reliability Issues and Stockpile Management," Tri-Valley CAREs, Livermore, CA.

[2]"Safe," in this context, means safe from accidental nuclear detonation. Nuclear weapons are in most but not all cases extremely resistant to accidental chemical detonation as well. The relevant literature and testimony is summarized in Mello, 1995, "Nuclear Weapons Safety: No Design Changes are Warranted," Tri-Valley CAREs, Livermore, CA.

[3]Drell, Sidney, et. al, 1995, "Nuclear Testing: Summary and Conclusions." Report of JASON panel to DOE Defense Programs.

2/40.05 continued

The most reliable weapons are thus the ones we have tested. No new nuclear designs are needed or wanted. The implication of this is that maintaining the nuclear arsenal requires skills and capabilities, but only a small fraction of the design personnel now employed at the weapons labs. The DOE is going in exactly the contrary direction: attempting to maximize funding, not reliability.

2. <u>The DOE's nonproliferation analysis is worthless.</u>

3/40.07

The DOE's nonproliferation analysis--just 4 paragraphs in length, on p. 2-11--is worthless. There is U.S. case law which says that agencies bringing forward a class of impacts in an EIS cannot defensibly do so in a way which omits the negative impacts in that class, as DOE has done here. DOE's analysis is specious and self-serving, if for no other reason than it omits the entire current controversy in Geneva over the intent and capabilities of the stockpile stewardship program and the scope of the proposed comprehensive test ban, as well as the commitments made in Article VI of the NPT.

3. <u>The DOE has unreasonably constrained the alternatives it analyzes.</u>

4/41.03

The Department of Energy (DOE) lists, on p. 2-1, a number of policy constraints for the SS and SM programs, including Presidential decision directives and memoranda, an act of Congress, three treaties, one proposed treaty, and one study. The most limiting of these constraints were developed with full DOE participation. In effect, the DOE has constrained itself, and now seeks to be excused from any analysis of other reasonable alternatives. In the case of the SS program, DOE's constraints have narrowed what is "reasonable" to the one alternative that is preferred. It is quite remarkable that only this program, not anything more, not anything less, and not anything different, is reasonable.

In fact, agencies must consider and analyze reasonable alternatives to proposed actions regardless of prejudicial actions they have already taken. It is precisely to avoid such prejudicial actions that NEPA analysis, and specifically programmatic NEPA analysis, is required. Programmatic decisions embodied or latent in Presidential decision directives, acts of Congress, and the Nuclear Weapons Stockpile Memorandum (NWSM) are not immune from NEPA alternatives analysis, where the actions which flow from them involve significant environmental impacts.

The fact that construction, or "line-item construction," has begun--the PEIS is ambiguous about which of these it means--likewise does not exempt any facility from analysis as part of a programmatic EIS. This is all the more true when construction was begun illegally, as in the case of DARHT.

Overall, DOE appears to misunderstand the nature of programmatic analysis. This is especially the case in the SS program. In the PEIS, DOE treats its programmatic SS decisions as already made, and then proceeds to construct a so-called "programmatic" EIS that is largely composed of a combination of project-specific analyses that implement that single preferred action, without recourse to any alternative. It would be far more cost-effective, and better NEPA analysis, to

4/41.03 continued

address a genuine range of programmatic alternatives and to do so openly, thoroughly, and with a broader brush, prior to attempting to understand the detailed impacts of each alternative. To pretend that no other alternative exists throughout much of its program, as the DOE does, is inexcusable, technically insupportable, and illegal.

5/41.18

4. **There is no programmatic analysis of alternatives in the SS program whatsoever, and under the mis-named "no action" alternative, DOE is already building most of the new facilities in the SS program.**

After dismissing some important proposed alternatives DOE received during the scoping process on pp. 3-5-7, DOE slides right past establishing any SS alternatives it does consider, either overall or in specific parts of its program.

First, no programmatic alternatives are being considered for maintaining testing readiness. DOE is in fact currently looking at alternative ways to fulfill Safeguard C of the President's August 11, 1996 announcement (oral communication, V. Reis) but these aren't mentioned in PEIS.

Second, there are essentially no alternatives mentioned for maintaining understanding of nuclear weapons primaries. The only alternatives mentioned are to build the Contained Firing Facility (CFF) or to not build it. DARHT is considered a fait accompli, and it is claimed that DARHT construction will not affect any subsequent DOE hydrotesting decision.

6/40.43

> For the purposes of this PEIS, DOE includes DARHT as an existing facility at LANL because DOE has reached an independent decision to construct and operate the facility. (3-17)

The decision to build DARHT is premature, as it has been done without analysis of reasonable alternatives. It is to avoid such a prejudicial "independent decision" that programmatic analysis is required. And such a "decision" is not an adequate basis to exclude DARHT from active analysis in the PEIS, either to reconsider the advisability of DARHT (taken as a whole or considering portions, such as the second axis, only) in light of other contemporaneous hydrotesting upgrades, or to reconsider the advisability of the other hydrotesting projects in light of DARHT.

Many alternatives are open to the DOE to maintain an adequate hydrodynamic testing capability. Instead of comparing these against each other, DOE is already proceeding in parallel with all of them, with the single exception of the environmental enclosure for LLNL's FXR facility (i.e. the CFF), and DOE has the gall to lump all of this ongoing work, amounting to more than $200 M in construction costs, under the "no action" alternative.

Under the mis-named "no action" alternative, DOE is:

- Maintaining PHERMEX
- Upgrading PHERMEX to double-pulse with a new detection system

6/40.43 continued

- Maintaining FXR, recently the subject of a major upgrade and renovation
- Establishing double-pulse capability at FXR
- Completing BEEF at NTS
- Completing DARHT with both axes and committing to phased containment
- Completing LYNER

Thus, under DOE's "no action" alternative, major new capabilities are now being installed at four different hydrotesting machines at three different sites, not counting LYNER. The single so-called "programmatic" alternative being provided is nothing more than an environmental mitigation measure at one of these facilities.

In addition, the so-called "next generation" Advanced Hydrotest Facility (AHF), considered by DOE to be too far in the future to analyze, has been funded by DOE since FY95. DOE is already investing funds (CBR pp. 25, 76ff) in a facility it claims it cannot programmatically analyze (p. 3-21) because its design is not yet fixed. In fact, conducting "detailed environmental impact analysis" is not the point of a PEIS. Those detailed analyses are conducted in EISs that follow a PEIS. Thus the "no action" alternative actually contains significant programmatic commitment to the next generation hydrodynamic testing facility.

7/40.36

There has likewise been no programmatic analysis of alternatives for retaining knowledge of secondary physics. DOE proposes to build NIF and Atlas, but does not mention why this is necessary, particularly given the remarks of Sakharov cited in Kidder's 1987 paper--that secondary function can be established simply by scaling. We know the computational resources he had available! The DOE's own surveillance data, together with the yield data compiled by Kidder in 1987, likewise suggest that secondary function is not an issue.

Once again, this bears spelling out a little, at the risk of repetition. The relative simplicity and high reliability of the physics package has already been discussed above. Within the nuclear explosive in turn, the secondary has been the most reliable part, having experienced only one or two trivial problems that were very easily fixed. These secondaries are sealed and have no high explosives in them. They have a long life, and are relatively inexpensive to remanufacture as needed. The U.S. now possesses an enormous manufacturing overcapacity in this area, which can be maintained in a standby condition at "minimal" cost.*

These facts are important because the contribution of NIF and Atlas to the stockpile stewardship program lie in their alleged role in studying nuclear weapons secondaries--components which have had essentially no problems and need little study. If there were problems in the future (which is not expected), NIF and Atlas could not really discover or solve them in any case. Those are tasks for routine surveillance and remanufacturing, which are necessary and sufficient, as well as far simpler and cheaper.

*See DOE, 1996, "Draft Stockpile Management Preferred Alternatives Report," p. 17.

7/40.36 continued

NIF's (and Atlas') link to stockpile maintenance is thus indirect, through its role in maintaining and training staff. The actual data it would provide is admitted to be far secondary, if relevant at all.

The DOE has omitted any mention, or programmatic/environmental analysis of, the OMEGA laser at U. of Rochester, (p. 174, CBR), or the Nike laser at NRL.

8/41.17

In the realm of weapons effects testing, DOE's "no action" SS alternative appears (I have been told) to include ongoing work on SNL's X-1 facility. I have not had time to investigate this, but we see in the CBR, p. 67, that modification of PBFA-II is to be completed, and "advanced pulsed power" will continue.

5/41.18 continued

DOE's "no action" alternative also apparently includes the fait accompli decision to modify LANL's LAMPF facility into LANSCE (transferred to DP in FY96; see p. 80, CBR). This is a $783 M project (LANL FY1996-2001 Institutional Plan, p. 83).

DOE's "no action" alternative likewise apparently includes its Nuclear Weapons RD&T Facilities Revitalization, Phase II, Various Locations project, (CBR, p. 165ff), including (highlights only):

- 01-Integrated Materials Research Laboratory, SNL/NM
- 02-Defense Engineering Laboratory, SNL/CA
- 03-Advanced Technology Laboratory, NTS
- 06-Nuclear Test Technology Complex, LLNL
- 07-Materials Science Laboratory, LANL
- 08-Explosive Components Facility, SNL/NM
- 11-Defense Programs Research Facility, LLNL

Thus the "no action" alternative effectively embraces most of the DOE's actual proposed SS program, even just looking a new construction. When operations are included—which are probably responsible for most of the environmental impacts in the SS program—the "no action" alternative looms even bigger.

5. <u>The Department has not considered, programmatically, the degree to which some of its existing programs may substitute for new construction.</u>

ASCI (FY96 $85M, FY97 $122M requested; CBR p.44) and the Enhanced Surveillance Program should be evaluated in this light.

6. <u>DOE is already building, prejudicially, stockpile management facilities.</u>

These include the CMR Upgrades at LANL (CBR p. 137ff); PETL at SNL (CBR p. 121ff). "Stockpile Management Restructuring Initiative—Pit Component Fabrication Capacity/LANL" (CBR p. 207; p. 213 says this program began in FY95 at the latest, is now [FY96] funded, and

5/41.18 continued

is requested to be funded in FY97); and, I believe, other facilities for which time is too limited to research

This must conclude my comments at this time. Obviously, they are incomplete. Were sickness not an issue, I would still be wondering if this EIS was worth any further investment of time, given its fundamentally flawed character. Please withdraw it and start again. If you give me a decent document I will give you more thorough comments.

Sincerely,

Greg Mello

Greg Mello, Director

SSM-F-015 COMMENT LETTER

REVIEW COMMENTS
STOCKPILE STEWARDSHIP AND MANAGEMENT
DRAFT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT (EIS)
TEXAS NATURAL RESOURCE CONSERVATION COMMISSION (TNRCC)
OFFICE OF WASTE MANAGEMENT
April 30, 1996

1/11.35 The TNRCC believes that, contrary to the statement in Section E.3.1, page E-13, exposure to hazardous chemical releases to surface water, groundwater, and soils should be included when assessing the risk to the public and site workers. Although waste management performance has greatly improved at Pantex and is expected to continue, past experience indicates that hazardous constituents can be released to the environment. In addition, wastewater discharges to the ditches and playas can be expected to contain some contaminants, even if they are at permitted levels.

2/11.41 It is not readily apparent whether DOE's risk assessment includes those hazardous constituents that do not meet the narrow definition of hazardous waste under RCRA or toxic substances under TSCA. As an example, hazardous wastes destined for the wastewater treatment plant are pretreated before reaching the wastewater treatment plant. After pretreatment, DOE considers the constituents remaining in the wastewater stream to be non-hazardous and, as defined in Table H.1.1-1, page H-2, without a defined health risk. Although the definition of hazardous vs. non-hazardous may be technically correct from a RCRA waste management perspective, the constituents still pose a degree of risk that should be taken into account. In a broader sense, it would be appropriate for DOE to consider the risk posed to human health and the environment by what DOE defines as non-hazardous waste constituents.

3/40.61 The TNRCC also suggests that DOE provide a definition of hazardous chemicals in the glossary or possibly use the term "hazardous substances".

4/11.36 The TNRCC is concerned that the Hazard Indexes and Total Cancer Risk provided for the Phaseout Alternative at Pantex (Table E.3.4-12) are not properly evaluated. The risks for the phaseout of Pantex are lower than the risks cited for the other programmatic alternatives, with the exception of the Assembly/Disassembly and High Explosives Fabrication Alternative, which essentially equal the risks of the phase-out alternative. However, the amounts of hazardous and mixed low-level waste generated during phaseout of Pantex are anticipated to be a hundred to a thousand times greater than the other alternatives (Tables 4.5.3.10-2 and 4.5.3.10-3). The TNRCC suspects that the risk from hazardous substance exposure during the phaseout of Pantex would be greater than all the other alternatives. The discrepancy may be due to the fact that the wastes generated during the phaseout process will occur over a six year period, while the risks for the other alternatives are modeled over a 25 year period.

Page 4-220 of the EIS states that no hazardous chemical emissions are anticipated for the phaseout alternative at Pantex and that the hazard index and cancer risk for the public and onsite workers would be zero. The TNRCC believes that it is more reasonable to assume that some exposure will occur during a phaseout of Pantex when over 6 million cubic meters of waste is generated.

If you have any questions regarding these comments, please contact Mr. Geoffrey Meyer, Industrial and Hazardous Waste Division, Federal Facilities Team, at (512) 239-2577.

SSM-F-016 COMMENT LETTER

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: JEFFREY M.I.: R Last Name: SEIPPAWEN

Street Address: 22 CAMINO CERRO CHATO

Street Address 2:

City: CERRILLOS State: NM Zip Code: 87010-

Organization:

Telephone: Fax:

Comments:

LOOKING OUT MY WINDOW TOWARD THE JEMEZ MTS. WHICH SURROUND LOS ALAMOS A CLOUD OF SMOKE ERUPTS INTO THE SKY. "JUST A FOREST FIRE." BUT AFTER THE DOE "MEETING" IN SANTA FE 4-25-96 IT IS A POIGNANT REMINDER OF WHAT LOS ALAMOS IS ALL ABOUT.

1/40.06 THE U.S. NUCLEAR ARSENAL IS LARGER THAN NEEDED TO KILL OUR FOES. WE (THE CITIZENS TAXPAYERS WHO FUND SUCH HORROR) ARE TOLD THAT THIS ARSENAL IS KEPT AS A DETERRENT TO WAR. KOREA, VIETNAM, DESERT STORM TO BOSNIA, NUCLEAR ARSENALS DO NOT DETER WAR AND I'M SORRY THAT OUR TALENTED SCIENTISTS ARE KEPT BUSY POLISHING THE SWORD AND NOT FREE TO USE THEIR MINDS TO PURSUE MORE POSITIVE GOALS. HAVING LIVED ABROAD AND SEEN THE U.S. OBJECTIVELY OUTSIDE OF THE U.S. MEDIA WHICH LOOKS NOT TO THE REST OF THE WORLD AS COMMUNITY, I MUST AGAIN →

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us

Date of Receipt: Receiver's Initials:

SSM-F-016
COMMENT LETTER

PAGE 2 OF 2

Comments (cont'd):

1/40.06 continued

CONSIDER MOVING ABROAD SINCE MY CONSCIENCE CANNOT EASILY ACCEPT SUPPORTING A COUNTRY THAT IS BUILT ON ETHNIC CLEANSING OF THE NATIVE AMERICANS AND CONTINUES TO PROMOTE DEATH (U.S. WEAPON SALES) AND POISON THE VERY LAND (ROCKY FLATS, LOS ALAMOS, WIPP?) THAT IT'S SUPPOSED TO PROTECT.

PLEASE MRS. O'LEARY AND PRESIDENT CLINTON, STOP THIS MADNESS.

IF ANYONE SHOULD ACTUALLY READ THIS LETTER PLEASE SEND ME A NOTE WITH SOME TYPE OF HUMAN MARK ON IT.

REGARDS,

[signature]

A POSSIBLE POLITICAL REFUGEE FROM NUCLEAR AMERICA

SSM-F-017
COMMENT LETTER

PAGE 1 OF 4

To Whom it May Concern
(1-800-820-5156)

May 6, 1996

From L.B. Thomas *LT*
3409 Pickard Ave, NE
Albuquerque, NM 87110

Subject: Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management Comments

I wish to present the following comments:

1/40.74 — 1) The Purpose and Need on page 2-7 should include the new mission of recertifying dispositioned HEU and Pu.

2/40.23 — 2) Like WIPP support functions of DOE management, SSM research and development should be moved to where assembly and storage occur. DOE is not following its own procedure and principles found in DOE Order 5480.19. Support functions like research and design are not line functions. Therefore the labs should be moved to the line. What part of DOE Order 5480.19 authorizes separating assembly and research facilities. Recommend relocating labs to Amarillo or change 5480.19.

1/40.74 continued — 3) Should the Industrial Base on page 2-8 include a mission for recertifying non-fissile materials placed into storage and disposition? Please also address comments sent to S & D PEIS.

3/40.32 — 4) Did DOE consider under the Nonproliferation mantle which facilities or sites pose the least security risk? Why isn't security capabilities addressed in infrastructure impact analysis. DOE should consider redoing infrastructure analysis to include security capabilities. If LANL has a bad record like the apparent security breach that helped the Russians develop their first weapon, why doesn't DOE consider an alternative site where security is taken seriously?

1/40.74 continued — 5) Stockpile management on page 3-23 should include recertification of Pu and HEU?

4/40.52 — 6) Why isn't Pit Reuse Facility at Pantex included as a reasonably foreseeable activity.

5/10.21 — 7) On page 3-84 second column, second paragraph-Based on the discussion of reduced scrap, waste, and residue, is Pu and HEU pits, scrap, materials, and residue placed into storage a solid waste?

6/10.28 — 8) Further on page 3-84, second column, third paragraph-Pu is a hazardous waste or at least a hazardous residue. Question-When does Pu and HEU meet the definition of a solid waste? This section clearly makes the argument that machining and processing residues are a solid waste. Question-is stored Pu and HEU in any form a solid waste as defined under RCRA? Please provide independent confirmation of this issue by EPA and the US Justice Dept.

7/10.17 — 9) Further on page 3-85, column one, paragraph two-HEU machining scrap is recycled. Is it not true that recycled materials are defined as a "solid waste?" What is DOE's legal interpretation of their statement and the definition of "recycled?" Does EPA and US Justice Dept concur? If I machined lead (Pb) are the residuals a hazardous waste?

10) Page 3-85, column one paragraph two-What is meant by the term "residue production?" Isn't it DOE's policy to prevent and minimize residue not produce it?

1

Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management Comments

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COMMENT LETTER

PAGE 2 OF 4

1/40.74 continued

11) Section 3.5.4. Why are explosive materials disposed but Pu and HEU are dispositioned? If a pit and Pu/HEU residue is classified and thus dispositioned why would HE that is classified is disposed?

12) Further section 3.5.4. Why is classified HE potentially part of an "alternative disposal technologies"? Why not "alternative disposition technologies"?

13) Further-What is excess explosive materials? What is the difference between excess explosive materials and surplused Pu and HEU? What is the difference between surplused Pu and HEU and lead-acid batteries accumulated speculatively?

8/10.18

14) Page 3-88 column two, paragraph 2. "Both sites have adequate waste management facilities to treat, store, and/or dispose..." Is this true? I thought NTS mixed waste disposal was limited to ER activities from certain projects? Is there mixed waste disposal for operational wastestreams? At Pantex, is it not true that they are planning to treat mixed waste but currently have limited disposal? How many offsite disposal shipments have they done since 1984? 1976?

9/11.33

15) Page 3-88 column one, paragraph two-"Worker exposure to radiation is expected to be about equal." Question is it reasonable to believe NTS workers might receive higher doses for several years because of the lack of experience compared to Pantex workers? I realize that the workers at NTS receive training but nothing replaces actual experience. DOE should consider a learning curve at NTS.

10/30.04

16) Page 3-89 column one paragraph one. Should it read "in the unlikely event?"

3/40.32 continued

17) Page 4-2 section 4.1.2 Since nonproliferation is so important should not infrastructure evaluate the security capabilities of the sites with a key element being the quantity security breaches over the last ten years? Aren't there comparisions and assessments of each sites capabilities. The decision maker should know which sites are truly meeting the expectation of nonproliferation. Sites that are lacking should not be considered for more work.

11/11.34

18) Page 4-9 Hazardous Chemical Impacts. Why was CERCLA guidance used? Isn't CERCLA guidance based on NIOSH information? Do not believe the CERCLA guidance bounds the issue because the higher risk occupations would not be covered such as medical personnel, fire fighters, radiation workers, HE workers, roofers, machine operators, security personnel, etc.

12/10.19

19) Section 4.1.10 Is it prudent to include waste minimization in the analysis? The impact assessment is reduced and does not bound the impacts.

13/40.21

20) Page A-38 Env. Reg Setting According to this page DOE is in compliance with all requirements. "All" is unlikely. Reword.

14/43.02

21) Global comment. Why are all DOE's really bad Superfund sites called a National Environmental Research Park (NERP)? DOE should change it to National Environmental Research Disaster Site (NERDS). Is DOE upset that Love Canal, probably the most notorious Superfund site, has cornered the word love. I'll bet the public relation guys in DOE worked really hard on this one. I wonder which definition of park is being used-my vote is for a place of ground... for ornament and recreation.

1/40.74 continued

22) Page A-40, should considered adding a sixth mission surveillance and recertification of Pu and HEU reserves.

15/10.20

23) Page A-51 Is an unusable part a waste? Is sanitize and demilitarize a treatment process? Please describe what sanitize and demilitarize mean. What are these processes and their purpose? Is an unusable part in-herently waste like?

2

Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management Comments

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PAGE 3 OF 4

16/40.75

24) Page A-56 Based on the estimate of 200 weapon parts per weapon how many parts are backlogged waiting for sanitization and demilitarization. If a backlog exists, what are the impacts of downsizing, relocating, no action, etc on this backlog. Since nonproliferation is so important who is responsible for sanitization and demilitarization? Why isn't this discussed in infrastructure? Why aren't the impacts assessed? What is the through put capacity of sanitization and demilitarization for each of the 200 estimated parts? Are these processes readily available at other sites? Has DOE considered this nonproliferation capability in selecting alternatives?

15/10.20 continued

25) What is the expected timeframe for the sanitization and demilitarization of all qualified HE? What processes are used? Are these considered in selecting alternatives?

26) If NTS is selected to do A/D, would Pantex finish backlog of sanitization and demilitarization or NTS. Have the impacts been analyzed?

27) If LANL or LLNL is selected to do HE, would Pantex finish backlog of sanitization and demilitarization or LANL/LLNL. Have the impacts been analyzed?

17/30.05

28) Table A.3.1.1-1 Should include a Burning Ground?

29) Table A.3.1.1-1 Where are the sanitization and demilitarization facilities? Where are the waste management facilities?

16/40.75 continued

30) Figure A.3.1.1-5 The figure shows classified waste being sent to sanitization? I thought classified stuff are sent to sanitization before becoming a waste? Is sanitizing a RCRA treatment? So classified waste (parts) are a solid waste? In figure A.3.1.1-5 Bulk HE wastes go to explosives waste treatment and then classified parts go to sanitization and demilitarization. So classified parts are solid waste?

31) Figure A.3.1.1-5 Where are the exit arrows for sanitization and demilitarization? Recommend using arrows in both direction that way the classified waste is in a constant state of movement without revealing its true nature or secrets.

5/10.21 continued

32) Since nonproliferation is so important why aren't sanitization and demilitarization capabilities discussed?

33) On page A-93 Classified wastes enter a declassification step resulting in classified and unclassified waste. What does this mean? Is DOE stating that some materials will be classified no matter what physical or administrative action occurs? So when does stored Pu and HEU become a "solid waste."

34) Figure A.3.3-1 shows nonnuclear parts become waste without further processing. If classified nonnuclear parts become waste, why isn't Pu and HEU surplused a "solid waste"?

15/10.20 continued

35) Figure A.3.3.1-3 solid waste enters the flow diagram activities including classified shapes to which some solid waste enters the sanitizing process and solid waste exits. What is the difference between storage of Pu and HEU as classified material (especially surplused material) and solid waste in a classified shape?

36) Table A.3.5.1-2, where are sanitization and demilitarization facilities? Is the Burning Ground limited to explosive disposal? Does it complete sanitization and demilitarization through open burning? Doesn't RCRA define materials are solid waste if they are abandoned by being: burned or incinerated; or accumulated, stored, ... in lieu of being abandoned by being disposed of, burned, or incinerated?

37) Page A-131 (missing the number) second column paragraph one. According to the above mentioned figures explosive components are solid waste. Where does treatment and disposal fit into demilitarization, sanitization, and disposition?

3

Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management Comments

SSM-F-017
COMMENT LETTER

PAGE 4 OF 4

	38) Page A-163 second column, paragraph 1. Why isn't recycling scrap HE a waste? Both recycle and scrap are clearly associated with solid waste definition in 40 CFR 261. Under what solid waste exclusion in 40 CFR 261 does DOE claim?
18/10.22	39) Page A-163 second column paragraph three and five. HE-contaminated process water is not a waste but in paragraph five HE-contaminated process water is collected in tanks and then treated with activated carbon filters. Do you mean filtered? You treat waste and filter process water-right? Also change waste minimization and recycle to pollution prevention. Technically speaking you can't minimize or recycle a material that is not a waste.
	40) Page A-177 same comments as #39.
	41) Page B-1 4.X.2.3 and 4.X.3.3?
19/03.02	42) Page B-1 Please include a statement on the level of QA supporting Air Quality. Please provide a signature verifying the statement.
	43) Please extend the comment period. These documents are to long and difficult for such a short period.
20/41.14	44) Please send me a copy of the Final.

SSM-F-018
COMMENT LETTER

PAGE 1 OF 3

THOMAS R. ADAMS
ANN BROADWELL
DANIEL L. CARDOZO
MARC D. JOSEPH
LIZANNE REYNOLDS

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FACSIMILE TRANSMISSION SHEET

Please deliver the following pages to:

NAME: U.S. Department of Energy
COMPANY: Office of Reconfiguration
FAX NO.: 703/931-9222

FROM: Thomas R. Adams DATE/TIME: May 7, 1996/2:47pm

MAILED COPY TO FOLLOW: Yes PAGES TRANSMITTED INCLUDING THIS PAGE: 3

DESCRIPTION OF TRANSMITTED DOCUMENT: Letter to U.S. Department of Energy from Adams dated 5/7/96 re Draft PEIS for Stockpile Stewardship & Management (DOE/EIS-0236)

REMARKS: cc: Doyle Williams

If you do not receive all of the pages, please call us back as soon as possible at 415/589-1660 and ask for Bonnie Heeley

SSM-F-018
COMMENT LETTER **PAGE 2 OF 3**

ADAMS & BROADWELL

ATTORNEYS AT LAW

May 7, 1996

VIA FACSIMILE

U.S. Department of Energy
Office of Reconfiguration
P.O. Box 3417
Alexandria, VA 22302

Re: Draft PEIS for Stockpile Stewardship & Management (DOE/EIS-0236)

Dear Sir or Madam:

These comments are submitted on behalf of Plumbers and Steamfitters Local 342 of Concord, California.

1/21.06 Local 342 supports construction of the National Ignition Facility at Lawrence Livermore National Laboratory. This project will achieve significant national and international goals with respect to Stockpile stewardship that are essential to continued national security as well as safety of the Stockpile.

As a matter of allocating its resources, Local 342 has focused its review on the site specific analysis of construction and operation of the NIF at LLNL. Local 342 believes that this analysis of environmental impacts fairly and adequately presents information which, together with the comments on this draft and the responses thereto, can support a federal decision to proceed with the NIF at LLNL.

As presented in the Draft PEIS, the adverse impacts at this site are generally not significant. In fact, the LLNL site offers many advantages for the NIF.

2/21.18 Particular care, however, should be taken with respect to compliance with both state and federal air quality standards.

A1342.001

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COMMENT LETTER **PAGE 3 OF 3**

U.S.DOE
May 7, 1996
Page 2

2/21.18 continued This facility may contribute to exceedances of state standards for PM_{10} and VOC emissions. As the Draft PEIS notes, the San Francisco Bay Area generally enjoys good air quality; and Local 342 believes that complying with air quality standards will help sustain economic growth and vitality in the region. Consequently, Local 342 recommends that the NIF obtain offsets to mitigate its emissions of PM_{10} and VOC from operation of the Facility. These offsets should be provided as a matter of comity even if they are not legally mandated.

Thank you for your consideration of these comments.

Very truly yours,

Thomas R. Adams

TRA:bh

cc: Doyle Williams
Business Manager

SSM-F-019
COMMENT LETTER

PAGE 1 OF 1

2237 Peachtree Street
Amarillo, Texas 79109
May 7, 1996

U.S. Department of Energy
Office of Reconfiguration—Attn. SSM PEIS
P.O. Box 3417
Alexandria, VA 22302
FAX 703-931-9222

Dear U. S. Department of Energy:

1/40.84 Thank you for providing the public with the opportunity to respond with comments concerning the DPEIS for the nuclear Stockpile Stewardship and Management Program. I would like to say, with due respect, that I found the Document unclear in presenting what the intended aims and plans are that are being proposed for our Panhandle area. For that reason, it has seemed difficult to comment with detail; however, some points stand out. I would hope that all options will be considered to insure the safety and well-being of persons and environment in this country and elsewhere. It appears that smaller stockpiles are needed now than have been needed in the past. This would indicate that the Government could concentrate on cleaning up nuclear waste generated from past operations, and the research that would show the best determinations for the nuclear waste. Problems go unsolved, as is universally recognized. Many people feel that the best determination for these untenable waste situations is to conduct serious research at the sites where the waste is now located. Rocky Flats is one of these major sites.

2/42.06 Amarillo citizens are aware, from newspaper articles and other public informations sources, that Coloradoans face a major environmental disaster from the storage of excess plutonium and other nuclear wastes at Rocky Flats, and from run-off from Martin-Marietta and from the Arsenal in different areas close to Denver. Amarillo citizens do not want plutonium problems.

3/40.07 There is also concern that proliferation of weapons sends the wrong message to other countries, when we are encouraging all to downsize their stockpiles. This has been much in the news lately. I personally feel that waste generation is a threat to all of us, beyond the weapons threat. United States citizens are so grateful to see a diminishing of the need for nuclear weapons stockpiles, and we would also like to see further effort at protecting our national resources such

4/04.05 as the Ogallala Aquifer, the largest freshwater aquifer in the U.S. Our agricultural land is also of the scope to be important in world economy. These things are of the scope to come in to consideration in a plan such as the DPEIS for Stockpile Stewardship and Management.

Many considerations may play into the final document for this Program. I hope that the exigencies of time do not unduly force the Department of Energy to overlook or ignore factors which are important to the well-being of U. S. citizens. Unwise use of funds should not threaten things which are important in the long run. A conservative approach to use of funds can be a key to conserving resources as well. Thank you for accepting our comments. Other countries have pledged not to develop nuclear weapons in response to a perceived conservative stockpile policy

2/42.06 continued on our part. I hope particularly, that we can intelligently find solutions to the excess plutonium and other hazardous materials problems that we have now, without moving the plutonium about and further complicating clean-up considerations.

Thank you,
Mary L. Shennum

SSM-F-020
COMMENT LETTER

PAGE 1 OF 8

STATE OF CALIFORNIA—THE RESOURCES AGENCY PETE WILSON, Governor
CALIFORNIA ENERGY COMMISSION
1516 NINTH STREET
SACRAMENTO, CA 95814-5512

May 6, 1996

Mr. Jay Rose
Office Reconfiguration
U.S. Department of Energy
P.O. Box 3417
Alexandria, VA 22302

Re: COMMENTS ON DOE'S DRAFT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT FOR STOCKPILE STEWARDSHIP AND MANAGEMENT (DOE/EIS 0236) (February 1996)

We have reviewed the US Department of Energy's (DOE) Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management (DEIS). The California Energy Commission is one of the agencies (along with the Department of Health Services, the Highway Patrol, the Office of Emergency Services, and Department of Transportation) responsible for developing policy on the state's nuclear waste activities. As such, we have provided comments on earlier DOE nuclear waste transport proposals.

DOE has identified in this EIS the preferred alternatives of: constructing and operating the National Ignition Facility (NIF) and the Contained Firing Facility (CFF) at the Lawrence Livermore National Laboratory (LLNL) in California. The NIF project, which would allow the study of radiation physics in the laboratory under conditions approximating a thermonuclear detonation, would generate low-level, mixed, and hazardous waste during operation. In addition, as part of the Stockpile Stewardship and Management proposal, LLNL is being considered for Secondary and Case Fabrication, which currently is performed at Oak Ridge and involves uranium processing to provide finished uranium parts and products, High Explosives (HE) fabrication (Pantex currently manufactures HE components and may be downsized), and nonnuclear fabrication. LLNL is also a candidate site for a waste treatment and disposal facility as described in DOE's Waste Management Programmatic EIS (WM EIS). Under the latter proposal, LLNL would treat and dispose onsite its own low-level and low-level mixed waste, as well as wastes from offsite. DOE, as part of the DEIS on Stockpile Stewardship and Management, is also considering relocating the weapons assembly/disassembly function (retired weapons dismantled, nuclear components and nonnuclear components assembled into nuclear weapons, and weapons surveillance) to the Nevada Test Site, which, depending on routes, could impact California.

1/10.12 Clearly, these combined activities will have a significant impact on the numbers and quantities of nuclear and hazardous materials and wastes moved in and out of the LLNL site and to and from the Nevada Test Site. The large number of nuclear waste shipments anticipated in the WM EIS and the DEIS for Stockpile Stewardship and Management, combined with waste shipments from other DOE proposed activities at LLNL, including environmental restoration activities, would be unprecedented. The cumulative transport and waste management impacts of these combined proposed actions must be considered in any decisions regarding future activities at LLNL.

Mr. Rose
May 6, 1996
Page 2

2/09.08 It is essential that transport issues be addressed in a thorough and timely manner prior to shipment, that DOE work closely with corridor states impacted by these shipments to develop transport plans and emergency response preparedness, and that DOE's waste treatment and disposal facilities be sited in areas that minimize public risk.

Our comments on the Draft Programmatic EIS for Stockpile Stewardship and Management are enclosed.

Sincerely,

Barbara Byron
Nuclear Issues Coordinator

H. Daniel Nix
Deputy Director

Enclosure: 1

Comments on the

US DEPARTMENT OF ENERGY'S
DRAFT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT
FOR STOCKPILE STEWARDSHIP AND MANAGEMENT (DOE/EIS-0236)
FEBRUARY 1996

May 1996

The State of California has provided comments on nuclear waste transportation impacts considered in various DOE environmental assessment and impact statements. These include environmental impacts pertaining to the U.S. Foreign Research Reactor Spent Nuclear Fuel Program, the Lawrence Livermore National Laboratory, the Waste Isolation Pilot Plant, and DOE's Programmatic Environmental Impact Statement for Managing Treatment, Storage and Disposal of Radioactive and Hazardous Waste.

2/09.08 continued

Over the last decade, we have raised a number of concerns regarding transuranic waste shipments in California including: (1) transuranic shipment routes in California traverse densely populated areas, including the Los Angeles Basin, that are subject to long delays and congestion; (2) DOE has used outdated packaging for transuranic waste shipments in California that provide far less protection than the double-contained TRUPACT II planned for shipments to the Waste Isolation Pilot Plant in New Mexico; (3) emergency response capability to handle a potential accident involving transuranic materials needs improving; and (4) DOE needs to provide the State with accurate, reliable information on planned transuranic waste shipments and provide adequate lead time for emergency response preparation. Similar concerns regarding routing, packaging, emergency response preparedness, and need for shipment information also apply to the radioactive shipments described in DOE's Draft Programmatic EIS for Waste Management (DOE/EIS-0200-D) and the Draft Programmatic EIS for Stockpile Stewardship and Management (DOE/EIS-0236). State involvement in federal nuclear transportation planning is essential to provide the public with assurance that DOE's transportation programs are designed in a safe manner and that public safety concerns are addressed in connection with actions pertaining to DOE's programmatic goals.

Recommendation 1: DOE should: (a) directly involve corridor states and tribes in preparing for large quantity radioactive material shipments associated with DOE's Stockpile Stewardship and Management program and other DOE programs; this would include developing rail and truck transport plans, preferred routes, and procedures prior to shipment (similar to that developed by DOE and the Western Governors' Association for transuranic waste shipments to WIPP); (b) use only shipping containers that can be manufactured to meet current federal transport safety requirements; and, (c) provide accurate projected shipment information (quantities, schedules), as well as necessary assistance and lead time for state emergency response preparation.
Waste Management

Waste Management

DOE's proposal [under the Waste Management Programmatic EIS (WM EIS)] to site a low-level (LLW) and low-level mixed waste (LLMW) treatment and disposal facility at LLNL is included in the No-Action alternative in the cumulative waste management impact evaluation of this DEIS. In effect, this DEIS assumes that LLNL would become a LLW and LLMW permanent disposal site. However, there is absolutely no basis upon which to make this conclusion. By including the LLW and LLMW from the proposed treatment and disposal facility at LLNL in the No Action Alternative, the Draft EIS underestimates the cumulative impacts of the proposed alternatives. The waste management cumulative impacts for the Stockpile Stewardship and Management alternatives at the Livermore site, shown on p. 4-550, are, therefore, misleading since they show very little change over the No Action Alternative.

1/10.12 continued

Recommendation 2: The No Action Alternative in the DEIS' estimates of cumulative waste impacts should use current waste generation annual rates at LLNL, not waste generation rates from a non-existent waste treatment and disposal facility at LLNL.

The DEIS states that LLW is packaged in approved waste containers and transported for staging onsite, pending shipment to the Livermore site or shipment directly to the Nevada Test Site (NTS) for disposal (P. 4-345). Mixed wastes generated by Site 300 are currently stored and will be stored at LLNL until DOE-approved disposal options are available (p. 4-346). It is our understanding that the NTS is not available for LLW or LLMW disposal from LLNL. What are LLNL's options for waste disposal should NTS not become available for receiving these wastes and should the LLW and LLMW treatment and disposal facility at LLNL not be approved?

Recommendation 3: The DEIS should state what options are available for LLW and LLMW disposal in the event that NTS and the proposed LLW/LLMW Treatment and Disposal Facility at LLNL are not available.

The DEIS estimates the annual generated waste volumes for Stockpile Stewardship and Management Alternatives at LLNL as: Low Level Liquid Waste would increase from 181 cubic meters to 287 cubic meters (an increase of 106 cubic meters); low-level solid wastes would increase from 307 to 680 cubic meters (+373); mixed low-level liquid wastes would increase from 20 to 32 cubic meters (+12); hazardous liquid wastes would increase from 342 to 892 cubic meters (+550); and hazardous solid wastes would increase from 237 to 263 cubic meters (+26). These are significant increases in the total amount of nuclear and hazardous wastes generated at LLNL.

Nuclear waste has been accumulating onsite at LLNL, pending DOE securing a means of disposing of this waste. DOE's proposal to construct new facilities at LLNL that would nearly double the current annual waste generation rates at LLNL would appear to be ill-advised without adequate identified means of treating and disposing of these wastes. Siting a new low-level waste and low-level mixed waste treatment and disposal facility at LLNL, as envisioned in the WM PEIS, is not an acceptable means of mitigating potential waste storage capacity impacts at

LLNL from the Stockpile Stewardship and Management program. LLNL has the highest health risk population (6,324,234) and the highest seismic risk of the sites considered in the WM EIS. In light of the high seismic risk at the LLNL site, high surrounding population density, LLNL's proximity to major drinking water sources (the South Bay Aqueduct, a branch of the California Aqueduct, is just south of the Livermore site), and the fact that both LLNL and Site 300 have been listed on the National Priorities List because of environmental contamination, the potential impacts from project proposals at LLNL must be carefully evaluated. DOE's proposal to site additional waste generating facilities at LLNL (including a waste treatment and disposal facility) that would result in a significant increase in the generation, handling, and transport of radioactive and hazardous wastes to and from LLNL would only compound existing problems and cannot be viewed as a solution.

Siting a low-level and low-level mixed waste treatment and disposal facility at LLNL is not an acceptable means for solving waste management problems at LLNL that may arise from the proposed actions. DOE's selection of LLNL as a candidate site for a LLW/LLMW treatment and disposal facility, despite LLNL having the highest offsite population density and being located in one of the most seismically active regions of the US, demands a critical review of DOE's site selection criteria

1/10.12 continued

Recommendation 4: DOE should reconsider its selection of LLNL as a candidate site for expanded Stockpile Stewardship and Management Alternatives that would significantly increase waste generation rates at LLNL and risk to the surrounding population.

DOE has stated that "radioactive and mixed waste shipments will increase significantly under the transportation requirements of corrective activities and environmental restoration programs at LLNL". (Briefing on LLNL's Five-Year Plan for Fiscal Years 1992–1996, August 22, 1990, WGA Transport Advisory Group Meeting with DOE at LLNL.) (Environmental restoration activities include facility cleanup, decommissioning, stabilizing contaminated soils, and exhuming buried drums of wastes.)

Recommendation 5: The Draft EIS' evaluation of cumulative impacts resulting from waste management and transport to and from DOE facilities should include an evaluation of environmental restoration-generated wastes.

LLNL has been criticized for its inadequate waste characterization procedures and handling of radioactive and hazardous wastes. A 1990 Tiger Team Assessment of LLNL operations found the systems were not in place to properly characterize the waste, and waste drums may not have contained what the labels identified; process records for containers of stored waste were not considered adequate for proper classification and management. Mischaracterization of waste could result in higher or lower radionuclide inventories than those used in transport risk assessments.

Recommendation 6: The DEIS should explain how transport and facility risk assessments take into consideration uncertainties and inaccuracies in waste characterization data and

1/10.12 continued

procedures. The DEIS should explain how potential human errors during waste handling and packaging will be minimized.

Impact on LLNL's Regional Economy

3/08.27

If the Secondary and Case Fabrication, High Explosives Fabrication, Nonnuclear Fabrication, National Ignition Facility Missions and Contained Firing Facility were all located at LLNL, the resulting benefits to the regional economy (changes in total employment and per capita income) is estimated by DOE to still be less than 1 percent. Given the additional radioactive and hazardous materials and wastes to be shipped to and from LLNL and handled at the facility, the projected increases in radiological risk to the public (albeit small, as estimated by DOE), how would the regional/State costs from these proposed actions be offset by benefits?

Recommendation 7: The DEIS should explain how regional/State economic costs resulting from the proposed action will be offset by benefits to the regional economy. The potential impact on the local economy of the public perception of increased public risk caused by the proposed activities should be evaluated.

Groundwater Quality

4/04.08

Maximum groundwater concentrations of gross alpha, nitrate/nitrite, trichloroethylene, and tritium exceeded water quality criteria/standards in 1993 (p. 4-325). VOCs have been detected in the onsite groundwater and in the area around the Livermore site. VOC-contaminated water is present under 85% of the Livermore site (p. 4-325). The contaminated plumes have migrated off site and one plume of tetrachloroethylene is migrating northwest at about 68.9 ft. per year. Three municipal supply wells located about 2.4 miles from the plume are potentially impacted (p. 4-327). Given current groundwater quality issues at LLNL, what measures are proposed to mitigate further groundwater contamination at LLNL resulting from the proposed actions?

Recommendation 8: The DEIS should describe in detail what measures are planned to limit further groundwater contamination at LLNL from the proposed actions.

Radiation Doses and Potential Risk to the Public

The radionuclides released from LLNL in 1994 are shown on p. 4-342. Releases prior to and since 1994 should also be provided. One year of data is insufficient in showing whether these values are truly representative or whether it was an unusual year.

5/11.15

Health risks to the surrounding population should weigh heavily in potential decisions regarding future activities at LLNL. For example, the DEIS states that, in the event of an accident involving High Explosives fabrication at LLNL, due to the higher population surrounding LLNL, public impacts could be higher at LLNL, compared to Los Alamos and Pantex (p. 5-37).

5/11.15 continued

Recommendation 9: The DEIS should provide at least 5-10 years of radionuclide releases from LLNL, including past accidental releases to the environment and their potential health impacts. Health risks to the surrounding population should be a key screening criteria used for siting new facilities in the DOE Weapons Complex.

The Radiation and Hazardous Chemical Environment Section 4.73.9 needs rewriting to provide a clear, more easily understood explanation of potential health impacts from the proposed alternatives. The DEIS states that the "HI for the public (1.12) narrowly exceeds the cumulative HQ screening level of 1.0 (the HI) as a result of the total emissions of over 100 of 130 hazardous chemicals listed in appendix table E.3.4-22 under the No Action alternative. Individual OSHA standards for specific effects were not necessarily exceeded. However, if reanalyzed according to organ/tissue specific effects (i.e., after second stage analysis), it is very likely that the HIs would prove acceptable. The cancer risks for the onsite worker (.00000179) narrowly exceed the EPA default values as a result of the emissions of 1,1-dichloroethylene, 1,4-dioxane, arsenic, benzene, cadmium, carbon tetrachloride, chloroform, chromium VI, epichlorohydrin, folpet, methylene chloride, nickel and trichloroethylene." (p. 4-374) This explanation and analysis is far from being readily understandable.

The DEIS states that operations under the "low case scenario" for secondary and case, High Explosives, and nonnuclear fabrication would not adversely affect the health impacts and cancer risks to the public and the onsite worker (p. 4-377). However, the DEIS further states that operations under the "high-case scenario" for secondary and case fabrication could result in up to a 2 to 4-fold increase in the emission of hazardous chemicals at LLNL and a substantial increase in the health impacts to the public. Cancer risks for the onsite worker were reported to already exceed the "EPA default value" and operations under the high-case scenario would further contribute to the adverse cancer risk impacts. What are the low-case and high-case scenarios? Are either of these scenarios envisioned in the proposed facilities at LLNL? What is the "EPA default value?" What is the significance of exceeding this value?

Similarly, the DEIS states that operations under the high-case scenario for High Explosives fabrication may result in a two-fold increase in the emission of hazardous chemicals from LLNL (p. 4-377) and raise the HI for the onsite worker, which already exceeds the "EPA default value", above the HQ screening level of 1.0. This section again needs to be more clearly written and the significance of these values and findings explained.

The DEIS states that the combined program health impacts for the public narrowly exceed the acceptable health regulatory level; this discussion is not clear since below this statement it states that the onsite worker health impacts and cancer risk to the public are within the acceptable regulatory levels, but that cancer risks to the onsite worker would remain above the EPA default value (p. 4-379).

Recommendation 10: The Draft EIS' discussion of potential health impacts from the

program alternatives is unclear and needs a better explanation of its findings and conclusions.

Accident History

5/11.15 continued

The DEIS says that there were no accidents at LLNL prior to 1960 with offsite impacts and that, since 1960, there have been a number of accidents that have resulted in offsite exposures (p. 4-344).

Recommendation 11: The DEIS should identify the accidents and provide estimated exposures resulting from these accidents and their potential impact to onsite workers and the public.

Characterization of Radioactive Material Shipments

The DEIS compares the percentage of radioactive packages shipped by DOE annually (6,200 radioactive packages) to the number of shipments made nationwide by all shippers (2.8 million packages). A more meaningful comparison would be the quantities (in terms of curie levels and volumes) shipped by DOE compared to other shippers. The majority of commercial shipments of radioactive materials are small quantity radiopharmaceuticals, whereas, most of the large quantity radioactive shipments that are projected or have been made in the past are by the Department of Energy. The DEIS should provide pertinent statistics about the projected increase in the number of shipments likely from the proposed action.

2/09.08 continued

Recommendation 12: The DEIS should quantify the number, volume, transport mode, and characteristics of radioactive materials being transported under the proposed alternatives relative to baseline shipments.

Comments of

SOUTHWESTERN PUBLIC SERVICE COMPANY

Amarillo, Texas

to

UNITED STATES DEPARTMENT OF ENERGY

Re: Drafts

Programmatic Environmental Impact Statement

for Stockpile Stewardship and Management, February 1996

Environmental Impact Statement

for Continued Operation of the Pantex Plant

and Associated Storage of Nuclear Weapon Components, March 1996

and

Storage and Disposition

of Weapons-Usable Fissile Materials, February 1996

May 7, 1996

Southwestern Public Service Company is the investor-owned electric energy provider to the Pantex Plant, near Amarillo, Texas, and to approximately 367,500 other customers (about one million persons) in the Panhandle and South Plains of Texas, eastern and southeastern New Mexico, the Oklahoma Panhandle, and southwestern Kansas. SPS through the past several years has been an attentive and active participant in United States Department of Energy public information/participation activities related to DOE nuclear complex planning.

1. SPS actively supports the interests of Pantex and Pantex employees -- so long as those interests are coincident with protection and improvement of environmental conditions in the Pantex region of influence and with prudent and rational national defense policies and strategies.

1/40.11

2. At this juncture in the proposed and appropriate downsizing of the nuclear complex, we again strongly encourage the Department and Administration to predicate all actions related to the nuclear complex on the conservative assumption that at least rogue-state or terroristic nuclear aggression against the United States is probable.

U.S. vigilance and nuclear preparedness are key to coexistence with mad nations and persons.

2/30.01

In turn, the Pantex Plant is, uniquely, a key to economically efficient continuing nuclear preparedness.

SPS's further comments today on the three major draft environmental impact statements under review intentionally are brief. We forego repetition of comments filed with the Department in the past, and concentrate on issues of particular relevance to appropriate future missions for Pantex:

3/40.52

3. Fundamental to DOE's further consideration of the roles Pantex should play relative to the changing missions of the nuclear complex is the unequivocal recognition that even accumulatively, there would be NO significant adverse environmental impacts from retention and potential expansion of the variety of missions possible for Pantex.

The summaries of the relevant draft EISs do not report this fundamental conclusion explicitly; rather, in some instances, the summaries misrepresent that conclusion, reporting, instead, effectively minuscule environmental potentialities that are characterized as "adverse" only because they do not equate to measurable "benefits." We suggest the rote language of EISs should be expended to recognize effectively neutral outcomes (not merely "beneficial" or "adverse" consequences).

However, the underlying draft statements themselves are conclusive in regards to the actual insignificance of "adverse" potential impacts of expanded missions at Pantex. Moreover, DOE and consultant representatives in public meetings in Amarillo publicly and explicitly acknowledged that fundamental conclusion (see, especially, transcript of April 23, 1996, morning discussions).

Because the Department, through its representatives in Amarillo on April 23, committed to highlighting, in the subject Final Environmental Impact Statements, this fundamental and irrefutable conclusion about the actual insignificance of any adverse environmental impacts of increased missions at Pantex, Southwestern will not enumerate and rebut the litany of potential environmental concerns reflected in the EISs.

4/42.10

5. (However, we do request that the Department include in the record "dockets" for these EISs the comments by SPS relative to listed potential environmental concerns recited in the draft Tritium Production-related EIS of 1995.

In those comments, SPS rebutted the overly sensitive, generally not really site-specific but knee-jerk and ill-informed, and frequently inaccurate characterizations of environmental "concerns" about expanded missions at Pantex. Clearly, those earlier characterizations of possibly "adverse" impacts, especially those related to uses of ground water, now are rejected by DOE. Nonetheless, a replete record supportive of the Department's April 23, 1996, publicly articulated conclusion that NO significant adverse impacts would result, is appropriate.)

2/30.01 continued

6. Southwestern endorses the Department's "preferred alternative" for continuing assembly, disassembly, and pit reuse functions at Pantex. This "preferred alternative" is environmentally sound, and economically appropriate. Transferring these functions to the Nevada Test Site would be highly questionable in both regards.

5/34.01

7. We strongly encourage the Department to retain high explosives functions at Pantex (rather than relocating those functions to Los Alamos and Lawrence Livermore labs). There would be negative environmental impacts, of course, associated with transfer of those functions to the labs – impacts related to construction and expansion of the labs' facilities, for instance. Those impacts would not occur at Pantex, where facilities already are available and in use for these very purposes. Additionally, there would be economic waste associated with such transfers; simply put, it would be more expensive – by DOE's estimate, $50 million more expensive – to move the functions than to retain them where they presently are performed.

Too, high explosives functions should be retained at Pantex because under the assembly/disassembly preferred alternative, Pantex would be required to continue to have high explosives capabilities sufficient to handle disposition and disposal of current inventories and those anticipated from near-term dismantling --

again, retaining the high explosives functions at the present site would eliminate the necessity of duplicating them elsewhere.

Finally, high explosives functions should be retained at Pantex because, should future need arise for new weapons production, it will be critical to have the high explosives facilities at the weapons production/assembly site -- which site, demonstrably, should be the Pantex site.

5/34.01 continued

8. The environmental and related socio-economic impacts of new storage and disposition functions at Pantex (as outlined in the Fissile Material programmatic EIS) certainly suggests Pantex in fact is the prime candidate for those functions -- especially the storage functions (both those related to reserve weapons grade plutonium and "excess" materials, for which Pantex already has facilities and demonstrated expertise).

Clearly, the facilities and expertise for storage are existent at Pantex: the site provides storage for over 6,500 pits, and has FONSI (Finding of No Significant Impact) authority to house 12,000 pits. With slight modifications, the site likely could "FONSI-out," following an environmental assessment for 20,000 pits. Equally clearly, Pantex is well prepared to store some 21.3 metric tons of the 38.2 tons of the nation's "excess" plutonium – the 21.3 tons are in place at Pantex now. Apparently, only slight expansion would be necessary to securely store the remainder.

3/40.52 continued

Fundamental to this conclusion, too, are the obvious synergies of collocation of assembly/disassembly activities with necessarily attendant, on-site storage.

In fact, as a result of the (altogether appropriate) decision to continue assembly *and disassembly* at Pantex, all plutonium functions, including storage and

3/40.52 continued

disposition, logically flow to Pantex. Incurring extraneous and unnecessary, and high, costs for redundant activities at separate sites would be imprudent.

2/30.01 continued

9. Pantex is the nation's premier nuclear complex production facility; it is imperative that the "production core competencies" presently at the site not be lost or diluted by transfer of management (or production) functions to the labs.

The Department indicates that "stewardship core competencies" must be preserved, perhaps at the laboratories – and the Department seems to indicate that may mean sacrificing "core production competencies" existent at Pantex. It would make better sense to maintain the stewardship competencies by visits or residency at Pantex, than to lose the production competencies that have evolved there.

Transferring assembly and disassembly functions to any site inexperienced in weapons production and, likely, incapable of significant weapons production, could prove disastrous should the need for an augmented nuclear arsenal arise (or when such need arises). Please, do not eliminate or significantly diminish our nation's most effective weapons production facility's competencies.

Relative to disposition alternatives, Southwestern Public Service Company notes that electric power and energy that could be used in immobilization and vitrification, or in processing for oxide fuel, would be priced very competitively at Pantex. (We refer the Department again to our comments, relative to electric supply and costs, in the Tritium Production EIS Inquiry.) We are confident that Southwestern's position as a low-cost producer will encourage the Department to choose Pantex as the most cost-effective site for disposition activities.

3/40.52 continued

10. DOE always should seek the most cost-efficient alternatives for the nuclear complex's operations. Generally, the most cost-efficient alternatives, rather

3/40.52 continued

related to capital investments, transportation, training, security, energy utilities, etc., will be those available to the nation at Pantex.

We request – we are tempted to demand – that fair and open cost comparisons among the alternative sites for each function be used in analyzing sites, and that such accountings be shared with the publics that have demonstrated interest in the nuclear complex.

11. Southwestern must specifically reject the conclusion in the Storage and Disposition draft EIS, under Phaseout, page S-21 (emphasis supplied), as it would apply to the Pantex region of influence: "All of the regional economic areas surrounding the DOE sites would experience a loss in employment with phaseout. However, *compared to total employment in these areas, the loss of jobs would have no or negligible impacts* at all the DOE sites."

6/08.25

In fact, the impact of Pantex employment in the region of influence is highly significant to the region. Measured in terms of total payroll, Pantex is by far the area's largest employer. The reasonable job multiplier developed by Dr. Ray Perryman at Southern Methodist University, a multiplier of 3.87, applied to the some 3,500 employees at Pantex, suggests the site is responsible for a total of over 13,500 jobs. *Employment related to Pantex represents over 12% of the jobs in the Amarillo metropolitan area.*

Incidentally, the three subject EISs inconsistently analyze the indirect jobs created in the region by Pantex employment: The site EIS assumes 1.65 indirect jobs for each job at Pantex; the stewardship and management EIS assumes 1.16; the storage and disposition EIS, 3.51 (by far, the most consistent with Dr. Perryman's, which is the same, regional-experience-based multiplier employed by the Amarillo Economic Development Commission).

6/08.25 continued

Certainly, we consider a potential 10% to 12% reduction in metro-area employment a major loss, and by no means a "negligible" concern. We strongly urge the Department to correct the socio-economic impact portions of all three EIS documents to accurately reflect the impact of Pantex employment in its region of influence.

3/40.52 continued

12. Unlike other nuclear complex sites, for instance the notorious Rocky Flats, Hanford, and Savannah River sites, and yes, Los Alamos, Pantex has not had radioactive materials contamination problems. The nuclear complex-related operations at Pantex, in fact, apparently are the best-managed, relative to protection of the environment, in the nuclear complex. Partially to reward the superior, environmentally benign, history of the site, and certainly to capitalize on superior environmental performance, the Department should retain and expand the technically competent operations at Pantex.

Public support for retention and expansion of the Pantex operations has been nurtured by the facility's performance over many decades. Just as the public here has respected that performance, so should the Department.

Moreover, the Department must surely recognize in the resounding public support Pantex enjoys still further advantages to retention and expansion of the missions at Pantex.

In summary, the criteria for evaluating the alternatives and arriving at the most suitable Record of Decision -- the criteria of environmental impact, cost, and technical feasibility -- support retention and expansion of nuclear complex missions at the nation's premier production site, Pantex Plant.

Southwestern appreciates the opportunity to participate in this important decision making process, and welcomes questions and dialogue, directed to:

William T. Crenshaw
Environmental Issues Analyst
Southwestern Public Service Company
(806) 378-2120

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION

May 6, 1996

US Department of Energy
Office of Reconfiguration
PO Box 3417
Alexandria, VA 22302

To Whom It May Concern:

As the Governor's Lead Contact for National Environmental Policy Act (NEPA) state reviews, I am responding on behalf of the State of Tennessee to the *Draft Programmatic Environmental Impact Statement (DPEIS) for Stockpile Stewardship and Management; No. DOE/EIS-0236; February 1996.*

1/40.13 The State of Tennessee supports efforts to streamline functions and increase fiscal efficiency within the DOE Complex system due to changing national and international policy. We realize that these decisions will not be made easily. However, we urge you to consider costs and benefits of the proposed alternatives in a holistic manner.

Holistic consideration of costs associated with the management of existing facilities or transfer of operational authorities to more efficient locations should include: (1) costs of creating and operating new facilities on currently uncontaminated sites; (2) costs to dismantle existing facilities or manage existing facilities in "cold standby"; (3) costs to manage the balance of facilities remaining after operational functions are transferred to other facilities and (4) fair and realistic assessments of the Department of Energy's responsibility and ability to meet its obligations for environmental restoration at active, dismantled or "cold standby sites". We believe that the Department of Energy has not offered adequate information in the current PEIS for the state or the public to adequately assess the true costs and benefits of the proposed alternatives.

States like Tennessee with major DOE facilities whose functions may be transferred or terminated cannot make proper evaluations of these potential actions without adequate information. Enclosed are many questions that we feel should be addressed in your DPEIS. Your response to these concerns and questions will be expected. If given appropriate notice and time, our positions can be reevaluated.

2/33.01 Due to concerns stated in the adjoining comments, the State of Tennessee supports that the DOE Y-12 facility in Oak Ridge retain its secondary and case fabrication mission. We believe

Office of Reconfiguration
May 6, 1996
Page 2

2/33.01 continued that this is in the interest of the nation as well as Tennessee. The selection of any other alternatives will require much more justification than is currently provided in this PEIS. If DOE prefers to pursue other alternative actions we urge you to issue a second draft PEIS or DOE amendments to the current draft that provides additional justification and reflects public comments. This will require an additional draft comment period.

Please consider the enclosed comments as additional clarification of the positions taken by the State of Tennessee for this NEPA document. If you have any questions, please contact our NEPA staff coordinator at (615) 532-0545. Your consideration of our interests is greatly appreciated.

Sincerely,

Justin Wilson
Commissioner

Enclosure

c: Ken Bunting, Administrator
Earl Leming, DOE-Oversight
Dodd Galbreath (NEPA coordination file)
Jim Hall, Manager, DOE ORR

SSM-F-022
COMMENT LETTER

PAGE 3 OF 6

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DOE OVERSIGHT DIVISION
[illegible]
[illegible]

April 24, 1996

Mr. Justin Wilson, Commissioner
Tennessee Department of Environment and Conservation
c/o Tennessee Environmental Policy Office
14th Floor L&C Tower
401 Church Street
Nashville, Tennessee 37243 - 1553

Dear Commissioner Wilson

Document NEPA Review -- Draft Programmatic Environmental Impact Statement: Stockpile Stewardship and Management, DOE/EIS-0236, February 1996

The Tennessee Department of Environment and Conservation, DOE Oversight Division has reviewed the above document for your concurrence and transmittal to the following DOE office

U.S. Department of Energy
Office of Reconfiguration
PO Box 3417
Alexandria, VA 22302

The Division's review was conducted in accordance with the requirements of the National Environmental Policy Act (NEPA) and associative implementing regulations 40 CFR 1500 - 1508 and 10 CFR 1021.

2/33.01 continued | After review and research, the Division supports the Y-12 plant in retention of the secondary and case fabrication mission. The Y-12 plant has the existing infrastructure to continue the secondary and case mission without negative environmental impacts.

SSM-F-022
COMMENT LETTER

PAGE 4 OF 6

Justin Wilson, Commissioner
April 24, 1996
Page Two

3/10.33 | The Division is concerned that this document lacks adequate information from which to draw conclusions for future impacts should the shifting of Y-12 plant facilities to cold standby conditions occur if the proposed preferred alternative is selected. DOE must make it clear that continued readiness of environmental treatment systems (West End Treatment Facility, Y-12 steam plant, wastewater treatment, solid waste disposal, air pollution control) in cold standby will remain, should future increases in production occur.

4/33.11 | The Division recommends that DOE have the funding mechanisms for proposed downsized Y-12 facilities in place prior to the Record of Decision.
5/41.10 | Also, the Division is concerned with the overburden of numerous NEPA documents released to local stakeholders for simultaneous review. Within the review and comment window for this document the Division also reviewed five other NEPA documents.

We request that the attached comments on the above document be given full consideration in the preparation of the Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management.

If you have any questions, please contact Dale Rector at (423) 481-0995 or Steve Nisley at (423) 481-0163.

Sincerely

E.C.L.

Earl C. Leming, Director

Attachment
el218.99

Tennessee Department of Environment and Conservation/DOE Oversight Division

Comments on Draft Programmatic Environmental Impact Statement, DOE/EIS-0236, February 1996, Stockpile Stewardship and Management

GENERAL COMMENTS

2/33.01 continued

If the secondary and case work is moved from Y-12 to the western laboratories, Y-12 may ultimately loose all defense funding. The loss of defense funding could leave Y-12 with inadequate funding for environmental cleanup, including decontamination and decommissioning (D&D) of abandoned facilities. In addition, if the secondary and case work is moved from Y-12, good usable facilities (which are already contaminated) would be abandoned at Oak Ridge and new facilities would be constructed on uncontaminated sites in the western United States. As a result, current brownfields would be abandoned and new brownfields would be created out of greenfields.

6/33.10

If the "Secondary and Case Component Fabrication - downsize the Y-12 Plant at Oak Ridge Reservation" alternative is chosen, necessary utilities, wastewater systems, and other operating systems at Y-12 will be tremendously oversized. Also, the downsizing will impact the decontamination and decommissioning program at Y-12. As a result of the proposed downsizing please explain the impacts to future continued operation of these facilities, operating systems, and programs.

4/33.11 continued

Explain how Y-12 can be assured of timely funding for environmental cleanup activities if Y-12 "Secondary and Case Component Fabrication" is downsized at. Also, explain what funding mechanism would be used to accomplish decontamination and decommissioning of excess facilities in the event the secondary and case work is downsized at Y-12.

2/33.01 continued

In projecting annual costs for the ORR in millions of dollars versus fiscal year and Core Stockpile Management costs over the next ten years of downsizing, explain why the costs shrink significantly. The costs of displaced labor will be an appreciable fraction of the labor costs because ORR workers in downsizing areas have been employed an average of fourteen years or more. Please provide information on the cost estimates of training required for transformation of an employee into a skilled craftsman or competent researcher.

If LLNL is chosen to manage "Secondaries and Cases," the costs associated with dismantling and cleanup of corresponding segments of the Y-12 facility and the cost of dismantling plus future costs of cleanup of the LLNL facilities at a future date should be included in the costs associated with the preferred site cost estimates.

Will Y-12 equipment and material require transfer to other DOE facilities? If so, please provide the costs associated with appropriate Y-12 equipment and material transfers in the cost evaluations of manufacturing "Secondaries and Cases" at LLNL and/or LANL.

7/40.47

The data from LLNL and LANL sites are not as complete as ORR in regard to many of the tabulations on resource requirements such as water. Please provide complete data. Without complete data, no inferences supporting the conclusions of the document can be made.

8/21.05

The scope of this draft PEIS appears to be limited. Clarify with regard to the choice of reasonable alternatives on why this programmatic document includes a Project-Specific Analyses. The Council on Environmental Quality NEPA Regulation 1506.1 states that an agency cannot take any action that would limit the choice or reasonable alternatives before a Record of Decision is issued. It appears inappropriate to include Project-Specific Analyses in this PEIS. The Contained Firing Facility, National Ignition Facility, and the Atlas Facility Project-Specific Analyses within this document appear to bias the decision-makers toward the potential location of those proposed facilities.

SPECIFIC COMMENTS

2/33.01 continued

1. Summary, Page S-17, Paragraph 4
"These components are designed by LANL and LLNL; therefore, each of those facilities would be reasonable alternative sites if this function is transferred to the weapons laboratories." Please explain how LANL and LLNL, which have no experience in actually building these weapons, could be reasonable alternatives for this proposed project.

9/04.13

2. Volume I, Section 4.2.3.4, Page 4-46, Paragraph 3
"The phaseout of the secondary and case fabrication mission at ORR would have no adverse impact on water quality in the East Fork Poplar Creek." Please address whether or not the proposed downsizing will result in decreased water flow in East Fork Poplar Creek. If so, provide the cumulative impacts on the phaseout of process water. Also, provide information on any potential impacts to the methylmercury from sediments in the water column, and impacts on biota.

10/08.01

3. Volume I, Section 4.2.3.8, Page 4-50, Paragraph 3
"These losses would be offset by an increase in the decontamination and decommissioning (D&D) effort which would require approximately 1,318 workers." Please provide information on the D&D jobs. Would these jobs move in immediately or are they to be phased in over several years. Are the 1,318 D&D jobs a steady number required for D&D?

11/40.93

4. Volume I, Pages 3-64, 3-68, 3-71, 3-76, 3-77, and 3-82
"Surge Operation Annual Requirements" is shown in the title of several tables on the referenced pages, but is not defined in the glossary in Chapter 9. Please provide a detailed explanation of "Surge Operations" in the glossary.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAY 7 1996

OFFICE OF ENFORCEMENT AND COMPLIANCE ASSURANCE

Mr. Jay Rose
Office of Reconfiguration
U. S. Department of Energy
1000 Independence Avenue, S.W.
Washington, DC 20585
Attention: SSM PEIS

Dear Mr. Rose:

The Environmental Protection Agency (EPA) has reviewed the Department of Energy's (DOE) Draft Programmatic Environmental Impact Statement (PEIS) for Stockpile Stewardship and Management. Our review is provided pursuant to the National Environmental Policy Act and Section 309 of the Clean Air Act.

1/11.15 The proposed action is to provide an integrated technical program for maintaining the continued safety and reliability of the nuclear weapons stockpile in the absence of underground nuclear testing and no new nuclear weapons production. The stockpile stewardship portion of the draft PEIS analyses the potential environmental effects of three proposed facilities on four potential sites, and a no action alternative. The stockpile management portion of the draft PEIS evaluates the potential environmental effects of five management activities at eight potential sites, and a no action alternative. EPA has rated the document EC-2, environmental concerns - insufficient information. We recommend that the DOE provide additional information and clarity concerning the accident risk analysis. In particular, more information on the assumption inputs to the MELCOR Accident Consequence Code System model could greatly enhance the public's understanding of the differences in safety risk between alternatives if an accident were to occur. Currently, the PEIS provides only limited review of the model but relies heavily on it to conclude that there is little danger to the public from accidents and little difference in accident risk among the alternatives considered. Further discussion could strengthen the credibility of these conclusions. An explanation of EPA's ratings is provided in Enclosure 1. Detailed comments are provided for your consideration in Enclosure 2.

Thank you for the opportunity to comment. If you have any questions, please contact Susan Offerdal at (202) 564-7158.

Sincerely,

Richard E. Sanderson
Director
Office of Federal Activities

Enclosures

Enclosure 1

SUMMARY OF THE EPA RATING SYSTEM
FOR DRAFT ENVIRONMENTAL IMPACT STATEMENTS:
DEFINITIONS AND FOLLOW-UP ACTION *

Environmental Impact of the Action

LO--Lack of Objections

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC--Environmental Concerns

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA intends to work with the lead agency to reduce these impacts.

EO--Environmental Objections

The EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no-action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU--Environmentally Unsatisfactory

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the CEQ.

Adequacy of the Impact Statement

Category 1--Adequate

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis of data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2--Insufficient Information

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

Category 3--Inadequate

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

* From EPA Manual 1640 Policy and Procedures for the Review of Federal Actions Impacting the Environment

February, 1987

Enclosure 2

EPA COMMENTS ON THE DRAFT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT FOR STOCKPILE STEWARDSHIP AND MANAGEMENT

Radiation: In general, it appears that the conclusion drawn in the programmatic environmental impact statement (PEIS) to the effect that there are no major radiological consequences of any of the alternatives is reasonable. Both the doses modeled and the probability of these doses are small. This conclusion seems particularly warranted in the case of routine operations.

2/11.12 In the case of accidents, while the conclusion of little or no risk is still plausible, some questions do arise. The PEIS does not clearly differentiate the safety risks associated with each alternative if an accident were to occur. This is of some note because, as the PEIS notes, accidents are of major concern to the public and the decisionmaker.

3/11.24 The accident scenarios assume a worker a kilometer away from the accident site. Is this a reasonable assumption? What is the basis for this? At least in the case of Hanford, the effect of a facility accident on the maximally exposed individual in the general population is a hundredfold less than the worker already a kilometer away. What assumptions produce this result? Again, more discussion of how the MELCOR Accident Consequence Code System (MACCS) model is applied would add to the confidence one has in the results. It is clear that given the small dose the model predicts and the very low assumed probability of the more serious accidents (a severe earthquake has a one-in-ten million chance of occurring) the resulting risk is small and not of concern.

4/11.28 The PEIS needs to document more fully why these assumptions and others associated with the accident scenario are reasonable, and how these and other inputs are used by the MACCS model.

5/12.10 Environmental Justice: Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires special attention to be given to subsistence consumption of fish and wildlife. "Federal agencies, whenever practicable and appropriate, shall work in a coordinated manner to publish guidance reflecting the latest scientific information available concerning methods for evaluating the human health risk associated with the consumption of pollutant-bearing fish and wildlife. Agencies shall consider such guidance in developing their policies and rules." Consumption issues are important to address in this PEIS because of their uniqueness in minority and low-income populations and the detrimental range of impacts they may have.

SSM-F-024
COMMENT LETTER

PAGE 5 OF 5

6/43.06 — **Executive Summary**: The executive summary could benefit from summary tables of environmental effects and a section on cumulative impacts.

7/22.02 — **Proposed Atlas Facility (page S-27)**: The description of this facility is limited in both the executive summary and on page 319 of Volume 1. We recommend that the DOE expand the discussion of the uses of the facility since it is unclear, and therefore, difficult to review the potential environmental impacts.

8/41.12 — **Next Generation Stewardship Facilities (Page S-28)**: There is no discussion of the current proposed alternatives' relationship to the anticipated next generation stockpile stewardship facilities. There may be some utility in this discussion since some of the proposed alternatives may integrate better with the next generation facilities and when evaluated together may have less adverse environmental impacts (e.g., the anticipated timing of the current alternatives and the next generation facilities may be of interest).

SSM-F-026
COMMENT LETTER

PAGE 1 OF 4

Comments on
the Draft Programmatic Environmental Impact Statement
for Stockpile Stewardship and Management

The Oak Ridge Environmental Peace Alliance

May 7, 1996

Introduction

The Department of Energy has prepared a draft programmatic environmental impact statement which sketches the broad outlines of the nuclear weapon stockpile support complex of the future. Under the title "science-based stockpile stewardship and management," the Department proposes to build new facilities and upgrade current facilities in order to maintain a huge nuclear arsenal and to maintain the capability to research, design, produce and test new nuclear weapons.

1/40.07 These actions of the Department of Energy are in fundamental and essential conflict with the stated nonproliferation policies of the United States as well as with international treaty obligations. The Department has chosen to ignore these conflicts in preparing the draft programmatic environmental impact statement.

2/40.27 The current draft programmatic environmental impact statement fails to consider all reasonable alternatives; it is clear from the first page of the document that it has been prepared by the national laboratories responsible for weapons production whose naked self-interests are served throughout the document. In response to political pressure by those responsible for weapons production activities in Oak Ridge, the Department of Energy has publicly agreed to re-examine its preference for moving highly enriched uranium production activities from Oak Ridge. The Department also announces in its cover sheet that, as a result of its study, it has identified only one "preferred alternative," choosing in this election year to build a $4.5 billion facility in the state with the most electoral votes of any state. The blunt politicization of decisions related to nuclear weapons is despicable and sad. The implications for both our national policy, for domestic spending, and for international relations are profound and none of them are positive.

The Oak Ridge Environmental Peace Alliance calls on the Department of Energy to set aside all political consideration and address in a reasonable way the issues surrounding the maintenance of a declining nuclear weapons stockpile. Such analysis should have as its primary goal the support of US nonproliferation policy and the international treaty obligations of the United States.

1/40.07 continued

Concerns of the Oak Ridge Environmental Peace Alliance

Enduring stockpile or Declining stockpile?

The Stockpile Stewardship and Management draft programmatic environmental impact statement begins with the presumption of an enduring stockpile of nuclear weapons (p. S-1). This presumption reflects the commitments of the national weapons laboratories, but is in direct conflict with the commitment of the United States under Article VI of the nuclear Nonproliferation Treaty. Furthermore, the commitment to an enduring stockpile, when measured against the shift in geopolitical reality of the last ten years and the agreement entered into by the United States and Russia to reduce stockpiles, is less reasonable than a commitment to a declining stockpile. Clearly the Stockpile Stewardship and Management draft programmatic environmental impact statement should address the safest and most appropriate way to "build down" the US weapons stockpile. The draft programmatic environmental impact statement should support, rather than an "enduring" stockpile, *a declining nuclear stockpile until such time as the United States achieves its commitments under Article VI of the nuclear Nonproliferation Treaty."*

The Department's commitment to an enduring stockpile, at the same time that it presents itself as a champion of nonproliferation, is not credible. The plans outlined in the current draft programmatic environmental impact statement undermine all US efforts to reduce the nuclear danger at home and abroad. The US can not credibly achieve its nonproliferation goals while it moves forward toward "next generation facilities" (p.S-5). Clearly, the list on page S-5 attempts to leap forward in time over the current attempts to construct the true "next generation facilities" which are covered in this draft programmatic environmental impact statement—the National Ignition Facility, the Contained Firing Facility, and the Atlas Facility. There is no credible argument which can reconcile construction of these next generation facilities with our nonproliferation objectives. The only explanation which makes sense out of the Department's current course is that nonproliferation objectives have been subjugated to political goals of the

1/40.07 continued

current Administration and the directors of our national weapons laboratories.

Article VI—Reasonable or Not?

The current draft programmatic environmental impact statement contains an internal inconsistency in its discussion of Article VI of the nuclear nonproliferation treaty. On page S-7, the draft programmatic environmental impact statement lists "four principal national security policy overlays and four related treaties that define program conditions for the reasonably foreseeable future." This list includes the Nuclear Nonproliferation Treaty (sixth bullet).

Understanding the moral and legal authority of the nonproliferation treaty, and the central role Article VI will play in the success of the nonproliferation treaty (as was clearly demonstrated in last summer's negotiations over the renewal of the nonproliferation treaty), members of the public asserted in overwhelming numbers during DOE's earlier scoping hearings on stockpile stewardship and management, that DOE must consider as a reasonable alternative, a zero-stockpile option.

3/40.60 The Department has chosen to disregard this overwhelming public desire and instead to assert, on page S-10, in a paragraph describing the nonproliferation treaty, that it consideration of a zero-weapons stockpile "goes beyond the reasonably foreseeable future." This statement, coming only three pages after the draft programmatic environmental impact statement acknowledges the nonproliferation treaty defines the reasonably foreseeable future, is simply an assertion of the document preparers which describes their shortsightedness and their commitment to an enduring stockpile rather than the realistic future. The Department's commitment in examining reasonable alternatives must be to the realistic future. Efforts to bolster the dismissal of the public's scoping comments with a quote from a US Ambassador are inconclusive at best—if the Ambassador believes it is unwise to predict the future, and if the Department agrees with him, it stands to reason that the Department should consider all reasonable alternatives rather than excluding some. It is the Department, in denying the possibility of the United States keeping its commitment to the nonproliferation treaty, which is predicting the future and limiting options.

DOE attempts to further bolster its dismissal of the zero-weapons stockpile with an opposite comparison, saying, "For the same reason, DOE has not chosen to speculate on a return of the nuclear arms race requiring a stockpile larger than START-I size"—though it is *not at all for the same reason!* The reasons for considering a zero-weapon stockpile are three-fold:

- the nonproliferation treaty obligates the US to pursue complete nuclear disarmament;
- all recent accords between nuclear nations and the clear desire of the international community is toward continued reductions in arsenal size, not a return to an arms race; and
- in the scoping hearings, where the public identifies for the agency what issues it considers within the scope of the environmental analysis, the overwhelming sentiment was for consideration of a zero-weapons stockpile.

The reasons for considering a return to an arms race, which DOE tries to equate with zero-stockpile alternatives, would require the complete disregard of each of the above reasons. The two alternatives are in no way comparable.

1/40.07 continued

Finally, DOE makes a specious argument that the nonproliferation treaty is not applicable in this document because, "the NPT does not provide any time period for achieving this goal." This statement is the argument made by those resisting the moral and legal obligations of the treaty. It is comparable to the position of southern governors who resisted school desegregation in the wake of *Brown v. The Board of Education* for nearly ten years.

The lack of a specific time period for achievement of the goal of the nonproliferation treaty in no way relieves the US of its obligation to pursue in good faith the achievement of that goal. Quite the opposite, without a specific timeline, the nations of the world rely solely on the good faith of the United States and other weapons states to make good on their Article VI promise to pursue "at an early date" negotiations in pursuit of complete disarmament. Not only is our reputation and credibility on the line, but our efforts to achieve nonproliferation goals around the world are supported or undermined by our activities in pursuit of Article VI.

3/40.60 continued

In summary, the draft programmatic envirnmental impact statement provides not one persuasive or supportable argument for the failure to consider the zero-weapon stockpile as an alternative in the future. Arguments DOE attempts to marshall to support its position actually undermine its position. DOE must consider as a reasonable alternative for analysis the build-down-to-zero option.

Oak Ridge—a confusion of mission?

The Oak Ridge reservation's Y-12 Plant has a clearly defined mission for the future—the dismantlement of nuclear weapons secondaries and the processing and long-term storage of weapons-usable highly enriched uranium. This mission is currently confirmed by the Department's Environmental Assessment on the Interim Storage of Highly Enriched Uranium at Y-12 and the environmental impact statements currently in preparation regarding the disposition of surplus highly enriched uranium and the long-term storage of highly enriched uranium.

4/40.24

This mission, consistent with the nonproliferation goals of the United States, is not consistent with continued support activities for weapons research, developing, production and testing in Oak Ridge.

US dismantlement, disposition and storage activities must, in order to achieve US nonproliferation goals, be subject to international verification. Transparency at virtually every step in the process will be required. Currently, the International Atomic Energy Agency maintains administrative control of one storage vault in Oak Ridge.

Attempting to maintain a production mission at Y-12 will inevitably compromise efforts to achieve complete transparency. A production mission at Y-12 would also increase Y-12's attractiveness as a target of hostile forces and divide the community's support for Y-12's mission and activities.

5/40.36

The Department of Energy, except for an unsubstantiated assertion, has not demonstrated the need for a commitment of resources to weapons research, development, production and testing. The draft programmatic environmental impact statement should not include further production activities in its scope. There is no justification for consideration of alternatives which include "fabricating pit, secondary and case, HE, and other nonnuclear components. (S-5)"

Furthermore, it is inadvisable for the Department to co-locate production and dismantlement activities at the same facility for the reasons cited above. The Department should be clear with the community in Oak Ridge about its future mission and should make an enduring commitment with the community that it will continue to receive the support of the federal government for its important dismantlement/disposition/storage mission.

Conclusion

4/40.24 continued

The flaws noted above are not insignificant or trivial; they are fundamental and profound. The draft programmatic environmental impact statement on Stockpile Stewardship and Management can not proceed to a decision until these flaws are addressed. The Department of Energy, in carrying out its responsibilities under the National Environment Policy Act, must analyze "all reasonable alternatives" in the programmatic environmental impact statement. This includes a zero-weapons stockpile. The draft programmatic environmental impact statement for Stockpile Stewardship and Management should be withdrawn, redrafted, and re-issued for public comment when it provides the legally required analysis of all reasonable alternatives.

BOB MILLER
Governor

STATE OF NEVADA

JOHN P. CO[illegible]
Director

DEPARTMENT OF ADMINISTRATION
Capitol Complex
Carson City, Nevada 89710
Fax (702) 687-3983
(702) 687-4065

May 7, 1996

Stephen M. Sohinki, Director
Office of Reconfiguration
U.S. Department of Energy
1000 Independence Avenue, S. W.
Washington, D.C. 20585

Re: SAI# 96300148: State of Nevada Comments on the U.S. Department of Energy's Draft Stockpile Stewardship and Management Programmatic Environmental Impact Statement

Dear Mr. Sohinki:

Thank you for providing us the opportunity to review the Draft Stockpile Stewardship and Management Programmatic Environmental Impact Statement (SSM-PEIS).

As you might recall, in August 1995, the State of Nevada submitted extensive scoping comments on the Notice of Intent for this PEIS. In those comments, we identified several issues of national and local concern. From a national perspective, we suggested that DOE should evaluate a weapons remanufacturing and limited non-nuclear/hydronuclear testing alternative. From the local perspective, we suggested that certain institutional constraints that directly affect the Nevada Test Site (NTS) should be analyzed if the NTS were to be considered for major projects such as the National Ignition Facility (NIF). Unfortunately, our review of this draft PEIS indicates that neither of these concerns has been addressed.

1/40.33 In reference to the first issue, we were not surprised that DOE chose to avoid a detailed assessment of the weapons remanufacturing and limited nuclear and hydronuclear[1] testing alternative in the PEIS. With the recent presidential decision to achieve a "zero" yield Comprehensive Test Ban Treaty, we realize that DOE had little incentive to assess a remanufacturing and limited nuclear/hydronuclear testing program. We still contend, however, that this alternative could easily provide a "short term" 20-year strategy to address safety, reliability, and performance of the nation's enduring nuclear stockpile. Additionally, the cost of implementing a remanufacturing program would be far less than the cost of the proposed National Ignition Facility.

2/40.07 In a related matter, we are concerned that the construction and operation of the NIF[2], along with other proposed "nuclear simulation machines," could undermine national policies designed to ensure safety and reliability in the nuclear stockpile (i.e., stockpile maintenance). It appears that these simulation machines could also be used to improve and advance new warhead designs. The Final EIS should clarify whether or not this is the policy of the United States. The Draft SSM-PEIS is not clear on this point. It is worth mentioning that the Nuclear Nonproliferation Treaty (Article VI), along with existing Presidential decisions, directives, and public laws[3], promotes the concept of maintaining reliability and safety of the stockpile as opposed to the development of new weapons design capabilities.

---

1 *Hydronuclear tests can produce nuclear yields of a few pounds to a few hundred pounds of TNT.*

2 *The Proposed Action sites the NIF at the Lawrence Livermore National Laboratory in California.*

3 *See SSM-PEIS Summary, page S-11.*

3/40.02 The PEIS also fails to make a clear distinction between the types of sub-critical tests[4] proposed at the NTS and how these tests relate to stockpile reliability and performance simulations that would be conducted using the NIF, the Contained Firing Facility, and the Atlas Facility. Hence, the Final PEIS should both explain and clarify how all of these testing activities fit together to foster safety, reliability, and performance of the nuclear stockpile.

4/40.45 The second issue we addressed during scoping concerned the assessment of the impacts of national siting decisions for specific projects like the NIF on the environment, infrastructure, and institutional constraints at the NTS. Since most of these concerns are now moot because the NTS[5] is not being considered a preferred alternative for major Stockpile Stewardship and Management activities, we have purposely forgone a detailed review of the environmental impacts presented in the PEIS. Nevertheless, there are other issues that DOE officials should be aware of that were not addressed in the PEIS. These issues could play an important role if the NTS were ever reconsidered for any of these new defense facilities. As we mentioned during scoping, there are unique legal and institutional issues that pertain exclusively to the NTS, and we contend that these issues cannot be ignored in the context of federal agency compliance with the National Environmental Policy Act.

5/01.06 Specifically, the current Public Land Orders[6] for the NTS limit the use of the site to weapons testing and related research and development facilities only. And,

---

4 *Lyner Complex and the Big Explosive Experimental Facility, See NTS Site-Wide EIS (DOE EIS 0243)*

5 *In this context, NTS also includes the North Las Vegas facility, which is also evaluated as a siting alternative for the NIF.*

6 *Public Land Orders (PLOs) 805, 1662, 2568 and 3579. Bureau of Land Management (BLM). 1984. Continuation of Withdrawals, Department of Energy, Nevada Test Site 4310-84. (This file is located at the BLM State Office in Reno, Nevada*

SSM-F-028
COMMENT LETTER

PAGE 4 OF 5

5/01.06 continued

when the Nevada Legislature ceded its jurisdiction to the public lands that now comprise the NTS, it did so on the basis of these stipulated uses. Although the Draft SSM PEIS indicates that the lands comprising the NTS are federal lands, they are in fact public lands that have been withdrawn for a specific national defense purpose, and that purpose does not include large scale weapons' assembly/disassembly and/or the siting of laser fusion technologies such as the NIF.

During the scoping process, we suggested that DOE should propose a path forward in the PEIS to address actions concerning the mission of the site and that this path forward should identify a process for seeking approval from the Nevada Legislature to use NTS for purposes other than nuclear testing (the Nevada Legislature approved the NTS withdrawal as a federally sanctioned activity). We note that CEQ regulations [1506.2(d)] require EIS statements to discuss any inconsistencies with approved plans or laws. Accordingly, if the NTS is chosen for one or more of these major testing facilities, an analysis must be contained in the Final PEIS that addresses the stipulated facility-use restrictions contained in the Public Lands Orders. A precedent for such an analysis has been acknowledged in DOE's recently published Storage and Disposition PEIS.[1] In that document, it is clearly stated that the potential for adverse impacts to land resources exists "due to nonconformance with existing land-use plans, policies, or controls" at the NTS. The referenced PEIS also mentioned that the expanded-use alternative presented in the NTS Draft Site-Wide EIS is inconsistent with the NTS land withdrawal.

6/42.09

Finally, in reference to the interim storage of plutonium pits and/or pits assembly/disassembly, Nevada's position on this issue continues to be that DOE must develop a final proposed action for the permanent disposition of plutonium pits before selecting an interim or long-term storage site for this long-lived material. Nevada

[1] *U.S. Department of Energy, February 1996. Storage and Disposition of Weapons-Usable Fissile Materials Draft Programmatic Environmental Impact Statement, Summary, (DOE/EIS-0229-D), page S-19&20.*

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COMMENT LETTER

PAGE 5 OF 5

6/42.09 continued

officials have said that DOE should link long-term fissile materials consolidation and management with options for final materials disposition before siting interim or long-term pit storage facilities, whether it is for surplus materials or strategic reserves. DOE should not fragment major federal decisions to support either short- or long-term plutonium storage and disposition, where such decisions could cause significant impacts to the people and environment in Nevada. Such actions would not conform to the spirit and intent of the National Environmental Policy Act.

Again, we appreciate the opportunity to provide comments on the Draft SSM-PEIS. If you have any questions about these comments, please contact me or Mr. John B. Walker, Nuclear Waste Project Office at 702-687-3744.

Sincerely,

Julie Butler

Julie Butler, Coordinator
State Clearinghouse, DOA/SPOC

JB\jbw
cc: Governor Bob Miller
Nevada Congressional Delegation
Perry Comeaux, Dept. of Administration
Robert R. Loux, NWPO
Harry Swainston, Deputy Attorney General
Lew Dodgion, Nevada Division of Environmental Protection
Affected State Agencies
Leo Penne, State of Nevada, Washington Office
Terry Vaeth, Joseph Fiore, Don Elle, DOE/NV
Carol M. Borgstrom DOEHQ\NEPA
Ann Morgan, State Director, BLM

SSM-H-SRS-001
COMMENT LETTER
PAGE 1 OF 2

DOE Public Meeting on
Draft Environmental Impact Statements
April 30,1996

There are three draft environmental impact statements on which the DOE is soliciting public comments. These three documents cover plutonium storage and management:

* The Pantex EIS considers SRS as an alternative for storage of up to 20,000 plutonium pits, most of which are currently stored at Pantex.
* The Stockpile Stewardship and Management EIS evaluates SRS as an alternative for plutonium recovery and remanufacturing of plutonium pits to maintain the nuclear stockpile.
* The Disposition of Weapons Usable Fissile Materials EIS considers alternatives for consolidating plutonium storage and technologies for disposing of surplus plutonium.

SRS is under consideration for a major role in each of these programs. Following are some points that relate to these issues:

(1) A key part of any decision concerning these programs is the attitude of the neighboring communities.

1/32.06

SRS's neighbors in Georgia and South Carolina have supported SRS operations since the location was named 46 years ago as a weapons material production plant. Over these years, operators of SRS have been prudent, responsible, and world-class in technical ability. This community naturally welcomes additional missions of this type and jobs and money coming in, especially after so much has left the last few years. We also know and trust the people at SRS. Because of the support SRS enjoys, we urge DOE to choose SRS as the site for the future needs discussed in these EIS's.

(2) In many cases SRS has the facilities and capability already in place for certain of the EIS alternatives, and additions needed could be installed very cost-effectively by DOE.

Storage of nuclear materials, for example, is commonplace activity at SRS, and SRS officials report that they are already planning a modular storage facility, which could be easily modified for additional capacity. The storage unit is budgeted at $150 million, and additional storage capacity would roughly double that number.

(3) If it is determined that the national interest requires a large scale effort to reconstitute the plutonium pits now in the stockpile, a large percentage of which are decades old and potentially unreliable, SRS has the expertise and many of the facilities to perform that job

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COMMENT LETTER
PAGE 2 OF 2

1/32.06 continued

cost-effectively.

The capital investment of that option is about $350 million, much of which would return to he community in the form of purchases and construction wages.

(4) Excess plutonium must be managed properly. Storage is an option, but there is also the possibility of obtaining energy benefit from plutonium by making mixed oxide fuels for use in nuclear reactors. SRS is a logical place for fuel manufacture because of the existing plutonium handling facilities and expertise onsite. This would represent construction and related expenditures of about $350,000.

At the same time, SRS is essentially the center of applied vitrification technology in this country, and would be the ideal location for vitrifying plutonium as an anti-proliferation action. Capital costs would be about $500 million.

(5) It must be remembered that SRS has the only active large-scale plutonium processing facility in the nation.

(6) SRS not only has the capability to perform each of these missions safely and effectively, but in fact, is the only site that which can perform all of the missions.

SRS has the technology, infrastructure support, and facilities to immediately implement the NEPA decisions. Only SRS retains large-scale functioning plutonium capability. Only SRS has experience at startup and operation of nuclear facilities with today's standards of operation. Only SRS can provide the Department the capability to merge all of its plutonium functions at a single site with billions of dollars of savings which will result from this approach.

W. Penland Mayson, Jr.
3028 Bransford Rd.
Augusta, Ga. 30909

SSM-H-SRS-002
COMMENT LETTER

PAGE 1 OF 2

Comment Form

These comments apply to the following documents:
Storage and Disposition Draft PEIS
Stockpile Stewardship and Management Draft PEIS
Pantex Site-Wide Draft EIS

United States Department of Energy

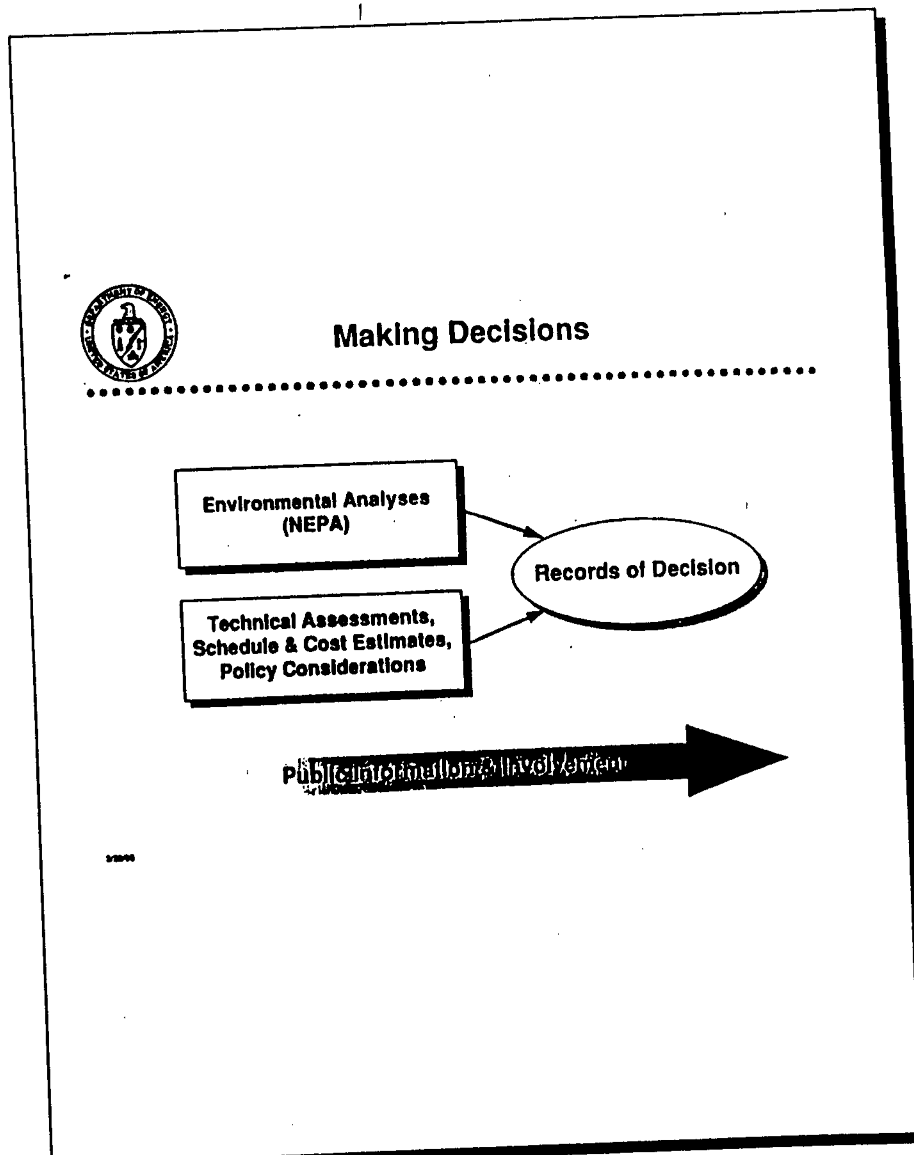
NAME: (Optional) Ed Arnold
ADDRESS: 2352 Burnt Creek Rd Decatur, GA 30033
TELEPHONE: (   )

1/41.03

See attached graphic representing "Making Decisions"
"Public information + involvement" never intersects with "Records of Decision".
What really happened?

SSM-H-SRS-002
COMMENT LETTER

PAGE 2 OF 2



J. Christopher Noah, Sr., Ph.D.
528 McKinne's Line
Evans, GA 30809
(706) 855-7223
fax (706) 869-0166

May 3, 1996

U. S. Department of Energy
Stockpile Stewardship and Management
Draft PEIS Office
P.O. Box 23786
Washington, DC 20026-5156

VIA FAX

Dear Sirs:

Thank you for the opportunity to present my views on the Stockpile Stewardship and Management Draft EIS on April 30, 1996 in North Augusta, SC. As a follow up, I have additional points to be expressed. They are:

1. After years of study of the land use and environment of the Savannah River Site and the potential environmental impact this project may have; it is my conclusion that *SRS can accommodate a project of this magnitude without adversely affecting the environment.* Forty-five years of government control has actually enhanced the environment of SRS. This has been documented by the Savannah River Ecology Laboratory (University of Georgia) and the Savannah River Forest Station (USFS/USDA). However, there are indeed pockets of contamination that require attention. These can be controlled by institutional controls on future land uses.

1/40.76 2. *Many large-scale future missions can be accommodated by SRS.* Given the infrastructure, security, workforce competency, community support and land use, there is no reason why new missions such as this project cannot be located at SRS. This does not mean that development should be given carte blanche. Environmental controls, comprehensive planning and operational safeguards should be implemented. Having lived in Alaska during the construction of the Alyeska Pipeline, I saw first-hand how development and the environment could co-exist. However, this technological accomplishment did not come without a tremendous amount of work.

2/41.10 3. *This and the other projects discussed at the EIS meetings on April 30, should be considered in one planning document* (It does not have to be large). Besides being programmatically linked, future uses such as these should be judged in the aggregate. This would save time, resources and reduce confusion to the public and SRS employees.

3/01.01 4. Most importantly, *careful land use planning should be undertaken prior to this or any other large scale projects.* Section 101 of NEPA generally states that planning should be undertaken and coordinated by the federal government. However, Section 102 specifically states that planning is very important and should be utilized. This was reiterated by "The Father of NEPA," Dr. Lynton Keith Caldwell, when he visited SRS on April 2. Land use planning studies concerning large federal facilities in other agencies, other DOE sites and SRS have yielded significant results - Most notably in environmental protection, consolidation of resources and savings to the public.

4/10.07 5. Finally, *there should be a concerted effort to open Yucca Mountain.* It is difficult to view this project in fair terms if no end-state of nuclear materials is identified.

To provide a little background on myself, please see the attachment.

Thank you again for considering my comments.

Sincerely,

[signature]

attachment

"FUTURE ENVIRONMENTAL USES AT FEDERAL FACILITIES"

CHRISTOPHER NOAH, Ph. D.

Public Meeting
Draft Programmatic Environmental Impact Statements for Plutonium Storage and Management
North Augusta, South Carolina
April 30,1996

Situation

Environmental Uses At Federal Facilities Are:

Reactive To:

Myriad Of Federal Acts, For Example:

- NEPA
- CERCLA ("Residential Use")
- Community Environmental Response Facilitation Act (Land Transfer)
- RCRA
- Endangered Species
- Federal Land Policy And Management Act
- Federal Property And Administrative Services Act
- National Historic Preservation Act
- McKinney Act (Homeless)
- State Primacy And MOAs
- Etc.

C Noah

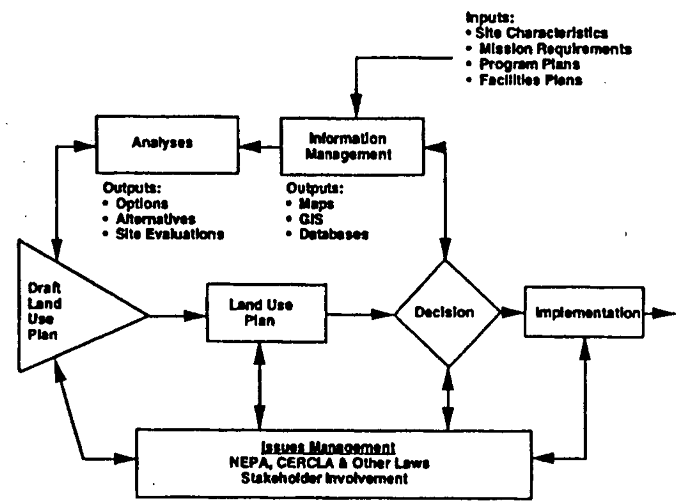
Situation (Continued)

Responsive To Outside Stimuli, Such As:

- **Community Re-Use Organizations (CROs)**
- **Environmental Groups**
- **State Governments**
- **Federal And State Legislators**

C. Noah

LAND USE PLANNING PROCESS



Christopher Noah
Westinghouse Savannah River Company 1995

Environmental Planning Factors

Land Use Planning

Risk Management

Business And Economics

Ethics

C. Noah

Environmental Planning Tools

Land Banking

Land Exchanges

Land Trusts

Research Areas

Multiple Use Programs

C. Noah

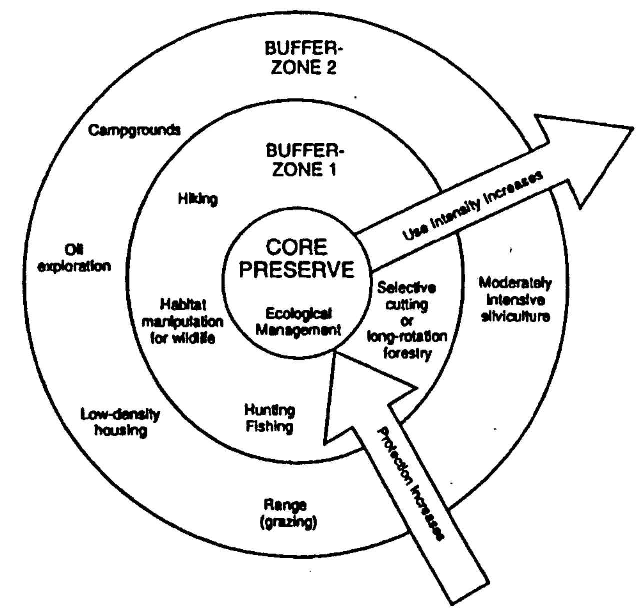
Current Environmental Uses Could Be Expanded

Without **Affecting Current Missions**

With **Thoughtful Planning**

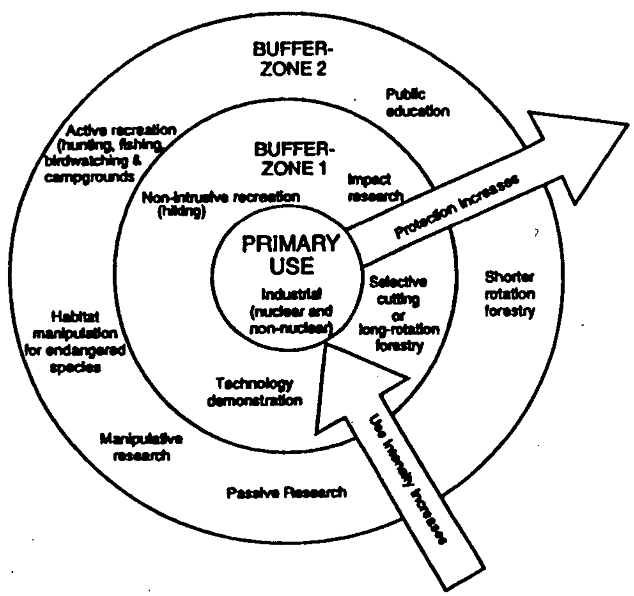
C. Noah

MULTIPLE USE MODEL



Source: R. Noss, "Protecting Natural Areas in Fragmented Landscapes," Natural Areas Journal (1987), 6.

PROPOSED MULTIPLE LAND USE MODEL FOR SRS



Christopher Noah
Westinghouse Savannah River Company
April 1996

Examples Of Environmental Uses Which Could Be Expanded

Research

Technology Demonstration

Natural Resource Management

Recreation

Public Education

C. Noah

Recommendations for Future Uses of the Savannah River Site

SRS Boundaries Should Not Change And The Primary Mission Should Remain Industrial With Multiple, Concurrent Activities.

- **Reason One - The Number, Time Frame And Cost Of Studies Prior To Turnover**
- **Reason Two - Possible Future Need**
- **Reason Three - SRS' Uniqueness**

No Area Of The Site Should Be Designated "Residential"

Environmental Research And Technology Demonstration Activities Should Be Increased.

Natural Resource Management Activities Should Be Maintained And Possibly Increased.

Recreation Activities Should Be Significantly Increased.

Public Education Activities Should Be Significantly Increased.

C. Noah

Conclusion

Federal Facilities *Should* Be Viewed As Environmental Assets *Not* Environmental Liabilities

C. Noah

SSM-H-SRS-004
COMMENT LETTER

PAGE 1 OF 1

Comment Form

These comments apply to the following documents:
Storage and Disposition Draft PEIS
Stockpile Stewardship and Management Draft PEIS
Pantex Site-Wide Draft EIS

United States Department of Energy

NAME: (Optional) Robert Menard, ORISE
ADDRESS: P.O. Box 117; Oak Ridge, TN 37831
TELEPHONE: (423) 576-6676

1/41.05 Fact sheets for the all the EIS were well done, especially the Stockpile Stewardship & Management Draft PEIS fact sheets.

SSM-H-SRS-005
COMMENT LETTER

PAGE 1 OF 1

Comment Form

These comments apply to the following documents:
Storage and Disposition Draft PEIS
Stockpile Stewardship and Management Draft PEIS
Pantex Site-Wide Draft EIS

United States Department of Energy

NAME: (Optional) Rick Geddes
ADDRESS: 807 Big Pine Rd, N. Augusta, SC 29841
TELEPHONE: ( )

SSM EIS

1/32.07
- Stated objective is to preserve "core competency", but program fails to address this issue with regard to pit manufacturing. A pseudo-manufacturing capability in an R&D lab is not the same

2/40.13
- SSM program needs to look at potential cost saving and minimization of impact available by piggybacking on much larger disposition programs.

SSM-H-SRS-006
COMMENT LETTER

PAGE 1 OF 1

Comment Form

These comments apply to the following documents:
X Storage and Disposition Draft PEIS
X Stockpile Stewardship and Management Draft PEIS
X Pantex Site-Wide Draft EIS

United States Department of Energy

NAME: (Optional) RODNEY C. WILCOX
ADDRESS: 40 CADENCE CT, AIKEN, SC 29803-7710
TELEPHONE: (803) 648-1456

1/32.06 SRS SHOULD RECEIVE A MAJOR PORTION/ROLE IN EACH OF THE RESULTING DECIDED PROGRAMS AS DETERMINED IN THE RECORDS OF DECISION. SRS HAS THE PEOPLE, FACILITIES, INFRASTRUCTURE, AND EXPERIENCE THAT IS NEEDED FOR SAFE, SECURE, COST EFFECTIVE AND INSPECTABLE OPERATIONS, MANAGEMENT, AND SATISFACTORY DISPOSITION OF WEAPONS-USABLE FISSILE MATERIALS. IN GENERAL THE SUPPORT FROM ADJACENT COMMUNITIES IS VERY FAVORABLE AND THIS NEEDED SUPPORT WILL GREATLY ASSIST DOE IN ACCOMPLISHING THE DESIRED MISSIONS.

FOR BETTER REASONS, THE EXCESS WEAPONS GRADE PLUTONIUM SHOULD BE UTILIZED TO MAKE MOX FUEL. SMALL REASONS SHOULD BE ELIMINATED AND RESOLVED TO ALLOW SUCCESSFUL USE OF MOX FUEL.

SSM-H-ALB-001
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: SUSAN M.I.: E Last Name: MYERS
Street Address: 212 E Marcy St #7
Street Address 2:
City: SANTA FE State: NM Zip Code: 87501-
Organization: Los Alamos Study Group
Telephone: 505-982-7747 Fax: - -

Comments:

1/03.01 Air quality - using in-house data is not acceptable (to the State of New Mexico, US EPA and the citizens of N.M.)

2/04.11 Water Resources - evaluate hydrology (not just potable sources) not surface & subsurface waters. Hydrology involves the potential for subsurface travel of materials. (ex. petrochemical contamination SNL in S. valley of Albq - Not enviro. justice)

3/11.04 Radius of 50 miles for estimating risk based on NUCLEAR REACTOR data is inappropriate. The LANL Environmental Report uses at least 100 mile radius. 50 miles does not include the potential for the spread of contamination by air or the Rio Grande.

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

[illegible]
Date of Receipt: 4/23

Receiver's Initials: BJ

SSM-H-LANL-001
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: RICHARD M.I.: E Last Name: HERBST

Street Address: RT 1, BOX 127-H

Street Address 2:

City: LOS ALAMOS State: NM Zip Code: 87505-9803

Organization: SELF

Telephone: 505-984-1922 Fax: 505-984-0922

Comments:

1/40.04 PLANNED PROGRAM SEEMS TO BE JUSTIFIED ALMOST EXCLUSIVELY ON BASIS OF DIMINISHED THREAT REPRESENTED BY END OF COLD WAR AND BREAK-UP OF FORMER SOVIET UNION. SOME EMPHASIS SHOULD BE PLACED UPON REMAINING AND POTENTIALLY GROWING NUCLEAR POWERS/THREATS, EG. CHINA, INDIA, FRANCE, ETC. CURRENT EMPHASIS FEEDS ILLUSION THAT THREAT OF NUCLEAR WAR VANISHED WITH COLD WAR END AND SOVIET UNION BREAK-UP. DOE SHOULD NOT DO THIS.

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

Receiver's Initials:

SSM-H-LANL-002
COMMENT LETTER

PAGE 1 OF 1

LOS ALAMOS COUNTY

P.O. Box 30 Los Alamos, New Mexico 87544 505-662-8080 FAX 505-662-8079

April 25, 1996

Department of Energy
PEIS Hearing
Santa Fe, New Mexico

SUBJECT: STOCKPILE OVERSIGHT

1/40.51 The stewardship of the Nuclear Stockpile is a function that is best done at Los Alamos National Laboratory. This is a very critical component of our nation's security. My lawnmower will not start immediately after sitting all winter – it is ridiculous to assume that a sophisticated device consisting of over 5,000 parts, and some very exotic materials, would not require close and careful monitoring to ensure safety and reliability.

In addition, Japan and Germany are relying on the United States to maintain a credible stockpile, and if we don't they would probably proceed to develop a weapon of their own, possible within just months.

The Los Alamos Study Group's (consisting for the most part of people outside Los Alamos) vision for Los Alamos is a ghost town - a vision which if realized would destroy the economy of North Central New Mexico and threaten national security. They have forgotten the lessons of the 1990s.

Our vision for Los Alamos is to guarantee the integrity of our nation's stockpile, and thus the freedom of this Country. Also, the Laboratory has, and will continue to make substantial contributions to finding solutions to problems in diverse areas including medicine, energy, and transportation. As a County, we whole heartedly support Los Alamos National Laboratory in their efforts.

Sincerely,

Denise Smith
Council Chair
Los Alamos County Council

"A Consolidated City and County Government"

SSM-H-LANL-003
COMMENT LETTER **PAGE 1 OF 1**

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: Morris M.I.: B Last Name: Pongratz
Street Address: PO Box 30
Street Address 2:
City: Los Alamos State: NM Zip Code: 87545-
Organization: Los Alamos County Council
Telephone: 505-662-8080 Fax: 505-662-8079

Comments:

1/41.07 • Safety – Citizens Advisory Board not accountable to the citizens of Los Alamos. Trusted agents? CAB cannot [illegible] citizens in LA.

2/40.06 • Judgement as a choice between options – is this necessary for national security? What are the risks to our citizens? & what is in it for our citizens for taking the risks?

3/08.06 > LANL director quoted as saying pit production was not University's proper role.
> U of C that does not pay taxes – does not pay state for cost of providing public school education.
> U President that thinks Northern NM Regional [illegible] of LAC.
> 20 new jobs – great! Have a private, tax-paying contractor do the work!

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

[redacted] 5/96

Receiver's Initials: [illegible]

SSM-H-LLNL-001
COMMENT LETTER **PAGE 1 OF 2**

CITY OF LIVERMORE

April 11, 1996

Honorable Chairperson,

1/40.44 My name is Cathie Brown and I am the Mayor of the City of Livermore. On behalf of the 65,000 residents of the City, I would like to thank you for holding this public hearing in the City of Livermore and for giving me the opportunity to speak to you about the City's overwhelming support for the Department of Energy's (DOE's) Stockpile Stewardship and Management Program. Also, since the proposed National Ignition Facility (NIF) is the cornerstone of the Stockpile Stewardship Program, I am strongly encouraging the DOE to not only support construction of the NIF but to locate it in Livermore at the Lawrence Livermore National Laboratory (LLNL).

2/21.06 My review of the Environmental Impact Statement (EIS) leads me to conclude that the NIF does not undermine the objectives of our Nation's Comprehensive Test Ban Treaty. This conclusion is further supported by the report the DOE prepared last year at the request of Congressman Dellums. This report looked at the question of whether the NIF would hinder or aid United States nonproliferation efforts. This DOE study confirmed the conclusions of the 1994 JASON Committee Report which stated (1) The technical proliferation concerns of NIF are manageable and therefore can be made acceptable; and (2) NIF can contribute positively to United States arms control and nonproliferation goals.

Another reason I am encouraging you to adopt the Programmatic Environmental Statement is because our community is eagerly awaiting the positive economic impacts construction of the NIF will have on our local and regional economy. The $1.07 billion construction costs will create 3,320 high-paying construction jobs, as well as 890 permanent jobs.

Honorable Chairperson
April 11, 1996
Page Two

3/21.12

Lastly, the Laboratory has been a good neighbor to the City of Livermore. They have been very concerned with and open about public health and safety issues associated with past and present projects at the Laboratory. It is because of this past track record that the City has confidence in the Laboratory that they will accept and diligently implement any mitigation measures that are contained in the Final Environmental Impact Statement on the NIF.

1/40.44 continued

In summary, the City is pleased to offer its support to the Laboratory and to the Department of Energy for funding the National Ignition Facility, and is grateful to the Laboratory's leadership for their efforts in viewing the City as a coequal partner in ensuring the future viability of the Laboratory. We are confident this partnership will continue to prosper in the future and look forward to working with you toward this mutual goal.

Thank you,

Cathie Brown

CATHIE BROWN
Mayor

CB/cm

The Regional Economics Of Constructing
The National Ignition Facility

1/21.09

1. Will the NIF create 1500 jobs?

The jobs created in the Livermore region by the NIF will vary during each year of construction. During year one, only 22 jobs will be created. By year five, approximately 600 jobs will be created. Construction jobs will then fall to 120 jobs by year seven. Only about 230 long-term operating jobs will stay at the NIF.

2/21.10

2. How much does it cost to create one job at the NIF?

LLNL data shows it costs almost $1 million to create each lab-related job. Construction jobs cost about $420,000 each, and electrical equipment-related jobs cost about $750,000 each to create.

3. How much does it cost to create construction and electrical jobs in the Bay area?

According to the Department of Commerce, it costs about $120,000 each to create either of these jobs anywhere else in the Bay area.

4. Will the NIF be a "magnet" for high tech industries and will this create local jobs?

Industries choose to relocate for many reasons, but regional economists recognize the following factors as being most important:

- Lifestyle: recreation, congestion, crime
- Low cost per square foot of building space
- Easy transportation access
- Low taxes and low fees.

The NIF will drive up the per-square foot cost of local construction due to the higher wages paid at the facility and competition for construction materials. Further, high tech industries that rely on tech transfer have been shown to be poor regional job producers.

5. Where will the money for the NIF come from?

The United States is operating at a deficit while trying to decrease our national debt. There is no money for new projects that does not come by shutting down old projects. NIF's initial funding was accompanied by cuts in nuclear weapon production waste cleanup, both nation wide and at LLNL. Further, there are

3/21.04

indications that additional funding for the NIF will come at the expense of other LLNL projects. These cuts will mean job losses that could offset any job gains realized from the NIF.

6. What is the outlook for the NIF project?

2/21.10 continued

The NIF is a "big science" project. The history of funding such projects in the US is not good, with the cancellation of the Superconducting Super Collider being only the most recent example. Because of its nuclear weapons connection and because of its high cost and because of its lack of credible justification, the NIF is unlikely to survive the annual budget process in Washington. If it is terminated after the the NOVA laser is dismantled, it will result in large job losses throughout the region. If it is built, cutbacks at other LLNL projects will probably be required. This will result, at best, in a neutral employment situation in the Livermore region.

William J. Weida – Economists Allied For Arms Reduction – March 8, 1995

Life Cycle Costs and Tradeoffs Associated With The
Proposed Stockpile Stewardship and Management (SS&M) Program

William J. Weida
Economists Allied For Arms Reduction
April 9, 1996

The Department of Energy (DOE) has proposed a Stockpile Stewardship and Management (SS&M) Program to "consolidate" the nuclear weapons complex and to preserve weapons research, development and manufacturing capabilities into the 21st century. This program is intended to maintain DOE's ability to design, fabricate and certify new warheads in the absence of underground nuclear testing.[1] It is being proposed in spite of the fact that the overwhelming majority of the American people want deep reductions in nuclear arsenals and a permanent end to nuclear testing. According to a national poll conducted at the beginning of 1995, 90% of Americans favored further stockpile cuts worldwide; 82% favored the elimination of most or all nuclear weapons, and 82% favored a global ban on all nuclear tests.[2]

The 1996 budget negotiations that led to the FY1997 SS&M budget request were based on a ten-year, $40 billion program. However, the amounts actually allocated to the program in that request were approximately:

$3.7 billion in FY1997
$3.8 billion in FY1998
$3.9 billion in FY1999 and thereafter.

There have been indications that annual SS&M allocations could rise to the promised levels of $4 billion per year after 2002.[3]

1/40.13 Given these budget projections, the total life cycle cost of SS&M can be calculated based on assumptions concerning the actual amount of funding provided, the length of the program, and the discount rate experienced over its life. The following calculations assume two probable life spans for the SS&M program--20 years and 40 years. The calculations also assume the discount rate is approximated by the current 7% rate the federal government pays to borrow money and that likely levels of SS&M funding are bracketed

[1] Statement by Dr. Harold P. Smith, Jr., Assistant to the Secretary of Defense (Atomic Energy) before the Senate Energy and Water Development Appropriations Subcommittee, March 1, 1995.
[2] Poll of 1,011 Americans by ICR Survey Research; results cited in the Congressional Record, January 17, 1995, p. E110-11.
[3] Hearing of the Subcommittee on Military Procurement, Committee on National Security, US House of Representatives, Washington DC, March 12, 1995.

1/40.13 continued

by the current level ($3.7 billion/year) and the promised level ($4 billion/year). With these assumptions, the present values of the life cycle costs of the SS&M program are shown in Table 1.

Program Specifications	Life Cycle Cost
$4 billion/year for 40 years	$53.34 billion
$4 billion/year for 20 years	$42.38 billion
$3.7 billion/year for 40 years	$49.33 billion
$3.7 billion/year for 20 years	$39.18 billion

Table 1
Alternative SS&M Life Cycle Costs

Thus, the likely present value cost of the proposed SS&M program lies somewhere between $40 and $55 billion (in FY1996 dollars). As a means of comparison, $1 billion can purchase:

- more than eighty new schools;
- eight electric power plants, each capable of serving 60,000 people;
- eight fully-equipped hospitals;
- about 120 miles of interstate highway.

As a further standard of comparison, the life cycle costs of the SS&M program could finance the following parts the 1995 US government budget:

1. all natural resources and environment programs for two years.
2. all transportation programs for a year and a half.
3. all education, training, employment, and social services programs for a year.
4. all Department of Justice programs for three years.
5. the operations of the entire US government for four years.[4]

Much of the expense for the SS&M program is directly related to pay for personnel. However, significant expenses are also related to the construction of new facilities. The DOE is planning $2.66 billion in construction or upgrades of SS&M Program facilities over the next decade. An advanced computing program--the Terraflop computer--will cost an additional $2.1 billion over 20 years. DOE's specific cost projections for the envisioned SS&M program facilities are displayed on the following page.

The $40-55 billion life cycle cost range substantially understates the actual costs of a SS&M program. This program will receive a considerable subsidy as site maintenance costs are transferred to DOE's environmental management program. Further, the SS&M proposal accounts for neither the

[4] Economic Report of the President, US Government Printing Office, 1995.

1/40.13 continued

PROJECTED STOCKPILE STEWARDSHIP FACILITIES COSTS

Facility	Location	Purpose	Cost
Advanced Hydrotest Facility	NTS or LANL	6 - 8 simultaneous views of imploding simulated primaries; will use DARHT technologies	$422 million
Atlas Facility	LANL	capacitor bank for simulated weapons environments; for study of secondaries.	$48.4 million
Chemical and Metallurgical Research (CMR) Building	LANL	3 phases of upgrades to LANL's largest building; analytical chemistry of plutonium and highly enriched uranium; first phase is under way.	$224 million
Contained Firing Facility	LLNL	contained hydrodynamic testing; study of nuclear weapon primaries.	$48.5 million
Dual Axis Radiographic Hydrotest Facility (DARHT)	LANL	open-air hydrodynamic testing; for study of nuclear weapons primaries; under construction, currently enjoined by court order.	$148 million
Explosives Components Facility	SNL	contained high explosives testing; under construction.	$27.8 million
Jupiter Facility	SNL	x-ray weapons effects facility; jointly funded by DOE and DNA.	$240 million
National Ignition Facility (NIF)	LLNL	192 beam laser system for fusion ignition and study of secondaries	$1.07 billion**
Phase II Facilities Revitalization	3 labs & NTS	9 subprojects for new or upgraded facilities	$248 million*
Phase III	SNL, NTS	infrastructure	$112 million
Phase V	SNL	infrastructure	$34.6 million
Phase VI	LANL	infrastructure	$34.7 million

*In DOE budget requests, DARHT is one of the nine subprojects in Phase II. In this table, DARHT costs are separated.
**The NIF has a $4.5 billion dollar life-cycle cost. (Does not include WM or D&D.)

Notes:
1. Total cost for proposed facilities construction and revitalization: $2,661,100,000
2. Accelerated Strategic Computing Initiative (ASCI): a massively enhanced computer network; cost extrapolated through 2010: $2,104,300,000
3. Combined costs (facilities + revitalization phases + ASCI) = $4,765,400,000
4. LANL=Los Alamos, LLNL=Lawrence Livermore, and SNL=Sandia National Laboratories; NTS=Nevada Test Site.
5. Source: DOE FY96 Congressional Budget Request, Project Data Sheets; Draft ASCI Program Plan, DOE, June 1995; FY96 LANL and SNL Capital Assets Mgmt Plans.

3

1/40.13 continued

decommissioning and dismantlement costs arising from its proposed activities nor for the environmental restoration activities the program will necessitate. In addition, as the US increases its technological advantage over other nuclear weapons states in areas ranging from hydrodynamic testing, inertial confinement fusion and pulsed power to computer simulation, it becomes more difficult for other nations to assess US capabilities. This raises the possibility of a "virtual arms race" in simulated test technologies, and it provides incentives for both nuclear weapons states and potential

2/40.07

proliferants to "break out" of a test ban regime. If such a breakout occurs it could restart the costly nuclear arms race that consumed so many US resources over the last forty years. The SS&M program would bear substantial responsibility for the resumption of these costs.

Conclusion:

3/40.33

One method to help combat the proliferation dangers posed by the SS&M program, and to help reduce the financial burden this program places on the citizens of the US could be to implement of a passive curatorship of the stockpile through the replication of weapons components as needed. At the curatorship level, it should be possible to maintain two teams at LANL & LLNL, each with 2 dozen scientists and engineers to monitor about a half-dozen weapon types. Including a support staff, 400 people could perform the task of Stockpile Stewardship (SS) at a cost of less than $100 million per year with redundant teams, contractors and oversight.

These annual SS costs equate to a present value cost of about $1.33 billion for a 40 year program, or $1.1 billion for a 20 year program--a savings of $38-53 billion over the proposed SS&M program. Additional stewardship funding would also be required for Sandia National Laboratory, but even in the unlikely event that this funding doubled the cost of the curatorship program, the results would still be a significant savings compared to the cost of the proposed SS&M program.

4/40.15

These savings gained by implementing a curatorship program would allow DOE to redirect funds to cleaning up the DOE weapon complex. Cleanup funds were cut by $400 million in 1996, and the Environmental Budget is scheduled to be cut by another $4.4 billion over the next 5 years. In fact, the President's Budget Request released on March 19, 1996, cuts DOE's defense and non-defense Environmental Management budget by $205 million while increasing the nuclear weapons budget by $244 million. These cuts are more troubling when one realizes that the DOE projects that the SS&M Program will generate 1,370,000 cubic meters of "low-level" waste and 144,000 cubic meters of "low-level" mixed waste over the next 20 years.[5]

[5] Draft Waste Management Programmatic Environmental Impact Statement US Department of Energy, DOE/EIS-200-D, August, 1995, p. 11, 13.

4

THE REGIONAL ECONOMIC IMPLICATIONS OF THE CONSTRUCTION OF THE NATIONAL IGNITION FACILITY (NIF)

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March 7, 1994

Summary Of Findings

1/21.09

The regional economic impacts from building the NIF cited in the Conceptual Design Report are inflated and misleading.

Regional economic effects of the construction and pre-operation of the NIF will be relatively small over most of the 7 year construction period. A large influx of construction employees during years three, four and five of the construction period and a correspondingly large decrease in construction employees during years six and seven has the potential to create a boom and bust scenario in the Livermore region: The Livermore region would have about 1200 people move in and out during the last four years of the construction of NIF.

The NIF is would be constructed in a time in which DOE budgets are falling and there is no new money for projects of any size. Thus, a real cost of building the NIF is the tradeoff its construction will cause with other projects such as cleanup and continued use of the NOVA laser. Virtually any other use of the NIF construction funds would create more jobs in the Livermore region than the NIF will, and since it costs so much to create one job at the NIF, allocating one-fourth of the money budgeted for the NIF to other construction work or one seventh to electrical equipment manufacturing in the Bay area would create the same number of jobs created by building the NIF.

Construction of the NIF also entails a cost to the nation as a whole. For example; a $2 billion program is roughly equivalent to new schools in more than twenty cities; two electric power plants, each serving a town of 60,000 people; or five fully equipped hospitals. There is no indication that the NIF will provide social benefits comparable to any of these alternative uses.

Lastly, many of the jobs at the NIF will be filled by those who are currently employed at the NOVA laser. These jobs are regarded as a "gain" by LLNL, but they are actually only a transfer of employment from one facility to another. To be correctly regarded as an

1/21.09 continued

employment gain, these jobs would have to have been lost at the NOVA laser, but the NOVA has an ample backlog of business to keep it in operation for some time to come. Further, when the NOVA is shut down due to NIF construction, a loss of jobs to the region will result. It is unclear whether the NIF will replace all these jobs, and thus, it is also unclear if the NIF will result in a net gain or loss of jobs.

ANALYSIS

Employment Calculations

The regional economic impacts from building the NIF are misleading. Most jobs associated with the project will be located outside the Livermore region and the Bay area. One-fourth of NIF project costs are slated to go to foreign industry.[1]

LLNL claims the following employment impacts from NIF construction:[2]

Location	Budget	Employment	$ to Create 1 Job
LLNL	$218	230	$948,000
Other Labs	$86	90	$960,000
Const Indust	$169	400	$420,000
Mfgr Indust	$600	800	$750,000
Total	$1073	1520	

This figure of 1520 jobs, often cited by LLNL, is meaningless. NIF construction will be a 7 year project. Spending is very uneven over the entire period of the construction, and thus, the number of jobs created each year varies widely. As Figure 1 shows, the number of direct jobs varies from 22 to 612 jobs per year, depending on which of the 7 years of construction is chosen. Figure 1 uses LLNL estimates for spending on the NIF (LLNL Budget Estimates) and estimates derived from the author's research (Alternative Budget Forecast). The differences between these two forecasts are explained in the sections that follow.

In addition, the 1520 jobs cited by LLNL are located all over the United States, not in the Livermore region. In fact, the map on page 18 of

[1] "LLNL ICF Program and Stockpile Stewardship with NIF", UCRL-MI-118179, L-18362-1, Lawrence Livermore National Laboratory, August 30, 1994, Executive Summary.
[2] Ibid., p. 22.

the Conceptual Design Report (CDR) Executive Summary shows that NIF contracts will go to 43 of the 50 states.[3]

1/21.09
continued

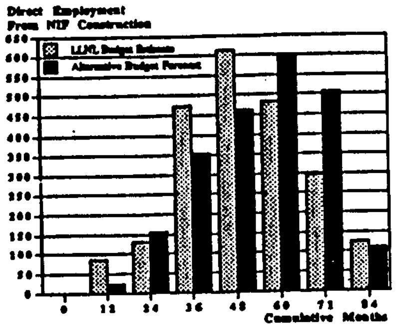


Figure 1
Direct Employment From NIF Construction
LLNL Budget Estimate and Alternative Budget Forecast

Annual Employment and Spending Impacts From NIF Construction

According to the LLNL Conceptual Design Report, spending associated with NIF construction occurs over seven years in the following manner:

	FY96	FY97	FY98	FY99	FY00	FY01	FY02
Budget Outlay($ Millions)	33	50	181	234	184	113	48

The total direct employment calculations on page 22 of the CDR Executive Summary ignore the differences in annual expenditures and hence, are incorrect. However, a basic expenditure curve can be used to calculate the annual employment associated with construction of the NIF. Figure 2 shows the expected cumulative expenditure curve for laser based projects.

[3]Ibid., p. 18.

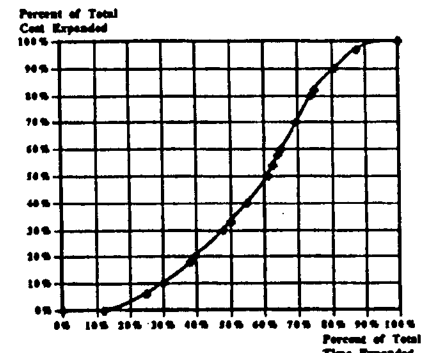
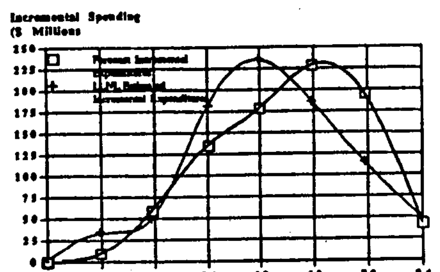


Figure 2
General Cost Curves For
Laser-Based Projects

This curve allows one to derive an independent forecast (called the "Alternative Forecast" in the sections which follow) to check the spending pattern chosen by LLNL. Figure 3 shows, on an incremental spending basis, the comparison between outlays for all past laser projects and those chosen for the NIF.



Source: National Ignition Facility Conceptual Design Report, NIF-LLNL-94-113, L-16873-1, Executive Summary, August, 1994, p.22.

Figure 3
Forecast And LLNL Estimated Incremental Spending For The NIF
Over Time During Facility Construction

2/21.08

While Figure 3 indicates a general agreement between the expenditure patterns called for by LLNL and those that have occurred in the past, the unevenness of LLNL's early expenditure estimates, coupled with the rapid growth of spending a year ahead of when it would be expected to occur based on past projects, leads one to conclude that the NIF may overspend early in the project cycle and may experience significant delays due to the attempt to "push" the project in the first four years.

Based on the incremental expenditures shown in Figure 3, one can derive the annual employment during construction of the NIF. Using these expenditures, annual construction employment for the NIF Facility under both the LLNL and the Alternative Forecast scenarios would be:

LLNL Estimate, NIF Facility Const., (MM of FY94$)							
Fiscal Year	FY96	FY97	FY98	FY99	FY00	FY01	FY02
Total Budget	33.4	49.5	181	234	184	113	47.5
Budget Obligation, NIF Facility Construction ($mm) In 1989 Dollars:	26.6	39.5	144	186	147	90.3	37.9
Regional Spending Impact (allocated at 40% of Annual Expenditures)	10.6	15.8	57.6	74.5	58.8	36.1	15.1
Annual Jobs (i.e., Total Regional Jobs) from New and Repair Construction (factor = 23.8 jobs per $1 million)	253	376	1371	1774	1399	860	360
Annual Direct Jobs from Construction (Total jobs divided by 2.9)	87.4	130	473	612	482	296	124
Alt. Forecast, NIF Facility Const., (MM of FY94$)							
Fiscal Year	FY96	FY97	FY98	FY99	FY00	FY01	FY02
Total Budget	8.43	59	135	177	228	194	42.2
Budget Obligation, NIF Facility Construction ($mm) In 1989 Dollars:	6.72	47	108	141	181	155	33.6
Regional Spending Impact (allocated at 40% of Annual Expenditures)	2.69	18.8	43	56.4	72.6	61.8	13.4
Annual Jobs (i.e., Total Regional Jobs) from New and Repair Construction (factor = 23.8 jobs per $1 million)	64	448	1024	1343	1727	1471	320
Annual Direct Jobs from Construction (Total jobs divided by 2.9)	22.1	154	353	463	595	507	110

Table 1
Annual Construction Employment
Both NIF Construction Scenarios

Additionally, a number of construction jobs will be taken by site staff. Out of a total construction/assembly/installation budget of $142,493,000, $17,735,000 or 12.4% of all work will be done by site staff. All annual employment effects will be substantially lower if it takes longer to build the facility, and it is likely that the CDR has underestimated the time required to build the initial parts of the project.

If the object is to create jobs, NIF is an extremely expensive way to go about it. For example, for the Bay area, the Department of Commerce's Rims II model predicts:

	Const	Elec Equip
Total Jobs per million$	23.6	22.4
Multiplier	2.93	2.57
Direct Jobs per million$	8.12	8.71
$ To Create 1 Job	$123,000	$115,000

These figures are about one-fourth of the amounts required to create a construction job on the NIF and one-seventh the amounts required to create electrical industry jobs for NIF products.

In sum, the regional economic effects of the construction and pre-operation of the NIF will be relatively small over most of the 7 year construction period. However, a large influx of employees during years four, five and six of the construction period and a correspondingly large decrease in employment during year seven both indicate that it is likely that the Livermore region will suffer a moderate boom-and-bust scenario.

Regional Impacts of Indirect Employment from the NIF

1/21.09 continued

The total number of jobs (both direct and indirect) created in the LLNL region is also exaggerated by the 1500 direct jobs figure used in recent LLNL briefings.[4] The total number of jobs created during the seven year construction phase are likely to be about:

	FY96	FY97	FY98	FY99	FY00	FY01	FY02
Total Jobs Created	64	448	1024	1343	1727	1471	320

Thus, each direct job discussed in the previous sections result in about 1.9 additional (indirect) jobs in whatever region the NIF is constructed. For this reason, the inflation of direct jobs that occurs in the CDR also results in an overstatement of indirect jobs by 190%. Further, since technology is completely portable there is little reason for any company to locate in the region where the NIF is located. The Stevenson-Wydler Technological Innovations Act of 1980 mandates the transfer of

[4]Ibid., p. 22.

technology from government to private hands, but it does not permit constraints on the location in the United States where that technology is used. In sum, the employment possibilities from the NIF appear to be significantly overstated.

Nuclear Weapons Safety: No Design Changes Are Warranted

A Review for Tri-Valley CAREs

by

Greg Mello

July 1, 1995

I am pleased to report the stockpile today is safe, secure, reliable, and meets current military requirements. We make that statement with confidence today and for the immediate future....Our stockpile is becoming safer and more reliable simply because we are retiring older weapons...Thus, we should enter the 21st century with a modern, safe, and reliable stockpile consistent with the demands of START I and with anticipated military requirements.

–Dr. Harold Smith, Assistant to the Secretary of Defense for Atomic Energy, to Congress on March 15, 1994

In addition to reducing the sheer size of the active nuclear inventory, a number of additional actions have been or are being taken to improve nuclear safety, security, and use control...I can confidently report today that the stockpile is safe, secure, and reliable. It also meets the requirements of DoD and the Services.

–Dr. Smith to Congress on March 1, 1995

Nuclear Weapons Safety: No Design Changes Are Warranted

An Issue Brief for Tri-Valley CAREs by Greg Mello, July 1, 1995

Summary

1/40.12
- The quest to make nuclear weapons "safe," in the fullest sense of the term, can never succeed and guarantees large appropriations without clear results.

2/40.70
- Weapons in the current U.S. arsenal are, technically speaking, safe and becoming more so as older weapon types are retired. Here, "safe" means that all the weapons in the START II stockpile are fully protected against accidental nuclear explosion.

3/40.77
- It is impossible to reduce the risk from nuclear weapons accidents to zero, however, and in particular there will always remain some risk that plutonium will be dispersed by fire or explosion. The simplest and best ways to further minimize this possibility are
  - o operational and deployment changes that reduce the chances of an accident and the risk to the public should there be one, and
  - o further retirements, leading to a smaller arsenal.

- The safety concerns raised at the beginning of this decade by the Drell panel have been mostly resolved by retirements and by changes in handling procedures. Dr. Drell now believes that changes in the design of the nuclear components of weapons to achieve greater safety are not warranted, given the reliability, arms control, and nonproliferation costs of such changes.

4/40.36
- While it would in theory be possible to replace some warheads in the arsenal to make them safer still, neither the Air Force nor the Navy, nor the Department of Defense (DOD), nor the Department of Energy (DOE) believes this action is merited. Therefore no warhead replacements for safety are currently planned.

- No safety problems are expected to occur in the aging process.

- The proliferation risks of upgrading the U.S. arsenal for any purpose, safety included, are potentially great.

5/40.07
- If the countervailing risks resulting from weapons testing, production, waste management, and eventual decommissioning and cleanup are included, it is highly likely that efforts to produce "safer" weapons will degrade overall nuclear safety.

- Attempts to upgrade safety will decrease reliability, because new designs cannot be tested.

1

4/40.36 continued

- None of the proposed new science-based stockpile stewardship (SBSS) facilities is needed to maintain the safety of existing nuclear weapons. Most proposed facilities, like the National Ignition Facility at Livermore, the Atlas facility at Los Alamos, and the Jupiter facility at Sandia, have no safety-related missions at all.

- The safety benefits per dollar spent on weapons safety upgrades are several orders of magnitude smaller than other federal safety investments, civilian or military.

6/11.31

- Morbidity and mortality in the cleanup crews at nuclear weapons accidents have not been studied, and long-term effects at these sites are unknown. With these possible exceptions, no one is known to have ever been injured from a nuclear weapon in an accident.

3/40.77 continued

- The risk of death from a nuclear weapons accident appears to be, very roughly, about a million times smaller than other causes of accidental death and about 100-1000 times smaller than the public health risks from exposure to environmental pollution at current health standards.

7/40.26

- The real purpose of the disproportionate and irrational drive to maximize safety in just one part of a complex and countervailing system of risks is to make nuclear weapons jobs and funding, and not the public, safe.

- For all these reasons, weapons safety concerns need not and should not drive the stockpile management program.

1. Introduction

"Safe" is hardly the first word anyone would choose to describe nuclear weapons. After all, nuclear weapons have been designed and amassed precisely because they are enormously destructive, i.e. because they are not "safe." From the outset, it is obvious that the oxymoronic quest to make nuclear weapons "safe" can never succeed. To adopt such a quest as a goal of public policy is a way of assuring that no amount of money, however large, will ever be adequate to complete the job. What might be called "existential safety" for nuclear weapons will never be achieved.

Yet, if the problem of nuclear weapons safety is defined in the narrow sense of preventing accidental detonation of the weapons or dispersal of their nuclear materials, there is a consensus among authorities that current nuclear weapons are safe--if not absolutely so then at or near the practical limit of safety. What might be called "practical safety" for nuclear weapons has already been achieved.

The contradiction between what has already been achieved and what can never be achieved has been harnessed by the Department of Energy (DOE) to produce enormous amounts of rhetoric. Where logic has faltered, the nuclear weapons orthodoxy demands faith, and to this end maintaining and improving the "safety, security, and reliability" of the nuclear arsenal has

become a constant litany that is ritually intoned to ensure support of the DOE's science-based stockpile stewardship (SBSS) program. This slogan is offered with little or no further explanation by the weapons laboratories and their sponsors whenever appropriations are questioned. Of the "safety, security, and reliability" trinity, it is the quest for endlessly "safer" nuclear weapons that has retained the most political cachet, pandering as it does to existential fears whose solution entirely transcends further technical adjustments in weapons design.

2/40.70 continued

The central theme of this paper is that nuclear weapons safety, as a technical problem for weapons designers, has been solved. Additional operational changes offer some further reductions in risk, but risks from nuclear weapon accidents are already orders of magnitude lower than in the recent past. Not only will further efforts to improve weapons safety be expensive and lead to greatly diminished returns in risk reduction, but when the safety issue is placed in its overall context, such "improvements" are shown to decrease overall nuclear safety.

At the same time, replacing selected weapons in the arsenal to "improve" safety will inevitably decrease reliability if the new weapons are not proof-tested. For these reasons, nuclear weapons safety is not an absolute good. The proper goal is an optimum level of nuclear weapons safety, not a maximum.

In some respects, the problem of "How safe is safe" is similar to the problem of "How clean is clean"—completely safe and clean are not the right answers. But there are differences: the nuclear weapons problem is relatively easy to solve politically, technically, and managerially; it has been a central goal since 1944; and it has been accomplished. None of these apply to the cleanup problem.

Often nuclear weapons safety and security are spoken of together, the two concerns being combined in the term "surety," which sometimes includes reliability concerns as well. With the planned addition of permissive-action links (PALs) to submarine-launched ballistic missiles, adequate use-control over the entire U.S. nuclear arsenal will in time be achieved.[1] Security will not be discussed in this paper.

2. The Drell panel

In December 1990, the Report of the Panel on Nuclear Weapons Safety, usually called the Drell Report after its chairman, Dr. Sidney Drell, published its strong recommendations for a greater emphasis on safety in nuclear weapons design and deployment and in the institutional arrangements governing weapons.[2] In brief, the Drell panel found that some weapons in the U.S. stockpile were not as safe from accidental detonation as had been thought (the particular weapons systems involved were kept vague). The panel also observed that most of the weapons in the stockpile were not equipped with state-of-the-art features to prevent plutonium contamination in the event of an explosion or fire.

To remedy these problems, Drell called for operational changes, some of which were quickly implemented, and the incorporation of the most modern safety features into all stockpiled

2/40.70
continued

weapons. To fully implement this latter recommendation for the large and diverse 1990 stockpile would have required dozens of underground nuclear tests and tens of billions of dollars in appropriations for weapons design and manufacturing. It would have required the construction of a new nuclear weapons manufacturing complex and the operation of that complex over an extended period of time, and it would have required the costly modification of some delivery platforms.

Thus, although the scope of the panel's investigation was ostensibly technical, its recommendations called for an enormous amount of new work (and new funding) for DOE's nuclear weapons program and its laboratories, just as the Cold War was winding down. Fortunately, Drell's most expensive and controversial recommendations were mooted by events which led to the retirement of some weapon systems and the stand-down of others.

The first of these events was the START I treaty, signed by the United States and the Soviet Union in July of 1991, followed by the "joint understanding" in June 1992 which led to START II in January of 1993. Major reductions in the deployment of tactical nuclear weapons were announced by the U.S. and Soviet Union in the fall of 1991, together with the removal of nuclear weapons from bombers on alert. In 1992, President Bush announced that there was no need for further U.S. nuclear weapons tests to develop new weapons, and in July of 1993, President Clinton joined the Russian-led moratorium on nuclear testing.

In addition to improving nuclear weapons safety, all these changes collapsed the central mission of the DOE weapons labs, which had been the design of new weapons. The result has been that, even though the nuclear arsenal has become markedly safer, the labs and DOE are all the more vociferously clamoring for "more" safety as a new mission. "Safety" has thus become more and more of an empty slogan as it expands into the vacuum of purpose that characterizes large portions of the laboratories.

3. All authorities agree: U.S. weapons are safe

Are U.S. nuclear weapons, in fact, "safe?" The unequivocal and unanimous conclusion of the nuclear weapons establishment is affirmative. In his testimony on March 15, 1994, Dr. Harold Smith, Assistant to the Secretary of Defense for Atomic Energy, told Congress.

> I am pleased to report the stockpile today is safe, secure, reliable, and meets current military requirements. We make that statement with confidence today and for the immediate future....Our stockpile is becoming safer and more reliable simply because we are retiring older weapons...Thus, we should enter the 21st century with a modern, safe, and reliable stockpile consistent with the demands of START I and with anticipated military requirements.[3]

This statement was made in the presence and with the approval of Dr. Victor Reis, Assistant Secretary of Energy for Defense Programs, who added.

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> Right now, as Dr. Smith said, that stockpile is safe and reliable.[4]

Dr. Reis and Dr. Smith are, respectively, a member (one of three) and the Executive Secretary and Staff Director of the Nuclear Weapons Council. There is no higher or more integrative authority on this subject. And what they said has been a consistent theme over the past few years. Smith's predecessor, Robert Barker, told the Senate in March of 1992,

> The Air Force and Navy, in cooperation with the Office of the Secretary of Defense and the Energy Department, evaluated the safety of all ballistic missiles that carry nuclear warheads. It was determined that there is not now sufficient evidence to warrant our changing either warheads or propellants.[5]

John Deutch, now Deputy Secretary of Defense, reiterated Barker's general conclusion for the specific case of the W88 warhead on may 3, 1993 when he told the House Panel on the Military Application of Nuclear Energy that incorporation of insensitive high explosive (IHE) into that warhead would not be worth its considerable cost (more than $3 billion).[6]

A few days later, Rear Admiral John T. Mitchell, Director, Strategic Systems Programs Office, U.S. Navy, was even more blunt. On May 11, 1993, he told a Senate committee that, for the W88 warhead, "We believe that there would be no gain in safety in changing to insensitive high explosive."[7] These comments by Deutch and Mitchell signalled that the safety questions that had been raised by the Drell Report regarding the W88 (see below) had been resolved, at least to the satisfaction of the DOD and the Navy.[8]

Deutch, a strong advocate of nuclear weapons design and testing, recently reiterated the government's consensus on the safety of U.S. nuclear weapons. On October 5, 1994, Chairman Hamilton of the House Foreign Affairs Committee suggested to Deutch, following the latter's presentation of the Nuclear Posture Review, that safety concerns might be a reason to resume nuclear testing. Deutch demurred, saying unequivocally, "It is my judgment that all the nuclear weapons that we have are adequately safe."

Dr. Smith unambiguously reiterated the continuing safety theme on March 1, 1995, in testimony before the Senate Appropriations Committee, Energy and Water Development Subcommittee.

> In addition to reducing the sheer size of the active nuclear inventory, a number of additional actions have been or are being taken to improve nuclear safety, security, and use control...I can confidently report today that the stockpile is safe, secure, and reliable. It also meets the requirements of DoD and the Services.

The repeated testimony cited here was offered by the highest responsible sources after careful review of those portions of the Drell Panel's recommendations that remain outstanding. This testimony states with abundant clarity that no safety problem currently exists in the nuclear weapons stockpile. Yet, since the weapons labs still hawk greater "safety" as a mission, many decisionmakers conclude that nuclear weapons safety is an unresolved issue.[9]

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4. What is the nuclear weapons safety problem?

Those responsible for designing, building, and maintaining U.S. nuclear weapons do so with a keen appreciation of the dangers inherent in these weapons and in the materials they contain. It is their job to make the protection of public safety a paramount concern in every aspect of their work. Their real goal is to effectively protect the public, not simply to build safer weapons at any cost. These two goals are not the same, as can be seen from the following outline, which supplies a common-sense context for analyzing the safety problem and maximizing the safety benefits of federal spending.

The Nuclear Weapons Safety Problem in Context

The Overall Goal: Protect the public[10]

A. from dangers other than those from nuclear weapons

B. from nuclear weapons dangers (DOE: "reduce the nuclear danger"[11]), including

1. nuclear attack
   a. by an existing nuclear-weapons state
   b. by a proliferant nation or group
2. risks to workers from nuclear weapons testing, manufacture, waste management, deployment, decommissioning and decontamination, and cleanup
3. risks to public health from the nuclear weapons operations listed above
   a. risks to current populations
   b. risks to future generations
4. any environmental risks not included in 3, such as loss of tribal lands and sites, environmental damage that is not human health damage *per se*
5. other, indirect, nuclear dangers (e.g. threats to democracy from counterterrorism activities)
6. nuclear weapons accidents
   a. unintentional nuclear detonation
   b. dispersal of plutonium

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Based on this outline, there are three relevant hierarchical levels of safety goals. The most fundamental goal is maximizing overall public safety. This means to minimize morbidity and early mortality, from whatever cause. Since it is clear that there is a finite amount of money available to the federal government to do this, it is certain that seeking to maximize safety from one type of danger without regard to cost, e.g. nuclear weapons, would damage overall public safety, not to mention impede other important goals of government. Choices will have to be made, then, and an optimum, not a maximum, level of safety chosen for each particular program, nuclear weapons included.

A subset of public safety is safety from nuclear weapons. Optimizing this—which is called by DOE "reducing the nuclear danger"—means to minimize morbidity and mortality from nuclear weapons operations taken as a whole: the production, storage, processing, and manufacturing of weapons materials, and the design, production, maintenance, deployment, and disassembly of the weapons themselves. It includes the public health aspects of waste management, as well as environmental restoration or the lack of it. It includes safety from any intentional use of nuclear weapons, and from nuclear accidents.

But since only a very limited amount of money is available for this task, it is possible, even certain, that seeking to reduce any one aspect of the nuclear danger without regard to cost—either cost in dollars or in environmental or proliferation risks—could well increase, not decrease, the overall nuclear danger.

Finally, a subset of safety from the dangers of nuclear weapons is safety from nuclear weapons accidents, which is served by the incorporation of safety features into the design of nuclear weapons systems. It is also served by operational changes that decrease the likelihood of accidents or the public health exposures from accidents, should any occur.

Thus the technical or design aspect of weapons safety is an important goal, but it is a subservient one. A sense of proportion is required. An optimum, not a maximum, amount of nuclear weapons safety is the inevitable and proper goal.

At present, however, the DOE weapons labs are promoting the quest for greater nuclear weapons safety as if it were an absolute good—as if it had no conflict with the other goals of the agency or with the other goals of the government as a whole. The damage that this quest could do to those larger goals is discussed briefly below, following a summary of the technical aspects of nuclear weapons safety.

5. Design aspects of nuclear weapons safety

In a nutshell, the nuclear weapons safety problem as it affects the design laboratories consists of minimizing the probability of two general kinds of untoward events:

1) unintentional nuclear detonation of a weapon, either from

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a) accidental activation of the firing circuits (e.g. by lightning or other electromagnetic pulse) or from

b) accidental detonation of the high explosive (HE) in the primary from an impact, fire, or other non-electrical cause; and

2) dispersal of plutonium due to an accident of any kind.[12]

The following discussion reviews each of these safety concerns in turn, and concludes with an overview of problems related to aging of weapons.

A. Accidental activation of the firing circuits is a problem that has been solved

Electrical safety in U.S. weapons is addressed by means of a protection policy known as Enhanced Nuclear Detonation Safety (ENDS), which is achieved by a technology called Enhanced Electrical Isolation (EEI). The Drell Panel describes this system in detail.

> The ENDS is designed to prevent premature arming of nuclear weapons subjected to abnormal environments. The basic idea of ENDS is the isolation of electrical elements critical to detonation of the warhead into an exclusion region which is physically defined by structural cases and barriers that isolate the region from all sources of unintended energy. The only access point into the exclusion region for normal arming and firing electrical power is through special devices called strong links that cover small openings in the exclusion barrier...Detailed analyses and tests give confidence over a very broad range of abnormal environments that a single strong link can provide isolation for the warhead to better than one part in a thousand. Therefore, the stated safety requirement of a probability of less than one a million...requires two independent strong links in the arming set, and that is the way the ENDS system is designed...both strong links have to be closed electrically--one by specific operator-coded input and one by environmental input corresponding to an appropriate flight trajectory--for the weapon to arm.
>
> ENDS includes a weak link in addition to two independent strong links in order to maintain assured electrical isolation at extreme levels of certain accident environments, such as very high temperature and crush. Safety weak links are...designed to fail, or become irreversibly inoperable, in less stressing environments than those that might bypass and cause failure of the strong links.
>
> The ENDs system provides a technical solution to the problem of preventing premature arming of nuclear weapons subject to abnormal environments...ENDS was developed at the Sandia National Laboratory in 1972 and introduced into the stockpile starting in 1977.[13] (emphasis added)

While there are some older weapons in the U.S. arsenal that do not contain ENDS, these weapons are currently being retired.[14] With these retirements, the problem of electrical safety of U.S. nuclear weapons has been solved.

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Note that the one-in-a-million standard applies in the case of accidents, which are themselves infrequent, and not in routine operations. The applicable specification for the probability of an accidental explosion during normal operations, including all environments in the stockpile-to-target sequence, must be less than 10^{9} per warhead lifetime.[15] Since the probability of a highly abnormal enviroment, i.e. an accident, is now much lower than it was during the Cold War with its intensive airborne transport of nuclear weapons, projects to develop firing circuits with still greater isolation possess only very small benefits.

Such work is, in any case, unlikely to affect the nuclear components--the physics package--of the warhead. It is primarily Sandia which designs and maintains the arming and safing systems of warheads, not the two physics labs. Modifications to these electrical systems are relatively routine and need not trigger major stewardship expenses.

B. The possibility of an accidental nuclear explosion due to impact or fire has been the subject of intensive study and is extremely unlikely

The second aspect of preventing an accidental nuclear explosion consists in ensuring that impacts, fires, explosions, and any other causes not covered by the electrical safety system cannot set off any weapon's high explosive in such a way that any significant nuclear yield results. Recognition of this danger led to the adoption of the so-called "one-point-safety" standard in 1968. This quantitative standard requires all weapons in the stockpile to be "one-point safe," which is defined as achieved if the probability of a nuclear explosion with a yield of four pounds TNT-equivalent or greater from detonation of the HE at any single point is less than one in a million in an accident.[16] And this safety performance must be intrinsic to the design, i.e. it must obtain in the absence of any mechanical safing device.[17]

Using more detailed computational analysis than had previously been available, the Drell Panel found that "unintended nuclear detonations present a greater risk than previously estimated (and believed) for some of the warheads in the stockpile."[18] To solve these problems, the Drell Panel recommended a major competitive effort at the weapons laboratories to design new warheads. Yet other than an implicit recommendation to quickly retire the SRAM-A system[19] and make sure the entire stockpile has ENDS, the unclassified Drell Report contains no specific recommendations for improving the nuclear detonation safety of the U.S. arsenal.

However, the report did recommend a broad and in-depth review of the safety of the Trident II (D5) missile system, given the fact that the W88s used there do not contain IHE and are mounted in a ring around the third-stage rocket motor, which contains a detonatable propellant. Kidder concurred with this recommendation and suggested that the Trident I (C4) W76 system be closely examined as well.

The results of the examination, which set these worries to rest, were provided to Congress in the testimony quoted above. Meanwhile, operational changes in the way Trident missiles were loaded into submarines were immediately implemented. Trident missiles are no longer loaded

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into their launching tubes with their warheads in place, which means, according to Drell, that there is now "no worry" about a dockside warhead explosion.[20]

C. To prevent plutonium dispersal, operational changes are most effective

Plutonium—capable of causing cancer deaths from doses in the microgram range—can be dispersed into the environment in any accident in which the conventional explosive in a nuclear weapon burns or explodes. If the explosive involved is IHE, an explosion is highly unlikely, since IHE is remarkably difficult to detonate. In the case of a fire, the plutonium will burn along with the IHE. Warheads made with HE may also burn in a fire rather than explode, and in fact this happened six times at U.S. Air Force bases between 1958 and 1965 when nuclear warheads were involved in fires.

The only good news here is that, in the absence of an explosion, the mean particle size of the plutonium oxide produced is larger and less likely to be inhaled, and is dispersed over far less area, resulting in many fewer potential casualties.[21] The Air Force in fact claims that these six accidents resulted in only localized contamination, which was cleaned up in some fashion in each case.[22]

All in all, between 1950 and 1980 there were 32 serious nuclear weapons accidents ("Broken Arrows"). None have occurred since 1980. During that 30-year period there were two accidents that involved explosions with plutonium.[23] These were airplane crashes at Palomares, Spain in 1966 and at Thule, Greenland in 1968. Luckily, these occurred in relatively unpopulated areas, and no major public exposures resulted. It seems likely, however, that significant danger was experienced by the cleanup crews, which were probably not well trained or equipped, both in these cases as well as in the six accidents in which weapons burned.

Can the possibility of nuclear weapons accidents in which plutonium is dispersed be eliminated? The answer, of course, is no. Even with IHE, with fire-resistant pits (FRPs, which have a refractory shell[24] surrounding the plutonium), and with speculative "super-safe" designs in which the fissile material is somehow kept separate from the HE or IHE until the arming sequence—there will always be a finite chance of plutonium dispersal in the event of a fire or other accident. And this finite chance will continue to be much greater than the one-in-a-million standard adopted for electrical isolation and for one-point safety.

Still, the dangers from plutonium dispersal, while quite serious, are far less than those from a nuclear detonation. Claims by lab officials that a plutonium dispersal accident could be "worse than Chernobyl" are at least two orders of magnitude off base.[25]

In order to prevent plutonium dispersal, the Drell committee recommended that "all nuclear bombs loaded onto aircraft—both bombs and cruise missiles—[be built] with both IHE and FRPs." On its face, this had some appeal, since some 84 percent of serious nuclear weapons accidents have involved aircraft.

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Unfortunately, equipping all airborne U.S. weapons with IHE and FRPs would require redesigning and rebuilding thousands of nuclear weapons, entailing dozens of nuclear tests and the construction of new nuclear weapons factories, such as a replacement for Rocky Flats. Kidder's more practical recommendation was, instead, to implement cost-saving operational changes that would reduce the risk of accidents which could result in plutonium dispersal to near zero. These changes basically consist of not putting nuclear weapons on aircraft in peacetime, eliminating the possibility of any aircraft accident leading to plutonium dispersal. Carson Mark, Director of the Theoretical Division at Los Alamos for 26 years, had argued a month before Drell that operational limitations on warheads (e.g. no routine deployment for airborne weapons) would be far more cost-effective than redesigning them to, for example, incorporate IHE.[26]

Removing nuclear weapons from aircraft has now largely been effected. In September of 1991, not long after Kidder's study, President Bush decided to take all U.S. strategic bombers off alert, meaning that all U.S. airborne strategic nuclear weapons have now joined U.S. tactical nuclear weapons in secure storage bunkers, out of harm's way. President Bush's initiative essentially solved the safety issues for airborne nuclear weapons.[27]

Since, according to Drell, the consequences of a plutonium explosion are roughly one hundred times worse than a plutonium fire, the addition of IHE to a weapon removes about 99 percent of the plutonium dispersal danger. FRPs could remove part of the remaining 1 percent of the danger. FRPs add no degree of safety if the explosive in the warhead detonates, so there is little point in adding FRPs to a weapon that does not also have IHE. FRPs cannot reliably withstand a rocket propellant fire, which could be much hotter than a jet fuel fire (about 2000 degrees centigrade versus 1000 degrees), so there is little point in adding FRPs to ballistic missile warheads.

So are FRPs worth the expense? Even before President Bush took nuclear weapons off airplanes, Assistant Secretary of Energy for Defense Programs Richard Claytor told Congress that "for weapons such as the B-61 family and the W-80, which already have IHE, this [addition of FRPs] will be a very costly upgrade to accomplish a modest improvement in safety." He added that "for tactical systems, where weapons are normally stored in bunkers, the reduction in risk may be very small."[28]

The Air Force's official response to the Drell Panel also panned the marginal benefits of FRPs.

> Qualitative assessment indicates that [the] safety risk associated with incorporating FRP into bombs and cruise missile warheads which already have ENDS and IHE would exceed the safety gain realized by FRP, [and so such weapons] should not be modified to incorporate FRP.[29]

The Drell Panel called for an aggressive study of "super-safe" designs, such as designs in which the plutonium was physically separate from the IHE or HE. In response, Kidder pointed out that such designs had been under study for at least 15 years (by 1991) without practical result. Furthermore, any designs finally created would very likely be quite complex, which means that

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they might have serious reliability problems. In any case they would require numerous nuclear tests. This recommendation, like the one calling for all airborne warheads to have IHE and FRPs, was evidently not considered practical by the Nuclear Weapons Council, leading to the testimony cited previously.

Note that IHE was intentionally not incorporated into the W88 Trident D5 warhead, because IHE is less energetic and reduces the yield of the weapon, the range of the missile, and/or the number of warheads it can carry. A conscious decision was therefore made to not make these particular weapons as safe as possible, because they were, and still are, judged to be safe enough. In addition to the W88, IHE is also not present in the W62 and W78 Minuteman III warheads and the W76 Trident C4 warhead. The W62 and W78 warheads are being retired, which will leave the Navy's W76s and W88s as the only warheads in the START II arsenal lacking IHE.[30]

Interestingly, an FRP-equipped cruise missile warhead (the W84, one of only three such FRP-equipped weapons in the stockpile) has been taken out of the active stockpile, in favor of cruise missile warheads that lack FRPs (specifically, the W80-0 and W80-1).[31] Thus the Air Force, the Navy, and the Nuclear Weapons Council have, on at least three occasions if not also on others, concurred in decisions that chose warheads for the so-called "enduring" stockpile that lack some of the possible safety features that could have been incorporated. The decisions to forego FRP- and IHE-equipped weapons contrast sharply with the rhetoric coming from the labs calling for so-called "safer" weapons.

Finally, note that incorporation of an FRP and, especially, IHE into a weapon would require a substantial redesign and would, in effect, amount to a new weapon. Kidder suggests that roughly three nuclear tests per warhead or bomb would be necessary to proof-test the former and that six such tests would be required for the latter.[32] Thus these are not minor changes, and they would require perhaps two dozen nuclear tests to accomplish for the entire START II stockpile. It is certainly not accurate to call such changes "safety improvements to existing weapons," as is now commonly done.

Table 1 (attached) shows the planned U.S. stockpile and its safety features.

D. Dr. Drell believes that physics package safety improvements should not be undertaken

Since his 1990 work, Dr. Drell has clarified his position on the advisability of modifying nuclear weapons physics packages to increase safety.[33] Writing with Bob Peurifoy, Drell acknowledges that some weapons in the so-called "enduring" arsenal do not have every safety feature to prevent plutonium dispersal and that some questions involving multi-point safety remain for the Trident systems. But these deficiencies should not, in their view, lead to modification of the stockpile physics packages.

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Drell and Peurifoy point out that if multipoint safety was judged to be inadequate for the Tridents, and monies were actually to be budgeted to improve them, this could be done by means other than modifying the warhead: installation of blast shielding around the third-stage motor and decreasing the number of warheads to compensate for the weight, changing the third-stage propellant, costing about 4% in range, or omitting the third stage motor altogether and decreasing the number of warheads from eight to four to give the same range as at present.[34]

Should some "devices"--the term used by Drell and Peurifoy for the nuclear explosives themselves--be changed to make plutonium dispersal less likely? They say not.

> Most importantly, in the case of a test ban, one should not tamper with the device hardware once it has been certified...in the absence of follow-on stockpile testing, hardware modifications must be avoided...New, untested devices should not be considered.
>
> ...
>
> From a technical point of view, safety improvements could be achieved in a continued underground testing program focused on safety. From a political perspective, however, continued testing of nuclear weapons may hinder efforts to counter, if not prevent, the proliferation of nuclear weapons in the years ahead.
>
> ...
>
> In our view, the early achievement of a strengthened and durable worldwide nonproliferation regime will contribute more significantly to worldwide nuclear safety than will further improvements in the safety of part of the US nuclear force.[35]

Drell and Peurifoy then call for the U.S. to "take the initiative" and "lead a joint effort by the five declared nuclear powers to negotiate an end to all nuclear weapons testing" (emphasis added). They also call for "a diverse and coordinated scientific program at the national weapons laboratories so that they can maintain and certify confidence in the US nuclear deterrent over a long period without testing."[36] Maintaining safety is not mentioned as a challenge for that program, for reasons that will now be examined.

E. There are no safety problems related to aging of weapons

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Although authorities agree that nuclear weapons are "safe" now, often vague reference is made to possible safety problems that could arise in the future. What these problems might be is never mentioned, however. After all this intensive review by the Drell Panel and subsequently by the labs--who were, it is fair to say, searching for every possible reason to continue nuclear testing and nuclear weapons design work in general--it is difficult to imagine that some heretofore overlooked safety problem of real significance would suddenly appear.

Likewise, no safety problems are expected to occur in the aging process. This was the first question posed to Dr. Kidder by the senators, and he makes it clear that aging does not create safety problems.

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Safety problems with nuclear warheads are generally inherent in the design of the warhead itself, not the result of aging or other causes. Such problems may not be identified until long after the warhead enters stockpile, but they were there to begin with.

Metals corrode, and organic materials such as plastics, adhesives, and HE that are present in a nuclear warhead will deteriorate with age. Such aging effects degrade a warhead's reliability rather than its safety. (The sensitivity to impact or fire of the HE used in nuclear warheads does not increase significantly with age.)

A severe case of aging was the deterioration of the HE in the W68 Poseidon warhead, which produced a harmful, chemically reactive effluent. This resulted in a potential loss of warhead reliability that necessitated a complete rebuild of all W68 warheads in stockpile. The reliability, but not the safety, of the warhead was affected.[37] (emphasis added)

Dr. John Immele, Director of Los Alamos National Laboratory's (LANL's) Nuclear Weapons Technologies Program, spoke to this same point on December 8, 1994 at a public hearing in New Mexico.

> Audience: I have one more question...in a deleterious way, they may age or crack. What do you mean, is there a risk to the public?
>
> Immele: No, there's not a safety risk. There's a performance problem...because insensitive high explosive is so insensitive that sometimes if it's cracked it won't light on the other side when it's supposed to, so it's basically a performance problem...We have not found aging problems that affect safety, that make the explosive more sensitive.[38] (emphasis added)

This testimony is very important, since the long-term behavior of IHE is not understood as well as that of HE, and it is sometimes mistakenly implied that this uncertainty extends to questions of safety, which it clearly does not.

The impression should not be left that once weapons are put into the stockpile they are forgotten. The stockpile surveillance program coordinated by the laboratories, especially by Sandia, routinely inspects weapons and their components and ensures, among other goals, that safety problems do not develop. Thus safety throughout the aging process is ensured by both the current weapons' inherent safety features and a coordinated surveillance program.

F. DOE's proposed new facilities have nothing to do with weapons safety

As part of its proposed SBSS program, DOE is planning to build a number of new experimental weapons science facilities with a total cost running into the billions of dollars.[39] The largest of these is the National Ignition Facility (NIF), a laser fusion machine with a currently-estimated capital cost of about $1.2 billion and a lifetime cost of about $4.5 billion.[40] The role of NIF

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in the SBSS program is to simulate the implosion process that occurs in the thermonuclear "secondaries" of nuclear weapons.

Throughout the 40-year history of the thermonuclear arsenal, no safety problems have ever been identified with secondaries, which contain neither plutonium nor high explosives. Nor are any expected. It is therefore patently obvious that NIF has nothing to do with nuclear weapons safety. Dr. Steven Younger, who was at the time Deputy Program Director of the LANL Nuclear Weapons Program, was among others who made statements to this effect at a DOE-sponsored workshop on NIF on September 8, 1994 in Washington.[41]

For the same reason, other facilities for simulating secondary implosion, like ATLAS (LANL's proposed new pulsed-power implosion facility) have nothing to do with nuclear weapons safety either. The only facilities with potential relevance for nuclear weapons safety are those being built or planned for the simulation of nuclear weapons primaries. These are the hydrodynamic testing facilities: the $124 million Dual-Axis Radiographic Hydrotest facility (DARHT), under construction at LANL but halted for environmental review, and the $422 million Advanced Hydrotest Facility (AHF), planned for the early years of the next century.

Hydrotest facilities cannot test either the high explosives or the plutonium pits of stockpiled weapons. The former cannot be separated intact from the pit they embrace, and the latter cannot be tested without a nuclear explosion. Therefore, these facilities test mock weapons assemblies. There is very little point in conducting hydrodynamic explorations of the safety of existing weapons. These weapons are already known to be one-point safe and their plutonium-dispersal properties are already clear--either they have IHE and FRPs or they do not.

The only purpose of these facilities, as far as safety is concerned, is that they can be used to design new primaries that have IHE and FRPs, either primaries for new weapons with new military characteristics or to retrofit into existing warheads and bombs. This can be done either directly, by testing mockups of these new primaries, or indirectly, by conducting precise hydrodynamic tests on existing designs for which nuclear testing data is available ("benchmarking"). Benchmarking allows the nuclear testing database to better inform the nuclear weapons codes, which can then be used to design new weapons.

Actually, DARHT may be inadequate either to design new weapons with IHE and FRPs or to benchmark some stockpiled systems, with or without these features.

> Recognizing the importance of continued research in radiography, the Laboratory [LANL] cites DARHT as its top construction priority...For a number of stockpile systems, particularly those that are designed with insensitive high explosives and fire-resistant pits, planned radiography upgrades [i.e. DARHT] do not provide resolution adequate to observe the gas cavity configuration of the primary stage late in the implosion process. For effective monitoring of stockpile weapons [sic] of this type, a next-generation hydrodynamic testing capability will need to be developed. Such an Advanced Hydrotest Facility (AHF) will include multiple

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beams that produce X-rays from four to six directions at various times to characterize the physical state of the pit more thoroughly.[42]

It is difficult to avoid the inference that DARHT is useful primarily to design new weapons which lack IHE and FRPs. This is not at all unlikely from a policy point of view, given that these features have already been intentionally omitted from significant portions of the arsenal.

Any use of these new hydrotesting facilities to examine safety problems relating to aging of weapons is moot, since logic, together with Drs. Kidder and Immele, all agree that there are no such issues.

6. Reducing the nuclear danger

The risk to the public from a nuclear weapons accident is only one among many interrelated risks associated with nuclear weapons. Attempts to increase safety from nuclear weapons accidents through redesigning warheads may easily create countervailing risks throughout this interconnected system. For example, the replacement of hundreds or thousands of warheads, and especially the plutonium pits of warheads, will create risks to workers and the general public during the manufacturing process and in the management of its wastes, not to mention during the eventual decontamination of buildings and equipment that will later be required. Any environmental contamination that occurs will require cleanup. These considerable risks tend to be minimized or forgotten entirely by the advocates of weapons redesign.

In fact, these manufacturing, waste management, decommissioning, and cleanup risks are likely to be much greater than the risk reduction that could be achieved by the addition of, for example, IHE to W88s and W76s, to pick one modification currently under consideration. The historical record suggests this. While there have been no known or putative deaths due to accidents from explosions or plutonium dispersal from completed weapons--even during the Cold War when thousands of weapons were shuttled all over the world--numerous deaths have occurred due to ordinary occupational causes in the nuclear weapons complex as well as to chemical toxins and radioactivity.[43] Meanwhile cleanup, which could be quite hazardous, has barely begun.[44]

Moreover, should the U.S. elect to upgrade its nuclear arsenal for the sake of "improved" safety or for any other reason, it can be expected that the other nuclear powers, particularly Russia and China but probably also Britain and France, may do likewise. In that case, the morbidity, mortality, and environmental damage in other countries, again notably Russia and China, can be expected to be equal or greater than here.

Thus, the quest for greater nuclear weapons "safety," if allowed to proceed within the compartmentalized thinking that characterizes the bureaucratic "stovepipes" of the federal nuclear establishment, will likely saddle current populations and future generations, here and abroad, with increased, not decreased, risk. And, as has been the case up to now, this risk will tend to

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fall most heavily on the vulnerable members of society and the populations that are weakest politically.

A. The proliferation impacts of safety "improvements" must be examined

Another component of the overall nuclear danger is nuclear proliferation. A public opinion poll conducted by Sandia National Laboratory for DOE suggests that the public considers the risk from nuclear proliferation to be the number two danger facing us today, right behind world hunger and ahead of AIDS, drug trafficking, and global warming.[45] Thirty-two percent of the public thought nuclear proliferation was an "extreme risk." This opinion is matched by a widespread concern among experts that the proliferation problem, far from being under control, is a very serious threat to the security of the United States. Assuming this is true, we can conclude that if safety improvements in nuclear weapons design incur even a small incremental risk to the world's nonproliferation regime, such "improvements" are likely to increase, not decrease, the nuclear danger. On its face, nuclear proliferation is simply a much more serious problem than nuclear weapons safety.

It is beyond the scope of this paper to discuss in any detail the proliferation dangers inherent in upgrading the U.S. arsenal to achieve "increased" safety. Suffice it to say that even a heuristic analysis of comparative risk must embrace the reality that such safety upgrades attempt to prevent events whose probabilities are already very low. The probability of proliferation under current policies, however, is not low at all, and the probability of nuclear attack or threat of attack by proliferant nations or groups approaches certainty in the long run if more effective leadership on this issue is not forthcoming.

Any analysis of the nonproliferation impacts of contemplated weapons upgrades must therefore consider every possible impact, even those which are slight. Just as every credible nuclear weapons accident should be examined and prevented, so should every credible potential proliferation impact also be prevented. The probability of an accidental nuclear detonation is kept at 10^{-6} per warhead lifetime, or roughly 10^{-3} for the current arsenal taken as whole over the next few decades; any decision to upgrade U.S. weapons should likewise be examined to see whether, through their impact on the nonproliferation regime, such upgrades could cause an increase in the probability of an intentional attack on the U.S. as small as 10^{-3} over the next few decades. Clearly, the expected mortality from an intentional attack is much larger than that for any credible accident, further emphasizing the relative importance of proliferation risks and the efforts needed to combat it.

This spring, the Nuclear Nonproliferation Treaty (NPT) was extended indefinitely. Despite some media claims to the contrary, this was not done by consensus but by an uncontested acknowledgement that a majority of states favored extension.[46] This extension was won only after what the Washington Post called a "global full-court press" by the U.S.;[47] as late as January of this year, roughly one hundred countries did not support indefinite extension.[48] The reason for the vocal and sometimes bitter debate that went on in New York was, above all else, deep international discontent with the failure of the nuclear weapon states to dismantle their

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nuclear arsenals pursuant to Article VI of the NPT. Because of this failure, substantive further strengthening of the world's nonproliferation regime now appears to be temporarily out of reach.

When even maintenance of arsenals can threaten to unravel the fragile fabric of the world's nonproliferation efforts, as it did this spring, how can upgrading that arsenal, whether for so-called "safety" improvements or any other purpose, not damage U.S. nonproliferation efforts? The conclusion of Drell and Peurifoy is sound: safety improvements to the nuclear components of weapons, which cannot be undertaken without underground testing, run counter to U.S. nonproliferation objectives.

Other nations may be concerned that "safety upgrades" can mask the development of entirely new weapons. There is considerable justification for that concern, as is discussed in detail by William Arkin, Greenpeace, and Tri-Valley CAREs.[49] Foreign "safety upgrades" may also be used to mask new weapon development, an outcome with negative security implications for the United States.

B. Fewer deployments and further retirements are virtually the only way greater overall nuclear weapons safety can be achieved

Given that upgrading and replacing nuclear weapons is likely to create serious countervailing risks--risks which, on their face, are considerably greater than those gained from any purported safety "improvements"--the search for greater nuclear safety must be directed elsewhere. Clearly, all other factors being equal, the probability of a serious weapons accident is proportional to the overall size of the arsenal. A minimum deterrent force--however one may define "minimum"--is also, therefore, an optimum safety arsenal. It is a minimum cost arsenal as well. A smaller arsenal would assist U.S. nonproliferation objectives, and would cause fewer dangers to the environment, to worker safety, and to public health. A smaller arsenal, to the extent that it corresponds to smaller arsenals abroad and especially in Russia, reduces the number of missiles which could be targeted at the United States.

Indeed, given comparable reductions in other nations' stockpiles, it can be persuasively argued that the optimum safety arsenal is one that is extremely, if not vanishingly, small. Many military and senior civilian defense leaders, past and present, have come to adopt this view.[50]

In addition to reducing the size of the arsenal, the movement of additional weapon systems away from active deployment and into safe bunkers would also reduce risk from accidents, as would the movement of nuclear weapons away from bases located in populous areas. Further restrictions on the airborne transport of nuclear weapons should also be considered.

C. Increasing safety will decrease reliability--and hence could generate calls for nuclear testing

As we have seen, the quest for "increased" safety has a very marked cost in terms of weapons reliability. That is, if weapons are changed to make them "safer," they will be less reliable--

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unless we are able to proof-test the new designs. Resuming nuclear testing, however, would conflict strongly with nonproliferation goals and our treaty commitments. Thus the quest for "safer" weapons, if accepted at face value, could keep the weapons labs in a booming business for a long time by eroding the reliability of the weapons.[51]

7. Public safety, not nuclear safety, is the goal

So far we have examined nuclear weapons safety issues from a narrow technical perspective and in the broader context of reducing the nuclear danger as a whole. From the still broader vantage point of public health and safety as a whole, further investments in safer designs for nuclear weapons have vanishingly small returns.

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A. Further investments in nuclear weapons safety have a very low benefit/cost ratio compared to other public safety investments

Would upgrading to IHE and FRPs be worth the expense? Analysis--not to mention common sense--shows that investments in other government programs (e.g. highway improvements, cancer screening) yield orders of magnitude greater safety benefits to the general public.

Steve Fetter and Frank von Hippel estimate that a worst-case accident involving explosion of the HE in ten W88 warheads at the Bangor Trident base directly upwind from Seattle would involve on the order of 1,000 plutonium-induced cancer fatalities in the long run.[52] They suggest, for the sake of argument, that the risk of this accident can be assumed to be on the order of 0.1% per year, in which case the expected fatality rate from this type of nuclear weapon accident is 1 death per year. The prevention of this accident by the spending of about $1 billion (Drell and Peurifoy's more recent article cites a cost of $1.6 to 1.8 billion) to equip some 3000 submarine missile warheads with IHE would represent a cost on the order of $100 million per fatality avoided.[53] This accident has, subsequent to their paper, been made very unlikely by loading the missiles and the warheads separately, lowering the expected fatality rate by probably at least one, if not two or more, orders of magnitude and correspondingly raising the cost per fatality avoided.

Fetter and von Hippel cite cost estimates in the range of $20,000 to $140,000 per life saved by cancer screening, $400,000 per life saved by kidney dialysis, and $30,000 to $300,000 per life saved for various highway safety improvements. Thus the IHE warhead upgrade program, even by their highly conservative calculations, would cost on the order of 250 to 3,000 times more than these other prevention programs per life saved--or, given the operational changes already put in place by the Navy, at least 10 to 100 times as much as this. This great disparity of benefit--at least 3 if not more than 5 orders of magnitude--signals that the overall sense of their conclusion is robust with respect to large changes in their assumed accident rate.

What is more, the government and private programs cited by Fetter and von Hippel are almost certainly not the most effective ones offered by government or private sources, either in terms of average cost or marginal cost per life saved. Programs targeted at populations at risk like

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the Women, Infants, and Children (WIC) program, for example, are arguably at least one order of magnitude more effective per dollar spent than highway improvements in preventing deaths. And, on average, WIC and other perinatal programs address a younger population--one young adult and one infant--than do the programs Fetter and von Hippel cite, giving more years of life saved per person in these cases.

It would be interesting to compare Fetter and von Hippel's numbers to the benefits of investments in strictly military health and safety. The military environment is a dangerous place, and large numbers of military accidents occur annually, sometimes with accompanying civilian deaths. It is highly likely that it would be more cost-effective to use a billion defense dollars to prevent unnecessary military mortality--through, for example, more complete training--than it would be to use this sum to upgrade Trident missiles and their warheads, for which purpose a billion dollars would probably not be adequate in any case.

This, of course, is a peacetime comparison. Since, realistically, nuclear weapons are useless in actual fighting, any investment in them deprives the soldier, sailor, or airman of just that much supporting materiel or training when he or she needs it most.

<u>B. The quest for nuclear weapons safety is inconsistent with other federal and DOE positions, past and present</u>

In the United States, 32.5 persons per 100,000, or approximately 81,250 people, died from "accidents and adverse effects" in 1990.[74] This is a very large fatality rate, much more even than a major conventional war. In the same year (as in every other year since the beginning of the nuclear age) not one person died from the accidental explosion of a nuclear weapon or, <u>as far as is known</u>, from exposure to nuclear materials from a nuclear weapons accident.[75] Actuarially speaking, nuclear weapons accidents don't even appear on the ledger.

But what about the future? A heuristic analysis, which can only be very crudely approximate, suggests that an estimate of risk of death due to a nuclear weapons accident is likely to be, on its face, two to three orders of magnitude below the risk factors typically used as a basis for federal environmental health standards, namely 10^{-4} per lifetime of exposure.[76] This comparison is made, for all its inevitable flaws, because the weapons laboratories from time to time engage in struggles to weaken these environmental standards, notably in regard to ground and surface water quality, saying that the safety risks involved are "negligible." Irony aside, this comparison is a *prima facie* indication that the public health cost of weapons safety "improvements" could easily exceed the risk reductions attainable through design changes--even if those "improvements" caused only those population exposures which were considered safe and no accidents did not occur in production, waste management, decommissioning, and cleanup associated with the design changes.

More ironic still is the fact that the same laboratories who are even now clamoring for money to develop "safer" nuclear weapons--this after the weight of evidence presented in the past four years and the military's lack of interest in the subject--are exactly the ones who were saying that

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above-ground nuclear testing was not dangerous just a few decades ago. Federal agencies, such as the Veterans Administration and the Department of Justice, as well as many individuals at the laboratories, still deny the legacy of this testing in specific cases and in general.

When it was convenient to do so, these institutions systematically lied to the public and to the servicemen who were intentionally exposed about the actual risks of nuclear testing. Even today they continue to withhold extensive information about measured fallout distributions.[77] Unlike nuclear weapons accidents, which, as far as we know, have been the cause of no casualties, the casualties of this intentional program were immense. A special team convened by the International Physicians for the Prevention of Nuclear War calculated the expected mortality from fallout worldwide to be 430,000 deaths by the turn of the century.[78] Frank von Hippel's update of Sakharov's 1958 estimates of mortality from above-ground testing suggest that the long-term death toll will be in the neighborhood of 5 million persons.[79] Against this background, the call for "safer" nuclear weapons rings very hollow indeed.

8. Conclusion

We have seen how fears about the "safety" of nuclear weapons have been rhetorically advanced by the weapons laboratories and the DOE with little regard to these simple facts:

- current U.S. nuclear weapons have the benefit of fifty years of technical improvements in safety, and further design improvements can bring only marginal and diminishing returns in actual risk reduction at a very large dollar cost;
- upgrading the arsenal for the sake of safety will create countervailing risks throughout the complex and the world;
- upgrading the arsenal could have enormous nonproliferation impacts; and
- much more cost-effective and elegant non-technical solutions to decreasing risk are available--such as retirements, further reductions in arsenal size, and changes in deployment and transportation.

It is as if the Department were simply pandering to images of doom in order to generate political capital for its science-based stewardship program, which actually has very little to do with safety. The Department as a whole is unreasonably tolerant of the stark contrast between its own very public promotional rhetoric and that of its contractors regarding the "safety" issue, on the one hand, and its joint testimony with the DOD to Congress, on the other, which essentially lays the issue to rest.

From a broader perspective, the nuclear weapons "safety" debate has lost its sense of proportion because it has focused on the safety of the <u>weapons</u>, rather than on the safety of <u>people</u>. In this all-too convenient process of linguistic contraction, weapons are made the primary reference reality, not the public. These distortions have occurred because the pitch from the labs and the DOE is actually not motivated by safety, but by a desire for a less-conflicted weapons ideology, especially for the younger scientists, and for perpetual funding. It is this <u>funding</u> that would be

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made safer. Nothing else can explain the irrationality of the open-ended quest for so-called "safer" nuclear weapons.

Endnotes

1. Testimony of Deputy Secretary of Defense John Deutch before the House Foreign Affairs Committee, October 5, 1994: "...advanced permissive action devices, so-called coded control devices, will be introduced into the B-52, the Minuteman IIIs, and eventually into the Trident force as well."
The draft "Stockpile Stewardship Program Plan for Fiscal Years 1995 through 1997," prepared for the Interagency Working Group on February 27, 1995, makes it clear that permissive action links are the subject of active research, development, and replacement in several, if not many or all, weapons in the stockpile.

2. Sidney Drell, John Foster, and Charles Townes, "Report of the Panel on Nuclear Weapons Safety," House Armed Services Committee, December 1990.

3. Testimony before the House Appropriations Committee, Subcommittee on Energy and Water Development, Energy and Water Development Appropriations for 1995, Part 6, pp. 413-414.

4. *Ibid.*, p. 419.

5. Quoted in Tom Zamora-Collina, "New Jobs for Old Labs," Bull. Atomic Scientists, November 1992, p. 16.

6. Quoted in Frank von Hippel and Tom Zamora-Collina, "Testing, Testing, 1, 2, 3--Forever," Bulletin of the Atomic Scientists, July/August 1993, p. 28-32. Deutch went on to say, "...there are operational steps that one can take to...ameliorate the safety problems when you mate the warheads to the missiles that are being looked into, but I would not think this an immediate problem..."

7. Testimony before the Senate Subcommittee on Nuclear Deterrence, Arms Control, and Defense Intelligence, cited by von Hippel and Zamora-Collina.

8. Sidney Drell, John Foster, and Charles Townes, Report of the Panel on Nuclear Weapons Safety, House Armed Services Committee, December 1990.

9. The most authoritative and detailed review of these issues in the open literature is still that of senior Livermore weapons physicist Ray Kidder, who was requested to provide an independent analysis of the safety question by several members of the U.S. Senate. See Kidder, "Report to Congress: Assessment of the Safety of U.S. Nuclear Weapons and Related Nuclear Test Requirements," July 26, 1991, UCRL-107454, and also his "Post-Bush Initiative Update" of the same paper in December of 1991, UCRL-109503. His thorough investigation followed, and built upon, that of the Drell Panel and incorporates relevant portions of their work in summary fashion.

10. Public safety is only one of the goals of government, and so this hierarchy of goals is really just one component of a larger picture. While this outline is an oversimplification, the primary roles and risks of nuclear weapons are all included here. Some believe that nuclear weapons have a role in extended deterrence, i.e. in protecting against conventional attack against U.S. forces on foreign soil or against non-nuclear weapons of mass destruction. Others, such as the present writer, believe that nuclear deterrence in any form is counterproductive and illegal in the long run, if not also in the short run. These issues are beyond the scope of this paper.

11. This slogan has been in frequent use in the nuclear weapons community since at least 1993. It is the integrating principle of the draft DOE National Security Strategic Plan, dated November 3, 1993. Reducing the Nuclear Danger: The Road Away From the Brink is the title of a book by McGeorge Bundy, William Crowe, and Sidney Drell (Council on Foreign Relations, 1993).

12. These safety concerns are reflected in the military characteristics (MCs) required by the Pentagon during the weapon design process. Those requirements include, in order of priority, nuclear safety, size and weight, plutonium dispersal safety, operational reliability, yield, conservative use of nuclear materials, and operational simplicity. In the event of a conflict between design priorities, nuclear safety is the highest priority. See George H. Miller, Paul S. Brown, and Carol T. Alonso, "Report to Congress on Stockpile Reliability, Weapon Remanufacture, and the Role of Nuclear Testing," 1987, UCRL-53822.
Interestingly, this official paper, in its exhaustive review of all the reasons to continue nuclear testing, does not mention any unresolved safety issues with then-current warheads or bombs. It was only in the early 1990s that safety issues gained prominence, first during the nuclear testing debate, and now as a challenge for science-based stockpile stewardship.

13. Drell, Foster, and Townes, pp. 25-26.

14. These weapons are the 9-megaton B53-1 gravity bomb (which has only one electrical safety system rather than two independent ones) and the W62 Minuteman III warhead; see Christopher Paine, "CTB Negotiating Issues with Implications for Nuclear Nonproliferation," Natural Resources Defense Council, 1994, and Stan Norris and Bill Arkin, "Nuclear Notebook," Bulletin of Atomic Scientists January/February 1995, pp. 69-71.

15. Drell, Foster, and Townes, p. 13.

16. More recently, "multi-point" safety has also been made an objective. The discussion which follows includes both one- and multi-point safety concerns.

17. Mechanical safing, which has been available and in successful use for more than two decades, can virtually eliminate the possibility of an unintended nuclear explosion, even if many points of the HE or IHE are detonated at once. According to Frank von Hippel, mechanical safing can be added to a nuclear warhead without nuclear testing. See von Hippel, testimony to the Senate Foreign Relations Committee, July 23, 1992.

18. Drell, Foster, and Townes, p. 25. The only place these analyses could have been done, given the classification barriers, the specialized codes, and the data requirements, was the weapons labs. It is quite likely that at least preliminary analyses of this type had already been done when the Drell Panel began its work. Indeed, at least part of the impetus for the Drell Panel was testimony offered by the three weapons lab directors before the Senate Armed Services Committee in May, 1990, which all but said that the Short-Range Attack Missile-A (SRAM-A) was too dangerous to deploy in peacetime (see Drell, p. 40).

19. "It is not sufficient to pull such weapons off the alert ALFA force but retain them in the war reserve stockpile in view of the hazards they will present under conditions of great stress..." *Ibid.*, p. 32.

20. *Ibid.*, p. 29.

21. The Drell Panel estimates that a Pu fire or deflagration would contaminate about one square kilometer, while an explosion "could" contaminate an area of "roughly" one hundred square kilometers. *Ibid.*, p. 30.

22. Frank von Hippel and Steve Fetter, "Worse than Chernobyl?" Arms Control Today, September 1992, p. 13. Descriptions of these accidents can be found in Chuck Hansen, U.S. Nuclear Weapons: The Secret History, Orion Books, 1988 or in the Congressional Record, August 3, 1992, pp. S11172-5.

23. A third such accident may have occurred at Dyess AFB in Texas in 1958. See note 54.

24. Vanadium has been used; see Miller, Brown, and Alonso, *op. cit.*

25. von Hippel and Fetter, *op. cit.*

26. J. Carson Mark, "Do We Need Nuclear Testing?", Arms Control Today, November 1990, pp. 12-17.

27. See Kidder's December 1991 update, cited above, for the text of the President's announcement. Kidder notes this announcement did not go quite as far as to completely eliminate the air transport of nuclear weapons in peacetime, but points out that such transport "could be reasonably terminated after the mandated return of overseas nuclear weapons has been completed..." (p. 3).

28. Cited by Ray Kidder in "How Much More Nuclear Testing Do We Need?," Arms Control Today, pp. 11-14. Claytor spoke before the House Armed Services Committee, DOE Defense Nuclear Facilities Panel, February 20, 1991.

29. Air Force Response to the Drell Panel, Nuclear Weapons Council Standing Committee briefing, Lieutenant Colonel John R. Curry, Secretary of the Air Force/Assistant Secretary, Acquisition, August 1, 1991; cited by Kidder, 1992.

30. Norris and Arkin, *op. cit.*, and Paine, *op. cit.*

31. *Ibid.*

32. Kidder, July 1991, pp. 8-9.

33. Sidney Drell and Bob Peurifoy, "Technical Issues of a Nuclear Test Ban," Annual Review of Nuclear and Particle Science, 1994, pp. 285-327.

34. *Ibid.*, p. 313.

35. *Ibid.*, pp. 321, 325, and 326.

36. *Ibid.*, both quotes are from p. 326.

37. *Ibid.*, p. 6.

38. Colloquy at public environmental impact scoping hearing regarding the Dual-Axis Radiographic Hydrotest Facility (DARHT), December 8, 1994, in Santa Fe; transcript available from DOE Albuquerque or LANL.

39. Tom Zamora-Collina and Ray E. Kidder, "Shopping Spree Softens Test Ban Sorrows," Bulletin of the Atomic Scientists, July/August 1994, pp. 23-29.

40. See DOE FY 1996 Congressional Budget Request, Project Data Sheets, Vol. 1, p. 332. The total cost cited is the sum of capital and annual operating costs.

41. Personal communication at LANL site-wide environmental impact statement hearing, Santa Fe, fall 1994.

42. Los Alamos National Laboratory, Institutional Plan FY1995-FY2000, p. 43.

43. A 900-page report on this subject is due from the International Physicians for the Prevention of Nuclear War in July of 1995, entitled A Global Guidebook to Nuclear Weapons Production and Its Health and Environmental Effects, MIT Press, Cambridge.

44. See Office of Technology Assessment, Hazards Ahead: Managing Cleanup Worker Health and Safety at the Nuclear Weapons Complex, OTA-BP-O-85, February 1993.

45. Released by Sandia on June 24, 1994.

46. "Beyond the NPT: 'Abolition 2000!'" A special report of the Western States Legal Foundation, June 14, 1995, Oakland.

47. Washington Post, May 14, 1995.

48. "Atom Arms Pact Runs Into A Snag," New York Times, January 26, 1995, p. 1.

49. See "Changing Targets: Nuclear Doctrine from the Cold War to the Third World," Hans Kristensen and Joshua Handler, Greenpeace International, January 1995; "Nuclear Agnosticism When Real Values Are Needed: Nuclear Policy in the Clinton Administration," William Arkin, Federation of American Scientists Public Interest Report, September/October 1994. The potential proliferation impacts of the DOE's "science-based stockpile stewardship" program, and DOE's design program for new nuclear weapons, will be analyzed in forthcoming papers from Tri-Valley CAREs.

50. General Horner, former head of the Air Force Space Command and leader of the air war against Iraq, is one ("U.S. Should Trash Nukes, Top Air Force General Says," Albuquerque Journal, July 16, 1994). General Andrew Goodpaster, former NATO commander, is another ("Tighter Limits on Nuclear Arms: Issues and Opportunities for a New Era," and "Further Reins on Nuclear Arms: Next Steps for the Major Nuclear Powers," The Atlantic Council of the United States, 1992 and 1993 respectively). The views of Les Aspin, recent Secretary of Defense, are likewise well-known.

Even some weapon designers are beginning to agree. Tom Thompson, dean of current designers at Livermore, admits, "I can't think of any target for anything in our stockpile" ("Science Comes in from the Cold," Los Angeles Times, 12/22/94).

51. Dr. Steven Younger, Deputy Program Director for Nuclear Weapons Technology at Los Alamos, admitted to the writer that these arguments were "defensible." He concluded, for these reasons as well as reliability concerns, that "we should not open up existing weapons [to changes] unless it is absolutely necessary" (personal communication after Los Alamos Study Group panel discussion in Los Alamos, July 18, 1994).

52. Steve Fetter and Frank von Hippel, The Hazard from Plutonium Dispersal by Nuclear-Warhead Accidents, Science & Global Security, Volume 2, 1990.

53. Norris and Arkin estimate that the total number of W76s which will remain after START II is 1328, and that of W88s 400, making 1728 submarine-launched warheads without IHE after START II, slightly more than half the number von Hippel and Fetter used in 1990.

54. Statistical Abstract of the United States, U.S. Governmental Printing Office. The accidental death rate has declined some 40 percent over the last two decades, reflecting the effectiveness of societal investments in safety like the highway improvements cited by Fetter and von Hippel. These investments, which compete for funding with nuclear weapons, have apparently prevented tens of thousands of deaths annually.

55. The unclassified record summarized by Chuck Hansen in his U.S. Nuclear Weapons: The Secret History shows what appear to be nine nuclear weapon accidents involving release of nuclear materials from weapons. The official summaries of each event do not mention which, or how much, nuclear materials were released. A tenth such accident, cited by Drell and Peurifoy in their Table 1, involved the detonation of a bomb at Kirtland AFB in 1957; that bomb did not have its plutonium pit installed when it was inadvertently dropped from the airplane. Declassification of nuclear weapons accidents is not complete, however, and it is possible that further accidents have occurred.

It is likely that cleanup crews were exposed to plutonium at some of these accident sites. The accidents at Palomares, Spain (January 17, 1966), and at Thule, Greenland (January 21, 1968), as well as possibly at Dyess AFB, Texas (November 4, 1958) involved detonations of HE with resultant nuclear contamination; these accidents appear to be the ones generating the most difficult cleanup problems and the greatest likelihood of long-term residual contamination. I am not aware of any study of morbidity or mortality of the workers who cleaned up after these or any other accidents. The cleanup crews, together with any undocumented population exposures (at the time of the accident or in the long run), represent the primary uncertainties in the claim that no one is known to have been injured from the specifically nuclear aspect of U.S. nuclear weapons accidents.

56. These order-of-magnitude estimates are included here, for all their uncertainty, because it has been observed that rational thought often breaks down when nuclear weapons safety is discussed. This occurs even, or perhaps especially, at the top-most levels of the DOE. With the image of the mushroom cloud foremost in our minds--particularly in the minds of those who are responsible for nuclear weapons--no amount of funding for safety improvements seems too much. That, of course, is because they have not been asked to choose between their own programs and other societal means of reducing morbidity and early mortality. It may also be because safety as a goal is psychologically compensatory for those who participate in threatening other nations with weapons of mass destruction, which is, after all, what nuclear deterrence is all about.

These estimates suffer not only from attempting to quantify what cannot be quantified, but also from the implicit error of assuming that the risks of low-probability, catastrophic events are comparable to high-probability, less-severe events. An accidental nuclear explosion, or even a plutonium accident, would arguably have a qualitatively much more severe long-term effect on a society than a comparable number of automobile fatalities.

From 1950-1980, the rate of "Broken Arrow" accidents was approximately one per year. Current safety standards require that a warhead or bomb be able to endure such accidents with a 10^{-4} or less chance of nuclear detonation. Applying the 1950-1980 rate of serious accidents to the deployed START II arsenal, the probability of roughly 4,000 total weapons experiencing one accidental detonation per year with some nuclear yield greater than 4 pounds of TNT-equivalent is less than 4 X 10^{-1}. The current accident rate is much smaller than the historical rate, however, since (a) there are to be fewer deployed weapons than the height of the Cold War, (b) these weapons are now flown around on airplanes much less frequently than in 1950-1980, (c) dangerous exercises like airborne refueling are surely no longer conducted with live nuclear weapons, and (d) these weapons are not kept on alert aircraft parked on runways. These four factors, taken together, probably reduce the rate of "Broken Arrow" accidents by a factor of about 100. Our order-of-magnitude estimate of the current accident rate might therefore be about 10^{-2} per year, and of accidental nuclear explosion about 4 X 10^{-3}.

Most nuclear weapons are stored and transported away from urban areas, so the probability of an accidental explosion in a city is quite small. The size of an accidental nuclear explosion could, by definition, be anywhere between 4 pounds TNT-equivalent and about 1.2 megatons (see Table 1). Perhaps 10^5 people is a reasonable upper bound for the number that would be likely to die from an accidental explosion; that is approximately the number of fatalities that occurred when the center of a city largely made of light buildings--Hiroshima--was bombed. In other words, we might expect, in very round numbers, a reasonable upper bound of 4 deaths per year from a nuclear weapon explosion, with an expected number of deaths per year perhaps two orders of magnitude below this, or 0.04 deaths per year.

This compares with the worst-case scenario drawn up by Fetter and von Hippel for a plutonium dispersal accident, for which the corresponding number was 1 death per year. The probability of the particular accident scenario which Fetter and von Hippel analyzed has been greatly reduced if not virtually eliminated, however, by the simple expedient of separating warheads from rocket motors during loading. The possibility of a plutonium-dispersing accident elsewhere than the Trident docks has not entirely vanished, of course, despite the fact that all

of these non-Trident weapons have IHE and some of them have FRPs as well (see Table 1). Assume, arguendo, that these changes have reduced the expected annual deaths by a factor of 10 to 100, i.e. to about 0.01 to 0.1.

It seems therefore plausible that the *a priori* expected number of annual deaths from a nuclear weapons accident is on the order of 0.1 or fewer persons/year, or roughly one million times less than the expected number of deaths from other accidents. The probability of dying in any accident is, in turn, about 50 times less than dying of a disease, which is about 0.98. Our rough estimate of the probability of any given person in the U.S. dying from a nuclear weapons accident in a given year is thus about 4 X 10^{-10} or less, or less than 3 X 10^{-8} in a 75-year lifetime. These numbers are very low, and errors in them of up to three orders of magnitude will not affect the conclusions which follow in the text.

57. See Stewart Udall, The Myths of August: A Personal Exploration of Our Tragic Cold War Affair with the Atom, Pantheon, 1994. Dr. Hugh DeWitt of Lawrence Livermore has recently drawn attention to the continued classification of historic fallout data and called for U.S./Russian bilateral release of this data.

58. Radioactive Heaven and Earth, Apex Press, 1991, available from the Institute for Energy and Environmental Research, Takoma Park, Md.

59. Andrei Sakharov, "Radioactive Carbon from Nuclear Explosions and Nonthreshold Biological Effects," 1958, reprinted with Appendix by Frank von Hippel in Science and Global Security, 1990, V. 1, pp. 175-187.

Table 1: The Projected U.S. Stockpile After Implementation of START II

Weapon	Use	Yield (kt)	Number	Design Lab	Produced	IHE	FRP
B61-7	Strategic bomb	10-350? (Hansen: 500)	450	LANL	1985-? (pits 1966-1971)	yes	no
B61-mods 3/4/10	Tactical bomb	1-150? (H: 300)	100	LANL	1979-1990	yes	no
W76	SLBM C4/D5	100	1,280	LANL	1978-1987	no	no
W80-0	SLCM	5 & 150	350	LANL	1984-1990	yes	no
W80-1	ALCM	5 & 150	400	LANL	1982-1990	yes	no
B83	Strategic bomb	low to 1,200	500	LLNL	1983-1990	yes	yes
W87-0	ICBM	300	500	LLNL	1986-1989	yes	yes
W88	SLBM D5	475	400	LANL	1989-1990	no	no
Reserve Stockpile After START II (estimate of Norris and Arkin)							
W76	as above		1,000	as above			
W78	ICBM	335	1,000	LANL	1979-?	no	no
B53-1? B61 & B83 W80-1	gravity bombs and ALCMs	5 to 1,200; 9,000 if B53-1	1,500	both	B53: 1962-1965	B53: lacks IHE, FRP, and full electrical safety	
Total weapons after START II: about 8,500 (includes spares)							

IHE: insensitive high explosive
FRP: fire resistant pit
LANL: Los Alamos National Laboratory
LLNL: Lawrence Livermore National Laboratory
ICBM: intercontinental ballistic missile (Minuteman III in this case)
SLBM: submarine-launched ballistic missile
ALCM: air-launched cruise missile
SLCM: submarine-launched cruise missile
C4: Trident I C4 missile
D5: Trident II D5 missile

Sources:

Tom Zamora-Collina and David Albright, ISIS Report, October 1993; Christopher Paine, "CTB Negotiating Issues With Implications for Nuclear Nonproliferation," Natural Resources Defense Council, April 1994; Stanley Norris and William Arkin, "Nuclear Notebook," Bulletin of the Atomic Scientists, Jan/Feb. 1995; Chuck Hansen ("H" above), U.S. Nuclear Weapons: The Secret History, Orion Books, 1988.

This table was prepared for Tri-Valley CAREs, Livermore, CA by Greg Mello

No Serious Problems: Reliability Issues and Stockpile Management

A Review for Tri-Valley CAREs

by

Greg Mello

February 6, 1995

No Serious Problems:
Reliability Issues and Stockpile Management

An Issue Brief for Tri-Valley CAREs by Greg Mello, February 6, 1995

Summary

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- The U.S. nuclear arsenal has been extensively tested and is reliable.
- The arsenal is becoming more reliable each year as older weapon types are retired.
- The weapons which are to remain in the stockpile can be expected to last many more years if serviced. So far, age has tended to make nuclear weapons more, not less, reliable, and no weapon has ever been retired due primarily to aging problems.
- Although the nuclear arsenal is increasing in reliability, confidence in nuclear weapons is declining as nuclear weapons lose political importance. The two issues--reliability and confidence--should not be confused.
- U.S. nuclear weapons are adequately "robust" with respect to the minor variations in manufacture that have occurred throughout the prototyping and production processes.

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- There is no serious technical impediment to remanufacturing existing kinds of weapons and weapon parts. For example, Los Alamos is now gearing up to remanufacture plutonium pits.

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- Changing the design of nuclear weapons without nuclear proof-testing has been the source of serious reliability problems in the past and can be expected to cause more problems if it is done in the future.

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- The present, effective process for monitoring the reliability of nuclear weapons places only small demands on weapons research and development personnel.
- A high level of weapons reliability can be assured with modest levels of funding and with current diagnostic facilities. New facilities, especially the $2 billion National Ignition Facility, are not needed. Engineering and production skills, rather than scientific research, are most essential to maintaining and remanufacturing nuclear weapons.

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- The only purpose of reliable nuclear weapons is to deter a nuclear attack. Efforts to continually refine nuclear weapons conflict with U.S. nonproliferation goals and could well degrade confidence in the overall efficacy of our deterrent.

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Introduction

In the debate over a nuclear test ban in the late 1980's, advocates of continued testing, led by the two weapons physics laboratories, took the position that the reliability of U.S. nuclear weapons would decline unacceptably under any kind of testing ban. Specifically, weapons labs managers argued that changes in manufacturing techniques, materials, and personnel would seriously degrade confidence in the U.S. nuclear deterrent.

These concerns were not shared by everyone in the weapons design community, however, and the lab managers' view, when weighed against contrary technical evidence from senior independent and retired experts, failed in the end to convince even the Pentagon. All relevant agencies of the government--including the managers of the labs--now agree that it is feasible to maintain a nuclear deterrent without nuclear testing. While not everyone in government wants a test ban--John Deutch, Undersecretary of Defense does not, for one[1]--everyone now finally admits, either implicitly or explicitly, that the U.S. nuclear stockpile can be maintained under a comprehensive test ban treaty (CTBT).

Indeed, the current leadership at the Pentagon "requires" that the nation retain the capacity--even under a test ban--to design, fabricate, and certify new weapons, a much more difficult task than simply refabricating existing weapon types.[2]

With a CTBT now an official goal, reliability issues, like safety concerns, are again being raised, this time to promote the new facilities and large appropriations proposed for the Department of Energy's (DOE's) expansive "science-based stockpile stewardship" (SBSS) program. Are these concerns real? Is it necessary to keep research, development, and testing (RD&T) spending at Cold War levels to maintain reliable weapons? Are major new facilities needed? This paper, part of a series on these and related questions, suggests that reliability concerns can be addressed in a much simpler and relatively cost-effective manner through more effective management of the nuclear weapons complex.[3]

Congressional testimony shows that the U.S. arsenal has no significant current reliability problems.

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The best starting point for this discussion is the most authoritative testimony available. Speaking before Congress on March 15, 1994, Dr. Harold Smith, Assistant Secretary of Defense for Atomic Energy, said

> I am pleased to report the stockpile today is safe, secure, reliable, and meets current military requirements. We make that statement with confidence today and for the immediate future....Our stockpile is becoming safer and more reliable simply because we are retiring older weapons...Thus, we should enter the 21st century with a modern, safe, and reliable stockpile consistent with the demands of START I and with anticipated military requirements.[4]

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So not only are U.S. nuclear weapons reliable, but they are, at least for the "immediate future," becoming even more reliable as older weapons are retired. This statement was made in the presence of, and with the approval of, Dr. Victor Reis, Assistant Secretary of Energy for Defense Programs, who added,

> Right now, as Dr. Smith said, that stockpile is safe and reliable.[6]

Make no mistake: nuclear weapons in the stockpile are certified to explode at nominal yield <u>after</u> experiencing all the environments that a deployed weapon could reasonably be expected to weather in its life, and <u>after</u> the severe accelerations, cold, heat, shock and radiation (e.g. from the explosions of other warheads) that are expected to occur during the stockpile-to-target sequence. This performance is exhaustively analyzed and tested in a diverse array of demanding tests coordinated primarily by Sandia, whose mission is to weaponize the physics packages' developed at the other two laboratories. It appears that most, or perhaps even all, of the weapons in the current stockpile have been tested in underground nuclear tests using not only prototypes but also actual production weapons, with simulated end-of-life and stockpile-to-target conditions.[7]

So the reliability concerns that have been raised are concerns over the long term. What, in this context, is the "long term?" And just how serious are these concerns?

<u>No serious reliability problems are expected in the stockpile for many years, even without remanufacture.</u>

Dr. Dan Kerlinsky investigated in detail the subject of reliability in relation to stockpile stewardship throughout the summer and fall of 1994 for the Secretary of Energy's Panel on the Future of the DOE Labs (the Galvin Panel). In the process, he attended and initiated numerous classified discussions and interviews with senior scientists and managers at all three weapons laboratories.

Kerlinsky found that data on historical reliability and repair had been systematically collected by Sandia National Laboratory in a two-year study commissioned by Secretary Watkins, called the Stockpile Life Study, which was completed in 1994. This study was designed to answer two basic questions: (1) "How long do nuclear weapons last?" and (2), "What programs and activities are required to keep them in the stockpile?" To answer these questions, the detailed history of the entire stockpile was examined over the past thirty years.[8]

Sandia was in an excellent position to gather this data, as it is the laboratory that coordinates the stockpile surveillance program for the Department. But in order to be sure that the Sandia study did not leave out any problems that might be known to Los Alamos and Livermore but not to Sandia, Kerlinsky interviewed weapons program personnel at these two laboratories as well. He found that the Sandia data was indeed comprehensive.

The thirty years of experience summarized in this study revealed that there is not known to be any upper limit on weapon life, given appropriate maintenance and renewal of perishable

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materials and parts (e.g. tritium). No U.S. weapon has ever been retired due primarily to aging problems, even though some weapons have, in the past, been in the active stockpile for more than 30 years before being superseded by new designs. (The weapons in the present stockpile are, in contrast, believed to be all between about 6 and 15 years of age.) Aggregate data show that the rate of required modifications and repairs of stockpiled weapons <u>decreases</u> as the years go by, reflecting continually increased reliability as the "bugs" are gradually worked out of weapons systems.

Fully half of the 300-odd problems encountered in the stockpile over the years were judged to have no effect at all on the reliability of the weapon. At least another 40% of the problems investigated would have had only a slight impact on reliability. Only a small minority–less than 10%–of the problems found would have led to a decrease of 10% or more in the probability of achieving the certified yield. All of these problems have been fixed. Many of them were caused by rushing inadequately-tested weapons into the stockpile, as will be discussed below.

Overall, among the defects found, very few have been in the physics packages, which typically are the simplest part of the weapon, comprising less than 5% of the overall number of parts in the B83, to pick one example.[9]

What is most important to realize is that the weapons in the enduring stockpile have been designed and built using all this and more accumulated experience. Design and production mistakes that occurred with earlier weapons have not been repeated. The stockpile is more reliable than ever before, and is increasing in reliability as older systems are retired.

Before examining this subject in greater technical detail, it is important to step back and look at the difference between reliability of, and confidence in, the stockpile.

<u>Reliability is sought only for the purpose of creating a convincing deterrent.</u>

It is important to distinguish between the <u>reliability</u> of a warhead and <u>confidence</u> in a nuclear deterrent. Reliability is a technical problem. Confidence is based on reliability, but it is also based on psychological, social, and political realities and perceptions. Confidence is not at all the same to every observer. For most decision makers, confidence in a nuclear deterrent is the genuine objective of nuclear weapons expenditures, not simply reliability. They seek this confidence in an attempt to allay fears of a nuclear attack, and they attempt to project this same confidence to would-be aggressors and potential enemies in our foreign wars.

Confidence is eroded whenever the experts at the nuclear weapons labs, who have a strong financial and institutional interest in the matter, say there is a reliability problem of any kind, no matter how trivial or even false. So the scientists at the weapons labs, along with their sponsors at the DOE and DOD and the consultants who serve them, are precisely in a position of considerable influence over confidence in the U.S. stockpile, quite independent of actual weapon reliability.

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In a different and perhaps more fundamental sense, confidence in the stockpile is also eroded whenever the utility of warheads to accomplish national goals—including deterring non-nuclear aggression—is questioned. This is now occurring with greater and greater regularity. Many people believe that the 49-year *de facto* norm against the use of nuclear weapons, together with the repugnance with which the nations of the world would regard their use, make that use quite unrealistic and counterproductive for any purpose other than the narrowest one of deterrence of nuclear attack.[10] In a very real sense, nuclear weapons are becoming less reliable as instruments of policy and power. They are becoming politically unreliable—which makes everyone more secure.

In this context, senior bureaucrats, members of Congress, defense officials in the executive branch, and others who have focused years of their life on the production, maintenance, and deployment of nuclear weapons sympathize readily with the fretting about long-term reliability now being done by the laboratories and their sponsors. Confidence in the ability of U.S. nuclear weapons to explode is not in any serious doubt, but the funding, purpose, direction, and meaning of the U.S. nuclear weapons program is very much in doubt, and the two kinds of doubt are very easily confused.

In any case, perfect reliability is not essential to deterrence. The technical—as opposed to the political and psychological—requirements of deterrence consist only of providing any aggressor with enough confidence that U.S. weapons might explode to deter his attack.[11]

A more detailed technical analysis of the reliability
question does not reveal any serious problems.

The "reliability" question was authoritatively examined in a 1987 report to Congress by Dr. Ray Kidder, a senior Livermore weapons physicist, commissioned by former Congressman (and later, Secretary of Defense) Les Aspin. Kidder's overall conclusion was,

> It is found that a high degree of confidence in the reliability of the existing stockpile is justified, and that it is sufficiently robust to permit confidence in the reliability of remanufactured warheads in the absence of nuclear explosive proof-tests.[12]

Note that this confidence was warranted in 1987, without the new facilities that are proposed for the SBSS program.

In the course of his study, Kidder found that in the entire history of the U.S. stockpile, only one weapon (the W68) experienced reliability problems after being in the stockpile more than four years.[13] The Stockpile Life Study's conclusions, as we have seen, confirm this vote of confidence and bring it up to date.

In his paper, Kidder analyzed the fourteen often-cited cases of stockpiled weapons that required nuclear tests to evaluate problems. Nine of these occurred in the 1960's—Kidder calls these the

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"Sixties Nine"—as a direct result of the rush to build and stockpile weapons during the 1958-1961 test moratorium. That rush led "to a stockpile that was very poorly tested by today's standards," he notes. Kidder continues,

> Our understanding of how nuclear weapons work, our experience with nuclear tests, and our computational capabilities were all significantly inferior to that which exists today [i.e., in 1987]. There has been no rush to build the present stockpile, and it has benefited from a quarter-century of additional nuclear and nonnuclear tests since the hectic days of the Moratorium. For these reasons, it is concluded that experience with the Sixties Nine, long ago, has little or nothing to say about the reliability of the stockpile of nuclear weapons that exists today.[14]

Five other actual or potential reliability problems occurred in the 1980's, likewise as a result of inadequate testing. In two cases, the production weapons were different than the tested prototypes and had never actually been tested at all (one worked; one didn't). In two cases, weapons had never been tested after the rugged stockpile-to-target sequence of events (one worked; one didn't). And in one case, the high explosive in a weapon was changed; the explosive—unique to that failed weapon—had never been adequately tested in the first place and didn't work properly. All these problems, and the lack of testing that allowed them to go unnoticed prior to production, are irrelevant to the current stockpile.

Carson Mark, Director of the Los Alamos Theoretical Division for 26 years, summed up the situation in 1993 by saying that the reliability argument, as it was then being used against a test moratorium, was "utter rubbish."[15] Mark links reliability and stockpile confidence to preservation of the original warhead design, without change or "improvement."

> Most important, no changes or improvements in matters which could affect the behavior of the nuclear system in an existing, certified weapon design would be acceptable [during a test ban].[16]

Mark makes the further point that the real threat to confidence and reliability of the arsenal is the historical insistence that, to quote an old policy of the DOE, "the nuclear weapons stockpile must dynamically evolve to satisfy changing threats and deterrent requirements."[17]

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Reliable warhead remanufacture is feasible.

The concept of maintaining confidence by preservation of design is at the heart of "warhead remanufacture," to which we now turn. Kidder tabulated the results of U.S. nuclear tests, dividing them into four groups, and found that the agreement between predicted and actual yield was "remarkably" good. He concludes that

> this impressive record would not have been possible if U.S. nuclear weapons were not comfortably tolerant of the small variations in materials and manufacturing that accompany any practical production process...The test record

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> indicates that the nuclear weapons in the existing U.S. stockpile are sufficiently robust to allow for future replication...This conclusion is in agreement with earlier statements by nuclear weapons authorities Dr. Hans A. Bethe, Norris E. Bradbury, Richard L. Garwin, J. Carson Mark, and Andrei Sakharov affirming the possibility of reliable remanufacture without nuclear explosive proof-tests.[18]

This conclusion is reinforced by an experiment at Los Alamos in which an intentionally off-spec pit was made and successfully tested in Nevada.[19]

Kidder appends the convincing statements of these authorities to his paper. Needless to say, when he wrote these words in 1987 Kidder did not, nor could he have, made them contingent upon the existence of new science-based stewardship facilities.

Kidder added, however, that for later remanufacture to be feasible, original materials would have to be used. If changes were made, confidence would be undermined. When I spoke to him last year about this, he did not think that material substitution would be a problem in each and every case. Some changes could, in fact, be tolerated: parts which are supposed to be transparent to radiation, for example, could be replaced with parts which are at least as transparent, and parts which are supposed to be opaque, with parts at least as opaque. He noted that since his 1987 study, there have been further classified studies of this issue, including a "Stockpile Remanufacture Study" in FY91. At the present time, he is "not aware of any problems" with warhead remanufacture, provided adequate funding is available.[20]

Mark agrees. On the materials question, he says

> it is ridiculous to suppose that substitutes would ever be needed. Nuclear weapons production has never been dependent on commercial supplies or suppliers to meet its needs for obtaining and handling separated isotopes, polonium, plutonium, or explosives. The production system can certainly be set up, or arrange, to acquire safely any needed supplies of beryllium, plastics, asbestos, or whatever else may have served effectively in past production even if in the future it should be dropped from commercial use because of hazards or lack of demand.[21]

As for the level of expertise needed to implement such a remanufacture program, Mark points out that the only real need for experienced weapons designers would arise in the determination of "whether a particular problem found in the surveillance program did or did not require replacement of the stockpiled weapons with new ones built to the original, certified, and tested specification." . Mark, for one, has no doubt that if the problem were considered important enough, a body of experienced experts could be convened <u>regardless of the level of staffing at the weapons laboratories</u>. Mark goes on to say,

> Past experience casts doubt on our supposed utter dependence on maintaining a corps of scientific and engineering veterans of the Nevada test site. There were no such persons anywhere in 1943 when the effort to build an atomic bomb was

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> begun; and in 1950 when official hydrogen bomb efforts were announced, the corps of seasoned experts was very small and had very meager experience in testing - now said to be the *sine qua non* of capability. Yet in each case, the United States succeeded in developing and testing a weapon based on an entirely new physical principle within two to three years.[22]

Kidder points out that the institutional arrangements needed to maintain reliability are "nothing new." It would, in his opinion, take only relatively small teams, with focused responsibility for each weapon system, to resolve stockpile questions. At present, he said, it is rare for weapons designers to receive questions regarding changes in weapons specifications. Before this happens, several levels of expertise--the inspectors and production engineers at Pantex, then their supervisors, then the weapons engineering teams from the weapons labs which regularly travel to the production plants--must be exhausted first. He believes there is no reason to change this system, which works. The highest priorities for a strong remanufacture program would probably be product and production engineering, test equipment, and so on, rather than new science *per se*, although a scientific base must also be maintained, including hydrotesting facilities.[23]

In 1987 Kidder concluded, long before SBSS, with its proposed panoply of new design and diagnostic facilities, appeared, that

> The robust character of the nuclear weapons in the present stockpile, together with the ample time available to accomplish the task, suggests that it will eventually be possible to be confident of the reliability of remanufactured nuclear weapons without requiring the services of nuclear weapon design engineers and scientists that have themselves benefited from direct experience with nuclear explosive tests. (p. 9)

At the same time--1987--as Kidder conducted his study, managers at Lawrence Livermore National Laboratory (LLNL) were writing their own report.[24] This report--a *cri de coeur* for nuclear testing--is very useful as a compendium of problems that had been experienced in weapon design and manufacture. Based on the historical record, these managers believed three kinds of problems would occur in a future without nuclear testing: the loss of both scientific and production experience, unavailability of materials (and/or subtle variations in them) with no way to test how substitutions and changes affected performance, and inadequate documentation and specifications for many materials and processes, leading to inadvertent production changes.

Yet the official LLNL conclusions of 1987--that exact remanufacture is impossible and that nuclear testing is necessary to retain the reliability of the arsenal--have both now been widely rejected. In the end, data like that of Ray Kidder have been strongly persuasive over the attempt to extrapolate future problems from problems discovered--and corrected--in the past. For if minor variations in manufacture, materials, or specifications were indeed a serious problem, we just would not see what Kidder called the "impressive" testing record in Nevada, either for new primaries or stockpiled weapons. Especially given the near-perfect record for <u>new</u> primaries, why should it be so difficult to merely maintain existing designs?[25]

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The JASONs believe the best approach to reliability is exact remanufacture.

In their recent report on SBSS, the JASONs—an elite group of academic defense consultants convened by the MITRE corporation—endorse exact replication of weapons, especially plutonium pits, as the best way to ensure confidence in the arsenal.

> ...the primary—if not the sole—nuclear weapons manufacturing capacity that must be provided for in an era of no nuclear testing is the remanufacture of copies of existing (tested) stockpile weapons...the ultimate goal should be to retain the capability of remanufacturing SNM [special nuclear materials] components that are as identical as possible to those of the original manufacturing process and not to "improve" those components. This is especially important for pits..."[26]

The plutonium pit forms the core of the fission primary, and its function is critical to the reliability of the entire weapon. Pits are composed of various materials which must be alloyed, shaped, and joined with great precision. Even so, the JASONs point out that it is the finished pit that must be the same as the proof-tested model, and not every manufacturing detail or process along the way. To ensure this, they call for "a narrowly defined, sharply focused engineering and manufacturing curatorship program."[27] This is an excellent approach to stockpile management overall, but the point here is that they found no serious obstacles to their exact remanufacturing proposal. That is, the inevitable inexactness of "exact" remanufacture evidently appeared quite tolerable to the JASONs, contrary to what is often said by the laboratories.

Remanufacturing is not only practical—it is about to start.

In addition to alleged reliability problems caused by declining expertise, unavailable materials, and inadequate documentation, it has more recently been suggested that there will be reliability problems associated with the adoption of novel production methods. For example, plutonium metallurgy is complex, and the processes formerly used at Rocky Flats to make pits are different in some respects from those now being set up at Los Alamos to do the same job. But Los Alamos is remanufacturing pits.

> Associated with pit surveillance activities is the Pit Rebuild Program, which will demonstrate the capability at Los Alamos to fabricate pits of war reserve quality. Specific technology areas that must be developed or enhanced at Los Alamos include certification of the beryllium machining capability, certification of the tubulation capability, development of the capability to interface pit materials, and development and certification of joining processes. The capability for manufacturing a pit for a W88 weapon will be in place in FY 1996...
>
> Los Alamos is currently the only DOE site capable of fabricating a plutonium pit and, as such, may be the only practical near-term upgrade-in-place option for plutonium processing and fabrication. In conjunction with its plutonium research and development responsibilities, Los Alamos will maintain

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> those technologies and capabilities required to build plutonium pits for development and demonstration purposes..."[28]

Thus the capability to produce W88 pits for the stockpile will be put in place long before any of the so-called "necessary" new diagnostic facilities, such as the Dual-Axis Radiographic Hydrotest (DARHT) facility, are available.[29] While both DOE and the laboratories are trumpeting exotic solutions to alleged reliability "problems," a fully-certified production line is being set up this year for the most critical and difficult-to-manufacture component in a weapon: the plutonium pit.

What is more, much of the slow start-up in the Pit Rebuild Program results not so much from the difficulty of being sure the pits produced will be good enough *per se*, but from the painstaking work of matching or modifying the specifications and procedures--the official cookbook--that LANL inherited from Rocky Flats. It is the quality assurance aspect that takes the most time. Asked how long it would take to produce a working pit for the stockpile in an emergency, independent of the formality of the certification process, LANL managers told Kerlinsky, "Three days."[30]

But this is not all–

> As part of the Stockpile Support Program, Los Alamos will maintain a capability to make the components for a complete nuclear physics package, thereby ensuring that the requisite technologies and expertise are retained in the DOE complex and that weapons RD&T requirements can be met in the future. Because upgrades in canned subassembly (CSA), assembly, and radiation-case capabilities will be required, Los Alamos and Livermore are preparing a study for DOE/AL to evaluate joint capabilities in both pit and CSA manufacturing."[31]

Thus LANL at least believes that it can manufacture not only pits but entire physics packages for RD&T purposes, if not also for the stockpile. And the two labs together not only have confidence in, but are actively seeking, manufacturing capability for complete physics packages for the stockpile.[32] Thus, what the labs said just a few years ago couldn't be done for all the reasons they trumpeted, they are now actively promoting—and at their own facilities, no less.

To the extent that nuclear weapons are to be retained, reliability and quality assurance issues will always require attention. But the inescapable conclusion from the labs' current programs and proposals is that they do not believe that reliability issues stand in the way of remanufacture of nuclear weapons.

There is no need to retain weapons in the stockpile long after their expected life.

It is often mistakenly asserted that, with an end to nuclear testing, weapons will have to remain in the stockpile for unprecedented periods of time. There is no reason why this need be the case. About six weapon types could remain in the "enduring stockpile" for a long time, should further disarmament measures fail, but individual weapons can be remanufactured if it is decided

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to do so. Therefore there is no need to endlessly study how problems which develop only after decades in the stockpile might affect reliability—if reliable nuclear weapons are desired, new parts, or new weapons, of existing types can be made. This logic applies to the aging of insensitive high explosive (IHE), to metallurgical changes in plutonium pits, and in fact to essentially all potential long-term stockpile problems.

Stockpile problems are now detected by a variety of non-exotic means, such as physical inspection, static radiography, chemical analysis, and testing of subsystems. These problems can be simply remedied, if necessary, by replacement of the affected part from inventory or from remanufacture—or by retiring the weapon.

Conclusion

Retention of a nuclear deterrent is not a demanding technical requirement. Such a task is not a major scientific undertaking at all. It is rather an engineering and organizational problem with scientific components.

5/40.58 In particular, there is no need to construct advanced new diagnostic facilities. While these facilities could, in some cases, marginally advance the state of U.S. nuclear weapons science,
6/40.07 to the extent they do this they will inevitably undermine the global nonproliferation regime.[33] Thus, while contributing little or nothing to the reliability of U.S. nuclear weapons, these new facilities could well decrease confidence in the overall efficacy of our nuclear deterrent.

5/40.58 continued What is more, a DOE budget centered around SBSS, with funding included for large, unnecessary, and distractive gadgets like the proposed National Ignition Facility, could overshadow and weaken those programs most useful for actually maintaining the existing stockpile. This fact has not escaped the notice of many analysts, including the Congressional Budget Office and the Natural Resources Defense Council.[34]

Fundamentally, the scale and direction of the science-based stockpile stewardship program envisioned by the DOE and the weapons labs is not so much driven by concerns about the reliability of weapons as it is driven by concerns regarding the reliability of funding. Creating new "products"—i.e. new weapons designs—in that program, an outcome which is probably necessary to maintain internal interest in the program in the long run if not also in the short run, may be the best way to create reliability problems in an arsenal which now has none.[35]

Endnotes

1. The following exchange occurred between Chairman Hamilton and Dr. Deutch during the latter's presentation of the Nuclear Posture Review to the House Foreign Affairs Committee, October 5, 1994:

Rep. Hamilton: "Do we need more (nuclear) testing?"
Dr. Deutch: "In the near term? How long do you have in mind, sir?"
Rep. Hamilton: "You pick the time frame. It doesn't make any difference."
Dr. Deutch: "The position of the administration, I believe, is that we don't need more testing..."
After three more attempts by Rep. Hamilton to elicit candor from Deutch, the latter finally admitted:

"Mr. Chairman, you catch me personally here at a rather awkward position, and let me explain to you straight why, and that is that I have written widely on this subject before I entered government, and so what I'm trying to answer to you now is the position of the administration."

Although Hamilton questioned Deutch closely as to reasons to continue nuclear testing, Deutch provided none, even though he was personally in favor of testing. Hamilton even suggested that safety as a reason to continue testing, but Deutch demurred, saying "It is my judgment that all the nuclear weapons that we have are adequately safe." At no point did Deutch bring up any reliability issues—either past, present, or possible future.

2. See the viewgraphs used to present the Nuclear Posture Review in late September and early October, 1994, available from the Pentagon; the one quoted here is titled "DOD requirements to DOE." The "requirements" terminology is both problematic and revealing.

3. Greg Mello, "Redefining Stockpile Stewardship," Tri-Valley CAREs, Livermore, CA, 1995.

4. Testimony before the House Appropriations Committee, Subcommittee on Energy and Water Development. Energy and Water Development Appropriations for 1995, Part 6, pp. 413-414.

5. Ibid., p. 419.

6. Physics package: the nuclear "core" of a weapon, typically and schematically comprised of the fission primary, the thermonuclear secondary if present, related initiating and boosting devices, and the case.

7. Ray Kidder, "Maintaining the U.S. Stockpile of Nuclear Weapons During a Low-Threshold or Comprehensive Test Ban," October 1987, UCRL-53820, LLNL, pp. 4-5. His exact word or adjectival phrase has been omitted by the classifiers but the import of his sentence is clear. Kidder discusses stockpile confidence tests (SCTs) more extensively on p. 3 and in Appendix B of his report, both of which have been substantially classified as well. I do not know how many SCTs were done in the years between 1987 and 1992, when testing ceased, or whether there remain, at this point, any weapons which have not been so tested, or whether any systems without SCTs are to be retained in the START II arsenal. It is quite doubtful that inadequately tested weapon systems would be chosen for retention in the so-called "enduring arsenal." Even if so, the "remarkably accurate" predictability of SCTs (Kidder, p. 15) supports a high level of confidence in the reliability of any weapon (if there is one) which has not had this final, post-production, test. The large number of nuclear tests that were available for such tests argues that if any SCTs were not done, it was because they were not considered very important. The Nuclear Testing Moratorium Act specifically allowed testing for reliability purposes, but none has been requested.

8. Classified and unclassified results of this study were made available to the Galvin Panel. The unclassified summary is currently being suppressed by Assistant Secretary Rais and Undersecretary Curtis.

9. This information is found in viewgraphs prepared by Sandia National Laboratory.

10. Seth Cropsey of the Heritage Foundation is one such person (see "The Only Credible Deterrent," Foreign Affairs, March/April 1994, pp. 14-20. General Horner, head of the Air Force Space Command, is another ("U.S. Should Trash Nukes, Top Air Force General Says," Albuquerque Journal, July 16, 1994). Tom Thompson, dean of current weapons designers at Livermore, is another. As he recently put it, "I can't think of any target for anything in our stockpile" ("Science Comes in from the Cold," Los Angeles Times, 12/22/94).

Many senior military commanders have held and/or hold the view that nuclear weapons are useful only to deter other nuclear weapons, and not for any military use; Robert McNamara listed some he has known to hold this view in the United States and Britain in a speech to the Economists Allied For Arms Reductions in New York on May 19, 1994. Still other civilian and military defense leaders cited by McNamara have stronger views—that nuclear weapons should never, under any circumstances, be used at all. McNamara says he conveyed this opinion, which he has held since the early 1960's, to Presidents Kennedy and Johnson.

11. One senior weapons manager at LANL put the whole reliability question in perspective with a pointed question. "Would an aggressor gamble that Israeli nuclear weapons [which are far less tested than U.S. weapons] won't explode?" To be understood, any aggressor must have confidence that the U.S. deterrent as a whole won't work, i.e. that all, or essentially all, of the weapons launched by the U.S. will be complete duds. It is this aggregate reliability that counts for deterrence, and the burden of proof is solidly on those who would doubt that aggregate reliability. As described in the previous note, many people—the present writer included—believe it would be a mistake to retaliate against an attack, even a nuclear attack, with nuclear weapons. As General Horner put it,

"I just don't think nuclear weapons are usable. I'm not saying that we unilaterally disarm. I'm saying that I have a nuclear weapon, and you're North Korea and you have a nuclear weapon. You can use yours. I can't use mine. What am I going to use it on? What are nuclear weapons good for? Burning cities. What President of the United States is going to take out Pyongyang?"

If, however, nuclear weapons are to be maintained and deployed as just another weapon of war, ready for first use against an enemy in times of crisis, a higher standard of reliability is required. Yet even this dangerous and counterproductive posture can be readily and reliably supported by maintenance and remanufacturing of existing weapon types.

There is yet another reason why confidence in deterrence is robust relative to reliability of a weapon. In a nuclear explosion, the maximum radius at which a given overpressure is experienced is proportional to the cube root of the explosive yield. A five-fold decrease in explosive power thus causes only a 1.7-fold decrease in destructive radius and a 2.9-fold decrease in destructive area. (See Samuel Glasstone, The Effects of Nuclear Weapons, U.S.A.E.C., 1964, p. 127.) Even significant declines in expected yield are unimportant outside a warfighting context.

12. Kidder, op. cit., p. 1.

13. This problem, arising from chemical instability in a type of HE that is no longer used, is not relevant to the current arsenal.

14. Kidder, op. cit., p. 4.

15. Personal communication.

16. J. Carson Mark, "Do We Need Nuclear Testing?", Arms Control Today, November 1990, pp. 12-17; p. 14.

17. Mark, op. cit., cites DOE, Program Status of Preparations for Further Limitations on Nuclear Testing, February 1990. Far from being dead, this anachronism lives on, most conspicuously in the recent Nuclear Posture Review quoted above.

18. Kidder, op. cit., p. 6.

19. Daniel Kerlinsky, personal communication.

20. Ray Kidder, personal communication, 11/17/94.

21. Mark, op. cit.

22. Ibid.

23. Ray Kidder, personal communication.

24. George Miller, Paul Brown, and Carol Alonso, "Report to Congress on Stockpile Reliability, Weapon Remanufacture, and the Role of Nuclear Testing, October 1987, UCRL-53822, LLNL.

25. "During the past decade [1977-1986], new boosted primaries have been designed and developed by the weapons laboratories...performed satisfactorily the very first time they were tested, the observed yield in no case falling short of that expected by more than...The one new primary that failed was of a more complex, less predictable design than the others. This primary was subsequently redesigned, tested, and failed again. None of the primaries in the existing stockpile employ...

"This experience demonstrates that the ability of the weapons labs to predict the performance of newly designed, as yet untested, boosted primaries of the kind currently in stockpile is indeed impressive—there were no significant surprises. This could hardly have been the case had these primaries been sensitive to differences that inevitably exist between the weapon configuration calculated and the weapon tested." Kidder, op. cit., p. 25.

26. "Science Based Stockpile Stewardship," Sidney Drell et al, November 1994, MITRE, McLean, VA, p. 81. The chapter quoted proceeds from different assumptions than most of the rest of the report. That report is criticized in a paper related to the present study, available from Tri-Valley CAREs, "Ask Few Questions, Get Few Answers: A Critique of the JASONs' Stockpile Stewardship Study," Greg Mello, 1995.

27. Ibid., p. 85.

28. Los Alamos National Laboratory, Institutional Plan, FY1995-2000, pp. 50-51.

29. DARHT, like the existing Flash X-Ray (FXR) and Phermex facilities at Livermore and Los Alamos, respectively, would evaluate mock pits during implosion. DARHT, if built, is expected to be available for experiments in approximately the year 2000.

30. Dr. Daniel Kerlinsky, personal communication.

31. Los Alamos National Laboratory, op. cit., p. 51.

32. The overall outlines of the labs' proposal can be found in a presentation by Larry Woodruff of LLNL to the National Security subgroup of the Galvin Panel on August 8-9, 1994. The responsibilities of Rocky Flats, Savannah River, and the Y-12 Plant would all be moved to LANL and LLNL under this plan, with Sandia taking over for Pinellas and the Kansas City Plant. The production capacity would be 150 weapons per year, with LANL specializing in fabricating parts made from fissile materials.

33. Detailed discussion of this point will soon be available from the present writer and Tri-Valley CAREs.

34. Congressional Budget Office, "The Bomb's Custodians," July 1994, p. x; Christopher Paine, personal communication.

35. See Defense Week, 8/15/94. Dr. John Deutch, Undersecretary of Defense, and Dr. Vic Reis, Assistant Secretary of Energy, were and may still be pressing for development of a new warhead. This notion differs from the military's preferred road map for maintaining reliable nuclear weapons, which does not involve reliance on an untested weapon.

Ask Few Questions, Get Few Answers:
The JASONs' "Science Based Stockpile Stewardship" Study

A Review for Tri-Valley CAREs

by

Greg Mello

February 14, 1995

Ask Few Questions, Get Few Answers:
The JASONs' "Science Based Stockpile Stewardship" Study

A Review for Tri-Valley CAREs by Greg Mello, February 1, 1995

Summary

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- The Department of Energy (DOE) asked the JASONs, a respected group of academic defense advisors, to evaluate its science-based stockpile stewardship (SBSS) program. The JASONs were not asked, however, about the relative merit of specific projects in SBSS, or which of these projects—if any—were essential, or to evaluate projects by their benefit-to-cost ratio. As a result their report is not very helpful in evaluating the DOE program.
- The JASON group cannot be considered "independent," since many of the group, including the chairman Dr. Sidney Drell, are closely connected to the DOE.

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- In the JASONs' view, "compensation" to the weapons labs for the loss of underground testing is the "basic principle" of the SBSS plan. They recognize, however, that if other nations view SBSS as compensation, this could conflict with U.S. nonproliferation goals.
- The JASONs' nowhere demonstrate the need for most aspects of SBSS to maintain a deterrent.
- The JASONs assume that new nuclear weapons must be developed and deployed and that SBSS is necessary to accomplish this. At the same time, the JASONs do not want the perception of this activity to be widely shared.
- The JASONs' analysis of the nonproliferation impacts of the SBSS is quite abridged. They essentially ignore the requirements of the Non-Proliferation Treaty.
- The JASONs propose declassifying many of the technical details of the SBSS program in order to defuse nonproliferation concerns. A senior DOE declassification officer strongly disagreed with this approach, citing direct proliferation risks. The JASONs' declassification proposal seems calculated to gain more scientific users of the new machines and therefore more political support for them.
- The JASONs endorse most of the proposed new facilities that will be the foci of the SBSS program, including all the hydrodynamic testing upgrades planned for this century and the National Ignition Facility (NIF). Yet they offer no reasons why these facilities, including NIF, are in any way necessary. They call for a public-relations campaign to sell NIF within the scientific community.
- The JASONs' prescription for plutonium capabilities calls for a narrowly-defined "curatorship" and for exact reproduction of existing designs, contradicting the rest of the report.

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Introduction

In November of 1994, 17 members of the JASON group published their study of the Department of Energy's (DOE's) science-based stockpile stewardship (SBSS) program, which is in its first year of implementation. Even in its draft form, DOE was very pleased with the results of the study and was, in October of 1994, looking forward to reprinting it for wide distribution.[1] The JASON study is likely to be influential in the policy debates of 1995 and beyond and so deserves careful scrutiny.

The JASONs are an elite group of academic defense advisors periodically convened to study selected scientific issues for the military. Their origins lie in the secret studies sponsored by the Pentagon in the late 1940s and early 1950s, most often coordinated by the Massachusetts Institute of Technology (MIT). The first of these was Project Lexington in 1948, which started the ridiculous nuclear-powered bomber program. This was followed by Project Charles, which studied civil defense against nuclear war, and then by many others. By 1966, the JASONs had become a permanent institution, enthusiastically advising McNamara regarding the promise of the "electronic battlefield" in Vietnam, an effort later described by one JASON as "very naive--extraordinarily naive."[2]

It is not clear from whence the name of the group was taken; one long-time JASON recently joked that it comes from the legend of Jason and the golden fleece. The JASON office is at the MITRE corporation, reflecting its MIT roots.

The point of this brief history is that even bright and well-meaning groups like the JASONs are often wrong, sometimes very wrong. They are especially vulnerable if the questions posed to them are too narrow or if those questions imply a narrow range of answers, all of which are yes. Such is the case in the present study.

Quoting from the abstract,

> The DOE asked JASON to review its Science Based Stockpile Stewardship program with respect to three criteria: 1) contributions to important scientific and technical understanding and to national goals; 2) contributions to maintaining and renewing the technical skill base and overall level of scientific competence in the defense program and the weapons labs, and to the broader U.S. scientific and engineering strength; and 3) contributions to maintaining U.S. confidence in our nuclear stockpile without nuclear testing through improved understanding of weapons physics and diagnostics.

Pointedly, the DOE did not ask the JASONs their opinion about which elements of the proposed SBSS program were necessary, or even to rank them in importance. Where multiple projects were being advanced toward the same end (as, for example, in hydrotesting) DOE did not ask the JASONs which facility or facilities to fund. DOE did not ask the JASONs to evaluate any other approach to maintaining the arsenal other than SBSS, or whether big-ticket SBSS projects could take resources from stockpile surveillance and remanufacturing. DOE did not ask how

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many scientists and engineers were necessary to retain in the labs' nuclear weapons programs, with which skills, and DOE did not ask in detail about the nonproliferation impact of the SBSS program. Unbelievably, the JASONs were apparently not asked, nor did they volunteer, to evaluate the programs and projects proposed on the basis of cost.

In short, the DOE appears to have not asked any of the hard questions it should have asked to help set its programmatic priorities and overall funding level. Quite the contrary: it is difficult to see the above questions as anything but an invitation—indeed a requirement—to glorify SBSS, using the outline conveniently provided by DOE. The charge to the JASONs assured that their report would be positive and devoid of any detailed tradeoffs between policy options. And so it is.

While the narrow technical qualifications of the JASONs cannot be impugned, it is not obvious that the JASONs comprise a truly independent review. Many of the authors of this report have worked or still do work for institutions which receive substantial funding from the DOE.[3] Some are the recipient of awards from the DOE. Dr. Sidney Drell, chairman of this and other studies on related subjects for the DOE, works at the Stanford Linear Accelerator (SLAC), which receives some $180 million annually from the DOE. This is not to imply that Dr. Drell or any of the other authors of this report are dishonest. But it is difficult for any of us to provide an entirely dispassionate analysis when the funding, perhaps even the survival, of institutions to which we have devoted ourselves could be at risk.

Neither is it obvious that the JASONs have in every case carefully thought through, or sought expert advice on, some of their conclusions. An illustrative case concerns the nonproliferation impact of SBSS activities. When Dr. Drell was asked by Joe Cirincioni of the Campaign for the Non-Proliferation Treaty what scientific data he could provide to support his assertion that the National Ignition Facility (NIF) need not, in the eyes of other nations, compromise U.S. commitments under Article VI of that treaty, he replied that he had obtained no data—that he and the other JASONs had relied entirely on personal judgement and intuition for their conclusion in this area.[4]

Conversely, Jonathan Medalia of the Congressional Research Service reports that:

> Many nonnuclear nations...view a halt to all nuclear explosions of all types for all time as the *minimum* scope of a CTB [comprehensive test ban]. Some want to go further, restraining stewardship to cement shut the door to testing and encourage further denuclearization. For example, Indonesia would ban computer simulations of nuclear tests; Egypt, Germany, and Sweden would ban preparation for nuclear tests; and Iran, Nigeria, and Pakistan would close test sites. Nuclear states feel themselves to be on a treadmill of rising expectations...
>
> ...
>
> At the same time, a large stewardship program might jeopardize indefinite NPT [Nuclear Non-Proliferation Treaty] extension. Many nonnuclear states want the scope of a CTB drawn to eliminate the nuclear nations' *ability* to design, test, and

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> certify new nuclear weapons. These states may view a large stewardship program as preparing to pursue the nuclear arms race by other means, circumventing the spirit of a CTB.[3] (emphasis in original)

This information is widely available. We must assume that the JASONs simply weren't interested in it or didn't take the time to obtain it. Unfortunately, the JASON study is replete with unsupported judgements such as the ones Dr. Drell described to Mr. Cirincione.

Unlike the JASONs, we cannot hope to convince by mere prestige. Nor do we have their access to classified information—information which is always carefully selected as it is provided to them. Our comments therefore seek to point out inconsistencies and to draw the reader's attention to facts and testimony the JASONs may have overlooked. We urge the reader to look beyond the knowledge of physics that went into the JASONs' report and to face the policy choices to be made regarding the future of the nuclear weapons program.

<u>Overall Comments</u>

"Compensation" (note the pun) for the ending of underground nuclear testing is understood by the JASONs to be the "basic principle" of the SBSS plan, to be achieved by "improved diagnostics and computational resources that will strengthen the science-based understanding of the behavior of nuclear weapons" (p. 1). Yet when the subject of nonproliferation is broached a few pages later, the JASONs say that the SBSS program

> must avoid the appearance that, while the U.S. is giving up nuclear testing, it is as compensation introducing so many improvements in instruments and calculational ability that the net effect will be an <u>enhancement</u> of our advanced weapons design capabilities." (p. 17, emphasis in original)

It is not clear how the SBSS program can "compensate" on p. 1 and "avoid the appearance...[of] compensation" on p. 17. This contradiction is a fundamental theme underlying much of the JASON report and indeed much of the SBSS program. It reflects poorly on the thoughtfulness with which the JASONs approached their subject. This quote makes clear, as we will see again below, that the JASONs think any nuclear weapons research and development (R&D) effort—short of one giving the <u>appearance</u> of designing advanced new weapons—does not conflict with nonproliferation efforts.

While the JASONs do not want the SBSS program to "be <u>perceived</u> as an attempt by the U.S. to advance our own nuclear weapons with new designs for new missions" (p. 3, item 2, emphasis added), we find later in the report that

> Over time it may become desirable to introduce design changes in some components of the present stockpile...It will require considerable computational analyses of both primaries and secondaries in order to develop even a limited capability for redesign of warheads without proof-testing. (pp. 89-90)

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We have already seen elsewhere[4] how DOE, while publicly abjuring new weapons, is actually seeking to design and fabricate a new so-called "robust" warhead and has design teams working on several other concepts as well, some of which do indeed involve new designs and new missions.

So the "threefold" purpose of SBSS (p. 2) must really be expanded to "fourfold," with the additional purpose being to provide, to the greatest degree that is consistent with a CTB, the capability to certify new weapons. The Pentagon made this requirement crystal clear in its September 22, 1994 briefing on the Nuclear Posture Review, which included the following viewgraph language:

> DOD requirements to DOE:
> ...
> —Demonstrate capability to refabricate and certify weapon types in enduring stockpile
> —<u>Maintain capability to design, fabricate, and certify new warheads</u>
> ... (emphasis added)

This language is echoed by the JASONs on p. 12, where they assume that "The US nuclear infrastructure under the SBSS will retain a capability to design and build new weapons, which could be deployed should the need arise..."

Quite apart from this contradiction, it is not clear why it is necessary to "compensate" for the termination of underground testing, since: a) the reliability and especially b) the safety of existing nuclear weapons do not require such compensation, as is discussed elsewhere in depth.[5] Improved diagnostics and computational resources are certainly not necessary to maintain reliability or safety; maintenance of a small core of technical staff, with continuing investments in surveillance and a small remanufacturing capability would be effective for these ends. The purpose of a CTB is to end the testing of new weapons, not merely shift its location.

The JASONs regard a "strong" SBSS program as an "essential component for the U.S. to maintain confidence in the performance of a safe and reliable nuclear deterrent under a comprehensive test ban" (p. 3). Nowhere do they, however, specify just <u>how</u> "strong" the program should be, nor do they ever clearly state why particular SBSS elements are actually needed. The entire question of need is simply dismissed with a wave of the hand and an invocation of the mantra of safety and reliability.

The JASONs assume that the same aging warheads will need to remain in the stockpile for "at least several decades" (p. 1). It is not at all clear why this need be the case. Warheads can simply be rebuilt whenever their reliability falls below some desired level. Furthermore, the United States has rightly committed to eliminating all its nuclear warheads in Article VI of the Non-Proliferation Treaty (NPT). It is hard to understand why the JASONs see no conflict between keeping a nuclear stockpile for "at least several decades" and the clear language of the NPT. In this connection, note that their periphrasis of that Article on p. 18 bears shockingly little resemblance to the actual treaty language.[6]

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Finally, it is by no means clear that an "improved understanding of warheads" is necessary or desirable for U.S. or global security purposes. Knowledge is not free of costs, and investments in the U.S. nuclear weapons program will have a variety of serious costs: to the federal fisc, to the effectiveness of the world's nonproliferation regime, to the environment, and to every other kind of scientific pursuit. It is not knowledge, but wisdom, that is in short supply in the nuclear weapons business. The JASONs have not improved this situation.

<u>The JASONs' Chapter 2: Basic Assumptions</u>

Much has been made, in the JASON report and elsewhere, of President Clinton's July 3, 1993 statement that "we will <u>explore</u> other means of maintaining our confidence in the safety, the reliability and the performance of our own weapons" (emphasis added). Note that the President said "explore;" he did not say "we will establish, for the indefinite future, a Cold War level of funding for science-based stockpile stewardship"—which is how his statement is being taken by the JASONs and others in the nuclear weapons community. The next sentence in the President's speech has been ignored, by both DOE and the JASONs:

> We will also refocus much of the talent and resources of our nation's nuclear labs on new technologies to curb the spread of nuclear weapons and verify arms control treaties.

Unfortunately, there has been no such refocus. The attitude at the weapons labs is instead typified by a conversation recently overheard by a UNM professor between lab managers on an airplane flight in which the two gentlemen assured one another that they would "outlast" the Clinton administration's attempted refocusing.*

The JASONs assume that old, more "robust," stockpile designs could be introduced into the stockpile, apparently with modifications to allow more modern "engineering and manufacturing practices" (p. 12). It is far from clear that this would be acceptable to the military. The assumption that new or redesigned warheads should and will be introduced and built is one that pushes the cost of stockpile stewardship very high, both in dollars and probably also in reliability. It is entirely unnecessary.

Missing from this chapter and this report are any quantitative assumptions about the arsenal or any descriptions of the warheads it will contain. The JASONs say the arsenal will continue to decrease in number and variety—but how? Failure to specify their assumptions about the arsenal more closely makes the reader suspect that the SBSS program they review is independent of the stockpile and its real-world requirements and problems.

Since the criteria by which the JASONs evaluated the SBSS program (their Chapter 3) have been strongly criticized for their narrowness already, we turn now to nonproliferation concerns.

<u>The JASONs' Chapter 4: Nonproliferation</u>

The JASONs understand that

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> Ultimately, non-proliferation can only be successful if the NNWS [non-nuclear weapons states] are persuaded that their national security is better served without nuclear weapons than by possessing them (p. 19).

How can all these countries possibly be persuaded of this when the nuclear weapons states (NWSs) assert just the opposite for themselves—that nuclear weapons are <u>central</u> to their national security? These NWSs are of course not just armed with nuclear weapons, but also with qualitatively and quantitatively superior conventional weapons as well. Yet still they assert that nuclear weapons are indispensable. Nowhere do the JASONs face or even acknowledge the fundamental contradiction between their statement above and U.S. plans, not just to maintain its nuclear arsenal indefinitely, but to continually "improve" it, an effort the JASONs acknowledge, approve, and seek to facilitate.

The JASONs, in their rush to bless DOE's plans, have fundamentally misread the politics of nonproliferation. After squirming their way past the clear language of the NPT and failing to address the fundamental contradiction of U.S. nonproliferation policy, they limit their concerns about the proliferation impact of SBSS to basically just one:

> One worrisome aspect of the SBSS program is that it may be perceived by other nations as part of an attempt by the U.S. to continue the development of ever more sophisticated nuclear weapons. (p. 19)

But this is hardly the entirety, let alone the root, of the problem. They compound their error with arrogance in the next sentence:

> This perception is particularly likely to be held by countries that are not very advanced technologically since they are less able to appreciate the limits on advanced weapons design that a lack of testing enforces.

Yet on the same page, the JASONs confirm this "perception":

> <u>While the potential for future developments cannot be excluded</u>, the SBSS activities should not be <u>interpretable</u> as laying the basis for the development of newer generations of nuclear weapons...(emphasis added)

It appears that the only policy consistent with all these confused statements is a policy of deception, which is the height of folly. Such deception would have to be aimed at the American people as well as other nations, and cannot succeed even temporarily. Clandestine vertical proliferation would be implicitly or explicitly used as an excuse by some horizontal proliferant some day, and would, by its very nature, threaten the integrity of the nonproliferation regime, which requires clarity and transparency to work. Such a policy would be very costly to U.S. national security.

The impacts of the SBSS program on nonproliferation efforts are certainly not confined to problems caused by the "perception" or "interpretation" that the U.S is engaged in further

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weapons development. This was thoroughly discussed at the September 8 workshop mentioned above, with Dr. Drell in attendance. It is worth reviewing the whole issue briefly from first principles.

The basic goal of nonproliferation, as it is perceived officially in the United States, is one of preventing other countries from acquiring nuclear materials and, especially, nuclear weapons. Most countries, of course, have no interest in taking on the dangers, cost, and opprobrium of nuclear weapons. But it is not the Danish bomb that is of concern. To effectively prevent proliferation in every case, even the difficult ones, a variety of tools are required: international treaties, national laws, bi- and multi-lateral agreements, and unwritten norms—all of which must, to be effective, carry with them an implicit or explicit possibility of political, economic, criminal, or military sanctions, directed against countries, companies, or individuals as appropriate. Positive rewards for compliance with nonproliferation norms also can be and have been used.

These potential sanctions, in their variety and comprehensiveness, are the real deterrent to proliferation in the most important cases. They must be credible to work. They are not likely to be credible if they are not very broadly based among nations, especially among the nuclear powers. And surely it is difficult to get very broad-based cooperation in enforcing tough nonproliferation sanctions if we ourselves violate the norms we would enforce. We cannot get treaties implemented by others that we do not follow or intend to follow. Nor can we easily enforce, except at great and often prohibitive cost, provisions of treaties—like the NPT—that we ourselves do not honor.

Let's get real: we will not stop nuclear proliferation unless we have tough laws and effective sanctions, actively supported by nearly every nation involved. This requirement is incompatible with our ongoing violation of the NPT, and with the maintenance and "improvement" of our own large nuclear arsenal, especially as this arsenal is accompanied by a declaratory policy of possible first use and configured to make this threat real.

The conflict between U.S. nuclear policy, including SBSS, and U.S. interests in nonproliferation is therefore much more fundamental than the perception that we might develop more advanced nuclear weapons. This perception would, of course, simply make our nonproliferation and credibility problems even worse, while advanced weapons and weapons science would provide no deterrent against a proliferant threat.

The JASONs faulty and superficial analysis of the nonproliferation problem leads them to a questionable recommendation for relieving the well-deserved "suspicions" of the non-nuclear weapons states. The JASON approach: declassify most of the SBSS program.

This strategy attempts to remove the potential complaints of the non-nuclear weapons states--which could, after all, have negative ramifications for SBSS funding—by simply inviting them to the weapons technology table. Any problems concerning proliferation of technology out of the SBSS program would be solved, in effect, by a redefinition of proliferation. Proliferation done officially wouldn't count anymore.

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History provides a warning: in every case since 1950, programs to build fission bombs have been conceived, hidden, and matured within the womb of fission energy programs. If we follow the JASONs' advice, we may have fusion weapons being developed under the cover of fusion energy programs—using data, codes, and techniques developed and disseminated in and by the U.S.

Aside from the rationale the JASONs provide, another political motivation for the declassification they propose is that it will to create a broader user community—and hence a broader constituency—for the stewardship program and its funding. This is particularly the case for NIF.[10]

Of particular concern is the possible declassification of all but "critical" parts of the weapons codes (p. 21) in order to allay the "suspicions" of the non-nuclear weapons states. Even if these suspicions did comprehend the entire nonproliferation impact of the SBSS program, which they don't, why would the declassification of technical arcana allay anything? More to the point would be the declassification of policy and planning documents, such as the nuclear stockpile memorandum.

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Looking at the problem of nonproliferation impacts of the U.S. nuclear weapons program as a whole, non-nuclear states' concerns—which are a matter of public record, not merely a possibility—could be better addressed by:

- a stronger and more successful effort toward a CTB;
- a change in U.S. declaratory policy on first use;
- the elimination of tactical weapons;
- bilateral reductions in strategic forces below START II;
- a ban on weapons-usable fissile material production;
- a limit on stockpile stewardship to the minimum that is actually needed; and
- opening U.S. weapons facilities to credible domestic and international inspectors, perhaps from Canada, Australia, or other appropriate non-nuclear-weapon states.

To succeed in its nonproliferation goals in the long run, the U.S. needs to accept the same level of transparency that it demands of other nations. Publishing major portions of U.S. nuclear weapons codes has not exactly been on the top of anybody's non-proliferation wish-list, however.

The JASONs assert that most new proliferators could derive no immediate benefit from these codes. Even if this is true, what about China, or Israel, or Japan—or India or Pakistan, for that matter? Wouldn't the knowledge that scientists from these countries get by using the NIF and its related computer codes train them to do secondary physics, just as U.S. scientists are trained? Or perhaps they could take the now-enclassified codes and modify them for weapons analysis, saving themselves person-years of work on the way to deliverable boosted fission or thermonuclear bombs. When the JASON declassification proposal was brought up in the context of NIF at DOE's September 8, 1994 NIF workshop, a senior DOE classification officer rose to vigorously contest the appropriateness of declassifying information from experiments at

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temperatures and pressures at or approaching those of a nuclear explosion, data which would definitely be useful in the design of weapons.[11]

International scientific cooperation is in general a very good thing. But scientists at the weapons labs of the various countries have more in common with each other than they do with their respective governments, as Dr. Hecker at Los Alamos National Laboratory (LANL) once remarked about Russia. The U.S. weapons labs have already been the source of a great deal of knowledge for foreign weapons programs.[12] Why open the door wider?

<u>The JASONs' Chapter 5: Stewardship Program Elements</u>

To provide a justification for enhanced SBSS capabilities, the JASONs refer on p. 24 to the "limited" number of cases where nuclear testing was needed to remedy or validate the remedies to stockpile problems of the past. These cases--fifteen in number--are extensively discussed by senior Livermore weapons scientist Ray Kidder in his 1987 study of weapon reliability under a test ban, and his conclusions--(1) that these resulted from rushing inadequately tested designs into the stockpile, and (2) that these problems are all lessons learned, i.e. of historical, but not predictive, importance--still stand.[13] As discussed elsewhere at length, there are no known safety or reliability problems in the U.S. arsenal.[14]

Certainly we need to retain, at least for now, some nuclear weapons scientists, as the JASONs point out on p. 24. It is not clear that we need to retain the <u>thousands</u> of scientists, engineers, and technicians now working in this program. If the intent is merely to retain our existing knowledge and expertise about nuclear weapons, there are cheaper and less provocative ways to do it than SBSS, namely by emphasizing retention of unique knowledge in archives and in a relatively few staff members. The emphasis should be on uniqueness, not quantity.

<u>The JASONs' Chapter 6: Hydrotesting</u>

The JASONs' treatment of hydrotesting and the proposed Dual-Axis Radiographic Hydrotest (DARHT) facility at LANL provides further examples of their lack of careful analysis. The JASONs believe that this facility will provide "capabilities of importance" (p. 4) to the SBSS program. In fact, they appear to offer unqualified support for <u>all</u> the hydrotest upgrades planned for this century, drawing the line at the Advanced Hydrotest Facility planned for the out years. But nowhere do they say <u>why</u> these capabilities are important.

In Kidder's 1987 paper we find the following.

> During the past decade [1977-1986], new boosted primaries have been designed and developed by the weapons laboratories...performed satisfactorily the very first time they were tested, the observed yield in no case falling short of that expected by more than...(See Tables H1 and H2 and Fig. H1) The one new primary that failed was of a more complex, less predictable design than the others. This primary was subsequently redesigned, tested, and failed again. None of the primaries in the existing stockpile employ...

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3/40.06 continued

> This experience demonstrates that the ability of the weapons labs to predict the performance of newly designed, as yet untested, boosted primaries of the kind currently in stockpile is indeed impressive--there were no significant surprises. This could hardly have been the case had these primaries been sensitive to differences that inevitably exist between the weapon configuration calculated and the weapon tested.[15]

This "impressive" capability existed between seven and seventeen years ago, in the <u>design</u> of <u>new</u> primaries. It is not clear why it is not enough to simply <u>maintain</u> <u>existing</u> primaries today.

Kidder's last point, which speaks to the insensitivity of primary yield to minor variations in manufacture, was corroborated by a manager (name withheld) at Los Alamos, who told Dr. Kerlinsky of the Galvin Panel that deliberately "off-spec" pit(s) had been manufactured at Los Alamos and tested successfully at the Nevada Test Site.[16]

Then why are all these new facilities needed? The JASONs answer this question on p. 27.

> Such information [from hydrotests integrated with code development] will lead to greater confidence in our understanding of weapons and, perhaps ultimately, <u>to a willingness to make relatively simple changes in primary design without underground tests</u>. (emphasis added)

Once again, it is not simple maintenance of a deterrent through remanufacture of existing weapons that is driving the "acknowledged need" (p. 28) for increased radiography capability, but the desire to design and certify new weapons in the absence of nuclear tests. It is the "design community" (p. 29) that has this "need," not the stockpile surveillance program, and certainly not the nation. The surveillance program has never depended upon hydrotesting, let alone advanced hydrotesting, to do its job.

Overall, it is far from "clear" that "improved hydrotesting is crucial to continued confidence in the safety and reliability of nuclear primaries" (p. 32). As far as reliability is concerned, this statement is contradicted by the data collected and presented by Kidder. And in Kidder's paper, the JASON opinion is contradicted by that of Hans Bethe, Carson Mark, Norris Bradbury, Richard Garwin, and Andrei Sakharov, all of whom felt that simple remanufacturing--<u>without</u> advanced new hydrotesting facilities--was completely feasible.[17]

4/21.07

<u>The JASONs' Chapter 7: The National Ignition Facility</u>

The JASONs find the NIF "exciting" (p. 37). They are crazy about it. And crazy is hardly too strong a word, for they quickly gush: "Nuclear weapons operate under conditions...of great interest to astrophysics." Yes, no doubt this is true, but it is hardly the central point, and it is not reassuring to hear it put quite that way. <u>Avoiding</u> the "operation" of nuclear weapons is what this report is, or should be, about. In their passion for hotter hohlraums,[18] they neglect the human. It is not the JASONs' chilling objectivity which is distressing here, but their chilling <u>lack</u> of objectivity. Their enthusiasm is about physics, not nuclear weapons policy. And the

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4/21.07 continued

fact that nuclear weapons "operate" only with unimaginable horror is not a noticeably important factor in the JASONs' thinking about NIF.

Their discussion of NIF's importance as a "proof-of-principle" experiment appears overblown. Ignition of deuterium-tritium pellets has already been achieved in experiments at the Nevada Test Site. The NIF would not so much demonstrate the principle as demonstrate--what? That inertial confinement fusion (ICF) is feasible? No, not this either. Perhaps this: that ICF can be funded, papers can be published in the subject, and careers can be pursued by real people with real ambitions. ICF is, by all accounts, a remote and unlikely source of energy, one that has already been superseded by proven renewable sources that do not share its enormous costs, its environmental and social externalities, its proliferation problems, or its uncertainties.

The attainment of ignition is not the major problem in developing fusion energy, in any case. It is the engineering and materials problems in any practical ICF system that are more likely to be insurmountable at anywhere near a realistic life-cycle cost per unit energy produced.

While the JASONs downplay the uncertainty of ignition, some scientists at both LLNL and LANL do not.[8] The margin of uncertainty in the minimum energy needed to overcome instability and other difficulties may be significantly larger than the 1.8 megajoules NIF will deliver. Therefore, the statement on p. 41 that "...the attainment of ignition in NIF <u>will</u> demonstrate..." seems too confident and a little premature. It betrays the lack of objectivity that concerns us throughout this report.

There is no question that NIF could provide interesting experiments in several fields of physics. But a closer look at the JASONs' zeal for creating a user community for NIF (pp. 43-47) goes far beyond science to reveal the JASONs as a special interest lobby, calling for an active sales effort for the NIF project. They wrap up this four-page discussion by saying that:

> ...the growth of this nascent enterprise [user communities] needs to be further encouraged by way of the vigorous dissemination of information about the capabilities and accomplishments of the ICF program and about the scope of activities to be undertaken at the NIF...if scientific goals are to be a significant component in the justification of the construction of the NIF (as we strongly believe they should be), then the ICF community bears a special responsibility in fostering an "out-reach" program...Succinctly stated, the NIF represents a credible and powerful opportunity to strengthen otherwise disjoint efforts in the weapons, the ICF, and the university communities. (p. 47)

Why are the JASONs so interested in promoting NIF? Why are they, here and elsewhere, so preoccupied with the "credibility" of cross-linking the nuclear weapons community with ICF and university science? Why is it necessary to encourage a "vigorous" program of disseminating information about NIF--can't scientists decide for themselves whether it can help them? Why is it so desirable to recruit the ICF "community" to support NIF? The simple truth to which these questions point is that, when it comes to NIF, the JASONs themselves view their role as promotional, not objective.

The weapons applications of NIF, which the JASONs leave to last, are not convincing. There is no need to quantify the "effects of low tritium concentration" (p. 49) and no need to study cracked radiation cases (p. 50). Replacing the latter is cheaper than studying whether or not to replace them, and retiring them is the safest and cheapest solution of all.

The defects of the JASON analysis of the nonproliferation impacts of NIF have been discussed above. It is important to make one addition here. Contrary to what the JASONs say, "balancing non-proliferation objectives of the United States with responsible stewardship under a[n] SBSS program" (p. 50) is <u>not</u> the problem. Given that weapon safety and reliability "problems" are not difficult to solve and the requirement for an effective deterrent rather easy to meet, responsible stewardship can only be defined as that form of stewardship which best supports nonproliferation goals. Stewardship should be a subset of nonproliferation efforts.

<u>The JASONs' Chapter 8: LANSCE, Stockpile Surveillance, and Materials Science</u>

The JASONs assume that weapons will remain in the stockpile far beyond their lifetime, and therefore will require intensive study of issues relating to aging. It is not clear why this need be the case.

5/40.36

This chapter, like most of the others, does not really begin with the needs of the stockpile surveillance program but with what a particular facility--the Los Alamos Neutron Science Center (LANSCE)--might be able to do for the program. Again, the approach is one of a major facility looking for missions to justify it, and several possibilities are suggested. The JASONs are lukewarm, however, about these possibilities and make any endorsement of LANSCE contingent upon several "ifs."

The claim that a 1 mm resolution in neutron radiography would "perhaps" be enough to see cracks, etc. in pits seems optimistic (p. 61). A 1-mm crack is very large. It would be better to begin with, or at least mention, the needs of the program rather than the capabilities of the projects already being promoted.

<u>The JASONs' Chapter 9: Pulsed Power</u>

There is no real need for any of these facilities for stewardship of the existing stockpile, and the JASONs have not provided any justification for them. Further weapons effects testing, beyond what is already known, is a relic of warfighting strategies and should be dropped from the stockpile stewardship program. Likewise, the (further) study of cracks in implosion need not be of particular interest. If one wants reliable weapons of mass destruction, replace the cracked ones. Better still, help meet our treaty obligations and retire them. And why not? The START II strategic arsenal of 3500 weapons is enough to create a 5-psi overpressure spike--a lethal amount--over most of the area of <u>all</u> the cities over 500,000 people in the world. To deter one or two countries requires a very tiny number of weapons.

5/40.36 continued

The JASONs' Chapter 10: Special Nuclear Materials (SNM) and Processing

This chapter does not share with the preceding and succeeding ones the assumption that new weapon designs are inevitable and desired; in fact, it assumes quite the contrary.

> ...the primary—if not the sole—nuclear weapons manufacturing capacity that must be provided for in an era of no nuclear testing is the remanufacture of copies of existing (tested) stockpile weapons...the ultimate goal should be to retain the capability of remanufacturing SNM components that are as identical as possible to those of the original manufacturing process and not to "improve" those components. This is especially important for pits...(p. 81)

If nuclear weapons must be manufactured at all, this is the best way to do it.

The JASONs point out that it is the finished pit that must be the same as the proof-tested model, not every manufacturing detail or process along the way. And they suggest that a production capacity of "ten or so" pits per year is adequate for the present time (p. 85).

This is a scale of activity consistent with practical maintenance of an arsenal. While it does not imply rapid drawdown of that arsenal, as we might wish, this approach is compatible with such drawdown. It is highly unlikely that a smaller scale of effort would meet current political realities. In any case, Los Alamos already has a nascent capacity to manufacture pits at least ten times this great.[3]

The JASONs do not take up the issue of how best to make tritium. They correctly point out that a number of options exist for procuring this material, and that any need for it may be postponed by further stockpile reductions. They appear to err, however, in saying that

> Dismantlement of U.S. nuclear weapons under START II and correspondingly large reductions in tactical nuclear weapons will result in a recovered amount of tritium adequate to supply the needs of the remaining operational stockpile until close to the end of the first decade of the twenty-first century. (p. 83)

The best information available to us strongly suggests that current supplies of tritium are adequate to maintain the larger START I, not just the START II, arsenal, until approximately 2014.[4]

The JASONs conclude this chapter by saying that

> Having an open research program on the physics and metallurgy of uranium and plutonium is highly undesirable from the perspective of nuclear proliferation. Consequently, we see the SNM manufacturing component of the stewardship program as a narrowly defined, sharply focused engineering and manufacturing curatorship program. (p. 85)

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5/40.36 continued

There is absolutely no reason that this excellent, common-sense approach cannot be applied to the other elements of the stewardship program as well, thus eliminating the "need" for expensive new SBSS facilities with their attendant proliferation impacts.

In fact, if this approach is to stand at all, it logically must be applied to the stewardship program as a whole. For what is the point of designing improvements in weapons if it is decided in advance not to make them? And making them would be a bad idea, for the sound reasons the JASONs articulate in this chapter. So not just the assumptions, but the conclusions of this chapter—with which we find little fault--are quite inconsistent with the rest of the report.

The JASONs' Chapter 11: Advanced Computing for Stewardship

2/40.07 continued

Aside from the dangerous assumptions incorporated into this chapter on p. 89 (quoted on page 4 above) and what may be applied from our other comments to the question of the purpose and need for weapons computing advancements, we offer few additional comments.

Obviously, the proliferation dangers of weapons codes that have been brought up to date, documented properly, and translated to run on inexpensive and universally-available computers are increased in the event of any security breach. This is a specific case of a general rule: the more weapons activities that are going on, and the more open these activities are, the greater the likelihood that somebody will steal or be given something important.

Concluding Remarks

5/40.36 continued

The JASONs are clearly enamored with science, and they clearly want to see the weapons labs fully funded to do work they consider interesting. Their approach to the issues surrounding stockpile stewardship is too narrow and too vague, however, to be of much use in evaluating even the technical questions, let alone the policy and nonproliferation questions. It is hoped that the DOE will seek further clarification of these issues before continuing its marketing of science-based stockpile stewardship, based as it is upon specious assumptions and the questionable goals of keeping weapons scientists busy and producing new weapon designs. These activities are costly and dangerous to this country and others.

Endnotes

1. Personal communication with Dr. Victor Reis, October 1994.

2. This history is from Gregg Herken, Counsels of War, expanded edition, Oxford University Press, NY, 1987. Quote is from p. 211.

3. Christopher Paine of the Natural Resources Defense Council made this point in a conversation with the present author.

4. This exchange occurred at the DOE workshop on NIF, Washington DC, September 8, 1994; Joe Cirincione, personal communication.

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5. Jonathan Medalia, "Nuclear Dilemmas: Nonproliferation Treaty, Comprehensive Test Ban, and Stockpile Stewardship," Congressional Research Service, December 1994, 94-1107F.

6. See "Redefining Stockpile Stewardship," Greg Mello for Tri-Valley CAREs, Livermore, CA.

7. Ibid.

8. The actual language of Article VI of the NPT is: "Each of the Parties to the Treaty undertakes to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a Treaty on general and complete disarmament under strict and effective international control."

The JASONs paraphrase this as "The NWS [nuclear weapons states] will reduce their nuclear weapons stockpiles and will reduce, over time, the reliance of their national security policy on nuclear weapons, thereby decreasing the discriminatory nature of the non-proliferation regime" (p. 18). The legal commitment made by the U.S. and the other nuclear powers to nuclear disarmament is entirely discounted by the JASONs.

Aside from this, the JASONs' "interpretation" is illogical: if a NWS like the U.S. decreases its arsenal to only 1000 or even 100 nuclear weapons, as versus zero for a non-nuclear weapons state, this does virtually nothing to "decrease[e] the discriminatory nature of the non-proliferation regime."

9. Denise Fort, personal communication.

10. It is not just the JASONs that recognize the importance of expanding the political constituency of the nuclear weapons program. In 1993, Dr. Immele of LANL waxed glowingly about the new corporate "sponsors" of the LANL weapons program in his "State of the Nuclear Weapons Program" address in December, available in video from LANL. Numerous other examples could be provided.

11. Marylia Kelley, personal communication. In the case of the NIF, and the inertial confinement fusion (ICF) program in particular, the Arms Control and Disarmament Agency (ACDA) recognized these direct proliferation dangers as early as 1980 in their FY 1981 Arms Control Impact Statements (written for the committees on Foreign Affairs and Foreign Relations of both houses of Congress). As they put it then, "If an advanced non-nuclear weapon state with an ICF research program undertook a nuclear weapon program, it might subsequently be able to move more quickly to develop boosted fission and thermonuclear weapons than would otherwise be the case."

The subject of direct proliferation impacts is discussed more fully in Mello, op. cit.

12. For examples, see William E. Burrows and Robert Windrem, Critical Mass: The Dangerous Race for Superweapons in a Fragmenting World, Simon and Schuster, NY, 1994.

13. Ray Kidder, "Maintaining the U.S. Stockpile of Nuclear Weapons During a Low-Threshold or Comprehensive Test Ban," LLNL, 1987, UCRL-53820, p. 25.

14. Mello, op. cit.

15. Kidder, op. cit.

16. Dr. Dan Kerlinsky, personal communication.

17. These men all speak with great authority on this issue. Nobel Laureate Hans Bethe directed the Theoretical Division at Los Alamos during the war and has consulted at LANL up to the present day; Carson Mark was his successor and directed that Division for 26 years; Norris Bradbury was Oppenheimer's successor and directed Los Alamos for 25 years; Richard Garwin has been a consultant to Los Alamos since 1950 and is highly regarded for his analysis of a range of defense issues; and Andrei Sakharov, preeminent among Soviet weapons designers, was responsible for the independent development of the Soviet thermonuclear bomb.

18. *Hohlraum* is a German word which means to physicists what "black body" does in English: an idealized non-reflective cavity which radiates energy in accordance with its temperature. The interior of a nuclear weapon, and the hollow target cylinder at NIF, resemble and are called hohlraums.

19. It is best not to say who, because even so senior a scientist as Dr. Steven Younger at LANL has already been called on the carpet by Assistant Secretary Reis for his true statement that NIF has nothing to do with safety of nuclear weapons, made at the September 8, 1994 DOE NIF workshop.

20. The original design specifications of Building PF-4 of TA-55 at LANL were reported by John Fleck of the Albuquerque Journal on December 8, 1993. In 1978, PF-4 had a capacity of 100 kg Pu per month for casting and machining, or about 20 weapons/month. Since then, occupational radiation exposure limits have decreased from 5 rads/yr to 2 rads/yr, and PF-4 has been reconfigured, both of which decrease this capacity, according to LANL.

A presentation by Larry Woodruff of LLNL to the Galvin Panel on August 8, 1994 entitled "Downsizing the Capacity of the Nuclear Weapons Complex" shows a capacity for making 150 pits/yr in the downsized complex, i.e. at LANL. While LLNL now has the capacity make pits, the presentation to the Galvin Panel, along with interviews with LLNL personnel by Dr. Kerlinsky of that Panel, make it clear that LLNL anticipates transferring its pit manufacturing technology to LANL.

The LANL FY1995-2000 Institutional Plan says on p. 51 that LANL's Pit Rebuild Program will be capable of building pits for W88 warheads "by FY1996."

21. The statement of Dr. Harold Smith, Assistant Secretary of Defense for Atomic Energy, to the House Appropriations Subcommittee on Energy and Water Development, March 15, 1994 contains the following.

> The Nuclear Weapons Stockpile Plan, which outlines specific requirements for the nuclear weapons program...requires an active nuclear stockpile that supports the START I limits through 1999 and then transition to START II in subsequent years. ...[The Plan requires the U.S.] to retain the capability to reactivate weapons from the inactive stockpile if necessary, to maintain a policy that provides an assured supply of tritium...
>
> In the absence of a new source, in [deleted] the U.S. may not have sufficient tritium to support the nuclear weapons stockpile and required reserves consistent with START I commitments...The current goal is to make a decision on a new source for tritium in FY95 with initial funding for the development of that source beginning in FY96." (pp. 737 and 741, Vol. 6, Energy and Water Development Appropriations for 1995, emphasis added)

In his oral remarks that day, Dr. Smith emphasized that the U.S. must be able "to return to START I in the 21st century" (Ibid, p. 415). This cannot be done without a tritium supply consistent with a START I arsenal.

Dr. Victor Reis, Assistant Secretary of Energy for Defense Programs, shed additional light on the subject during that same hearing in response to a question:

> If one assumes...that a new [tritium] facility is to be built, then based on the current stockpile plan and the conservative view that a new tritium production source could take as long as 15 years to produce new tritium, a funding decision would be necessary in FY1996. That would allow the facility to be in production 3 years before strategic reserves of tritium are exhausted. (Ibid, p. 458)

Congressman Myers was hearing different dates from DOE and DOD regarding the acquisition of a new source of tritium, and asked for clarification. Reis gave an enigmatic reply, then Smith said, "There is plenty of discussion going on between the two Departments, between Dr. Reis and myself. The driver here is the assumption on whether or not we want to have the ability to maintain or return to levels consistent with START I." (Ibid, pp. 423-424, emphasis added)

It appears that there is adequate tritium to support a START I arsenal until 1996+15 years for construction+3 years, i.e. until 2014. The "START II arsenal" appears to include the capacity to bring enough reserve weapons back into the active arsenal to reconstitute a START I force level.

Tri-Valley CAREs

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MEMORANDUM

From: Marylia Kelley, Tri-Valley CAREs
Subject: Arms Control Disarmament Agency analysis of Inertial Confinement Fusion

Last spring, Pierce Cordon of ACDA (and head of the "backstopping" committee on the CTB negotiations) suggested to me that I ask Livermore Lab for a copy of an analysis he did at ACDA on ICF. I have just received that analysis. I think this document will be of interest to you.

While the analysis was submitted to Congress in May 1980, much of it is surprisingly relevant today. Moreover, advances in ICF and world changes since 1980 have exacerbated many of ACDA's concerns (as well as adding new issues).

1/21.12

ACDA raises the concern that "others may be attracted by the peaceful 'cover' ICF provides for weapons-related research and development" (page 474). Further, on the same page, ACDA cites "...perceptions by non-nuclear weapons states of the potential value of ICF research to nuclear weapon states could affect our arms control policy objectives."

ACDA speaks directly to the usefulness of ICF research to nations with technological sophistication in speeding their ability to achieve boosted fission and/or thermonuclear capability. For example, ACDA says, " (an advanced state) might subsequently be able to move more quickly to develop boosted fission..." (page 471). This concern is raised in several places.

Long-range ACDA concerns include the proliferation promoting aspects of a fusion-fission hybrid reactor, which would breed, for example, plutonium 239 in a blanket of uranium 238 (page 472 and elsewhere). That tritium will be bred from a lithium blanket is taken as a given by ACDA, and is of some concern to the agency as well.

This document raises several of the same concerns as those voiced by Tri-Valley CAREs and others. I am not happy that in the approximately 18 hours of "round table" discussion we have had with LLNL on the proposed NIF, no one from LLNL has put this analysis on the table. It is only because I was at a conference with the report's principal author from ACDA that I even knew to ask for it. And, it is only through repeated requests that I got a copy.

96th Congress } JOINT COMMITTEE PRINT
2d Session }

FISCAL YEAR 1981 ARMS CONTROL IMPACT STATEMENTS

Statements Submitted to the Congress by the President Pursuant to Section 36 of the Arms Control and Disarmament Act

MAY 1980

Printed for the use of the Committees on Foreign Affairs and Foreign Relations of the House of Representatives and Senate respectively

U.S. GOVERNMENT PRINTING OFFICE
61-413 O WASHINGTON : 1980

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

INERTIAL CONFINEMENT FUSION

I. INTRODUCTION

This Arms Control Impact Statement addresses the Department of Energy (DOE) program in inertial confinement fusion (ICF) research.

The bulk of US ICF research and development (R&D) is carried out at Lawrence Livermore National Laboratory (LLNL), Los Alamos National Scientific Laboratory (LANSL), and Sandia National Laboratories Albuquerque (SNLA) which conduct nuclear weapon research as well as non-weapons energy research for the DOE. Supporting work in ICF is being conducted at Brookhaven, Argonne and Lawrence Berkeley Laboratories, at the Naval Research Laboratory, KMS Fusion, Inc., and the University of Rochester. The DOE ICF research is supported by Defense Program funding and has been justified as having application to some aspects of nuclear weapon technology, and potential longer-term application to civil energy production. A large share of the current program effort is directed toward development of high-energy, short-pulse lasers and particle beam sources. This effort is largely unclassified. Some of the target design and experimental work is classified because it utilizes still classified nuclear weapon-related information and technology. Supporting technologies, such as target fabrication, system studies and diagnostics, are

(460)

similarly classified [deleted].

[Deleted]. The open (visible) ICF program in the Soviet Union has suffered numerous setbacks in recent years [deleted]. Japan has a rapidly expanding and advancing laser fusion program; [deleted]. Other countries doing research in ICF include Argentina, Canada, China, France, FRG, Israel, Poland, Spain, and the UK.

At the time of the 1975 Non-Proliferation Treaty (NPT) Review Conference, the Swiss raised questions about ICF research. The US responded by declaring that in its view certain types of ICF energy sources* do not constitute nuclear explosive devices within the meaning of the NPT. [Deleted].

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* Identified as "involving nuclear reactions initiated in millimeter-sized pellets of fissionable and/or fusionable material by lasers or by energetic beams of particles, in which the energy releases, while extremely rapid, are designed to be, and will be non-destructively contained within a suitable vessel." For full text, see page 12.

[Deleted].

II. PROGRAM DESCRIPTION

A. The Concept.

Inertial confinement is a concept for attaining the density and temperature conditions that will produce nuclear fusion by use of lasers or other high power sources to compress and heat small pellets containing fusionable fuel (deuterium and tritium, isotopes of hydrogen denoted by D and T). If a properly shaped pulse of sufficient energy can be delivered to the pellet, the density and temperature should become high enough for fusion or "burn" of a significant portion of the fuel to occur before it is dispersed. The energy thus released is in the form of fast neutrons, X-rays, charged particles, and debris, and can be used in much the same way as the energy output of any other fusion (or fission) process. Specifically, the energy could be captured and converted into heat energy to drive electric generators. Capture of neutrons by a lithium or lithium compound blanket would also produce tritium, which could be recovered from the blanket material and used as fusion fuel or for other applications.

Another scheme for energy production which could be used with either ICF or other neutron producing processes would use thorium-232 or uranium-238 isotopes in the blanket. Capture of neutrons would lead to creation of the fissile isotopes, uranium-233 or plutonium-239. These isotopes could be separated from the remainder of the blanket material and used as fuel for nuclear fission power reactors or for nuclear weapons. This concept of energy production is termed "hybrid" since it utilizes both nuclear fusion and fission processes. Other possible applications include hydrogen production by radiolysis and process heat.

[Deleted].

B. Program Status.

A short pulse of high energy is required to compress and heat the fuel for ICF. Sources for this energy which are now being investigated include lasers, electron beams, and beams of light or heavy ions. The facilities at LLNL, KMS Fusion, Naval Research Laboratory and Rochester use glass lasers; those at LANSL use CO_2 gas lasers; and Sandia uses pulse power generators for both electrons and light ions. Other groups at the Argonne, Brookhaven, and Lawrence Berkeley laboratories are investigating heavy ion beam concepts.

Most US and foreign experimental data to date have been obtained using laser beams. The LLNL and LANSL groups have constructed large facilities for amplifying, shaping, and focusing high-power laser pulses, and have succeeded in releasing small amounts of fusion energy. The energies produced have been much less than the energy consumed by the lasers, and both groups are still years away from the "scientific breakeven" point, at which the energy produced by fusion reactions equals the beam energy used to cause the reactions. Forecasts are that scientific breakeven may be reached within six to ten years. Significant civil energy production by ICF is estimated to be at least 40 years away if the concept proves practical for this purpose.

Until recently, experimental evaluation of pellet design concepts has been limited largely to energy absorption studies and very small pellet yields at very low power compared to practical fusion energy requirements. The lasers and particle beam generators now available are being used to initiate studies of energy absorption and transport and fuel compression to many times liquid density. Consideration of the physics involved, experimental results and use of calculational codes (i.e., computerized mathematical models) have identified a number of system concepts as promising.

Much of the evaluation in the US of fuel pellet design and performance has been done using LASNEX, (deleted). Some earlier, simpler programs developed in the weapon program have been declassified, are in the public domain, and therefore are available for use in ICF research or for any other purpose. Some examples include hydrodynamics programs and neutron transport programs.

Compared with laser system development and fuel pellet design, relatively little work has been done so far on the problem of containment and energy conversion. These problems will be important in any eventual practical applications of ICF. Some possible approaches are under investigation, but intensive work awaits convincing demonstration of the basic ICF concept.

Within the past two years the HELIOS carbon dioxide laser at LANSL and the PROTO II electron beam source at Sandia

have come into operation. Encouraging indications of ablative compression of targets have been obtained in experiments on SHIVA (LLNL) and HELIOS (LANSL). The 6-beam Nd:glass laser at the University of Rochester has become operational; when completed as a 24-beam system, it is to serve as a national users facility.

In the past, gas targets have been compressed over 1000-fold, and, during the past year, compressions to 50-100 times liquid density have been attained with laser beams. Light ion beam power densities of over 10 terawatts per square centimeter on target have been achieved. In FY 1981 and following, experiments will be conducted to achieve higher compressed densities and to develop the pellet physics scaling laws leading to breakeven. Ultra-violet and visible wavelength laser target experiments will also be done to provide greater understanding of the effects of laser wavelength on target compression and guidance for the development of scalable lasers for fusion. Electron and light ion beam sources will continue to be developed and used to confirm beam transport and focusing approaches for electrons and light ions.

In addition to the carbon dioxide and glass lasers and electron and light ion pulsed beam sources referred to above, visible-to-UV wavelength lasers and heavy ion beams are considered as candidates for fusion energy drivers. Short wavelength lasers will be selected for scaling up to about the one kilojoule level. Laser selection will be heavily influenced by visible and UV wavelength target experiments. Induction and radio frequency linear accelerators, used for accelerating heavy ions, will be developed for an Accelerator Demonstration Facility to be built in the FY 1982-84 period.

C. Possible Applications.

The lasers currently being used in ICF research are also being used to make measurements of the physical properties of materials in regions of high temperature and pressure. These measurements are applicable to the modeling of some aspects of nuclear weapon performance and of nuclear weapon design.

Study of the behavior of ICF pellets will have potential applications to the study of nuclear weapon physics, the modeling of some aspects of nuclear weapon performance, and the development and proof of some features of computer codes for nuclear weapons.

In the future, if sufficiently large nuclear energy releases can be obtained from pellet fuel burn, it should be possible to simulate some of the effects of nuclear weapons (now simulated using other techniques) for the study of the vulnerability of weapon system components to such effects. Such nuclear energy releases may also have limited applicability to the simulation of some of the phenomena resulting from atmospheric and high altitude nuclear explosions.

If ICF proves practical as a source of energy its principal civil value would be to provide electrical or thermal energy or to breed fissile fuel, thus reducing concern about energy shortages.

III. STATED MILITARY REQUIREMENTS

There are no stated military requirements.

IV. FUNDING ("then year" $ in millions)

	FY 79	FY 80	FY 81
Operating	104.0	107.8	158.2
Equipment	8.2	8.5	11.0
Construction	31.0	28.5	31.5
Personnel Resources	.9	1.1	1.3
TOTAL ICF	144.1	145.9	202.0

V. ANALYSIS

A. Consistency with Arms Control Policy.

The US has not considered certain types of ICF R&D to be inconsistent with US nonproliferation policy. However, classified ICF work in the US and other nuclear weapon states has drawn from the theory, experiments, and technology of their nuclear weapon programs. [Deleted]. Concerns exist within the French, UK, US, and USSR governments that an ICF R&D program could be a precursor to an advanced nuclear weapon program insofar as non-nuclear weapon states used ICF work to acquire the information, technology, trained people, and facilities applicable to nuclear weapon development.

There has been a non-programmatic event which may significantly alter the implications of ICF for non-proliferation. This event is the recent public disclosure (in spite of rigorous executive branch efforts) of certain information on the basic design principles of thermonuclear explosives which occurred with the publication of a letter by Charles Hansen in the Madison Press Connection and subsequent publication of an article by Howard Morland in The Progressive magazine. [Deleted].

[Deleted]. The full impact of this disclosure relative to the arms control implications of ICF is not yet clear. However, the disclosure of such information has not changed the Administration's non-proliferation goals, or the objective to restrict information that could be used for proliferation purposes.

[Deleted]
[deleted].

A long range concern (perhaps 40 years in the future) relates to the possible use of ICF for civil energy production, since materials useful for building nuclear warheads would be produced. Tritium [deleted] would be used in the fusion pellets and would be produced from neutron capture in a lithium blanket material as part of the normal operation of an ICF driven power facility. Diversion of

some of the tritium to weapon purposes could occur. In addition, fissile material such as plutonium-239 produced in an ICF driven hybrid reactor could be diverted to weapon uses.

However, any fusion reactor — when available — burning deuterium and tritium, whether inertial or magnetic, would involve the use of tritium and the potential for diversion to weapon purposes. Also, any fusion reactor would be a source of fast neutrons and could be designed to produce plutonium or U-233 (currently produced in fission reactors). The possibility of diversion of these materials is, therefore, not unique to ICF.

B. Relation to Arms Control Agreements.

As noted previously, the US currently regards certain types of ICF research as consistent with the NPT in terms of what is meant by a nuclear explosive device. This is evidenced in the US statement at the 1975 NPT Review Conference:

> "Certain questions have been raised by the delegation of Switzerland related to the development of a potential source of energy, and its relation to the NPT. As we understand it, the question related to research which has been reported, involving nuclear reactions initiated in millimeter-sized pellets of fissionable and/or fusionable material by lasers or by energetic beams of particles, in which the energy releases, while extremely rapid, are designed to be, and will be non-destructively contained within a suitable vessel. On the basis of our present understanding of this type of energy source, which is still at an early stage of research, we have concluded that it does not constitute a nuclear explosive device within the meaning of the NPT or undertakings in IAEA safeguards agreements against diversion to any nuclear explosive device."*

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* Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, Final Document, Part III, NPT/ CONF/35/III, p.298. Geneva, 1975.

This statement was made in light of the then-current status of ICF research and perceptions of its applications. [Deleted]. Increasing international interest in ICF, as well as progress in US and other programs, has prompted the US government to keep under continuing review the relationship of ICF R&D by non-nuclear weapon states to US nonproliferation policies.

C. <u>Effect on Current and Prospective Negotiations.</u>

It is not anticipated that ICF research would be constrained under the prospective limited duration comprehensive test ban (CTB). [Deleted].

D. <u>Effect on Global and Regional Stability.</u>

ICF research might have some effect on regional or world-wide security. For example, if ICF work resulted in a major new source of civil energy, reducing worldwide dependence on oil, coal, natural gas, and uranium supplies, it could be stabilizing. To the extent that ICF facilitated acquisition of nuclear weapon technology or fissionable material that could be diverted to weapon use or that provided a useful "cover" for a weapons program, however, it could be destabilizing.

1. <u>Nuclear Weapon Technology.</u>

The development of a first generation fission device would be a demanding but relatively straightforward undertaking for a technically advanced country. The results of a sophisticated ICF research program would probably only be of indirect value to such an effort; [deleted].

ICF research could stimulate development of nuclear weapons technology in non-nuclear weapon states. [Deleted]

[deleted]. If an advanced non-nuclear weapon state with an ICF research program undertook a nuclear weapon program, it might subsequently be able to move more quickly to develop boosted fission and thermonuclear weapons than would otherwise be the case. This would almost certainly require full-scale and extensive nuclear testing, but ICF experience might serve to shorten the test program somewhat. Of course a non-nuclear weapon state capable of executing an ICF program would be capable of developing a nuclear weapon at a fairly brisk pace in any case.

For countries having already produced and tested nuclear weapons, weapon experts believe that ICF will be useful to some extent in improving the understanding of the physics of nuclear weapons and in effects simulation. The US, in fact, has stated that it expects these benefits to be significant. One relationship of ICF to weapon work is the similarity of computer codes used in the two activities. [Deleted]. Many of these codes, especially earlier, simpler codes, are unclassified and have been made available outside the weapon laboratories. Growing interest in ICF creates pressure for release of current, classified ICF and weapon codes. [Deleted].

2. Fissile Material.

As noted above, another concern is that an ICF program could facilitate the production of weapons-usable fissile material. This concern is very long range; such production might not occur until the 21st century. The concern is based on the possibility of using ICF for hybrid reactors — or fission/fusion pellets being used to transmute fertile material into fissile material (e.g., U-238 into Pu-239). The problem would be similar to that associated with operation of the world's fission reactors, which also create weapons-usable fissile material. This problem is not unique to ICF since a comparable situation would exist with any fusion reactor. One way of dealing with this problem might be to use safeguards via the IAEA as is done with many of the present civil nuclear reactors.

E. Technological Implications.

Even before demonstration of breakeven, ICF may contribute to nuclear weapon technology in states already possessing an advanced nuclear weapon capability, and, as noted above, to the possible acquisition of such technology by non-nuclear weapons states. [Deleted].

F. Potential Interaction with Other Programs.

While a long term justification for ICF programs is the possible civil energy applications, the near-term justification for the US is the anticipated usefulness to the nuclear weapon program. Some other potential nuclear energy sources would have fewer weapon technology concerns associated with them than would ICF. However, other nuclear energy sources could also be used to breed fissile material and could possibly be of some limited use in weapons effects studies.

G. Verification.

Currently, no agreement stipulates verification of ICF work, and, at present, there are no prospective arms control agreements which would place limitations thereon. [Deleted].

[Deleted].

VI. SUMMARY AND OVERALL ARMS CONTROL ASSESSMENT

ICF research is being pursued by a number of countries, including those possessing nuclear weapons; ICF research and development is partly justified by nuclear weapon states as contributing to their nuclear weapons technology. Information and technology developed in connection with nuclear weapons programs have been used in these ICF research programs [deleted].

[Deleted].

Although potential civil applications of ICF energy are very long term, a number of countries have already established their own ICF programs. The growing interest in ICF among countries not possessing nuclear weapons, together with the overlap between nuclear weapons technology and ICF technology, has raised concerns that ICF R&D might adversely affect US arms control policies. These concerns arise from the following points:

— Although it is unlikely that ICF research would be pursued by countries not already possessing nuclear weapons as the sole or even principal means of developing a simple fission weapon, [deleted].

— Countries already possessing a fission weapon capability (but not a thermonuclear weapon capability) might acquire the capability to develop thermonuclear weapons somewhat more rapidly in conjunction with ICF research than might otherwise be the case.

— Countries already possessing advanced thermonuclear weapons might derive some benefit for their weapon programs with regard to code development and physics measurements from ICF research.

In all cases, however, it is almost certain that full scale and extensive nuclear explosives testing would be required to develop or significantly modify any nuclear weapon more sophisticated than a simple fission device. ICF research will not provide a viable source of energy or fissile material for civil purposes in this century — indeed, it may never do so — but the possibility of such a long-term payoff is sufficient inducement to many countries to proceed with this research; others may be attracted by the peaceful "cover" ICF provides for weapons-related research and development.

The possible applications of ICF to nuclear weapon programs are primarily indirect. However, ICF programs in non-nuclear weapon states, and perceptions by non-nuclear weapon states of the potential value of ICF research to nuclear weapon states could affect our arms control policy objectives.

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

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Comments:

Very Good

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

Receiver's Initials:

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April 11, 1996

Testimony at Hearings on the Department of Energy "Stockpile Stewardship and Management" Plan

Shaping a peaceful world is a challenge, and it involves the hope of transforming society to one where justice is experienced by every person.

In light of the above, I find the DOE's "Stockpile Stewardship and Management" plan fails on a number of points:

Stewardship of the earth in our day requires the wisest choice for the investment of natural resources, human resources, and the national treasury, which is to be at the service of all, especially those most in need, and including future generations.

1/40.50

It is shortsighted, dangerous, and morally wrong to plan to fight a nuclear war. The NIF program is a program involving nuclear research and testing that has as its goal precise reliability of nuclear weapons for use in warfare.

The tremendous focusing of human genius, education, and talent in this direction is a error beyond calculating. This focus robs the country and the world of that same genius, education, and talent in solving the tremendous and most dangerous of all challenges, the growing inequality and stratifying of the world into rich and poor nations, and of nations into rich and poor people. From where do wars come? Is this not the question and the answer to which we should be dedicating ourselves?

The country is erroneously being lulled into belief that no more nuclear weapons are being made, and that we are moving toward signing the Comprehensive Nuclear Weapons Testing Ban which would outlaw nuclear testing, part of the machine of "better" nuclear weapons.

This fact will become known to signatories nations of the Nuclear Non Proliferation Treaty, which our administration favors extending

indefinitely into the future. In this way, the very purpose of the treaty, keeping other countries our of the exclusive "nuclear club", will be defeated.

2/40.12

The cost for the elaborate program over the next ten years has been given as $40 Billion, some of this including money for clean-up. This makes this program more costly to the US taxpayers than the Star Wars program. The shame is that this is happening simultaneously with the tremendous cuts and the dismantling of many necessary programs which have been proven to help our people.

3/21.04

The NIF program involves a deceitful manipulation of words in order to camouflage the reality that it is meant to keep power, world power in our own hands. It makes even more distant the world of justice, equality, and peace for which the Catholic Church stands.

The documents of the Catholic Church condemn the nuclear arms race, they demand that human resources be used for what benefits people.

Each of the above points could be elaborated at length.

SSM-H-LLNL-011
Comment Letter

JOHN SHIRLEY, DVM
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Wednesday, April 10, 1996

Department of Energy
PO Box 3417
Alexandria, VA 22302

To Whom it May Concern:

I have been a resident of Livermore for 42 years, am a retired veterinarian, and a former Mayor, and over the years have taken an active interest in what goes on at Lawrence Livermore National Laboratory (LLNL).

I have followed the National Ignition Facility (NIF) proposal through the Key Decision One and Key Decision One-Prime, and am glad to see it has now undergone an extensive environmental impact study.

1/21.07 It is evident from the study that the NIF constructed at LLNL will not have an adverse environmental impact on our community.

I believe NIF is important to our nation to evaluate the reliability and usefulness of our nuclear weapons until such time they are no longer required in our inventory of weapons. While I feel the NIF costs are justified as part of a system of facilities that will make underground nuclear testing unnecessary for our security, I also strongly feel the costs are justified to determine what is required to sustain a confined thermonuclear reaction (ignition) in the hope that we might someday develop energy from fusion reactions. In my opinion, it is very important to learn if fusion energy is a possibility or not, and the NIF program will give us answers to that important question.

It is my hope our nation will continue to fund the construction of NIF to achieve the security and economic benefits of the project.

Very sincerely,

John Shirley

SSM-H-LLNL-013
Comment Letter

Livermore Make-Work
National Ignition Facility (Livermore Lab, CA) **$4.5 billion**

Proposal & savings:
Terminate program. Save more than $4.5 billion over the 30 year lifetime of the project.

Background: The National Ignition Facility (NIF) is a project proposed by the Department of Energy (DOE). The DOE's preferred site is at the Lawrence Livermore National Laboratory in northern California.

Funded as a defense program, the NIF would use Inertial Confinement Fusion technology to beam lasers onto a fuel pellet of radioactive tritium and deuterium, which, if it works, would ignite a tiny thermonuclear explosion. The NIF's principal stated mission is to increase understanding of nuclear weapons physics and to provide an above-ground simulation capacity for testing nuclear weapon effects. Project proponents also hope that the facility will help in the development of inertial fusion energy for application to civilian power production in the distant future.

Recent action: For FY96, DOE requested $61 million which included $37.4 million for construction and $23.6 million for preliminary planning, manufacturing, engineering and Environmental Impact Studies. House budget-cutters on the Appropriations Committee attempted to cut the $37.4 million in construction funds, expressing skepticism about the availability of future funding given the other needs of the weapons program. The funding was restored in conference to the full amount.

Taxpayer & economic argument:
First, the NIF is unreasonably expensive, and its price tag is sure to rise. According to DOE's optimistic estimates, the NIF would cost at least $4.5 billion, including at least $1.1 billion for construction and another $3.5 billion for operating costs over the thirty year lifespan of the facility. However, NIF technology is unproven, fraught with scientific uncertainties, and has not left the drawing board.

Second, at a time when DOE is proposing major cuts in its programs it should not make this major budget commitment. The NIF would be the largest single defense program ever built at Livermore. Considering its title as the most expensive element of DOE's Stockpile Stewardship program, the NIF's value to stewardship of the U.S. nuclear arsenal is dubious at best. Seymour Sack, a prominent nuclear weapons physicist at Livermore Lab and a member of the JASON panel (an elite group of academics periodically convened to study scientific issues for the military), called NIF "worse than worthless" for ensuring either the safety or reliability of the nation's nuclear arsenal. The NIF's primary purpose appears to be maintaining the nuclear weapons budget at Livermore.

1/21.09 Third, despite its high price, operation of the NIF would create fewer long-term jobs at the Lab than almost any conceivable civilian project of comparable cost. Documents peg those jobs at only 230.

2/21.07 Fourth, the highly speculative future of inertial confinement fusion as a commercial energy source makes this justification for the NIF extremely suspect. Even supporters admit that a commercially viable demonstration plant will not be possible for at least three to four decades.

Environmental argument:
3/21.12 First, NIF would create radioactive waste. The fuel for the NIF experiments will consist of a 50/50 mix of radioactive tritium and deuterium, and the experiments will create additional radioactive materials, called activation products, along with radioactive wastes.

Further, the NIF poses serious nuclear non-proliferation threats. The NIF and other aspects of the science-based stockpile stewardship program undermine U.S. efforts to conclude a Comprehensive Test Ban Treaty (CTBT). By providing a means for nuclear weapons designers to continue their research and development in the absence of underground testing, the NIF attempts an end run around the primary purpose of a CTBT to cut off nuclear weapons advancement. By sending a hypocritical message to other countries, the NIF undermines the U.S. goal of non-proliferation.

Contacts: Maureen Eldridge, Military Production Network, (202) 833-4668; Jackie Cabasso, Western States Legal Foundation, (510) 839-5877; Marylia Kelley, Tri-Valley Citizens Against a Radioactive Environment, (510) 443-7148; Anna Aurilio, U.S. Public Interest Research Group, (202) 546-9707.

12 – *Green Scissors '96*

An Alternative Budget for Lawrence Livermore National Laboratory and How to Get There

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April 1, 1994

Working Paper #2 in Tri-Valley CAREs Conversion Study for
BEYOND THE COLD WAR: A CONVERSION PROJECT FOR LIVERMORE

This work is funded by the W. Alton Jones Foundation through a grant administered by Tri-Valley CAREs.

An Alternative Budget for Lawrence Livermore National Laboratory and How to Get There

March 28, 1994

The Present Situation: Lawrence Livermore at the Crossroads

In February, Secretary O'Leary submitted to Congress the Clinton Administration's second Department of Energy (DOE) budget request.[1] That request included a proposed cut of about 6% for DOE national security programs, including an 8% cut in nuclear weapons research, development, and testing (RD&T). Other DOE programs are, as of this writing, slated for support at current levels or higher, with the exception of the Superconducting Supercollider, now terminated.

The Administration's request would cut Lawrence Livermore National Laboratory's (LLNL's) DOE budget about 14% overall, from $743M to $638M. The proposed cuts at LLNL and the corresponding 6% cuts at Los Alamos National Laboratory (LANL) reflect not only changing national priorities, but probably also a recognition of the almost complete redundancy between the two labs' weapons programs.[2]

1/40.27 This downscaled budget request brings Lawrence Livermore to a crossroads. Can a nation with no real requirements for new nuclear weapons afford to support two complete nuclear weapons physics labs, each with tremendous overhead requirements?[3] We think not. Unfortunately, Lawrence Livermore's current leadership has no intention of relinquishing its nuclear weapons

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1. Department of Energy FY1995 Congressional Budget Request, DOE Office of Chief Financial Officer.

2. Even the technology transfer initiatives sponsored by the two labs, while they differ in details, fall into the same general technology classes. LLNL had, in January of 1994, 107 cooperative research and development agreements (CRADAs) with industry. Because of repetition and double-counting, these referred to 91 projects, and two of these were strictly military in nature. Of the 89 civilian or dual-use projects, 33% were in materials and associated processing, 16% in metrology and manufacturing technologies, 15% were related to electronic components, 12% in computers and software, and the balance in propulsion systems, biotechnologies, environmental technologies, fossil fuel R&D, nanotechnologies, and microwave technologies. While the individual projects are different, Los Alamos' mix of CRADAs repeats, with some variation, these general emphases.

3. See "Cuts killing future for nuclear weapons work," Los Alamos Monitor, 3/23/94, which quotes LANL Deputy Director Jim Jackson as saying that 80% of weapons spending at LANL goes to such activities as environmental protection, safety and health, physical plant support, and facility management.

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1/40.27 continued

identity. LLNL is now attempting to compensate for its budgetary losses by seeking very large new weapons-oriented projects like the National Ignition Facility (NIF), currently being promoted (misleadingly) as an energy research facility.[4] At the same time, LLNL is attempting to carve a niche for itself in the consolidated weapons manufacturing complex. To this end, LLNL has subsidized the development and demonstration of novel plutonium pit manufacturing capabilities and hopes to provide backup pit production capability for the complex, despite the absurdity of starting up "Rocky Flats II" in the California suburbs. LLNL also hopes to manufacture uranium bomb parts for the arsenal, and seeks to build a new high explosives manufacturing plant for stockpile maintenance purposes.

These efforts, even if successful, will confine Lawrence Livermore's future to an increasingly-sterile extension of its past. As the nuclear weapons budget continues to shrink, LLNL will shrink with it. Under such a scenario it will be increasingly difficult and expensive to attract or keep talent at the Lab. An unwanted result of the Laboratory's obsession with quantity over quality—on maintaining literally thousands of staff on the nuclear weapons payroll, in parallel to other thousands at Sandia and Los Alamos—will in all likelihood be, not competence, but institutional stagnation and mediocrity. Unfortunately, this is now the shape of the future at all three labs.

<u>Our Vision: Livermore as a "Green Lab"</u>

In contrast, what is described here is a laboratory devoted to urgent, genuine national needs along with fundamental scientific research, a laboratory which contributes directly to national security by helping rebuild the tattered American economy. Our vision for Lawrence Livermore is built around many of LLNL's existing competencies, which we would devote to research and development (R&D) in renewable energy technologies, in energy-saving transportation, in environmental research and new environmental technologies, and in a wide variety of cooperative projects for industry. These emphases, especially if undertaken in concert with supporting national policies, could create literally millions of new jobs while markedly increasing energy security, decreasing the trade deficit, enhancing the urban environment and saving the tens of thousands of lives now lost annually due to air pollution in our cities.

We present these alternatives in the table which follows these introductory remarks and in the notes which accompany it.

If LLNL invested the energy it now puts into promoting its nuclear weapons agenda into positioning itself to address urgent national needs, its future could be bright, and morale at the Laboratory would be buoyed by a renewed sense of purpose. But while LLNL dithers, competing laboratories—in government, academia, and industry—are positioning themselves to

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4. It should be noted that there are also serious technical questions about this project within the nuclear weapons community.

1/40.27 continued

take advantage of new currents in the nation's technology policy debate.

Our alternative provides for maintenance of nuclear weapons expertise at Los Alamos and Sandia, where downscaled programs in maintenance of a rapidly declining nuclear stockpile, dismantlement, nonproliferation, treaty verification, along with others, would responsibly reduce the nuclear danger—the often-exaggerated claims of the weapons laboratories notwithstanding.[5]

Current LLNL management asserts that further development of our nuclear arsenal is essential to combating nuclear terrorism. Even if this were true, there is no need for LLNL to do this work. And it is certainly not true: new U.S. nuclear weapons designs will not deter nuclear threats to the United States from either terrorist groups or irrational national leaders. Neither are new weapons needed to deter a nuclear attack from any of the existing nuclear powers; our existing arsenals are more than adequate for this.

Rather, it is urgently in the United States' interest to delegitimize nuclear weapons worldwide, and to embrace effective prohibitions against all nuclear weapons testing (both explosive testing and hydronuclear testing), against weapons proliferation (both horizontal and vertical), against nuclear weapons deployment, and against any possible use of nuclear weapons. We should also both embrace and demand increasing transparency in stockpile maintenance.

In this country, there is broad public support for further nuclear disarmament beyond the requirements of the START II treaty, and it serves both U.S. interests, as well as U.S. treaty commitments, to continue the global disarmament process while the opportunity exists.[6] Protocols in all these areas of concern need to be embodied into binding treaties upon which multi-lateral enforcement can be based. A downscaled RD&T budget and capabilities are essential to signal U.S. intent in this regard.

Instead of supporting these activities, LLNL, together with Los Alamos and Sandia, comprises a strong regressive force working to maintain and expand the legitimacy of nuclear weapons as instruments of national policy, not just in their traditional nuclear deterrent role but in dangerous new domains as well. They anticipate not just designing new weapons, but building small lots

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5. An egregious recent example of this was LLNL Director John Nuckolls March 22, 1994 testimony to the House Armed Services Committee, in which he warned that "the fabric of civilization" would "collapse" without at least $300 million more added to current nuclear weapons RD&T budgets, <u>plus</u> additional funds to counter nuclear proliferation ("Lab head urges $300 million more yearly to oversee nukes," <u>The Oakland Tribune</u>, 3/23/94).

6. Results of an ICR Survey Research Group poll of 1003 adults conducted on January 5-9, 1994 showed what Americans want: A global test ban treaty by 1995 (80%); further cuts in Russian and U.S. nuclear arsenals below START II levels of 3,500 each (84%); an official U.S. nuclear policy of "No first use" (64%); and a ban on plutonium production for weapons (63%).

1/40.27 continued

of weapons for "special" purposes.[7] They are apparently unaware that for most of the world, this is nuclear terrorism.

Not least, our alternative will directly save the nation billions of dollars each year, not only in reduced nuclear weapons RD&T requirements but also in relief from needless, technology-driven upgrades in both stockpiled warheads and their delivery systems.

Development of truly important new civilian technologies at LLNL, with tremendous value-added for the nation, is simply far less expensive than keeping excess nuclear weapons expertise exercised. And, while a few civilian technologies have come out of the LLNL weapons program, that program has not been and will never be a cornucopia of peacetime benefits.

Needless to say, the economic benefits of a civilian Laboratory will be greater, not just to the nation, but to the California economy as well, as discussed further below.

Our plan for Lawrence Livermore is based on completely phasing out all nuclear weapons RD&T and Department of Defense projects there. We present this case not as an extreme, but as the most reasonable option available. Ending these activities in Livermore would have several important benefits. First, the overhead costs associated with the nuclear weapons infrastructure at LLNL could be saved. Now, it has been argued that some of these facilities are unique to LLNL and therefore of irreplaceable importance to nuclear defense programs. Granted that some of these facilities are unique, it does not, however, follow that they are important, let alone necessary, to provide stewardship for the nuclear stockpile.

Second, the costs of the security apparatus—and the culture it spawns—would be virtually eliminated. These costs manifest as dollars spent on security and on background checks, as impaired communication with peers at other institutions, as difficulty in attracting talented scientists, and in the atmosphere of fear that circumscribes expression at LLNL. It is absolutely essential that the culture of secrecy be transformed, not just on the margin but in its entirety, if LLNL is to function effectively in an increasingly civilian role and to serve the needs of democratic society.

Third, the distortion of nuclear weapons policies which is occasioned by LLNL lobbying and self-promotion—which is well-funded, continuous, and highly-effective—would be brought to an end. It is no exaggeration to say that LLNL has confused the security of its own nuclear weapons programs with the security of the country as a whole, and its advice, which is considered very carefully in Washington, reflects this confusion. While lobbying by Los Alamos would continue, the effect of political pork on nuclear weapons policies would be greatly diminished.

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7. John Immele, "State of the Nuclear Weapons Program," Director's Colloquim, LANL, December 1, 1993.

1/40.27 continued

In any case it is, we note, simply impractical to keep a small cadre of weapons experts at one lab, while another lab conducts the bulk of the maintenance for the arsenal—an arsenal which would continue to diminish rapidly in size under sound policies. Some 79% of the so-called "enduring" arsenal was designed in Los Alamos, and it is primarily to Los Alamos, supplemented by key LLNL personnel, that the nation should turn to diminish the nuclear threat and guide us to a nuclear weapon-free world.

Our proposal closely resembles, in many respects, that offered in 1992 by Representative George Brown, Chairman of the House Science, Space, and Technology Committee. Brown spoke of the redundancy embodied in the three DOE weapons laboratories and the need for new lab missions in a letter to then-Secretary James Watkins. His proposal reads, in part:

> 1) Consolidate all nuclear defense and nuclear non-proliferation work at Los Alamos. Through a gradual transfer lasting perhaps three to five years, all nuclear design, ballistic missile defense, and other classified defense activities currently at Lawrence Livermore would be terminated or transferred to Los Alamos...
>
> 2) Establish Lawrence Livermore as a civilian technology lab. Building on strengths at the lab in materials science, fusion, computational science, environmental remediation, and biotechnology, create a new, entirely civilian mission for Lawrence Livermore, with particular emphasis on building consortia with industry and academia in areas of critical technologies and environmental technologies...
>
> ...
>
> 4) Reduce the DOE nuclear weapons research, development, and testing budget by 20 percent per year over the next four years...(emphasis in original)[8]

This proposal made sense two years ago; it makes even greater sense today. There is no need for new kinds of nuclear weapons; nuclear testing has ceased and there is no reason to re-initiate testing regardless of the actions of other countries; and the nuclear arsenal is shrinking as fast as possible. And, as was pointed out above, nearly all the warheads and bombs that will remain were designed in Los Alamos.

The Brown proposal cuts nuclear weapons spending everywhere; under his scenario, even if LLNL's weapons program is cut to zero and Sandia's to half its current size, Los Alamos' program also shrinks substantially. Brown's 1992 plan does not so much move anything to Los Alamos as it preserves enough of what is now there to care for a declining arsenal. It adds new missions, in non-proliferation for example, as needed.

What is missing from Rep. Brown's brief outline is a detailed and consistent analysis of the

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8. Letter from George Brown to James Watkins, February 8, 1992.

civilian work that is needed at Livermore and Sandia. Such an analysis would be the foundation for a unified new vision for LLNL, which is a necessary step in its transformation. For example, while Brown alludes to environmental work at LLNL, he also mentions research into fusion energy, which is intrinsically beset by environmental, economic, security, and other problems. As a potential energy supply, it is easily eclipsed by far more attractive and available technologies.

We suggest that the organizing principles around which LLNL's new work in the service of national needs constellate be "green" ones. These can be expressed as:

- ecological sustainability,
- social equity,
- grassroots democracy,
- personal and social responsibility,
- nonviolence,
- decentralization,
- community-based economics,
- respect for diversity,
- global responsibility and partnership, and
- responsibility toward future generations.

1/40.27 continued

Going further, we assert that technology development which does not in some way serve values such as these (or other similar ones) will not--even despite anticipated positive cash flows for some individuals--really contribute to either the nation or the world. Private benefit does not, as we should now know all too well, lead invariably to net benefits to the community or to the environment. There is considerable cogency to the conservative argument that R&D which leads only or primarily to private benefit, which is then redistributed by increasingly flawed and increasingly transnational market mechanisms, should be funded by private capital. In contrast, public funding should be applied to public, rather than private, purposes. These purposes include but must transcend economic growth. The articulation, and application in national policies, of values like those listed above can provide an effective basis for 21st century market growth and economic renewal, albeit in a new key and with new measures of success. It may be that such "green" principles actually provide the only fertile basis for a sustainable and just economic renewal.

However distant we may be from guidance by principles such as these--and nowhere more so than at the DOE weapons laboratories--University of California administrators have taken notice of LLNL Director John Nuckoll's slow pace in building LLNL's civilian programs. Because of this concern, as well as LLNL's intransigence on the nuclear testing issue, the University of California committee which oversees LLNL has reportedly called for his resignation.[9]

9. San Francisco Chronicle, March 16, 1994.

7

The University is correct in doing so. Setting aside the question of the Nuckolls team's performance in managing a nuclear weapons laboratory, it will be necessary, first and above all, to bring in a new management team for any change to occur at LLNL.

An Alternative FY1995-1998 Budget for Lawrence Livermore

For the past several years, citizens' groups in Livermore and in New Mexico have studied how the consolidation and transformation of the two weapons physics laboratories, Lawrence Livermore and Los Alamos, could be accomplished.[10] At the same time a number of studies of, and hearings on, this topic have proceeded in official venues in Washington, and a considerable literature on the subject has developed, too much to summarize in a short memorandum.

The accompanying table, which grows out of this previous work, shows one alternative budget for LLNL. It reflects genuine post-Cold War priorities in the general framework originally offered by Congressman Brown. It follows the same categories DOE used in its FY95 request to Congress for ease of reference.

1/40.27 continued

Under this consolidation and conversion plan, Lawrence Livermore would become an increasingly civilian and "green" lab. Some of the new and expanded programs it would host are discussed in the notes following the budget table.

In this scenario, Los Alamos would become the custodian of the nation's nuclear weapons expertise and the center, along with Sandia Albuquerque, for technical studies related to treaty verification, non- and counter-proliferation, increased transparency, training of inspectors, and for a variety of studies related to reducing the nuclear threat. It is interesting to note that Senator Domenici of New Mexico has also been arguing that a big part of LANL's future lies in these same programs. The New Mexico labs could also do much more civilian work.

Needless to say, no reorientation of this type should take place without intensive and substantive citizen involvement and discussion in both California and New Mexico. Such involvement is not merely a means to an end, it is a central value of any conversion process. It is, or rather would be, a renewal of democracy itself, now gravely imperiled by current political processes and, not least, by nuclear culture. To provide new forums of public involvement, which can make large bureaucracies increasingly responsive to local as well as executive and congressional priorities, and to institutionalize those forums, is a very high priority.

10. See, for example, The Conversion of Los Alamos National Laboratory to a Peacetime Mission: Barriers and Opportunities, November 1992, by Greg Mello and Lisa Oberteuffer, Concerned Citizens for Nuclear Safety, Santa Fe. Good earlier work at LLNL was done by Wendy Batson et. al. of the Nuclear Weapons Lab Conversion Project in "Shaping alternatives at Lawrence Livermore Laboratory: A Preliminary Analysis." 1979.

8

What is more, public discussion of the nuclear weapons issues underlying lab consolidation would irrevocably change, not just the political context in which U.S. nuclear policy decisions are made, but the decisions themselves. Current U.S. policies apparently rely largely on public inattention and secrecy for their maintenance, given the large discrepancy between what the public wants (see note 6, p. 4) and the policies we have.

Overall, the size of LLNL is somewhat less under this scenario than at present. For many reasons, the existing culture at either Lawrence Livermore or Los Alamos cannot be positively changed without downsizing them, and in any case these smaller laboratories are large enough to accomplish what the nation needs from them. What is more, the national security benefit--and even the economic benefit--from the national labs must be more and more closely compared with that resulting from other investments the nation could make, e.g. in health care and education. Of course, if LLNL fails to convert, it could well--and should--become considerably smaller than what is shown here.

1/40.27 continued

The size of the Laboratory is not, by itself, indicative of the regional economic importance of LLNL. The economic benefit of the Laboratory to the region would likely be quite a bit higher after conversion, due to increased industrial participation and an increased number of business spin-offs. Should local and state governments initiate markets for the technologies developing at LLNL--in this case, new greenish technologies--by means of feebates, regulations, taxes, or other incentives, large new industries could well be the result, both in California and elsewhere in the nation.

In any case, LLNL's existing budget should not be continued simply in order to preserve the jobs it provides, since LLNL constitutes a highly inefficient means to accomplish that end. Almost any other government investment would be more effective at creating direct employment than is high-technology R&D.[11] What is more, nuclear weapons R&D has never been and will never be a fertile field for new civilian technologies.

We suggest that a re-missioned LLNL be organized around the following missions:

- **Renewable energy and energy conservation R&D**
- **Advanced transportation technologies and underlying sciences**
- **Cooperative work for industry**
- **Environmental R&D**
- **Materials science**
- **Basic science, pure and applied, in LLNL's traditional specialties**

---

11. It is often hoped that helping American companies compete in the global marketplace will create new jobs for Americans. This may be partially true but is being greatly overstated by both companies and the laboratories, who can hardly be expected to be objective on the subject. Further remarks on the "competitiveness" mission will be included in the longer analysis which this memorandum summarizes.

- **Advanced computation (now driven by climate modelling instead of weapons R&D)**

LLNL has now, or has had in the past, programs in all these areas.

Note that the Laboratory envisioned here is an open campus, with no classified areas. This is preferable for many reasons: for economy, for identification with the scientific value of openness and thus providing increased appeal to talent, but most of all for promoting a culture that values the rapid and informal give-and-take of ideas that will maximize the value of public investments made in its missions.

The list of possible missions above, and the programs which follow, are the result of examining an initial larger list of many possible new missions for LLNL. There is no lack of R&D ideas, but filtering the various possibilities to see which are really green or greenish, which are compatible with LLNL's skills or reasonable extensions of them, and which can arguably be done well at LLNL limit the number of new missions we have found to the ones shown.

1/40.27 continued

<u>**How to Get There**</u>

1. **Make a clear decision** this year to remission LLNL, either at the DOE or in the Congress. Dragging out the inevitable transformation could ultimately waste billions of dollars and decrease the contribution of LLNL to the nation by failing to attract and retain skilled people at LLNL. The redundancy and waste embodied in the current LLNL/LANL competition is so widely appreciated that the DOE Secretary's Task Force on the Labs should, after an initial orientation, cut to the chase and issue an interim recommendation along these lines. If this cannot be done expeditiously in the Executive Branch, Congress--if for no other reason than economy--should step in and eliminate redundant programs.

2. **Halt new DOE Defense Programs (DP) and construction at LLNL** immediately. These projects are both redundant and unnecessary and have negative nonproliferation value. Detailed analysis supporting this assertion will be the subject of a separate memorandum. Funding for these new initiatives should be eliminated from the budget now before Congress.

3. **Halt new DOD and intelligence agency programs at LLNL** this year.

4. **Make the DOE Office of Energy Research the new landlord at LLNL** at the beginning of FY95.

5. **Support new legislation** this year which a) guides and b) funds an expanded industrial research program in the DOE laboratories. Rep. Brown's bill (HR 1432) should be modified to provide such guidance and funding.

6. At first in the White House and subsequently, in greater measure, in Congress, **fund major new initiatives in a) renewable energy and conservation R&D, and b) advanced**

transportation R&D, to be done at least in part at LLNL. Program start-ups can be financed in the interim by Laboratory-directed R&D (LDRD) funds. Funding for these initiatives, which serve national security directly in many ways, should come from cuts in DOE's nuclear weapons program.

1/40.27 continued

7. Replace current management during this fiscal year. The new management team would be selected by a panel co-chaired by the new DOE landlord agency and the University of California or its successor, but which would also contain local stakeholders. It is important that the community, as well as the prime contractor and the funding agency, have, in effect, veto power over the selection of LLNL management in order to restore the confidence that all parties need to advance the new missions of the Lab. In the long run, the size of LLNL will depend upon its degree of integration with the region around it.

8. Revise the LLNL management contract in a number of areas, such as contractor accountability, personnel practices, public information and participation,, and project review.

In Conclusion

We hope this summary will stimulate discussion, critique--and other proposals. In the final analysis, no facility can be converted without leadership from within. We do not know LLNL's strengths as well as the people who have those strengths. We hope you will come forward and make your voice heard.

AN ALTERNATIVE BUDGET FOR LLNL
(All amounts in millions)

DOE Budget Category	FY1994	DOE FY95 Request	TVC FY95	TVC FY98[12]
Energy Supply R&D	$99.8	$98.9	$110	$246
Uranium Enrichment	49.7	3.4	0	0
General Science	1.8	1.7	2	2
Weapons Activities	410.9	361.9	308	0
Environmental Restoration & Waste Management (ER&WM)	89.5	80.2	100	113
Materials Support & Other Defense Programs	74.1	73.9	56	0
DOE Administration	2.2	1.1	1	1
Fossil Energy R&D	0.9	0.4	4	11
Energy Conservation	0.4	0.5	24	158
Nuclear Waste Fund	13.8	16.1	16	18
Energy Information	0.5	0.5	1	1
Total DOE Funding	743.1	638.2	622	550
DOD Funding	122.0	77.8	58	45
Other Non-DOE Federal Work	77.2	74.8	30	34
Total LLNL Federal Funding	942.3	790.8	710	629
Industrial R&D Match	28?	40?	100	200
Total LLNL Funding	970	831	810	854

Notes to Table:

Energy Supply R&D: This includes biological and environmental research and magnetic fusion, along with several other programs. Ramp down magnetic fusion to zero over four years, and replace it with a large and diverse program in renewable energy technologies and related basic sciences. The DOE FY1995 Budget Request Highlights shows that many renewable energy technologies have or are about to greatly expand their market potential, becoming competitive with fossil fuels and nuclear power even with today's unrealistic pricing system. Further research, provided it meets certain basic criteria, should pay off handsomely with fertile

12. Reflects 4%/yr inflation.

industrial partnerships and significant public benefits.

Uranium Enrichment: This is the DOE portion of the uranium atomic vapor laser isotope separation facility (U-AVLIS) funding; we do not know if the U.S. Enrichment Corporation (USEC) is currently funding AVLIS, and the future of USEC funding is uncertain. There is no need for more enriched uranium. This technology presents a proliferation danger.

General Science: This modest program in high-energy and nuclear physics is unchanged in our scenario.

Weapons Activities: Ramp down to zero as duplicative, useless, and dangerous activities are ended and the remaining few essential stockpile activities transferred to Los Alamos and LLNL's facilities are cleaned up and out as quickly as is practical. The four-year pace of consolidation gives program staff and management time to make the necessary transitions, find important new work, and archive data to make room for new civilian missions.

In the current DOE request, the great bulk of the weapons funding is in the R&D and testing line items; these categories should be dropped altogether and the small fraction of genuinely important work subsumed under Stockpile Support, which embraces all or essentially all the justifications being offered for the RD&T lines.

Environmental Restoration (ER) and Waste Management (WM): Here give an initial boost to the ER program for equipment installation, on-going source investigations, and initiation of Site 300 clean-up; taper off WM as the waste load declines due to programmatic shifts while significantly expanding the program in environmental cleanup technologies, now slated for cancellation. The ER&WM program is given its own directorate in our scenario, rather than being stuck as an orphan in unrelated programs as at present.

Materials Support and Other Defense Programs: Despite the name, this also includes verification and control technology and related programs. Ramp these programs down to zero at LLNL, sending nonproliferation and related work to Los Alamos along with any essential materials support functions (which will be very small).

Fossil Energy R&D: This program is destined for large percentage growth in our scenario, though it remains a small program. It focuses on a variety of practical R&D problems of interest to the fossil fuel industry.

Energy Conservation: Begin two new programs here in FY95, one in broad-based energy conservation technologies and related policies, and the other (which would rapidly grow into a major focus of LLNL) developing advanced transportation technologies, especially an ultra-light clean car, along with underlying materials and related sciences.

The innovative transportation initiative would proceed on a very rapid basis, in order to leapfrog incremental automotive improvements and to jumpstart new manufacturing industries.

Nuclear Waste Fund: This is research on Yucca Mountain.

DOD Funding: (The first two columns are estimates from the LLNL FY1994-1999 Institutional Plan.) Our scenario envisions ending all strictly defense-related R&D at LLNL, with industrially-oriented dual-use R&D continuing.

Other Non-DOE Federal Work: (The first two columns are from the FY1994-1999 Institutional Plan; these include a hypothetical $45 million in FY94 and $40 million in FY95 from USEC for AVLIS.) This line also contains work for the intelligence agencies, which would ramp to zero in this scenario. We envision other intra-federal contract work as rising to partially compensate for this loss, including increased work for the Department of Commerce and the Environmental Protection Agency.

Industrial R&D Match: The first two entries on this lines are estimates; LLNL does not publish this information on an annualized basis. This line grows rapidly because of anticipated new legislation that makes CRADAs easier to consummate and fund, but even more so because industry can be anticipated to be quite interested in the technologies LLNL is developing under this alternative plan. Some industrial partners will be likely to set up shop in facilities freed by weapons program cuts.

SSM-H-LLNL-015
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: N. BARLOW M.I.: Last Name: MANNING

Street Address: 1946 HATHAWAY AVENUE #8

Street Address 2:

City: HAYWARD State: CA Zip Code: 94541-2382

Organization: PLUMBERS STEAMFITTERS 342

Telephone: 510-276-8863 Fax: 510-276-1361

Comments: FUSION WILL BE THE WAY OF THE FUTURE AND THIS PLANT WILL GO A LONG WAY TO MAKE THE NUCLEAR WEAPONS MUCH MORE SAFE & WILL NOT ELIMINATE THE PEOPLE FROM THE EARTH.

1/21.06

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

Receiver's Initials: [illegible]

SSM-H-LLNL-016
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: [illegible] M.I.: [illegible] Last Name: [illegible]

Street Address: [illegible]

Street Address 2:

City: [illegible] State: [illegible] Zip Code: [illegible]

Organization: [illegible]

Telephone: [illegible] Fax:

Comments: [illegible]

1/21.06

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

Receiver's Initials: JKB

SSM-H-LLNL-017
COMMENT LETTER — **PAGE 1 OF 1**

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: Earl M.I.: E Last Name: Root

Street Address: 835 Old Canyon Rd

Street Address 2:

City: Fremont State: CA Zip Code: 94536-1730

Organization: Plumbers & Steamfitters 342

Telephone: 510-792-5393 Fax:

Comments:

1/21.06 I am totaly in favor building the Lazer.

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

[redacted] Receiver's Initials: jks

SSM-H-LLNL-018
COMMENT LETTER — **PAGE 1 OF 1**

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: THOMAS M.I.: G Last Name: RANSON

Street Address: 5244 KATHY WAY

Street Address 2:

City: LIVERMORE State: CA Zip Code: 94550-3572

Organization:

Telephone: Fax:

Comments:

1/21.06 We should build the N.I.F. as soon as possible. The laboratory have helped us from having a another world war

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

[redacted] Receiver's Initials: jks

SSM-H-LLNL-019
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: RONICE M.I.: D Last Name: ECKHARD
Street Address:
Street Address 2:
City: LIVERMORE State: CA Zip Code:
Organization:
Telephone: 510-447-2340 Fax:

Comments:

1/21.05 I am a retired Engineer. I have worked for/with the Government for 35 years. I have seen the government do some good work and sometimes very poor work. I compliment on the logical approach you have taken on the evaluation of NIF and the EIS. The view graphs were very clear on what is being done including proposed time frame. The main thing missing was some specific data on the impact. Was Mary Lee Kelly's data correct. She had an impact on the audience. You could have countered that with some hard data. Although you run the risk of confusing some.

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

SSM-H-LLNL-020
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: ALFRED M.I.: J Last Name: FERNANDES
Street Address: 854 BEGIER AVE
Street Address 2:
City: SAN LEANDRO State: CA Zip Code: 94577-
Organization: PLUMBERS & STEAMFITTERS LU 342
Telephone: 510-686-5880 Fax: 510-685-3710

Comments:

1/21.06 I have attend two hearing on the National Ignition Facility. I believe the project will enhance the world peace. It will also be an opportunity to develop many other products that will help all mankind.

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

Receiver's Initials

SSM-H-LLNL-021
COMMENT LETTER — **PAGE 1 OF 1**

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: OMAR M.I.: D Last Name: CHATTY

Street Address: 2511 [illegible]

Street Address 2:

City: SAN JOSE State: CA Zip Code: 95114-1865

Organization: SEIG

Telephone: 801-972-4919 Fax:

Comments:

1/40.44 I support the DPEIS [illegible] adequately address NEPA, alternatives and [illegible]

2/21.06 [illegible] design & research strengths.

3/12.03 are human beings [illegible] "Environmental Justice"? [illegible] What about "Wise Use" of our environment, [illegible] LLNL [illegible]

1/40.44 continued [illegible]

Please continue on the other side if you wish to give additional ideas. THANK YOU—your comments are important to us.

[redacted]

[illegible]

SSM-H-NTS-001
COMMENT LETTER — **PAGE 1 OF 2**

J. Michaels

From: J. Michaels
5516 Cory Place
Las Vegas, NV 89107

Date: March 28, 1996

Comment regarding Stockpile Stewardship and Management PEIS:

I consider your preferred alternative to downsize PANTEX (PX) in place rather than relocate operations to the Nevada Test Site (NTS) after stockpile reduction to START level is achieved to be absolutely wrong. For the following reasons:

1/40.13 1. You state this is less expensive. Your argument that it is less expensive to operate both the NTS and PX than to operate just NTS is absolutely wrong. Your assumption that it costs too much to shut down and cleanup PX therefore you will operate both facilities is flawed. The expense to clean up PX was bought into as soon as PX was assumed from the Army after WWII. This is a sunk expense that DOE must bear, delaying cleanup only increases its ultimate cost, the present value of these clean up costs is relatively constant, no matter how long you delay cleanup. Delaying cleanup does not save any money. Please provide detailed economic assumptions and calculations, performed by a credetialled economist, that properly explains this socioeconomic issue.

2/30.02 2. Even if it was true that shutting down PX was more expensive. Please address why this is environmentally superior to cleanup at PX. How can you justify passing up the opportunity to closeup and cleanup the PX site. For the sake of money you are willing to keep such a contaminated site open. How much do you think it saves in terms of dollars and pay back. Please address why this is more justified than cleaning up and getting out of one more site.

3/11.01 3. Please address worst case accident analysis for a "perking lot" nuclear weapons accident for PX and NTS. On a safety basis to the public how you can justify operations at PX instead of at NTS. I read that DOE is taking special mitigating actions at PX to keep site boundary dose under 100 REM per person in the event of an accident at PX. The same accident at the NTS Device Assembly Facility must be less than 1% of this. No one lives at the NTS site boundary. The actual dose based on nearest resident must be less than 10 millirem. Please explain how for the sake of saving money you justify this additional risk to the public. How far is it to the nearest residence at PX and what is the expected dose to the public for a 10E-7 accident involving maximum bay limits of Pu and HE at PX and the NTS. How many people total would receive a dose greater that 100 millirem in case of such an accident at PX and NTS.

SSM-H-NTS-001
COMMENT LETTER **PAGE 2 OF 2**

Page 2

3/11.01 continued	4. The NTS is in completely controlled airspace. The DOE has the ability to close all airspace for 5 miles around the DAF. The probability for an aircraft accident is at least 1000 times less than at PX. PX is in the flight path of an major city (Amarillo) airport. Please address how you can justify exposing the public to this added risk just to save money. What is the dose to the public if such an accident occurs. Please address why this is justified in order to save money.
2/30.02 continued	5. Please explain the difference in operating costs for security guards at the DAF versus PX. You do not have to address the number of guards or total payroll costs if that is classified. However, please report the ratio or the difference in these costs: DAF vs. PX.
1/40.13 continued	6 If ultimate disposition is to be at NTS or Yucca Mountain. There will be extra transportation costs to ship to PX for disassembly and then ship pits to NTS. What are these extra costs vs. shipping once to NTS for disassembling and disposing.

SSM-H-NTS-002
COMMENT LETTER **PAGE 1 OF 1**

Comment Form

United States Department of Energy

NAME: (Optional)
ADDRESS:
TELEPHONE: ( )

1/22.01	(1) WHY IS THERE A NEW ARAS FACILITY UNDER CONSTRUCTION IN LOS ALAMOS WHEN DOE ALREADY HAS AN ARAS FACILITY IN NORTH LAS VEGAS, NV. If they are the same why is another needed. If they are different, why not change the name of the new one to avoid confusion.
2/40.02	(2) In addition to NTS readiness mission - the NTS has mission to support and conduct experiments deemed necessary by the national laboratories to meet their Stockpile stewardship mission. Labs are claiming they need subcritical experiments to do this. These subcritical experiments can be done only at NTS. Why should not the SSM PEIS address need to do subcritical experiments at NTS

SSM-H-NTS-003
COMMENT LETTER
PAGE 1 OF 1

Comment Form

[illegible] Storage and Disposition Draft PEIS [illegible] Stockpile Stewardship and Management Draft PEIS [illegible] Site-Wide Draft EIS [illegible]

United States Department of Energy

NAME: (Optional) William G. Flangas

ADDRESS: 4209 El Cederal Las Vegas NV 89102

TELEPHONE: (702) 871-1730

1/41.05

1. I have attended a great many of these public meetings in recent years & it is painfully obvious that —
   - a. Meetings are attended by & large by the same people grinding out their own agendas. Obviously not interested in facts
   - b. Too many participants suggesting they're representing the public — often this amounts to a public of 1 or 2
   - c. Meetings provide a forum for many negative anti-establishment & emotional vitriolic attacks on any good [illegible] efforts

2/40.04

2. In my opinion DOE officials need to do a better job addressing the fact that the nuclear deterrent is necessary & a fact of life for several more decades
   - a. We cannot unilaterally disarm & rely on the generosity of others in our national security
   - b. We must always be in the position to enforce peace, not beg for it.
3. We must do a better job of pointing out that our country is making a good faith effort in disarmament, dismantling, storage/disposal of material, etc. We have nothing to apologize for.
4. Perhaps, it's time to question the continuation of these meetings. Is the cost & effort really worth it?

SSM-H-ORR-001
COMMENT LETTER
PAGE 1 OF 2

Comments on Stockpile Stewardship
PEIS Hearing, Oak Ridge
April 1, 1996

1/40.89

- Nuclear Weapons Stockpile Stewardship surely includes storage security, safety, inspection, and maintenance so that the operability of any stored weapons are known and satisfactory.

- Presumably, weapons and weapons-material security have been studied exhaustively, so plans should be based on the thinking employed for some time. Those responsible should remain aware of technological advances in remote drilling control etc. that might make previously-secure storage locations less so.

- The need for inspection and maintenance is based on the possibility that materials in an assembled weapon might become functionally degraded over time through thermal or possibly radiation effects on material composition or physical properties. Since I do not know what materials are present and do not know the ambient conditions, I cannot suggest details.

2/40.36

I assume the weapons can periodically be disassembled, carefully inspected, and subjected to non-destructive examination (NDE). If so, small scale techniques are to be preferred to efforts to apply massive NDE techniques to fully assembled devices. The most-desired efforts probably do not require massive new machines as proposed for some of the stockpile stewardship work at the weapons laboratories. Technicians and mechanics have the main skills required, though those employed for these tasks must be very highly trained, experienced, and be <u>quite</u> careful and reliable!

- In the past I have not been concerned about continued safety in work with fissile materials, at Y-12 for example. However, I have read in the press that a transformation is underway from knowledge-based to procedure-based operations. This revelation was scary!

I believe in excellent procedures, and have composed some. However, one must combine procedures with thorough knowledge! I trust that the new paradigm does combine worker knowledge with well stated procedures.

SSM-H-ORR-001
COMMENT LETTER

PAGE 2 OF 2

3/08.07 • Assuming disasters are avoided, the main adverse impacts of a Stockpile Stewardship program would be associated with the construction of any new facilities and in the societal effects of shifting responsibilities among installations. If stewardship can be addressed as I propose, such effects could be minimal.

R. Peelle
130 Oklahoma Avenue
Oak Ridge, TN 37830

I am a nuclear physicist retired from ORNL, and a Fellow in the American Nuclear Society. I am a former longtime Roane County Commissioner. Here, I am representing only myself.

I have no experience with weapons or knowledge of weapons design.

SSM-H-ORR-004
COMMENT LETTER

PAGE 1 OF 1

ATOMIC TRADES AND LABOR COUNCIL

P.O. Box 4068
Oak Ridge, Tennessee 37831-4068

April 1, 1996

Stockpile Stewardship and Management Program

1/41.06 The PEIS costs millions of dollars with very little value, but lots of errors. The wrong people were used to come up with the data; the non-knowledgeable, non-production western laboratories research and development folks. If you are going to talk about highly enriched uranium production you would start with Y-12.

The bargaining unit, hourly production workers at Y-12, asks for a level playing field with accurate data from knowledgeable folks that can and have done the work, and can back it up with true facts.

For national security we will be glad to deal with the true facts and real data.

We would like for this document to become a part of the PEIS.

Sincerely,

Carl R. Scarbrough

Carl R. Scarbrough, President
Atomic Trades and Labor Council, AFL-CIO

CRS:jcd

c: K. W. Cook, Recording Secretary ATLC
W. E. Johnson, Vice-President ATLC
C. R. Scarbrough, President ATLC - RC

SSM-H-ORR-005
COMMENT LETTER **PAGE 1 OF 2**

CITY OF
OAK RIDGE

OFFICE OF THE MAYOR

POST OFFICE BOX 1 • OAK RIDGE, TENNESSEE 37831-0001

March 29, 1996

The Honorable Hazel R. O'Leary
Secretary of Energy
U.S. Department of Energy
7A-257 Forrestal Building
1000 Independence Ave., SW
Washington, DC 20585

Dear Secretary O'Leary:

1/40.23 The enclosed Resolution No. 3-42-96 was unanimously adopted by the Oak Ridge City Council at its regular meeting on March 25, 1996, and will be read on April 1, 1996, at the public involvement meeting to be held by the Department of Energy on the Stockpile Stewardship and Management Draft Programmatic Environmental Impact Statement (PEIS). This resolution places the Council on record in opposition to the "science based stockpile stewardship" approach as proposed in the draft PEIS and in support of maintaining the Oak Ridge Y-12 Plant's capabilities and competencies as integral elements in the future configuration of our nation's nuclear weapons complex.

The Council's concerns regarding the Stockpile Stewardship and Management Draft PEIS are many, but principally:

2/40.24
- We are concerned that the current proposal will adversely impact national security due to the tremendous reduction of skilled machinists, welders, chemical workers, assembly persons, sheet metal workers, inspectors and other critical craftspeople as well as technical and engineering specialists, all of whom are required to safely monitor and maintain quality nuclear weapons components. The collective ability of these craft groups and technical experts can not be replaced by science.

3/08.03
- We are concerned that the socioeconomic impact to Oak Ridge and our surrounding neighbors has not been appropriately analyzed. No Oak Ridge City staff person was directly involved in this analysis; therefore, the study's results must be questioned.

4/41.10
- We are concerned that our community cannot adequately analyze the constant stream of PEIS documents, including this proposal, within the constraints of our limited resources or in the time frame DOE has provided. We feel that DOE support for the PEIS process leans heavily towards proposal preparation and away from proposal analysis.

SSM-H-ORR-005
COMMENT LETTER **PAGE 2 OF 2**

The Honorable Hazel R. O'Leary -2- March 29, 1996

5/41.03
- We are concerned that the input from the local elected officials of this region has had little impact on this process.

Your careful consideration of the enclosed resolution and the concerns expressed in this letter will be sincerely appreciated.

Very truly yours,

Kathleen D. Moore

Kathleen D. Moore
Mayor

jb

cc: Tennessee Congressional Delegation
Governor Don Sundquist
Members of the Tennessee General Assembly:
Senators McNally and O'Brien
Representatives Coffey, Cantrell, and Kerr

SSM-H-ORR-006
Comment Letter

My name is R.P. Sauer. I live at 111 CARSON LN, OAK RIDGE

My question is about the draft Stockpile Stewardship and Management Programmatic Environmental Impact Statement.

I want my question answered in writing in the Final Stockpile Stewardship and Management Programmatic Environmental Impact Statement.

1/42.06 I recall from the July, 1995 Public scoping meeting held in Oak Ridge, DOE indicated it would select the location of its future HEU storage mission dependent upon its site selection for the secondary and case manufacturing mission. Where is the preferred ~~for~~ alternative for HEU storage discussed in the draft PEIS.

SSM-H-ORR-007
Comment Letter

My name is Clovis A Carver.
15 Peterson Road Rd.
I live at Sunbright TN 37872
worked 26 1/2 years

My question relates to the Draft Program Environmental Impact Statement for Stockpile Stewardship and Management.

1/40.42 What, if any consideration has been given to safeguards/inspection provisions in these studies?

Please include the answer to this question in the final Stockpile Stewardship and Management Environmental Impact Statement

SSM-H-ORR-008
COMMENT LETTER — **PAGE 1 OF 1**

My name is Carol F. Cooper

I live at P.O. Box 512 Wartburg, Tn. 37887
OR Y-12 21 yrs.

My question relates to the Draft Program Environmental Impact Statement for Stockpile Stewardship and Management

1/10.02 In paragraph 4.2.3.10, how do we project zero waste associated with the move of HEU to another location unless containers can be removed and shipped in existing trucks with no repackaging?

Please include the answer to this question in the final Stockpile Stewardship and Management Environmental Impact Statement

SSM-H-ORR-009
COMMENT LETTER — **PAGE 1 OF 1**

RESOLUTION OF THE TOWN OF FARRAGUT BOARD OF MAYOR AND ALDERMEN FOR SUPPORT FOR DEPARTMENT OF ENERGY'S Y-12 NUCLEAR FACILITY

WHEREAS, citizens of Farragut and surrounding communities have strengthened the security of the United States and her allies since 1943 through their work at the Oak Ridge Y-12 Plant, and

WHEREAS, through the efforts of these skilled craftsmen, engineers, and scientists, and countless other men and women throughout the United States, the Cold War has now ended and the President and Congress have directed the Department of Energy (DOE) to maintain a strong nuclear deterrent with a smaller and more efficient nuclear weapons complex, and

WHEREAS, the DOE is considering transferring the responsibility for the Y-12 Plant's nuclear weapons production, surveillance, dismantlement, and process development mission to another location, and

WHEREAS, transferring this mission would result in increased cost through the duplication of production facilities and the replacement of trained, skilled craftsmen, scientists, and engineers, and

WHEREAS, the culture and expertise necessary to continue this unique nuclear weapons mission exists only at the Y-12 Plant and that culture and expertise does not exist elsewhere, including the nuclear weapons design laboratories, and

WHEREAS, if the responsibility for the Y-12 production mission is reassigned to another site, the future security of the United States will be adversely impacted and there will be greater cost to the taxpayer,

NOW, THEREFORE, BE IT RESOLVED by the Board of Mayor and Aldermen of the Town of Farragut, Tennessee:

1/40.23 That the Farragut Board of Mayor and Aldermen express grave concern over any consideration by the DOE of moving the Y-12 nuclear production responsibility to another site where the facilities and production skills do not now exist and the potential for reduced national security exists while the DOE duplicates the capability with added expense.

BE IT FURTHER RESOLVED that the Board fully supports the retention of the traditional responsibility for the unique Y-12 mission in Oak Ridge so that the citizens of Farragut and surrounding communities can continue to further the national security through their skills and knowledge, without compromising our nuclear weapons stockpile.

BE IT FURTHER RESOLVED that the Board asks the Department of Energy to listen intently and without bias to the citizenry of the area who are experts in the production technology and who can advise the DOE properly on the continuation of this important mission assignment.

Signed this 28th day of March, 1996.

[illegible signature]
W. Edward Ford, III, Mayor

Mary Lou Koepp
Mary Lou Koepp, Town Recorder

SSM-H-ORR-010
COMMENT LETTER

PAGE 1 OF 2

NUMBER 3-42-96

RESOLUTION

WHEREAS, for over 50 years, the security of the United States and her allies has been strengthened through the efforts and the unique skills of the employees of the Oak Ridge Y-12 Plant, and

WHEREAS, due in part to the efforts of the employees of the Y-12 Plant, the world has witnessed the end of the Cold War, the halting of new nuclear weapons design, the end of underground testing by the United States, and the dismantlement of large numbers of nuclear weapons, and

WHEREAS, the President and Congress have directed the Department of Energy (DOE) to maintain the safety and reliability of the reduced nuclear weapon stockpile without any future underground nuclear testing, and

WHEREAS, to this end, the DOE has issued the Stockpile Stewardship and Management Draft Programmatic Environmental Impact Statement (PEIS) which provides various alternatives for stockpile maintenance, and

WHEREAS, this Draft PEIS employs as its foundation a completely new, unproven, risky, and expensive approach to maintaining our nation's nuclear stockpile. This approach, called "science based stockpile stewardship," shifts the major responsibility for oversight of process development, stockpile maintenance, surveillance, refurbishment, and dismantlement work from experienced production sites like Y-12 to weapons design laboratories, and

WHEREAS, this concept, if implemented, will require the reduction of nearly 2000 uniquely skilled defense program employees at the Oak Ridge Y-12 Plant as well as substantial reductions at the other nuclear weapons production and manufacturing facilities, while increasing the staff at the weapons laboratories even though their primary mission of design has been significantly diminished and the testing mission has been ended, and

WHEREAS, this concept, if implemented, will needlessly cost our nation's taxpayers billions of dollars for construction of new facilities, movement of mission expertise, and decommissioning of older, yet safe and functional facilities, and

WHEREAS, this concept, if implemented, will compromise the historic separation of the weapons laboratories' research, design and testing function from the manufacture, assembly, disassembly and surveillance function of the production complex that has successfully produced the highest quality nuclear weapons since 1945, and

WHEREAS, this concept, if implemented, will adversely impact the national security of the United States of America.

NOW, THEREFORE, BE IT RESOLVED BY THE MAYOR AND COUNCILMEN OF THE CITY OF OAK RIDGE, TENNESSEE:

1/33.01 That via this resolution, the Oak Ridge City Council transmits its grave concerns to the DOE over the impact to the national security of the United States if the Oak Ridge Y-12 Plant's core production, maintenance, surveillance, refurbishment, and dismantlement capabilities and competencies are not maintained as integral elements in the future configuration of the nation's nuclear weapons complex.

SSM-H-ORR-010
COMMENT LETTER

PAGE 2 OF 2

2/08.03 BE IT FURTHER RESOLVED that this Council challenges the DOE's analysis which concludes that there will be minimum socioeconomic impacts to the City of Oak Ridge and her surrounding neighbors associated with the reduction of nearly 2000 skilled, defense program positions at the Oak Ridge Y-12 Plant when no one from the City staff has been directly involved in assuring the data utilized in the analysis are accurate.

3/41.10 BE IT FURTHER RESOLVED that this Council urges the DOE to provide assistance to the City to allow for an independent evaluation of the cumulative socioeconomic and environmental impacts of this and other major DOE actions which when taken together have the potential to cause serious long-term impacts not evaluated in individual statements. It is no longer reasonable for the federal government to expect local communities to expend their limited resources to analyze Programmatic Environmental Impact Statements involving thousands of pages that government contractors have spent millions of dollars preparing.

This the 25th day of March 1996.

OAK RIDGE CITY COUNCIL

Kathleen D. Moore, Mayor

Francis M. Kovac

David R. Bradshaw

Edmund A. Nephew

Walter K. Brown

Patricia P. Rush

Thomas M. Coffey

-2-

SSM-H-ORR-011
COMMENT LETTER
PAGE 1 OF 1

DRAFT

Anderson County Commission

The U. S. Department of Energy (DOE) has provided two draft environmental impact statements to the Anderson County Commission for review and comments.

One document ~~proposes~~ addresses **significant job loss at the Oak Ridge Y-12 Plant and since the plant is located in Anderson County, it could have a detrimental economic impact on the County. The second document proposes to built a facility to locate the Department of Energy's plutonium in Oak Ridge which could have detrimental environmental and economic impacts on Anderson County.**

1/41.10 **The Department of Energy has spent ~~millions~~** thousands of thousands **of dollars preparing the environmental impact statements. DOE should not expect local communities with limited resources to review the voluminous reports without providing financial assistance. With modest financial assistance, Anderson County could contract for independent technical review with the University of Tennessee or some equally qualified organization. DOE will make decisions based on information and analysis prepared by Department of Energy contractors. It is critical that local communities impacted by DOE decisions be allowed suitable time and resources to analyze these documents. It is time that the federal government recognizes its obligation to assist local governments in meeting their obligations to the impacted communities.**

We ~~challenge~~ respectfully request that **the Department of Energy to provide funding to the Anderson County Commission for our independent review and analysis consistent with the intent of the National Environmental Policy Act.**

SSM-H-ORR-013
COMMENT LETTER
PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: Nelly M.I.: W Last Name: Olden

Street Address: 110 Meridian Cir

Street Address 2:

City: Oak Ridge State: TN Zip Code: 37830-

Organization: Retired

Telephone: 423-483-4751 Fax: - -

Comments:

Oak Ridgers continue to be concerned and continue to mistrust the DOE in Washington DC because the Headquarter Program Offices have been monopolized by Design Lab employees or former employees.

1/40.08 How can the DOE expect communities of production facilities to believe decisions are based on a technical basis vs political and skewed toward the design labs!

Please continue on the other side if you wish to use additional space. THANK YOU - your comments are important to us

[redacted] Receiver's Initials

SSM-H-ORR-014
COMMENT LETTER

LOCATION OF NUCLEAR WEAPONS MANUFACTURE AT A LABORATORY

I am Donald B. Trauger of Oak Ridge, Tennessee, retired with fifty years experience in the nuclear field. This was first at Columbia University on the Manhattan Project, then in the laboratory of the K-25 Gaseous Diffusion Plant and, for nearly forty years, with the Oak Ridge National Laboratory. As an Associate Director at ORNL, I visited Los Alamos on several occasions and once served, as a reviewer for LANL non-weapons programs. I hold both ORNL and LANL in high regard as excellent laboratories.

1/40.23 Based on the cited experience, I conclude that combining a manufacturing production with a laboratory function other than quality control is unwise. The mission of a laboratory is to seek improvement and change, that of manufacturing to produce a reliable and salable product. I could not recommend placing a manufacturing facility at either LANL or ORNL. In fact, when working in the laboratory at K-25, I petitioned the management to transfer research to ORNL as a better environment. A secondary purpose was freedom the constraint imposed by the manufacturing unit on major changes that had promise.

In the mission for restoring and maintaining weapons where the product can not be tested, it is critically important to keep the manufacture and, perhaps even thought processes, separate from research. Small revisions can be dangerous. Although external constraints are now present for weapons development, that may not always prevail. The present arrangement with Y-12 is proven; it should not be changed.

Donald B. Trauger
April 1, 1996

SSM-H-ORR-015
COMMENT LETTER

My name is Cecelia Rivers

I live at 7729 Kingsmoade Rd Powell, TN

My question relates to the Draft Program Environmental Impact Statement for Stockpile Stewardship and Management

1/08.01 3 7.1-5 Table The numbers used here imply that people required for D&D would provide an immediate amelioration of the socioeconomic impact of change in staffing, but what fiscal year budget does the reduction come in and what fiscal year is the D&D work budgeted in? The D&D on building 9201-4 has been on the long range schedule on and off for fifteen years and still has not risen to a level which would rate priority and considering the priority problems associated with D&D of plutonium facilities, does it not seem probable that this work might be scheduled thirty years from now? Would this work be done by Lockheed-Martin people or by contract workers, and how soon would it have to be scheduled in order for L-M workers to be kept on the payroll to do it?

Please include the answer to this question in the final Stockpile Stewardship and Management Environmental Impact Statement

SSM-H-ORR-016
COMMENT LETTER

PAGE 1 OF 1

My name is William Earl Johnson

I live at 841 New Hope Rd. Rockwood Tn 37854

My question relates to the Draft Program Environmental Impact Statement for Stockpile Stewardship and Management

1/32.02 3.5.1 Rocky Flats spent on the order of ten years and tens of millions of dollars on near-net-shape casting without success due to the complex metallurgical phase structure of the plutonium system; why do we think that better computer modeling will change the problem?

Please include the answer to this question in the final Stockpile Stewardship and Management Environmental Impact Statement

SSM-H-ORR-017
COMMENT LETTER

PAGE 1 OF 2

Lori Barber, Farragut, TN.

I am concerned about the increased responsibility that is being given to the design laboratories, ~~particularly LANL~~ for the production process development, quality surveillance and production oversight

1/40.24 for the secondaries manufactured by Y-12. I am particularly concerned about their potential role in ~~component assembly~~ weapons component and subassembly testing and inspection.

Why would we want to duplicate ~~facilities~~ ~~on~~ these testing and inspection ~~capabilities~~, personnel and ~~another site~~ ~~both trained people and possibly~~ facilities at another site?

SSM-H-ORR-017
COMMENT LETTER

PAGE 2 OF 2

Y-12 Physical Testing and Nondestructive Testing Capability

The Y-12 Plant has developed an extensive physical testing and nondestructive evaluation and inspection capability over its 50-year life which was put in place specifically for application to nuclear weapons components and subassemblies. These testing capabilities, which are not available in general industry, had to be developed because of their uniqueness to the nuclear weapons program needs. Extensive and unique facilities have been constructed throughout the Y-12 Plant to support the various testing needs for different materials, processes, and assembly operations.

Y-12 testing engineers played an important role for the nuclear weapons designers. They added the testing technology that the designers needed to fully understand and evaluate their designs. Designers would typically present conceptual designs to Y-12. These designs would not include important things such as joining details, fabrication tolerances, or material uniformity requirements. The Y-12 testing and inspection engineers would develop the details for the designer for his or her consideration or approval. Y-12 would then develop and engineer the tests for production application. Only with this important link between the weapons designer and the inspection or test engineer has the United States been able to deploy such a successful nuclear weapons stockpile.

Developing, designing, and engineering testing and inspection capability along with the production process has become a necessary way of doing business for the Y-12 Plant. This is because new technology with new materials and new requirements were being developed with each new weapon design. It became necessary as a part of the development process to test and evaluate the materials and components to verify that they met design requirements. This extensive testing guided the process development. Verification that expectations were being met is as important as making the product itself. Ways to measure or test material or component properties were continually being challenged. More knowledge was continually being sought about a product or process. The Y-12 testing community responded with new and innovative methods to prove and improve its product.

2/40.13 Y-12 testing facilities include extensive radiographic, ultrasonic, metallurgical, radiation gauging, and other testing facilities. Many facilities are engineered specifically for unique weapons materials or assemblies. The materials involved include some that are hazardous or radioactive, and therefore require special tooling or construction to protect the material or the worker. These materials range from radioactive uranium or thorium to hazardous beryllium, lithium or mercury. The government has invested millions of dollars for these capabilities, and they are still suitable for supporting weapons production and development. They should not be duplicated elsewhere.

JWGarber
2/14/96

SSM-H-ORR-018
COMMENT LETTER

PAGE 1 OF 4

My name is Harwell Smith
I spent many years in
the regular Army with a lot
of time in the Armed Forces
Special Weapons project in the
mid 50's. I also spent many
years at Y-12 in development,
fabrication, and weapons
engineering. To keep it
brief I'll read my remarks

SSM-H-ORR-018
COMMENT LETTER **PAGE 2 OF 4**

1/40.24

Whereas the current PEIS draft gives more recognition to "core intellectual and technical competences" required for manufacturing, the feeling of the authors of the document that manufacturing competences are somehow inferior to those required for research is still apparent. Highly educated and trained people have spent 40+ years honing their abilities just as persons at the design labs have done. The labs cannot learn manufacturing anymore

SSM-H-ORR-018
COMMENT LETTER **PAGE 3 OF 4**

1/40.24 continued

than Y-12 can learn the research business

As a second concern there is insufficient recognition that simply beginning with core competences is enough. No effort to find work load to continually do the necessary exercising of the production capability, regardless of where it is, is evident. The nice line drawn in about the year 2003 on the workload chart is no more than someones fondest wish.

SSM-H-ORR-018
COMMENT LETTER **PAGE 4 OF 4**

Is this aspect being examined seriously and if so by whom

SSM-H-ORR-019
COMMENT LETTER **PAGE 1 OF 1**

My name is D.H. Johnson and I live at 321 Peninsula Rd, Harriman, TN.

1/40.23

Comment: I take exception to Ms. Whiteman's comment that there is no intent to cut back on process development at Y-12. For example - examine the case of radiation case development. In the early 70's there was a conscious decision that this work would be done at Y-12. Over the years, the design labs cut back in staff and facilities and provided only oversight of the Y-12 development program. However, recently and in a timeframe which corresponds to the preparation of the PEIS document, LANL has built and refurbished a number of facilities to do the extensive development and manufacturing processing necessary to do this function. I find it hard to believe that monies are available to do work at both places.

2/40.33

Question: The draft PEIS is based on a preferred alternative of extensive, continuous nuclear R&D at the design labs. This is to be accomplished by large or massive capital and operational investment. What is the data which was used to make this decision compared to the inherently cheaper option of remanufacturing weapons which will help to/will maintain the strong process development and production ties which currently exist?

SSM-H-ORR-020
COMMENT LETTER

PAGE 1 OF 1

My name is James C. Franklin and I live at 141 Cumberland View Drive in Oak Ridge. I have both concerns and questions about the Draft PEIS the Stockpile Stewardship and Managment Plan (SSMP). Please answer the questions and concerns in the final PEIS.

The concerns:

1/40.33 A. The plan as I understand it, will use an untried and new program to assure that the weapons stockpile is both safe and reliable. The science based stewardship chosen as preferred alternative to remanufacturing has not been used and involves a large assumption that the "new" system will provide the required weapons stockpile assurance. It seems that DOE should provide a better description and justification of the rejection of the remanufacturing system of asssurance of the stockpile. The assertion that remanufacture to original specifications is not feasible requires justification. Can better justification of the science based stewardship option be provided?

2/40.29 B: The START I and START II require drastic reductions in stockpile and no production or design of new weapons, with very low rates of manufacture. I support the idea of reducing the size of the weapons complex, but it is difficult to understand how all the production plants are severly downsized to some small fraction of the 1980 levels with some plant closures, but the design agencies (LLNL SNL, LANL) are actually increased in capability, capacity, and staff with no design function required. Will DOE elaborate on the logic used to discard remanufacturing as a system to assure safety and reliability of the stockpile?

Questions:

3/40.24 A: The PEIS addresses urgently the need to attract and retain staff at the Design Laboratories, but does not mention the need to retain and attract staff to provide the technical skills to keep the production plants current. How is Y-12 expected to keep the core competencies in compliance with the National Defense Authorization Act, 1994 with a budget of $100 X 10^6 as shown for 2003 forward?

SSM-H-PTX-001
COMMENT LETTER

PAGE 1 OF 2

- Storage
- Employment
- Environment & Health

3 AREAS of Discussion

8 [illegible] 700 units per year

- The PEIS workload was ~~based upon~~ determined from projected stockpile sizes based upon treaties or agreements with other nations. Specifically the former Soviet union. ~~[illegible]~~ It does not appear that the ~~[illegible]~~ Russians are

1/40.11 eliminating their stockpiles at as great of pace as ~~[illegible]~~ we are. Do you not think that we are to ambitious toward dismantling not only our stockpile but our production capabilities as well?

~~What [illegible] are being built into the PEIS to upscale~~

2/40.68 - All the enduring stockpile was built from the late 1970 to Early 1990 (approximately 12 yr period) Assume the stockpile has 8400 weapons and the life of a weapon is 30 years then in about 2008 we would have to replace the stockpile at 700 units per year, yet we are sizing the complex to handle 300 units per year this appears to be a disconnect what is DOE Doing to address this?

SSM-H-PTX-001
COMMENT LETTER

PAGE 2 OF 2

1. So slow on disposal

1/40.11 continued
2. With our present President we donot know from one day to the next what he is going to do!
France is testing
China is testing etc.
It is foolish to be thinking of reducing the stockpile as it seem to be propose.

3/43.09
3 The environment damage that you may seem will affect this area. No consideration is given to all the chemicals that is poisoning the human body by allowing the chemical companies to put all their chemicals into our food supply which will harm all humanity in the U.S.
a. which is worse "the pollutants" put out by Pantex that affects the local Population. or
b. all the chemicals that go into our food which affects the whole nation

4/08.15
1. It will hurt the economy of this city to have another "pay roll" eliminated. The main 4 plans under plans to dispose of, and these already ... are - the air Base. Bell Helicopter.

SSM-H-PTX-002
COMMENT LETTER

PAGE 1 OF 2

Comment Form

United States Department of Energy

NAME: (Optional) Ronald D. W. Leam
ADDRESS: 6209 Rutgers Amarillo, Tx 79109
TELEPHONE: (806) 1477-4496

Having read through The three volumes of Documents, The Draft Stockpile Mgmt. Preferred Alternatives Report, the Draft Analysis of Stockpile Management Alternatives, and the Activity Implementation Plan (AIP) for the Transfer of High Explosives Production and surveillance from Pantex to the Los Alamos, Lawrence Livermore, and Sandia National Laboratories, I have the following questions and comments:

1/40.52
1) National Laboratory's Facilities are old - Los Alamos, built in the early sixties, Livermore, built in early seventies - These facilities do not meet current DOE Personnel Safety Requirements. Where in contrast - Pantex has facilities which are state-of-the-art both in meeting personnel safety requirements & meeting environmental requirements.

2/34.03
2) The High Explosive Mission is to be assigned only to facilities with existing infrastructure.
According to the Draft Analysis of Stockpile Mgmt Activities LANL is currently establishing a production infrastructure for the manufacture of detonators - however as late as December '95 no detonators have been produced.
According to the AIP - LLNL will restructure Site 300 to meet manufacturing requirements.

3/34.01
3) Transfer of Equipment
In the PEIS and the Draft Stockpile Mgmt Preferred Alternatives Report "no capital investments associated with transition are required" - Existing facilities and equipment

SSM-H-PTX-002
COMMENT LETTER

Comment Form

[illegible]

CONT

United States Department of Energy

NAME: (Optional) R. W. Zean

ADDRESS:

TELEPHONE: (806) 1477-4496

3/34.01 continued
AT TA-16 could be utilized. However, in the LAB AIP 60 pages of Equipment and 27 pages of processes are listed for transfer.

2) In the PEIS, The National LaBs supposedly have established expertise - the public is told time and again the labs are engaged in same type activities - However in the LaB AIP a significant period of process development/ process prove in - is required.

4/34.04
5) In PEIS - Four HE Alternatives are proposed & discussed - however in the Draft Stockpile Mgmt Preferred Alternative Report Only two options are recognized - Downsizing of Pantex and the Two LaB Concept. According to the Ranking Criteria Process the two LaB Concept ranks significantly

5/34.09
lower than Pantex, which itself received a ranking of 100 in all catagories. It is interesting to note as the Ranking Criteria Process was applied to each catagory throughout the SSM PEIS, the facility which ranked highest received the mission - High Explosive Fabrication is the only catagory which seems to run contrary to that rule.

6/34.06
6) What is the operating cost for the High Explosive Fabrication mission in the LaB Implementation plan?

7/09.06
7) Have hearings been held to discuss main charge transportation through the appropriately affected States?

SSM-H-PTX-003
COMMENT LETTER

PLEASE PRINT OR TYPE

Name DAVID L. MICHAELS

Address 6401 CLAREMONT DR

City AMARILLO State TX Zip Code 79109

MY COMMENT(S) ON THE PANTEX PLANT DRAFT ENVIRONMENTAL IMPACT STATEMENT IS/ARE:

GIVEN THE PAST EXPERIENCE WITH DOWNSIZING THE DOE BY RELOCATING MISSION ASSIGNMENTS FROM MOUND, PINELLAS AND

1/34.01
ROCKY FLATS TO OTHER SITES, I'M CONCERNED ABOUT THE POTENTIAL REASSIGNMENT OF THE HIGH EXPLOSIVES MISSION TO THE LABS FROM PANTEX. PAST AND/OR RECENT

2/34.05
SITE TRANSFERS HAVE YET TO PRODUCE ONE WR QUALITY PART AT THE LABS. THIS "LESSONS LEARNED" DOESN'T APPEAR TO BE CARRYING APPROPRIATE WEIGHT IN

1/34.01 continued
THE DECISION TO SITE HE OPERATIONS. H.E. MANUFACTURING MUST REMAIN AT PANTEX TO MAINTAIN QUALITY PROCESSES FOR WR USE AND PROPERLY MAINTAIN PRODUCTION SITE CORE COMPETENCY.

(USE BACK OF PAGE IF NECESARY)

Comments can be faxed in the SWEIS Faxline (1-800-822-5499), telephoned in on the SWEIS Hotline (1-800-788-0306), mailed in to DOE care of: Ms. [illegible], US Department of Energy, Albuquerque Operations Office, PO Box 5400, Albuquerque, NM 87185-5400; or sent via the Internet to [illegible]. Deadline is July 12, 1996.

SSM-H-PTX-004
COMMENT LETTER **PAGE 1 OF 2**

April 22, 1996

My name is Addis Charless, Jr. I own, live on, and operate a ranch ten miles north of the Pantex facility.

Although I am somewhat comfortable with the current mission at Pantex, I have marked reservations about an expanded role at Pantex that would include permanent storage of plutonium pits, other plutonium scrap, uranium, etc., as well as processing/reprocessing of same, and the possiblity that a nuclear reactor of whatever type might be built there to accommodate any burning of mixed oxide fuel (MOX), or to produce tritium.

1/04.05 To expand Pantex's role to accommodate any or all of the above is to me grossly irresponsible in view of the fact that the plant lies above the largest fresh water aquifer in the U. S., and that said aquifer is the lifeblood of this area's agriculture industry. Why the Ogallala aquifer has not been classified as a Class I water source is a puzzlement to me

2/11.13 None of the draft PEIS's have adequately addressed what would happen to this area's farm and ranch economy if a significant accident releasing substantial quantities of radionuclides were to occur regardless of how well it were to be cleaned up. I think the public's perception of the contamination would be such that it would make our products unmerchantable not just for the immediately affected area, but for the entire Panhandle's products.

SSM-H-PTX-004
COMMENT LETTER **PAGE 2 OF 2**

1/04.05 continued

It is a further contention by Pantex boosters that no substantial water pollution has occurred except for the perched water above the Ogallala aquifer. On June 27, 1995, a water sample was taken from one of my windmill wells and submitted for analysis. The results yielded the following information:

For 16 high explosives tested for, results were BQL.
For gross alpha, gross beta, Pu 239/240, Ra 226/228, Sr-90, tritium, U 234/238--detected, but below Safe Drinking Water Act maximums.

How much will these levels rise if Pantex's role is expanded? Is it something we are willing to risk? Is it truly necessary for the viability of Amarillo's or the Panhandle's economy? Is short term economic prosperity worth eternal contamination?

SSM-H-PTX-005
COMMENT LETTER
PAGE 1 OF 1

Issues of vital interest & concern for our state, our country, our world

Introduction —

I wish to address what is for me, the basic issue underlying the Stockpile Stewardship and Management Proposal -

1/40.50 This basic issue - which is not being addressed in these sessions - is a moral one & that the possession & therefore the threat - to use nuclear weapons of massive human and planetary destruction.

The DOE - PEIS proposal for the stockpile makes a mockery of our national integrity

2/40.07 1) To the signers of the recent non-proliferation treaty - and

2) As leaders in the Geneva discussions for a comprehensive test ban.

3/40.12 The costly expansion of nuclear weapon stockpiling in the proposal without any security justification, is particularly alarming in light of proposed cuts that will affect the lives of children - including "my children I guess" - and the elderly of this country.

Thank you -

Anna Marie Harkey
6338 Mimosa Lane, Dallas, TX 75230
214/363-6997

SSM-H-PTX-006
COMMENT LETTER
PAGE 1 OF 2

Mr. Vance Reed
President, Amarillo Economic Development Corporation

Comments on the Stockpile Stewardship & Management PEIS, the Storage & Disposition of Fissile Materials PEIS, and the Pantex Site-Wide EIS

Thank you for this opportunity to provide input to the Department of Energy regarding the operation of the Pantex plant. I would like to address two primary issues tonight regarding Pantex's future: 1) the environment, and 2) jobs.

1/40.52 Starting with the environment, I would like to reiterate this community's adament position that all work performed at Pantex continue to be done in a fashion that protects the environment. While the public has heard a great deal about "contamination" at Pantex, there has been little media attention given to the nature of pollution problems at Pantex. Most contaminants at Pantex are related to solvents and hydrocarbons that are very similar to those that would be found at practically any large manufacturing facility. This community is very reassured by the fact that Pantex has not had contamination problems from radioactive materials, such as occurred at Rocky Flats and Hanford.

The Amarillo Economic Development Corporation views Pantex in much the same manner as we view other large manufacturers in terms of presenting risks to the environment. For instance, if we were recruiting a computer chip manufacturer, we would realize that these plants have hazardous waste streams including arsenic and other heavy metals. The A.E.D.C. would only recruit a company that is committed to full compliance with E.P.A. and state environmental regulations. High tech businesses have created whole new industries and thousands of jobs, while working with very hazardous substances. This shows that protection of the environment and job creation can go hand-in-hand.

Likewise, we believe that Pantex can be a site where good, high-paying jobs are created in a work environment that includes potentially dangerous materials. When

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measured in terms of total payroll, Pantex is by far the area's largest employer. With 3,500 employees at the plant, a job multiplier of 3.87 shows that Pantex is responsible for a total of over 13,500 jobs in this region. This multiplier was established by Dr. Ray Perryman at Southern Methodist University. The multiplier reflects the fact that the money that Pantex brings into the local economy supports many retail, medical, educational, finance, insurance and real estate jobs. All told, employment related to Pantex represents over 12% of all jobs in the Amarillo metropolitan area. I urge the D.O.E. to correct the socio-economic impact portions of all three EIS documents to accurately reflect the impact of Pantex on our local economy. 2/08.15

Because of the importance of Pantex to our local economy, the A.E.D.C. is very pleased that Pantex has been chosen as the preferred site for continued assembly and disassembly functions. We also believe this decision is in the best economic interests of the nation, as it saves more than 1.5 Billion dollars to American taxpayers. 3/30.01

I also urge the D.O.E. to continue the high explosive fabrication mission that is currently performed at Pantex. Again, this not only protects jobs in our region, it saves American taxpayers 50 Million dollars compared with the cost of moving these operations to New Mexico. 4/34.01

For Pantex's future, the D.O.E. should locate storage and disposition missions at Pantex, as long as they can be done in an environmentally safe fashion. I urge the Department to make use of the expertise of the Amarillo National Resource Center for Plutonium. This resource center, which is operated by the University of Texas System, the Texas A&M University System, and the Texas Tech University System, can provide world-class evaluation of disposition options. I believe the Amarillo area will prove to be an outstanding operating environment for those storage and disposition functions that have been fully scientifically evaluated and safely implemented.

Once again, thank you for the opportunity to address you in this workshop tonight.

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COMMENTS REGARDING PANTEX HEARINGS

AMARILLO, TEXAS; APRIL 22, 1996 by JERI OSBORNE

I am Jeri Osborne. My husband Jim and I live and farm across FM 293 on the northside, downwind and downstream from the Pantex site. We raised our family of three children, one nephew, and kept another nephew and neice a good part of their lives on the farm. Jim and his brother and sisters were also raised there. His father bought the place in 1927.

I have come to speak on health and safety issues as well as the feasibility of having plutonium, other nuclear materials, and other types of hazardous materials and chemicals in our front yard as well as over the areas major water supply and in this very productive and vital agricultural, and a major food source -- for the nation as well as the world just for Amarillo's "powers that be" to possibly create a few more jobs and wealth for themselves.

At this time, there are no known results of long term health exposures to the effects of whatever is the present mission of Pantex --let alone future missions that may result from DOE's new plan. The technology is just not available at this time to perform many of the proposed missions. DOE does not now know what to do with surplus and weapon grade plutonium and other nuclear materials. How can they be so sure of the consequences of future missions that may be brought to the site? 1/11.25

Pantex is probably cleaner than other DOE sites, but it is on the superfund list. It may be safer than other sites, but we can

2/11.26 prove that accidents -- at least I hope the incidents that have affected us personally were accidents --have happened that has endangered our property as well as our personal safety and others in the neighborhood of Pantex. There have been numerous major fires on the site, three or four within the past two years. We took cold drinks and ice to the firemen on various occasions. We have had cast steel shrapnel chunked at us. We have picked up some 300 to 400 pounds of a naval breech block -- one piece weighing 59 pounds. Some of this shrapnel was found some one and one-half to two miles from where it was exploded. We have had tractor tires ruined from it.

Through the years, we have had windows broken, pictures knocked off walls, etc. On October 4, 1995, a very large charge of explosive was set off to signal the start of an emergency management drill. This "test" (drill) broke our house, cracked the slab, rafters, walls, brick, shower, plumbing causing flooding of the basement, and other damages, resulting in some $30,000 in repairs and replacement of carpets and other floor coverings, rebuilding the shower, cracks, etc. We also must have the house leveled. This incident was not only very frightening and dangerous, but has caused us much anxiety and inconvience. Trying to put up family for my mother's death and funeral and having family in for Christmas with a flooded basement, large holes drilled through the living room floor and in other areas of the house causes a great deal of stress to say the least.

Too many questions are yet unanswered by the studies that have been conducted. Granted, it would be impossible to anticipate all potential problems that may arise, but there does seem to be a lack of scientific research used for the study. It would appear that a conclusion has been drawn and figures to support that conclusion were used without any real scientific information.

One must question the credibility of those responsible for the documents and the realibility of the studies when such glaring inaccurate information can be found within the documents. One example of this is found in Storage and Disposition of Weapons-Usable Fissile Materials Draft Programmatic Environmental Impact Statement, Volume II, Pages 4-796 and 4-797 clearly show the town of Canyon outside the 80 kilometers radius and located within Deaf Smith County just north of Castro County. The population distribution map should show Canyon to be just south of Amarillo in Randall County, perhaps some 40 kilometers from Pantex. at the most.

We do not see the location of long term storage of nuclear materials, the possibility of processing /reprocessing, modification of pits, or the location of nuclear reactors at Pantex very good ideas. Nor do we

3/34.02 believe the moving of all the high explosive activities (to Pantex) in our best interests. The DOE has sites that are much larger and much farther away from population, agricultural areas, and major sources of water for its future missions than is Pantex.

Thank you.

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Perhaps a site around the 2000 block of Harmony or the 2700 block of Tecks or in SW Amarillo would suffice. If the city fathers ~~would~~ wouldnot want the activity in their neighborhoods, why would they want it for those neighbors to the east of Amarillo where a great deal of those within the trade area live and work to put food on their tables?

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COMMENT LETTER

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Comment Form

These comments apply to the following documents:

Storage and Disposition Draft PEIS

Stockpile Stewardship and Management Draft PEIS

Pantex Sitewide Draft EIS

United States Department of Energy

NAME: (Optional) RICHARD S. GOODOLL

ADDRESS: 7419 IMPERIAL DR. AMARILLO TX 79121

TELEPHONE: (806) 358 2039

1/40.52

I AM A CERTIFIED SAFETY PROFESSIONAL, AND I HAVE WORKED AT FOUR DOE FACILITIES, LOS ALAMOS NATIONAL LABORATORY, LIVERMORE NATIONAL LABORATORY, SANDIA NATIONAL LABORATORY, AND PANTEX. IN MY PROFESSIONAL OPINION PANTEX IS THE SAFEST AND MOST ENVIRONMENTALLY CONSCIOUS OF THESE FACILITIES.

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COMMENT LETTER

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HON. DIANNE BOSCH
CITY COMMISSIONER
CITY OF AMARILLO, TEXAS

COMMENTS ON THE STOCKPILE STEWARDSHIP AND MANAGEMENT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT, STORAGE AND DISPOSITION OF FISSILE MATERIALS PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT AND PANTEX SITE-WIDE ENVIRONMENTAL IMPACT STATEMENT

THANK YOU FOR THE CHANCE TO ADDRESS THE DEPARTMENT OF ENERGY IN THIS INTERACTIVE WORKSHOP FORMAT. AS AN AMARILLO CITY COMMISSIONER SINCE 1989, I HAVE WITNESSED COUNTLESS D.O.E. HEARINGS ON PANTEX. THE GIVE-AND -TAKE BETWEEN THE AUDIENCE AND THE D.O.E. OFFICIALS IS VERY

1/41.05 INFORMATIVE TO EVERYONE IN ATTENDANCE. THE D.O.E. IS TO BE APPLAUDED FOR THE USE OF AN INTERACTIVE FORMAT, AND SHOULD CONTINUE TO USE IT IN FUTURE HEARINGS.

2/40.21 THE D.O.E. IS ALSO TO BE APPLAUDED FOR THE OPEN MANNER WITH WHICH IT HAS, AND CONTINUES TO, ADDRESS LOCAL ENVIRONMENTAL CONCERNS. WE ARE ALSO THANKFUL THAT GOOD MANAGEMENT AT PANTEX BY THE D.O.E.'S CONTRACTORS, MASON & HANGER AND BATTELLE, HAS PREVENTED PANTEX FROM HAVING ENVIRONMENTAL PROBLEMS OF THE TYPE AND MAGNITUDE FOUND AT OTHER D.O.E. SITES. AS IS EVIDENT BY THE LARGE TURNOUT TONIGHT, THIS COMMUNITY STRONGLY SUPPORTS PANTEX, AND THIS

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SUPPORT COMES IN LARGE MEASURE FROM THE D.O.E.'S

2/40.21 continued COMMITMENT TO OUR LOCAL ENVIRONMENT. THAT CONTINUED COMMITMENT TO THE ENVIRONMENT IS CRITICAL FOR COMMUNITY SUPPORT OF ALL CONTINUED OR NEW MISSIONS AT PANTEX.

3/30.01 REGARDING THE STOCKPILE STEWARD SHIP AND MANAGEMENT PEIS, I STRONGLY SUPPORT THE CHOICE OF PANTEX AS THE PREFERRED ALTERNATIVE FOR THE ASSEMBLY AND DISASSEMBLY MISSION. THIS COMMUNITY IS EXTREMELY PROUD THAT PANTEX PLAYED AN IMPORTANT PART IN WINNING THE COLD WAR, AND WILL CONTINUE TO PLAY A CRITICAL ROLE IN REDUCING THE SIZE OF THE NATION'S NUCLEAR ARSENAL IN THE POST-COLD WAR PERIOD. KEEPING THIS MISSION AT PANTEX IS NOT ONLY THE RIGHT CHOICE FOR AMARILLO, IT ALSO MAKE SENSE FROM A NATIONAL PERSPECTIVE BECAUSE IT MAINTAINS A CONTINGENT PRODUCTION CAPABILITY, AND IT SAVES MORE THAT 1.5 BILLION DOLLARS WHEN COMPARED TO THE COST OF TRANSFERRING THE WORK TO THE NEVADA TEST SITE.

AS LONG AS WE ARE ON THE SUBJECT OF COST SAVINGS AND RETENTION OF PRODUCTION CAPABILITY, THE D.O.E. MUST NOT LET

4/34.01 THE HIGH EXPLOSIVE (H.E.) FABRICATION MISSION BE MOVED FROM PANTEX. PANTEX EMPLOYEES HAVE SUCCESSFULLY PERFORMED THIS MISSION FOR MORE THAN FORTY YEARS, AND THERE IS

4/34.01 continued

ABSOLUTELY NO REASON FOR THIS WORK TO BE MOVED. WHEN THE WEAPONS COMPLEX WAS ORGANIZED, IT MADE LOGICAL SENSE TO LOCATE HIGH EXPLOSIVE WORK WITH ASSEMBLY AND DISASSEMBLY. IT STILL MAKES SENSE. FURTHERMORE, THE D.O.E.'S OWN ANALYSIS INDICATES THAT THE COST OF TRANSFERRING H.E. WORK TO NEW MEXICO LABS WOULD BE FIFTY MILLION DOLLARS. IT IS INCONCEIVABLE. THAT THE D.O.E. MIGHT SEEK TO JUSTIFY SPENDING FIFTY MILLION DOLLARS ONLY TO END UP WITH LESS PRODUCTION CAPABILITY IN A LOCATION THAT HAS NEVER PERFORMED THIS MISSION.

IN TERMS OF STORAGE AND DISPOSITION ACTIVITIES, I WOULD FIRST LIKE TO NOTE MY PREVIOUS COMMENTS ABOUT THE NEED TO PROTECT THE ENVIRONMENT. I AM ENCOURAGED BY THE PREVIOUS COMMENTS ABOUT THE NEED TO PROTECT THE ENVIRONMENT. I AM ENCOURAGED BY THE OUTSTANDING ENVIRONMENTAL RECORD THAT PANTEX HAS REGARDING STORAGE OF PLUTONIUM OVER MANY YEARS. I HOPE THAT THE D.O.E. WILL MAKE THE RIGHT CHOICE AND CONTINUE THE SAFE STORAGE OF SURPLUS PLUTONIUM AT PANTEX. I ALSO HOPE THAT THE D.O.E. WILL KEEP IN MIND THAT PLUTONIUM FROM DISMANTLED WEAPONS REPRESENTS A TREMENDOUS INVESTMENT AND MAY PROVE TO BE A VALUABLE ASSET IN CIVILIAN

USE. I URGE THE D.O.E. TO CHOOSE PANTEX AS THE SITE FOR ENVIRONMENTALLY SOUND DISPOSITION ACTIVITIES.

ONCE AGAIN, THANK YOU FOR THE OPPORTUNITY TO COMMENT ON THE D.O.E.'S PLAN FOR THE FUTURE OF PANTEX. PANTEX HAS BEEN AN IMPORTANT PART OF OUR REGIONAL ECONOMY FOR MANY YEARS, AND WE SUPPORT THE CONTINUATION OF ENVIRONMENTALLY SOUND OPERATIONS AT THE PLANT. I WOULD ALSO LIKE TO THANK ALL THE CONCERNED CITIZENS OF OUR COMMUNITY WHO HAVE MAKE THE EFFORT TO ATTEND THIS MEETING TONIGHT.

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United States Department of Energy

NAME: (Optional) ROBERT L. BASS
ADDRESS: 2608 So. PARKER AMARILLO, TX 79109
TELEPHONE: (806) 372-3390

1/34.01 I strongly support the continuation of the high explosive function at the Pantex facility. I oppose any effort to move these functions to the national labs. Pantex is the most cost effective DOE facility and has an excellent track record in doing the high explosive functions.

2/40.20 • I believe that Pantex should be chosen as the location for fissile materials storage and disposition functions. Pantex already stores surplus plutonium and has a safety and security record that is unmatched in the DOE complex. When given fair budget consideration, strong local support and national security interest, Pantex is the ideal choice for this function of fissile materials storage and disposition.

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COMMENT LETTER

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STACY KNIGHT

1/34.01 I strongly support the continuation of the high explosive function at the Pantex facility. I oppose any effort to move these functions to the national labs. Pantex is the most cost effective DOE facility and has an excellent track record in doing the high explosive functions.

2/40.20 • I believe that Pantex should be chosen as the location for fissile materials storage and disposition functions. Pantex already stores surplus plutonium and has a safety and security record that is unmatched in the DOE complex. When given fair budget consideration, strong local support and national security interest, Pantex is the ideal choice for this function of fissile materials storage and disposition.

QUESTIONS:

3/40.83 • Please explain why the Lawrence Livermore National Laboratory and the Los Alamos National Laboratory stockpile management budgets show projected increases from 1996 to 2004, since the U.S. has terminated development of nuclear weapons.

• Are these projected increases in the stockpile management at the two labs based on transferring of missions to them which have previously been done at the production plants?

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COMMENT LETTER

BECKY ZENOR

1/34.01 I strongly support the continuation of the high explosive function at the Pantex facility. I oppose any effort to move these functions to the national labs. Pantex is the most cost effective DOE facility and has an excellent track record in doing the high explosive functions.

2/40.20
- I believe that Pantex should be chosen as the location for fissile materials storage and disposition functions. Pantex already stores surplus plutonium and has a safety and security record that is unmatched in the DOE complex. When given fair budget consideration, strong local support and national security interest, Pantex is the ideal choice for this function of fissile materials storage and disposition.

QUESTIONS:

3/40.83
- Are these stockpile stewardship management budget increases at the labs based on transferring missions to them which have previously been done at the Pantex Plant?

4/34.13
- In the Preferred Alternative Report, it gives the impression that the decision has been made to transfer high explosive works to the labs. Is this true? If not, on what basis will the decision be made?

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COMMENT LETTER

BELLE GAGE

1/34.01 I strongly support the continuation of the high explosive function at the Pantex facility. I oppose any effort to move these functions to the national labs. Pantex is the most cost effective DOE facility and has an excellent track record in doing the high explosive functions.

2/40.20
- I believe that Pantex should be chosen as the location for fissile materials storage and disposition functions. Pantex already stores surplus plutonium and has a safety and security record that is unmatched in the DOE complex. When given fair budget consideration, strong local support and national security interest, Pantex is the ideal choice for this function of fissile materials storage and disposition.

QUESTIONS:

3/34.10
- Please explain how DOE can justify the cost of 432 people at the weapons lab to manufacture explosive components when Pantex has identified about 50 people to perform that same operation.

4/34.07
- Is it reasonable to assume that the HE facilities to be used at the weapons lab for manufacturing explosive components are as new and as technologically advanced as those at Pantex?

1/34.01 continued
- Since the American taxpayer has already suffered the cost and burden of the new High "E" explosive facility at Pantex, wouldn't it be most reasonable to apply them to this mission?

"Just an Little Peace and Quiet" for Mac Stuart, All-American Physicist

by Rita Calvert, Director, Dallas Peace Center

Mac was a quiet, sensitive older brother, with a wacky sense of humor He was four when I was born, and was so excited that early morning that he ran from door to door on our street, knocking and announcing "Our little 'tiny' is here!" (I was stuck with that nickname for a long time!) He was a whiz at math and science (helped me with my story problems) but couldn't spell worth a darn! Each year when we would ask him what he wanted for Christmas, he would reply with a wry smile, "Just a little peace and quiet..."

He was not an egghead, though. He ran track (in spite of his asthma), and played terrific boogie-woogie and jazz piano. He could also knock out a powerful Chopin's Polonaise. He was voted the "Best Looking" in his Senior Class, and closely resembled a brown-eyed Robert Redford. But with all that, there was always an underlying seriousness, and a willingness to listen to his little sister's problems. His children told me that he was the same with them He would put aside a speech he was preparing, to talk or go pick them up when they needed a ride, and then go back to his work until well into the morning hours.


Mac Stuart (5 years) with Rita Calvert (1 year)

Mac was greatly touched by cruelty and hated violence, but he did love his Pittsburgh Pirates! I always dreaded when Dallas played Pittsburgh, because I knew one of us would lose. He had married a Chi Omega sister of mine, Sharon Meier, and they had a family of three girls and one boy.

He received his Doctorate in Nuclear Physics in 1955 from the University of Iowa, and went to work for Westinghouse right away. We never really knew what he was working on, since it was all classified. We eventually found out he had been one of the Senior Scientists on the first nuclear submarine, the U.S.S. Nautilus, working under Admiral Rickover for two years. He was responsible for the heat shield which protected the crew. The money from the new industry was good for a growing family, and they built a beautiful home in the suburbs of Pittsburgh.

As the Vietnam was was ending in 1973, he decided he did not want to work any longer in military projects, and went to work at Combustion Engineering in Granbery, Connecticut. This company designs nuclear power plants. Mac was in charge of the containment, or safety of the operation. After about five years, he became increasingly concerned about the possibility of a nuclear accident, (i.e. Three Mile Island) and asked to be loaned for research into alternate energy sources. His ultimate goal was to ret... to Evansville, Indiana, (our home) to teach.

After reaching Palo Alto, California and trying out his first swimming pool, he contracted a cough, which led to the discovery of carcinoma of the lung. He had surgery and chemotherapy, yet went to the office every day he possibly could (working as a consultant to the Electrical Power Research Institute.) While he was there, the real Three Mile Island incident occurred, justifying his fear.

By January, he began to have severe headaches, and tests found the cancer had metastasized to his brain. He continued to work through the radiation treatments.

By April, he called me and said he was "home free," and not to worry, he wasn't "going anywhere." He offered to send me a book he had been reading on the power of the mind over our circumstances, in response to my confiding problems with my new profession. We were planning to go to California after his hair grew back, for the wedding of his daughter, Holly.

On May 13 we called to wish him "The Big Five-O, and got no answer. The next day his minister called me to say he had entered the hospital that weekend, and exploratory surgery for fluid build-up had discovered the cancer had spread throughout his body, and he had maybe 10 days to live.

He died on June 2, after telling us to go to our hotel to rest, that we looked tired. At his memorial service his work associates told me that he had turned in his last project, as complete and concise as ever, and checked into the hospital for his final stay. His minister who went to comfort him, found himself comforted by the patient, who kept his sense of humor and had accepted his upcoming death with grace. At the memorial service when they played "Let There Be Peace on Earth, and Let it Begin With Me," I knew that Mac had found his "Peace and quiet" at last.


Stuart Family, 1962—Front: Sharon, Holly, Mac; Middle: Rob, Teresa; Back: Elaine

Postscript

Since the time of writing of the article above, I have been asked by people in the anti-nuclear movement if my brother could have been exposed to excessive radiation. Now that I know more about this issue, I am sure of it. He worked with atomic energy from 1951 to 1979, not exactly a time in history when we were aware of the scope of its dangers.

Three years after his death, his first wife Sharon developed leukemia, and died within 6 months. His youngest daughter, Holly gave birth to a 2 1/2 pound baby boy, who was hospitalized for three months. His second daughter, Teresa, developed a fibroid tumor when pregnant with her third child; and his oldest daughter, Elaine, was childless for almost 20 years, and only recently became pregnant after extensive fertility treatments. These events began to fit a pattern.

Mac was a heavy smoker. He suffered from asthma as a young boy, and was probably very susceptible to lung irritation. But he was also exposed to who-knows-how-much radiation for 20 years. He made many trips to White Sands, NM, and doubtless many other nuclear installations. He suffered episodes of thyroid and testicular inflammation in the 1960's which destroyed the function of those organs. I have every reason to believe that he, and probably his family, have been victims of radiation exposure, as well as tobacco smoke.

This knowledge adds greatly to the pain of losing these two young vibrant human beings, who left four children alone to fend for themselves these last 16 years. I have tried to be Mom and Grandma to his Grandchildren, but they have missed their own parents greatly. Who knows what they could have contributed to the world at large, not to mention their family?

When Fumiko Amano, a survivor of Hiroshima and a peace educator, came to my office at the Dallas Peace Center to speak, we embraced and grieved for the loss of our two brothers to the nuclear bomb. When will the Nuclear Holocaust end? When will we listen to the scientists and other victims who cry out from their graves and warn us every day of the dual danger of smoking and exposure to nuclear by-products? When will we destroy these weapons of destruction and learn to rely on nonviolent means to solve conflict?

President Eisenhower was prophetic when he said "The world in arms is not spending money alone. It is spending the sweat of its laborers, the genius of its scientists, the hopes of its children." The price is too high.

Call your Congressperson and both Senators today to ask that they oppose the trucking of nuclear waste from Maine and Vermont to dump on Sierra Blanca, Texas, upstream from Big Bend, 16 miles from the Rio Grande (or Bravo, as the Mexicans call it). Tell them to vote "No "on HR 558 and S. 419, the Texas Compact Bill, which we defeated in September, but which saw flurries of activity from proponents (including Texas Governor George Bush) in December and again in March. Also tell them to vote against the transfer of land in Ward Valley to California to build a nuclear dump near indigenous land, endangering non-human and human species (H.R. 2334 and S. 1596) See back cover and inside back cover for more information.

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It is my intent this evening to speak briefly to each of the Programmatic Environmental Impact Statements, and reserve comments on the Pantex Site-Wide EIS until the June public meeting.

These documents are being addressed in this community as an economic and jobs issue. While the local economy is undeniably important, both of these PEIS drafts deal with issues that have national and international implications, ~~and they deserve to be considered in that light~~. Those implications involve national and international security; they involve decisions about nuclear waste that we have been unable to make decisions about for more than 50 years; and they involve introducing new technologies with a wide range of health, ~~and~~ safety and environmental risks. They deserve to be considered in that light, read thoughtfully and carefully, and addressed with more than pep rallies about jobs.

1/40.36 The Stockpile Stewardship and Management PEIS, does not ~~make~~ adequately make a case for development of of more than $2.6 billion in new capital cost and $2 billion in development of a ~~new~~ new super computer. The reliability of US nuclear weapons has been tested over and over again. The French just recently completed a series of tests designed to allow them to continue nuclear weapons development by simulated tests and computer models. No reasonable person can look at

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2/40.07 the proposed new facilities and and believe they have any purpose other than continued weapons development.

The storage and disposition options provide us no good choices; reasonably so, because there are none. The emphasis on the spent fuel standard may leave us with a false sense of security – virtually every country which has developed nuclear weapons has done so from spent nuclear fuel. It may ~~prevent~~ provide some level of security from theft by terrorists, but the nuclear nations of the world themselves hold hostage each other and the non-nuclear nations.

We have for more than 50 years been unable to resolve the issue of what is to be done with spent nuclear fuel – producing more of it, or other materials equally as toxic, is more problem, not solution –

Mavis Belisle
HCR 2 Box 25
Panhandle TX 79068
335-1715

PANTEX WORKSHOPS April 22, 1996
Statement by William H. Seewald

Given the time allotted and the amount of information to be covered in these "workshops," remarks will have to be brief and abridged. However, notwithstanding the voluminous issues of great concern, some reference must be made to the process. Combining these three documents into a single opportunity for public input together with the very short amount of time much of the material has been available does justice

1/41.10

neither to the NEPA process itself, nor to the people and agencies that wish to make reasoned responses to these documents. At least in the case of the Stockpile Stewardship as well as the Storage and Disposition, the documents are substantive enough to require careful analysis. It is also an unavoidable conclusion that the hearing process envisioned by NEPA has been transformed by DOE into a format they feel they can more effectively control — that being the workshops. There is nothing wrong with workshops per se, but they do not meet the government's full responsibility to the public. That any of us at all are standing here to give testimony is only the result of citizen lobbying and the willingness of individuals to face down any obstacles to get their concerns into the public record.

2/41.05

One overriding point must be made regarding the Stockpile Stewardship and Management document even though one also must look at the cumulative impact of all three. It is clear that one of the significant premises compelling much of the decision-making process is the extraordinary attempt by the government to justify the continued operation of all three of the major DOE weapons laboratories, Los Alamos, Sandia, and Lawrence Livermore. The redundant laboratory capacity built during the cold war to spur competition can now only be characterized as an obscene abuse of the tax-payers pocketbook. That such a political decision gets made in Washington is certainly no surprise, but it is incumbent on all of us to demand accountability in these decisions, to refuse to acquiesce in expedient political decisions as well as those that are based on bad science or a disregard for the natural resources of the Panhandle.

3/40.27

The Storage and Disposition document with its potentially momentous effect on our area is tragically flawed in three important areas. Number one, it doesn't really live up to the second part of its title. If long-term storage decisions are to be made, it seems absolutely essential that they be informed by a least a fairly concrete sense of the method of disposal as well as where that will happen, the time frame, and a reasonable consideration of the processes themselves. Secondly, this EIS, as with the others under consideration today, does not make a realistic distinction between strategic and surplus plutonium. The effort to maintain two thirds of all the plutonium ever produced in the U.S. as "strategic" evidences a less than serious commitment to disarmament as well as giving rise to the suspicion that some effort to generate commerce in plutonium is superseding the security need to immobilize this dangerous substance. Thirdly, this

document sets out options that would obligate plutonium processing, generating all kinds of new nuclear waste streams that have never existed at Pantex before. The document gives little or no consideration to the effects on Panhandle agriculture. Just the threat of contamination from these activities could devastate the marketability of our products. It furthermore remains unconscionable that apparently considerations other than the water needs of domestic and agricultural usage seem to preclude the realistic designation of the Ogallala as an aquifer eligible for the fullest protection of federal law and policy.

The Site-Wide EIS, an effort brought about by citizen lobbying of the Department of Energy, has not really been in the public domain long enough for a detailed consideration. Unfortunately, the substance of the document itself may require much less time than the gravity of the issues warrants. There is again no consideration of the most basic industry of the Panhandle, agriculture. The agreement to evaluate alternative storage sites for pits, specifically Department of Defense sites seems to have been an insubstantial one since that site is not included in the actual storage EIS. If, as implied in the analysis, Manzano mountain becomes ineligible because of the the threat such a facility represents to Albuquerque, what are we to make of the government's concern for the residents of the Panhandle?

Sad to say we hear more about jobs than grave issues relative to safety and the protection of natural resources. But the best way absolutely to protect jobs in the Panhandle, whether in agriculture or at the Pantex Plant itself, is to keep the plant from becoming the next Rocky Flats. When that happens the only jobs will be for nuclear waste handlers and the state regulators who can only step in after the damage is actually done but who have no federally mandated authority over many of the processing functions being proposed. On top of the Ogallala Aquifer is the wrong place for long-term storage of plutonium, nuclear waste facilities, or any kind of plutonium processing.

Comments for PEIS Public Hearing on
Storage and Disposition of Weapons-Usable Fissile Materials
and
Stockpile Stewardship and Management
Amarillo, TX April 22, 1996
Doris Berg Smith

In a Democracy the voice of the people is important in any decision-making policies regarding how our government will manage surplus nuclear materials and what forms of disposition are being considered. At this time it is vital that all the right questions are asked to protect the natural resources of this area for the future generations of not only the Texas Panhandle and the State of Texas, but of the world.

Many issues come into play in this very over-arching discussion. Not the least among them the cost to us the taxpayer to produce these documents and to find them flawed in many ways. These Documents are lacking important information in many areas that make it virtually impossible to even begin the discussion.

The over-all cost to you and me, neighbor, for implementing the expensive options characterized in these documents are not prudent or wise. 1/40.07 Why is the Department of Energy so intent on building new Research, Development and Testing facilities when the entire world is looking to the U.S. for leadership in an extension of the Non-Proliferation Treaty, and a zero threshold for a Comprehensive Test Ban. Instead the intent seems to be continue to build and test!

2/40.12 In the SSM-PEIS the scenario for these options, in a downsizing of the nuclear weapons complex, alone is expected to exceed $30 Billion within a decade. These proposed new facilities are expensive! In this time of tight budget constraints, we the grassroots people should be imploring our Congressional leaders to stop all this massive spending on projects which lead to a build up in nuclear weapons. How many weapons do we need before we say, "That's enough?" How many nuclear warheads have we used?

It is time now, with the downsizing, to really actively pursue **REAL DOWNSIZING.** Do we want to continue to drag our country into further indebtedness by continuing nuclear weapons production? What is the real reason behind pouring dollars into Defense - are we trying to keep war and war games going in the pretense that this is the way to build peace and to achieve economic development in rural communities across America? This is a 'sunset industry', my friends and neighbors, and needs to be managed as such.

3/10.13 What will the DOE and "We" do with all the waste that will be generated for at least the next 20 years? There are no licensed facilities to accept the wastes that are piled up on facilities throughout the DOE Complex at this time - why generate more than needs to be generated.

We are now faced with storage and disposition of surplus fissile materials, every option considered has tremendous waste streams attached to any option. Where will this waste go? It seems quite evident that the site that creates the waste, keeps the waste. Will that saddle communities across this country with the economic and environmental problems of hosting waste treatment, storage and processing facilities?

1

4/43.09 In the PEIS's where were the impacts to the present agricultural economy which has built and sustained this area? Why were the risks to this economic stronghold not assessed? What will happen when we no longer produce food for people, where is our priority? Are bombs more important than food? We in agriculture strive to produce quality, wholesome food for the world population -one farmer feeds in excess of 131 people, yet the industry across the road from us builds bombs to annihilate people. Where is our sense of morality and respect for life?

5/04.05 The documents fail to address the issue of the location of Pantex over the Ogallala Aquifer. 4/43.09 continued Water and agriculture are the real wealth of the Texas Panhandle, without them there would be no "Texas Panhandle". Food is the most important commodity we produce - it must be protected.

Not all alternatives for siting the processes for storage and disposition were analyzed - If Manzano Weapons Storage Site at Kirtland Air Force Base has facility that could store 30,00 pits, why was it not further characterized in the other documents?

We say to you DOE, we want no storage of surplus plutonium at Pantex because it is dangerous and will lead to plutonium processing which results in additional waste generation and storage.

No processing of plutonium at Pantex since every plutonium processing facility has created large amounts of contamination which has adversely affected the workers and the public.

No waste disposal facilities at Pantex because we must preserve and protect the Ogallala aquifer.

Historically the plutonium at Pantex has been in pit form, now with these documents all of a the nation's weapons-usable plutonium not in active warheads will be stored at Pantex - plutonium will come to Pantex from Rocky Flats, Colorado; Hanford, Washington; Los Alamos, New Mexico; Savannah River, South Carolina; Nevada Test Site; and the Idaho National Engineering Lab. We find this unacceptable to an agricultural productive area.

No nuclear power reactors at Pantex - there is no need to construct them and the use of MOX fuel in them will not destroy the plutonium - it only creates more plutonium.

Please do not turn the Texas Panhandle, known for its beef and cereal grain production, into a plutonium waste site. You have created enough of these tragic land problems across the United States - the is no need to create another one here. It is very much like putting poison in your cereal bowl! When this area becomes contaminated - what have we gained?

-30-

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COMMENT LETTER
PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: Brooke M.I.: L Last Name: Isberg
Street Address: 2013A Calle Lesano
Street Address 2:
City: Santa Fe State: NM Zip Code: 87501 -
Organization: Humanity
Telephone: 505-988-3199 Fax: - -

Comments:
— MJ Byrne's clarity, resourcefulness & patience are respected and appreciated —

1/41.03 Was this some expensive slick horse & pony show — are your minds made up all ready? It feels as tho youre going through the appropriated motions, but really care little about what people want. I hate feeling helpless another holocaust. This entire evening really did sound like a scene from Dr Strangelove. Any more of this and I'm afraid I'll begin understanding WACO and the Michigan militia.

2/40.50 HEAR ME SOMEONE: I SAY NO

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

SSM-H-SF-002
COMMENT LETTER
PAGE 1 OF 2

SS & M PEIS Testimony - April 25, 1996

Christina Brown
Rt. 3, Box 173R
Espanola, NM 87532

My name is Christina Brown, I have lived in Northern New Mexico for the last twenty years.

1/40.36 The current plans the Department of Energy has regarding stockpile stewardship of nuclear weapons and increased plutonium production at Los Alamos Lab are unacceptable. It is just plain crazy to be spending billions of dollars on new, experimental, expensive facilities to test weapons reliability when we can already accomplish this with existing technologies and facilities. Meanwhile the many social, economic and environmental problems in this state are being ignored and underfunded by the government. New Mexico has been the national nuclear sacrifice zone for far too long. Enough is enough!

If the nuclear industry and politicians really cared about peoples' health and safety, or about the future of this planet, they would make cleaning up the radioactive waste that is already here their number one priority. What needs to happen is for the money and the politics to truly get behind the will of the people in this matter.

2/40.15 If we as a nation put the same kind of energy and purpose into permanently and ethically solving the nuclear waste problem as we did with the Manhattan Project in World War Two, we are capable of finding an answer. That is what the Lab should be doing first and foremost, using the great scientific minds at their disposal to deal with the radioactive mess that has already been made.

3/40.27 Current environmental restoration activities at Los Alamos seem to be the equivalent of putting a band-aid on a severed limb. And carting radioactive waste around the country to store in someone else's backyard - usually states with an under-represented, indiginous or poor population base -- is not only wrong, it's stupid, as it greatly increases the likelihood of a radioactive accident.

Another priority for the lab should be research and development of alternative, NON-POLLUTING sources of energy - solar energy being the most obvious choice for this state. After that, the lab should get serious about benign technology transfer, economic parity and environmental justice for surrounding communities that have been affected by radioactivity for the last fifty years.

SSM-H-SF-002
COMMENT LETTER **PAGE 2 OF 2**

4/40.69 Although the Department of Energy and LANL have become much more open about their activities in recent years, which is commendable, the fact is that people have been lied to about the risks of radioactive exposure and the true activities at the lab for so long, that it is really difficult for myself and many others to trust these institutions. I'm not here to shut down LANL completely or to take jobs away from people. I have close friends who live and work in Los Alamos; it used to be a truly beautiful, natural place. But every time I go up the hill, I can feel the fear and denial, and I wonder how many more "safe" levels of exposure my body can receive before I become affected by the poison that I know is there.

Our current ability to destroy ourselves and every living creature on the planet through nuclear weapons and waste is the ultimate result of losing touch with the natural world and disrespecting the Earth. Unless we halt this madness NOW, we can forget about any future whatsoever for human beings or the generations to come. To support a sustainable world, the lab MUST change its direction - there should be plenty of employment in the fields of environmentally sound waste disposal, alternative energy research and also in the medical field to find ways of healing people from this horrible legacy of death we have created.

3/40.27 continued

5/41.03 Finally, I strongly urge the Department of Energy and our representatives in Washington -- do not underestimate the urgency behind the comments given today at this public hearing. Because the people who believe that nuclear weapons production and nuclear waste exposure is morally, ethically and environmentally wrong are not going to go away. Don't assume that it is "just those radicals in Santa Fe" who feel this way - there are many, many more of us out their who either couldn't leave their jobs or families to attend these hearings, or who have already given up on having "the system" acknowledge and do something about their views. So please, please take this testimony very seriously. Thank you for the opportunity to express my views.

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COMMENT LETTER **PAGE 1 OF 4**

Submitted to the April 25th 1996
Hearing on the Future of LANL,
Doubletree Hotel,
Santa Fe, NM

LOOK AT THE DAY AND AGE WE LIVE IN.

RADIATION FROM CHERNOBYL IS NOT ONLY SMOULDERING, SOME OF IT RECENTLY CAUGHT FIRE – THE JURY'S STILL OUT ON THAT ONE. WHAT A STRANGE TIME TO BE CONSIDERING GREATER NUCLEAR OUTPUT FOR LANL

1/10.11 THE IRONY CONTINUES: NO ONE HAS YET PRESENTED A REASONABLE PLAN TO DISPOSE OF THE NUCLEAR WASTES GENERATED ON OUR SIDE, IN THE RACE WITH THE RUSSIANS. RUSSIA, ITSELF IN A STATE OF RELATIVE POLITICAL AND ECONOMIC TURMOIL, CANNOT ACCOUNT FOR MASSIVE AMOUNTS OF FISSILE MATERIAL. OUR OWN SENATE IN THE PAST MONTH HAS BEEN DISCUSSING WHAT TO DO ABOUT THE TONS OF PLUTONIUM AND ENRICHED URANIUM THROUGHOUT THE WORLD AND THE FACT THE A NUMBER OF *ILL*-PAID RUSSIAN EXPERTS COULD BE PREY TO *WELL*-PAYING, INTERNATIONAL TERRORISTS.

2/40.06 ARE *WE* THEN TO BE PREY TO A MONEYED MILITARY ESTABLISHMENT, EVEN NOW THAT

2/40.06 continued

THE COLD WAR IS SUPPOSEDLY OVER? ARE *WE* TO GIVE UP THE ONE MOVE THAT COULD HELP ELIMINATE THESE WEAPONS OF ARMAGEDDON – THE MOVE OF RELINQUISHING THEM OURSELVES?

WE HAVE OUR OWN, HOME-GROWN CATASTROPHES, EVEN IF THEY HAVE SO FAR BEEN ON A SMALLER SCALE THAN CHERNOBYL: OUR DOWNWINDERS, OUR VICTIMS OF SADISTIC RADIATION EXPERIMENTS, OUR TOWNS LIKE ROCKY FLATS.

3/43.06

AND NOW THE D.O.E. IS SUGGESTING THAT LOS ALAMOS TAKE ON ROCKY FLATS' – THIS HUMAN FAILURE'S – RESPONSIBILITY FOR THE PRODUCTION OF PLUTONIUM?

I WAS A JOURNALIST IN JAPAN FOR SIX YEARS. NATURALLY, MY READERS WERE VERY INTERESTED IN WHAT DROVE THE JAPANESE ECONOMIC MIRACLE. NATURALLY, THERE WAS NO SIMPLE ANSWER. MY RESPONSES INCLUDED THINGS MOST OF US BELIEVE IMPORTANT: HARD WORK, RESEARCH, TECHNOLOGICAL PROWESS, A DEVOTION TO EDUCATION. THERE WAS ANOTHER FACTOR THAT WAS RARELY REPORTED: THE PEACEFUL CONSTITUTION IMPOSED BY THE MACCARTHUR GOVERNMENT AFTER THE WAR. NOT ONLY IS

JAPAN LEGALLY A COUNTRY *FREE* OF NUCLEAR ARMS, BUT THE VERY SPIRIT OF JAPAN'S CONSTITUTION DISCOURAGES WARLIKE ACTIVITIES; RATHER, IT *ENCOURAGES* THE PRACTICES OF PEACE. NOW, ANYBODY WHO THINKS SUCH PRACTICE IS SIMPLY A PASSIVE ATTITUDE OUGHT GO TALK TO SOMEONE WHO HAS BEEN IN THE AUTOMOBILE BUSINESS FOR A LONG TIME, OR IN THE ELECTRONICS INDUSTRY. THE POINT IS THAT, YES, WE DO NEED TO REMAIN COMPETITIVE.

4/40.27

YES, WE NEED A LOS ALAMOS. WE NEED SCIENTISTS, EVEN TECHNOCRATS; BUT WE DO *NOT* NEED THEM SPENDING .THEIR PRECIOUS EFFORTS AND OUR TAX DOLLARS ON MECHANISMS OF DESTRUCTION THAT *NO ONE* SHOULD EVER USE.

WE NEED OUR SCIENTIFIC MINDS WORKING ON SERIOUS PROBLEMS: WAYS TO MITIGATE POLLUTION, TO SAVE ENERGY, TO FIGHT DISEASE, TO FEED THE HUNGRY, TO CONSERVE WATER. THE CREATORS OF LANL MUST HAVE BELIEVED THEIR EFFORTS WOULD BRING ABOUT PEACE. IF THAT IS THE CASE, LET'S MAKE LANL REALIZE ITS

ORIGINAL MISSION, OF BRINGING PEACE, AND NOT ANNIHILATION, TO THE WORLD.

THANK YOU.

Daniel E. Masler

DANIEL E. MASLER
1853 OBrien
SFe. NM 87508
(982-3144)

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: FRANCES M.I.: A Last Name: MATTEGY

Street Address: 636 Camino Lejo

Street Address 2:

City: Santa Fe State: NM Zip Code: 87505-

Organization:

Telephone: 505-983-1453 Fax:

Comments:

I was living in the southeastern part of W. Germany in April 1986 with my one yr. old daughter, when the Chernobyl accident happened. The first few days everything was hushed up. Then we were asked to stay inside as much as possible, not to eat our home-grown vegetables, wild mushrooms or wild herbs and not to drink the milk of our cows, sheep or goats. The contaminated milk was eventually shipped to the East Block & Third World countries in the form of powdered milk, the highly contaminated hazelnuts found their way into our chocolates years later. These are just a few examples of the unscrupulousness of many business people.
We were advised not to let our children play in the fields, in the sandboxes, on the earth for one whole year. The forests along the Western Czechoslova-

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

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COMMENT LETTER

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sian border is dead.
For months people were shopping vegetables with geiger counters to purchase the least radioactive vegetables.
My pregnant girlfriend, who was part of a self-sufficient country commune kept on living off her vegetables and goat's milk products and gave birth to a dead baby.
For 6 years we were advised not to eat wild mushrooms, as they soaked up the caesium from the earth. And this happened 1,000's of km away from Chernobyl.
I was considering moving to Asia to bring up my child in a healthy environment, but when I found out, that the Himalayas were also heavily contaminated, as that huge cloud of fall-out was moving all around the planet and the higher the elevation the more radioactive it is. I realized that there is no where to go. We are all more or less affected by radiological accidents. We live in New Mexico will be the biggest losers, but everybody on the planet loses.

1/10.30

I cannot understand the short-sightedness of the people behind nuclear energy as well as a source of energy as for the manufacturing of weapons.
We have had innumerable radiological incidents to proove that humans err. I don't believe we have the wisdom to handle this energy.

2/40.07

I also can't understand the hypocrisy of the U.S. Government concerning the Nuclear Non-proliferation Treaty on the one hand & designing new so-called "mini"-nuclear bombs. The U.S. Government is provoking the countries who don't have nuclear weapons to produce them, instead of discouraging them.

SSM-H-SF-005
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: CATHERINE M.I.: M Last Name: OMALLEY
Street Address: 7100 LOUISIANA BLVD NE
Street Address 2:
City: ALBUQUERQUE State: NM Zip Code: 87109 -
Organization: CITIZENS ALLIE
Telephone: 505 - 821 - 9592 Fax: - -

Comments:

1/40.60

I think that as part of these EIS proposals that we also be shown a zero-weapons analysis. This would be more congruent with our foreign policy objectives and much more economical considering our present deficit.

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

[redacted]

SSM-H-SF-006
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM
Please print clearly

First Name: ______ M.I.: __ Last Name: ______
Street Address: ______
Street Address 2: ______
City: ______ State: __ Zip Code: _____-____
Organization: ______
Telephone: ___-___-____ Fax: ___-___-____

Comments:

1/41.05 The meeting should have used a sign up list. It's not fair to people who planned to speak.

[signature]

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

[redacted]

SSM-H-SF-007
COMMENT LETTER

PAGE 1 OF 2

PHYSICIANS FOR SOCIAL RESPONSIBILITY/NEW MEXICO
The United States Affiliate of International Physicians for the Prevention of Nuclear War
Recipient of the 1985 NOBEL PEACE PRIZE

Comments of Janna Rolland, Executive Director of
New Mexico Physicians for Social Responsibility
on the Draft Programmatic Environmental Impact Statement for Stockpile
Stewardship and Management
Santa Fe, April 25, 1996

Good Afternoon. My name is Janna Rolland and I am the Director of New Mexico Physicians for Social Responsibility.

1/40.07 With the end of the Cold War, the DOE has the opportunity to shift away from weapons production to weapons dismantlement and maintenance of existing weapons. Instead of downsizing an consolidating, the DOE is proposing an unnecessary and expensive new program of Stockpile Stewardship and Management. PSR believes that this program is unnecessary, too costly, and harmful to non-proliferation and international security goals.

The DOE's plans to invest billions of dollars in large-scale experimental facilities to overcome limitations on nuclear weapons research and development programs imposed by the current moratorium on underground nuclear testing. Not surprisingly, the international community perceives these programs as attempts by the U.S. to get around a Comprehensive Test Ban Treaty. The development of advanced nuclear experimental capabilities creates the potential for a new breed of competition among nuclear weapons states. In this way, the proposed SS&M program violates the spirit of the Nuclear Non-Proliferation Treaty, which could lead other countries to abandon their treaty responsibilities, increasing the likelihood of proliferation and decreasing hope for Russian ratification of START II and future arm reduction treaties.

2/40.02 The "sub-critical" tests planned for the Nevada Test Site this summer, can only be seen by other nations as a mockery of the negotiations for the Comprehensive Test Ban Treaty currently taking place in Geneva. These experiments are not needed to maintain existing weapons and seriously call into question our government's commitment to arms control.

1/40.07 continued This PEIS must include analysis of alternatives that are consistent with U.S. treaty obligations, including the NPT's requirement to eliminate nuclear weapons. This includes analyzing arsenals of less than 1000 weapons.

3/41.18 Even as the SS&M PEIS considers three dangerous, costly and unnecessary facilities,

PSR/NEW MEXICO P.O. Box 4096, Albuquerque, N.M. 87196, (505) 266-5646

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COMMENT LETTER
PAGE 2 OF 2

3/41.18 continued — It fails to include in its scope the DARHT facility. We are told that the DARHT facility at LANL is an integral and essential component to the SS&M program, as are the Low Yield Nuclear Experiment Facility (LYNER) and Big Explosive Experimental Facility (BEEF) and the at the Nevada Test Site. The DOE should justify each new and existing facility in light of the end of the Cold War and true national security needs.

4/21.04 — The National Ignition Facility is estimated to cost $4.5 billion. This will only create 230 long term jobs at Livermore. Think how many teachers could be employed. Think how much health care can be provided to rural or inner city communities. Think how much low income housing could be created.

Rather than passively monitoring the nuclear arsenal while it awaits dismantlement, the DOE is proposing to spend billions of taxpayer's hard earned dollars in the name of national security. $40 billion over 10 years! A better

5/40.36 — approach is to maintain a minimal curatorship program that complies with arms control treaty obligations and nonproliferation goals. Such a program would be limited to passive maintenance of the arsenal as it awaits dismantlement.

In closing, I would like to remind you that a healthy, well-educated, well-housed citizenry living in a clean and beautiful environment is true national security.

Thank you.

SSM-H-SF-008
COMMENT LETTER
PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: NATIE M.I.: W Last Name: DOWNEY
Street Address: P.O. BOX #5180
Street Address 2:
City: VELARDE State: NM Zip Code: 87582
Organization:
Telephone: Fax:

Comments:

1/40.27 — STOP YOUR INSANE WORK
CONVERT TO Alternative Technology!
(i.e. Solar, Water Treatment, Wind,)
Please do this or just kill yourself.

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

[redacted]

SSM-H-SF-009
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: Louisa M.I.: Last Name: McElwain

Street Address: Rt 9 Box 73-M

Street Address 2:

City: Santa Fe State: NM Zip Code: 87505-

Organization: Mother

Telephone: - - Fax: - -

Comments:
When I described to my children, 4 and 6 years old, the nature of the event I was attending (the public hearing), they told me to "Tell them NO!"

1/40.72 There have been so many eloquent statements here tonight against bringing any more nuclear enterprises to our area; I simply add my name to the list.

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

SSM-H-SF-010
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: Iain M.I.: Last Name: Riebig

Street Address: Rt 11 Box 508-A

Street Address 2:

City: Espanola State: NM Zip Code: 87532-

Organization:

Telephone: 505-753-4239 Fax: 505 747-2180

Comments:
1/40.34 Please consider using a word other than "stewardship" when talking about nuclear weapons (and other weapons of mass destruction) and the stockpiling thereof. "Stewardship" implies caretaking of a valued resource. When we talk about waste we use the word "management." Why not use this one for the stockpile as well?

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

SSM-H-SF-011
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: PATRICK M.I.: K Last Name: SIMPSON

Street Address: 1108 W ALAMEDA

Street Address 2:

City: SANTA FE State: NM Zip Code: 87501 -

Organization:

Telephone: 505 - 986 - 9064 Fax: - -

Comments:

1/40.27 I AM STRONGLY OPPOSED TO PRODUCTION OF PLUTONIUM PITS AT L.A.N.L. TIME HAS SHOWN THAT LANL IS UNABLE TO CONTROL ITS' WASTE. IN ADDITION I BELIEVE THAT LANL SHOULD RE-DIRECT ITS ENERGIES TOWARDS PEACEFUL NON-NUCLEAR AREAS.

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

SSM-H-SF-012
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: Gail M.I.: T Last Name: Herling

Street Address: 1105 West Alameda

Street Address 2:

City: Santa Fe State: NM Zip Code: 87501 -

Organization: none

Telephone: 505 - 986 - 9054 Fax: - -

Comments:

1/10.29 LANL has not shown good faith in developing & maintaining safety standards while involved in nuclear weapons research & application: I don't want my child or any children in NM exposed to radioactive waste produced in the name of "safety & reliability" of nuclear stockpiles.

2/40.27 It's time for LANL to change its orientation, to catch up with the rest of the world and use technology in a way that promotes renewable, clean resources (ie- solar energy, geothermal, wind energy). This is the only alternative that seems viable, during such volatile times, when even LANL seems quite inept in controlling its emissions (via air & water).

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

SSM-H-SF-013
COMMENT LETTER

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: McKenna M.I.: Last Name: Joseph

Street Address: 1700 Vineita

Street Address 2:

City: Santa Fe State: NM Zip Code: 87501-

Organization:

Telephone: 505-984-2385 Fax:

Comments:

1/40.06 It is imperative that we as a society do all in our power to save ourselves from the threat of nuclear destruction. We must end the nuclear age before we all die by it.

If nothing else, think of your children and your grandchildren and your great grandchildren

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

SSM-H-SF-014
COMMENT LETTER

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: Garland M.I.: Last Name: Harris

Street Address: 5921 Guadalupe Trail NW

Street Address 2:

City: Albuquerque State: NM Zip Code: 87107-

Organization: Kiva Peace Community

Telephone: 505-343-8047 Fax:

Comments:

1/40.60 You must examine zero nuclear weapons as an option. If you do not, or cannot, you will continue to have no credibility with citizens who do not make their livings as DOE employees or contractors

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

SSM-H-SF-015
COMMENT LETTER — PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: LIVIA M.I.: M Last Name: BRIGGINS
Street Address: 609 N GUADALUPE ST. #G 373
Street Address 2:
City: SANTA FE State: NM Zip Code: 87501-
Organization:
Telephone: 505-829-7017 Fax:

Comments:
As a citizen, a voter for 25 years, a taxpayer

1/40.06 for 26 years, I vote "NO" that nuclear deterrance is the required choice for national security!!

National security demands peace building diplomacy and environmental safety for all living matter on our earth!

2/11.17 As a recent arrive to Santa Fe I am appalled that I am living at risk, without my choice. I arrived with a mission to contribute my expertise to help the area — water-wise landscaping is my specialty. It is there now, to my horror, a realization that unconsciousness around nuclear contamination may endanger my life and this beautiful land.

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

SSM-H-SF-016
COMMENT LETTER — PAGE 1 OF 2

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly.

First Name: KASS M.I.: Last Name: ATKINSON
Street Address: 2327 Calle [illegible]
Street Address 2:
City: SANTA FE State: NM Zip Code: 87505-
Organization:
Telephone: Fax:

Comments:

1/40.06 It is clear that the DOE has a moral responsibility to make decisions based on a greater truthfulness. We do not need any further weapons for any stockpile or to upgrade anything - we need to get rid of all of them ASAP.

2/40.27 Los Alamos is a place where the greatest scientific minds of our generation come to get brain cancer. We need to put them to work cleaning up the environment and stopping the insane acceptance of long-time pollution as the norm. The DOE must fight the battle to win, for all our children, the notion that the excesses of our generation can be handled far into the future when in reality, our energy is finite, our money is finite and our ability to solve the problem is finite, especially if dysfunctional agencies

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

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COMMENT LETTER

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continue to be willing to lie for a buck.

SSM-H-SF-017
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: CECILIA [illegible] M.I.: Last Name: DAWKINS

Street Address: 1206 [illegible]

Street Address 2:

City: SANTA FE State: NM Zip Code: 87505-

Organization:

Telephone: 505-471-3255 Fax:

Comments: Why do we need more weapons of destruction? The justification is always that we have to keep ahead of the other guy. So - that's their reason and justification, too. So it's continual escalation. Let's try to work on our best human feelings, not our worst. Paranoia breeds paranoia. Somebody has to live for peace

1/40.06

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

SSM-H-SF-018
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: Larry M.I.: Last Name: weaver
Street Address: P.O. 9027
Street Address 2:
City: Santa Fe State: NM Zip Code: 87504-9027
Organization:
Telephone: - - Fax: - -

Comments:

1/10.30 I am opposed to increasing activities at los alamos that would increase the production of radioactive waste. Current practice (for the past 50 years) is to pile up the waste at the site where it is produced. Thus, by implementing this project, you are creating a nuclear waste dump upwind of most of northern new mexico. This is apparent each night, for example, when the (incandescent) lights of los alamos are visible from Santa Fe.

2/40.15 Don't produce more radioactive waste until you have a safe long term disposal for it. Don't create a defacto waste dump in a place as unsafe (environmentally and in terms of security) as los alamos

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us. Thank you

SSM-H-SF-019
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: JON M.I.: M Last Name: YATABE
Street Address: 25311 SECRETARIAT CT
Street Address 2:
City: PLEASANTON State: CA Zip Code: 94566-
Organization:
Telephone: 510-462-6115 Fax: - -

Comments:

1/10.31 ENSURE THAT THE DISCUSSION of radioactive WASTE AND MIXED (Radioactive and hazardous) waste generation DISCUSS THE CAPABILITY of EXISTING PROCESSING FACILITIES and disposal sites to handle the projected quantities generated by the Stockpile Stewardship and Management Program.

2/42.01 This should be coordinated with the DOE Program on disposition of surplus fissile material (e.g. plutonium and highly enriched uranium) which also generates radioactive waste in approximately the same time period.

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

SSM-H-SF-020
COMMENT LETTER

PAGE 1 OF 2

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: PETER M.I.: Last Name: CUMMINGS
Street Address: RT 4, BOX 79C
Street Address 2:
City: SANTA FE State: NM Zip Code: 87501-
Organization:
Telephone: - - Fax: - -

Comments:

1/40.50 All of your comments, explanations, charts, and data 'downsize' the potential of humanity of realizing our entangled sameness. Your premises, based on fear and the quintessence of paranoia, are specious and easily biased, and [illegible] inaccurate and extremely dangerous.

2/40.06 Stop all nuclear production, all nuclear research, all mining of lethal metals, and all transportation of radioactive material.

Dismantle the entire weapons production system.

Your carefully calculated arguments regarding the necessity of what you want to do and the safety of what you are already doing are swept into actualization by money, power, and dark manipulative politics.

3/41.03 Your masquerade (as is it the public), pretending to listen to and be influenced by our statements in opposition to your ongoing mission, which most likely

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

SSM-H-SF-020
COMMENT LETTER

PAGE 2 OF 2

Comments (cont'd):

3/41.03 continued this entire farce is a tragic joke, is a done deal. So this hearing is a sham.

The earth, due to greed, ignorance, neglect, etc., is in tremendous ecological jeopardy, far more so than is widely thought the case.

4/40.15 You can shift your focus to sustainable environmental policies and clean up the horrible mess you have already made.

Spiritually, ethically, morally, financially, and priority-wise, this whole program is death. No one with any sense of life, decency, or humanity can see other reason to continue this nightmare.

As I waste my time in protest against you, I look at my life and think that perhaps as I send out love and sensible actions, perhaps the vibrations I make will impact somewhere. Your hopeless situation is so disheartening and demeaning to humanity, there is no expressing the gravity and tragedy inherent.

Peter Cummings

U.S. Department of Energy
PO Box 3417
Alexandria, VA 22302

SSM-H-SF-021
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: BONNIE M.I.: Last Name: YOUST
Street Address: BOX 674
Street Address 2:
City: TESUQUE State: NM Zip Code: 87574 -
Organization:
Telephone: - - Fax: - -

Comments:

1/40.72

I live in Tesuque, NM just south of Los Alamos. I have moved to New Mexico because of its natural beauty and healing atmosphere. I am not in favor of any further expansion of any kind regarding any kind of nuclear production or testing in New Mexico, specifically at LANL.

I am not very educated in this matter at present, but I need to communicate that should expansion happen, I would not feel safe... and would need to move out of the area. This would be a real shame: I love this area very much.

So if I have any voice that can be heard, I would appreciate this being passed on to authorities as a "no" vote.

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

SSM-H-SF-022
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: KKTEY M.I.: Last Name: THORNE
Street Address: 411 VEKANO LOOP
Street Address 2:
City: Santa Fe State: NM Zip Code: 87505 -
Organization:
Telephone: - - Fax: - -

Comments:

1/40.07

I strongly disagree with the Stockpile Program. How can you be building bombs when we have signed Peace Treaties to not build new bombs. You wonder why people are angry with the government. Where are America's ethics? We are the big guy on the block. We need to be the example that allows the world to change. Our building of new weapons only spurs the the arms race. Stop This Now

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

SSM-H-SF-023
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: [illegible] M.I.: Last Name: [illegible]
Street Address: Rt 11 Box 6-117
Street Address 2:
City: Santa Fe State: NM Zip Code: 87505-
Organization:
Telephone: 505-982-7759 Fax: - -

Comments:
I reject the expansion of Los Alamos National Laboratories in the areas of nuclear expansion. There are many other energy, engineering and environmental improvement areas of research, program development & expansion that can occur in this government facilitated & highly educated area of our country. This area of the country is a highly loved and beautiful part of our country. All should be done to keep it so and even to improve the damage that has already been done. Please listen, please care, please act in accordance with these concerns.

1/40.72

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

SSM-H-SF-024
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: CAROLYN M.I.: H Last Name: CREW
Street Address: 3191 ALEJANDRO ST
Street Address 2:
City: SANTA FE State: NM Zip Code: 87501-
Organization: PRIVATE
Telephone: (505) 986-4966 Fax: - -

Comments:
Please recognize nuclear energy as hazardous and deadly to life forms on this planet! It kills! In regards to the half life of radioactive waste — it will "affect" many generations of plants, animals and humans. We can no longer afford to escalate and stockpile creating more nuclear waste. Nuclear ions in our water tables and in the atmosphere and in the food chains is anti-life. No one will live if we continue to "test" and [illegible] radioactive materials. The planet, our earth, the land which we inhabit needs to be held in sacred respect and not raped by a phallic, power-mongering enterprise.
Please care! Act!

1/41.08

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

SSM-H-SF-025
COMMENT LETTER **PAGE 1 OF 2**

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: ORIT M.I.: Last Name: ADAR
Street Address: 2300 W. ALAMEDA D/3
Street Address 2:
City: SANTA FE State: NM Zip Code: 87501
Organization:
Telephone: 505-438-6605 Fax: 505-438-0938

Comments:

1/10.30

1) It is unfair and immoral to consider New Mexico as an empty state into which nuclear garbage can be piled with no opposition. Out of this does not ensue that this waste should be shipped to some poor ignorant third world country but that nuclear waste if produced at all should be treated properly on-site. If that cannot be done, and I am sure it can't, nuclear waste should not be produced.

2/09.11

2) Transporting nuclear waste thru New Mexican cities and countryside is dangerous, irresponsible and the chance of accidents too big to be taken.

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

SSM-H-SF-025
COMMENT LETTER **PAGE 2 OF 2**

Comments (cont'd):

3/40.06

3) United States should lead the world in gradual sensible disarmament. Nuclear weapons are senseless and nobody can disarm alone but the goal, the big picture should be kept in mind.

4/40.27

4) Monies should be diverted towards research & development of solar energy, sensitive energy, wind energy, ~~recycling~~, ~~reducing~~ & educating the public to consume less and return something to the earth.

5) The United States is a fearful giant who does not understand its own power. There is deep irrational paranoia behind the nuclear industry. The one who is strong, rich & mighty should treat others with [illegible] violence.

Let the sunshine of love illuminate your hearts.

ORIT ADAR
2300 W. ALAMEDA D/3
SANTA FE, NM
87501

U.S. Department of Energy
PO Box 3417
Alexandria, VA 22302

SSM-H-SF-026
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

4/25/96 COMMENT FORM

Please print clearly

First Name: SUZANNE M.I.: Last Name: STONE

Street Address: 3A WILDFLOWER WAY

Street Address 2:

City: SANTA FE State: NM Zip Code: 87501-

Organization: WP ROP PEACE

Telephone: 505-988-3050 Fax: 505-986-2720

Comments:

Please – Stop!

1/40.72 Your presentation felt like total propaganda – we are NOT interested in a Stockpile Stewardship and management program at Los Alamos or anywhere else. Get it?

2/40.50 I'm feeling helpless – as if this is a fait accompli – we do not want this to proceed.

1/40.72 continued I'm taking a stand for saying NO to your proposal for LANL

I appreciated ~~....~~ M.J. Byrne –

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

[redacted]

SSM-H-SF-027
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: MATTHEW M.I.: Z Last Name: CHASE-DANIEL

Street Address: PO BOX 9401

Street Address 2:

City: SANTA FE State: NM Zip Code: 87504-9401

Organization:

Telephone: 505-466-6367 Fax:

Comments:

1/40.72 I am present at these hearings today to register my strong opposition to any continued weapons design and/or manufacture at the labs in Los Alamos. It is universally understood that this is a both dangerous and immoral endeavor. If the DOE is here today to factor community feelings on the subject, the results are clear. Every speaker I have heard is strongly against LANL's continued involvement in weapons design and production. If our voice is a factor in decisions for LANL then your choice on how to proceed is clear. Stop now. You (yes, even you who is transcribing this) are responsible.

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

[redacted]

SSM-H-SF-028
COMMENT LETTER **PAGE 1 OF 1**

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: KAREN M.I.: M Last Name: KIHUEL
Street Address: 2836 VEREDA DE PUEBLO
Street Address 2:
City: SANTA FE State: NM Zip Code: 87505-
Organization: SELF
Telephone: - - Fax: - -

Comments:

1/40.06
Arms Reduction
No New Nuclear Weapons
Transmutation?
Use the expertise to dispose of present waste.

CHERNOBLE HAS SHOWN, IS SHOWING US WHAT CAN HAPPEN — No sarcophagus in the U.S. please.

How much has [illegible] been paid, to create the feelings & thoughts he has expressed.

In handing out pamphlets advertising this meeting, I found that people who live here and visitors from many other states all thought that nuclear weapons were not a good idea —

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

SSM-H-SF-029
COMMENT LETTER **PAGE 1 OF 1**

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: DANIEL M.I.: E Last Name: MASLER
Street Address: 1859 OTOWI
Street Address 2:
City: SFE State: NM Zip Code: 87505-3331
Organization:
Telephone: 505-982-3649 Fax: - -

Comments:

Meeting was run very smoothly & w/ a general feeling of goodwill.

1/41.05
The only concern of a member of the public is that this event may be no more than a quality P.R. strategy.

Will the comments made here — largely against further arms testing — have any influence upon the D.O.E.'s decisions?

Regards
[signature]

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

SSM-M-001
COMMENT LETTER

PAGE 1 OF 1

Mel Carnahan
Governor

Richard A. Hanson
Commissioner

State of Missouri
OFFICE OF ADMINISTRATION
Post Office Box 809
Jefferson City
65102

Stan Perovich
Director
Division of General Services

March 25, 1996

U.S. Department of Energy
Office of Reconfiguration
P. O. Box 3417
Alexandria, VA 22302

Gentlemen:

Subject: 96030010 - U.S. Department of Energy Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management

The Missouri Federal Assistance Clearinghouse, in cooperation with state and local agencies interested or possibly affected, has completed the review on the above project application.

None of the agencies involved in the review had comments or recommendations to offer at this time. This concludes the Clearinghouse's review.

A copy of this letter is to be attached to the application as evidence of compliance with the State Clearinghouse requirements.

Sincerely,

Lois Pohl, Coordinator
Missouri Clearinghouse

SSM-M-002
COMMENT LETTER

PAGE 1 OF 3

3-25-96

Greetings,

My name is Jerry Arnold and I am an a TDCJ-ID inmate affected by all actions concerning the Pantex ~~facility~~ facility. I use the DOE's own definition, "... impacts are evaluated ... for the general population residing in...[a]... 50 mile radius..." (~~see~~ DPEIS, Vol. 1, Feb 1996, sec3.1.1.1, pg 3-4). I feel it is a honor for me to be given this opportunity to present my comments for your review.

I believe the world would be a much better place if no
1/40.06 government felt the need to maintain a nuclear weapon intimidation stance. No country dares to take the lead in removing this danger from the planet. We,
2/40.07 the United States, need to actively pursue the intent of START I, II, CTBT, NPT, and all future nuclear deterrance treaties. The United States should
3/40.15 also lead the world in doing research into methods and processes

(2)

3/40.15 continued

of neutralizing radioactivity. Further, we should enlist the help of other governments and the international scientific community.

I believe that new facilities (such as the proposed Atlas Facility, and others) are not required and even counter to nuclear deterrance. The monies for their construction would be better spent doing research into neutralizing radioactivity and disarming the nuclear threat.

4/34.02

the A/D operations and HE operations currently at Pantex should be consolidated at NTS. I make ~~this~~ the recommendation to also transfer the HE operations at Site 300, LLNL to NTS. I make these recommendations based on information obtained from the DPEIS, Vol. II, sec. A.3.5., ppg A-135 to A-139. I use

5/33.03

this information to also recommend the transfer of A/D activities at ORR/Y-12 to SRS Since there is more acreage to provide an enviromental ~~imp~~ impact buffer zone.

(3)

1/40.06 continued

To close, I will summarize my thoughts. First, I believe a "zero level" stockpile is the only vaible option. Since that option is not

3/40.15 continued

being considered I strongly recommend that the United States pursue research and development of radioactivity neutralizing methods and processes.

4/34.02 continued

Finally, based on my understanding of HE and the A/D process these operations should be consolidated at NTS and SRS.

Thank you for your time and review. I appreiate the opportunity to present my comments and views.

Sincerely,

Jerry Arnold

Jerry Arnold 561165
1992 Hilton Rd
Pampa, TX
79065-9696

SSM-M-003
COMMENT LETTER

PAGE 1 OF 1

1/40.27 I strongly damn (all) nuclear weapons research and production anywhere. I absolutely (oppose) [illegible] nuclear weapons madness at Los Alamos in New Mexico.

I have personally protested bombs (over 300) times at the gates of Sandia and Kirtland Air Force Base. For (17 years) I have paid (NO) federal income tax to the U.S. because I refuse to pay for the U.S. to rob, torture, cripple, terrorize, murder, incinerate people all over the world. I have done [illegible] I host a weekly TV [illegible] 3½ years

[illegible] Schmader
1810 Silver S.E. [illegible]
phone 505-[illegible]

SSM-M-004
COMMENT LETTER

PAGE 1 OF 2

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: CHRIS M.I.: B Last Name: MECHELS

Street Address: RT 4 BOX 21-B

Street Address 2:

City: SANTA FE State: NM Zip Code: 87501-

Organization: RETIRED LANL

Telephone: 505-982-7144 Fax:

Comments:

1/32.03 I have many concerns about moving the Plutonium Pit Production to LANL. These concerns center around the lack of a sound ES&H culture at LANL, and their failure to implement "Conduct of Ops" successfully.

2/40.30 At the center of the LANL ES&H failures is the profound destruction of Employee Rights at LANL. LANL management, in outright defiance of their contractual commitments, destroyed the University of California Employee Rights of their staff in 1983. In 1993 they attacked the remaining employee rights at LANL. This wholesale destruction of employee rights has lead to a high level of fear and intimidation among LANL employees. This fact is borne out in Employee

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us!

[illegible] Reviewer's Initials:

SSM-M-004
COMMENT LETTER — **PAGE 2 OF 2**

Comments (cont'd):

2/40.30 continued

Surveys, The Fordtrola Report, the Employee Complaint Task Force Report, etc.

The employee who draws attention to Environmental, Safety + Health concerns is typically [illegible]. They [illegible] little sympathy from line management, as indicated by Lab's management reports. If the employee persists he [illegible] becomes a RIF candidate. In the [illegible] 1995 RIF for example, two TA21 (Tritium facility) employees were RIF'd because they raised safety issues. Plutonium Employees have [illegible] the [illegible].

Please address these cultural issues before the expanding LANL's plutonium role. I suggest:

1/32.03 continued

1) A separate "chain of authority" for ES+H personnel. The current scheme has these personnel reporting to line management, a conflict of interest which LAB [illegible] [illegible].

2/40.30 continued

2) Restore full University Employee Rights at LANL so employees can speak up without losing their job.

3/40.21

3) Reform the local DOE/LAAO office. Their oversight failings, detailed in the Tiger Team report of 1991, have not been corrected, have in fact worsened in [illegible].

SSM-M-005
COMMENT LETTER — **PAGE 1 OF 2**

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: HARWELL M.I.: F Last Name: SMITH JR

Street Address: 936 W OUTER DRIVE

Street Address 2:

City: OAK RIDGE State: TN Zip Code: 37830 -

Organization: RETIRED

Telephone: 423 - 483 - 9347 Fax: - -

Comments:

1/40.24

1. It is absolutely necessary to come up with a method of [illegible] production facilities with real work, probably [illegible] if a continuing production capability is to be maintained.

2/40.33

2. The [illegible] "[illegible] approach" is inferior to some sort of remanufacturing approach and is clearly the product of [illegible] people with job security in mind.

3/40.27

3 LLNL was started in the 50's to provide more [illegible] in free thinking weapons designs. There is clearly no longer a need for both LASL and LLNL. To keep both laboratories is ridiculous.

4/40.08

4 Clinton needs California. Hence LLNL [illegible].

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us!

[redacted]

Receiver's Initials: ______

SSM-M-005
COMMENT LETTER

PAGE 2 OF 2

Comments (cont'd):

5/40.50
5. Earl Whiteman is handling a difficult situation very smoothly - though I disagree with the conclusions behind the [illegible]

6/32.08
6. Where will ancillary part components be manufactured? This is not addressed!! Y-12 has the ancillary, the special capability for [illegible] etc and the experience. [illegible] [illegible] [illegible] components?

936 W [illegible] Dr
[illegible]

U.S. Department of Energy
PO Box 3417
Alexandria, VA 22302

SSM-M-006
COMMENT LETTER

PAGE 1 OF 1

850 Webster St. #1008
Palo Alto, CA 94301

April 14, 1996

U. S. Department of Energy
1000 Independence Ave. SW
Washington, D.C. 20077-5650

ATT: Outreach Officer DP 25

Dear Sir:

The phrase "stockpile stewardship" simply means that the U.S. is continuing to spend billions of dollars to support nuclear weapons development—and the laboratories that are thereby kept in business.

1/40.07
At the same time, the nations of the world are trying to reach agreement on the Comprehensive Test Ban which would ban all nuclear tests worldwide.

The Lawrence and Los Alamos laboratories are not playing the role of caretakers; they are designing facilities which will continue the development of nuclear weapons.

2/40.12
The Peacemakers of the First Congregational church of Palo Alto join me in protesting this costly and unnecessary proposal.

I want this statement to go into the

SSM PEIS

Yours very truly,

Dolly DuPrau

Dolly DuPrau

SSM-M-007
COMMENT LETTER

PAGE 1 OF 1

April 1, 1996

510 Melton Hill Dr
Clinton TN 37716

US DOE
Office of Reconfiguration
PO Box 3417
Alexandria VA 22302

Re: Comments re DPEIS on SSM and SDMUFM

I wish to formally submit these comments to DOE re the above noted PEISs as part of the public hearing process:

1/33.01 I support the Y12 Plant in Oak Ridge maintaining its traditional role in weapon secondary fabrication, weapon disassembly and storage, and long and short term storage of highly enriched uranium. Taxpayers have invested multiple millions of dollars in infrastructure at the Y12 Plant and the experience of the workplace is a national asset which should be preserved.

Sincerely,

Stanley L Roberts

SSM-M-008
COMMENT LETTER

PAGE 1 OF 12

PANHANDLE 2000
P.O. Box 9480 Amarillo, Texas 79105 (806)373-7800

May 2, 1996

U.S. Department of Energy
Office of Reconfiguration
P.O. Box 3417
Alexandria, VA 22302

U.S. Department of Energy
Office of Fissile Materials
P.O. Box 23786
Washington, DC 20026

Re: Public Comment on the Department of Energy's Stockpile Stewardship and Management (SSM), Storage and Disposition (S&D) of Weapons-Usable Fissile Materials, and the Pantex Site-Wide Draft Programmatic Environmental Impact Statements (PEISs)

Dear Sirs:

Thank you for the opportunity to comment on the U.S. Department of Energy's (DOE) Draft Programmatic Environmental Impact Statements (PEISs) on Stockpile Stewardship and Management (SSM) and Storage and Disposition (S&D) of Weapons-Usable Fissile Materials, as well as the Pantex SWEIS. Also, please consider this our comments on the Pantex Site-Wide Environmental Impact Statement (SWEIS)

As we explained in our communication on these subjects during the past few years, we were appointed by the City Commission of the City of Amarillo, Texas, on February 8, 1991 to co-chair Panhandle 2000, a group of Amarillo-area citizens interested in the environmentally sound retention and expansion of Pantex. We were also requested to organize community support for Pantex. Ours is a broadly representative organization of individuals and entities who reflect the strong support of the vast majority of area residents for DOE's work in the Texas Panhandle at Pantex.

1/08.15 The issues addressed in the three Drafts are of paramount concern to the people sharing the Texas Panhandle with the Pantex Plant and the DOE. The dramatic employment reductions forecasted in the Draft SSM PEIS will severely impact the Panhandle economy. While Pantex is willing to participate, if necessary, in efficient downsizing of the nuclear weapons complex, any reductions at Pantex should come only after intensive cost and technical analyses to assure that national security needs are still being met in a cost-effective manner

Ensuring confidence in the United States' nuclear stockpile and the safety and reliability of the nation's nuclear deterrent are vital issues that have been addressed by activities at the Pantex Plant for over forty years. As neighbors to the plant, we are very aware, and proud, of the critical role that Pantex plays in fulfilling our nation's goals for defense and energy needs. We look forward to maintaining a vital role in meeting our present and future national security needs.

2/40.23 The Administration's proposals to disseminate current Pantex functions to other sites seems certain to adversely affect the nation's ability to produce nuclear weapons in the future, and to dangerously weaken national security. This is reflected in the SSM PEIS's workload assumptions of 1,000 warheads in the future stockpile, a number far lower than even the 3,500 set in still-unratified START 2 treaty. We urge you to recognize the importance of DOE's production complex, and avoid surrendering the victory we gained in the Cold War through the planned obsolescence of our production capability, which can only be rebuilt at great cost in later years.

As DOE presses toward its Record of Decision regarding SSM and S&D functions, we find it necessary to begin with a summary of the existing facilities Pantex possesses which would require minimal upgrading to meet many of the needs presented in the Drafts. The following table presents the list of existing facilities that are available for particular stockpile management and plutonium storage missions:

Capability	Facilities
1. Weapons assembly/disassembly	Existing facilities in Pantex Zone 12
2. Nonnuclear components	Existing facilities with modifications
3. Nuclear components:	
a. Pit storage	Existing facilities with modifications
b. Pit reuse (minor)	Existing facilities in Pantex Zone 12
c. Replacement pit fabrication and reuse (major)	Existing facilities with modifications
d. Secondaries and cases	Existing facilities in Pantex Zone 12 with modifications
4. High explosives components	Existing facilities in Pantex Zones 11 and 12

Keeping this in mind, please consider the following comments on plans for the Complex as DOE prepares its final drafts on upgrading and/or downsizing facilities at the sites where Stockpile Management capabilities are located, and where Stockpile Storage and Disposition missions are contemplated.

I. SSM PEIS.

A. Assembly/Disassembly Functions at Pantex, and Strategic Reserve Storage.

3/30.01 We are pleased DOE selected Pantex as the preferred alternative for assembly/disassembly (A/D) functions, abandoning earlier, cost-prohibitive plans to

3/30.01 continued transfer these functions from Pantex to the Nevada Test Site (NTS). Pantex's demonstrated experience and strong safety record, as well as the monumental costs associated with recreating A/D facilities elsewhere, make Pantex the ideal site in maintaining these functions.

4/42.09 Further, DOE mentions that strategic storage should be co-located with disassembly, but does not emphasize the protection of those reserves to meet future national security needs.. Pantex should be the preferred site for such a mission in coordination with its stewardship functions. Parenthetically, Pantex should be selected for all S&D storage functions. It makes no sense from any perspective, budget or otherwise, to site strategic storage at one site and surplus at another.

3/30.01 continued Just as maintaining core scientific competencies in the three national laboratories will help ensure the safety and reliability of a smaller stockpile, *maintaining the core production competencies of Pantex* (the sole authorized site for weapons assembly) will ensure our ability to meet future national security needs for stockpile assembly and disassembly. Pursuing complete unilateral disarmament would run contrary to stated national security objectives. Absent total disarmament, we must maintain an assembly infrastructure capable retrofitting aged weapons and assembling new weapons as needed in the future. While DOE plans no new construction at the existing plant, Pantex should be considered for upgrading and/or new construction to prepare for these nuclear weapons production needs.

5/40.13 Finally, in its deliberations, *DOE should insist that budgetary comparisons between Pantex and other sites are accurate, and include capital, transportation, training, remediation, security, and other costs.*

B. High Explosives Fabrication at Pantex.

While we are pleased with Pantex maintaining A/D functions, we are very concerned that DOE did not name Pantex as the preferred site for continuing high explosives fabrication. In conjunction with the A/D functions, it is necessary to maintain HE fabrication at the corresponding site; thus, these functions should remain at Pantex.

6/34.01 The Draft SSM PEIS implies that Pantex would keep HE functions should it retain A/D functions. Since DOE intends to keep A/D at Pantex, Pantex should also retain HE fabrication. In any event, because of ongoing disassembly work at Pantex, DOE admits the plant "would have to retain disposition and disposal capability for the HE inventories currently on site and those expected from near-term weapon dismantlement regardless." In addition, should future needs arise for weapons production, it will be critical to have the HE facilities at the weapons production/assembly site.

If establishing core competencies at the labs are so important for high explosives, why is it not so for uranium functions? DOE has made it clear that in the instance of HEU, maintaining core competencies at the production site is a priority. Why not so for HE?

6/34.01 continued

We adamantly disagree with the statement in the draft PEIS that there is no significant cost benefit to siting HE at Pantex as opposed to the national labs. Earl Whiteman of DOE's Albuquerque Field Office admitted in the April 23 PEIS hearing that it would be more expensive to relocate HE to LANL and LLNL, but he attempted to justify this saying it was "only for a one-time cost." This analysis raises serious questions as to the criteria used to determine the cost considerations for this and other transfers. The capital outlay alone necessary for transfer is admittedly cost-prohibitive; and while transferring HE functions may be less expensive than transferring other functions, the least expensive alternative is to maintain those functions at Pantex. DOE appears to be overlooking or ignoring other glaring considerations like the upgraded facilities and trained personnel at Pantex versus those present (or, more accurately, absent) at the labs. The assertion in the Draft SSM PEIS that it might be cheaper to transfer HE to the labs than it would be to downsize at Pantex is fantastic and defies logic since transfer would still ultimately require some duplication of facilities. In order to reach such a conclusion, one must assume that capital, training, and other costs are not taken into account. Incredibly, the Draft SSM PEIS assumes that the labs, which have failed in every instance to successfully implement *any* production on the magnitude necessary to meet national security needs, could for the first time accomplish this with high explosives. At the public hearings, Mr. Whiteman admitted that Pantex has both capabilities necessary for high explosives work (the quality assurance component), while he labs only have one (the ability to "press" explosives, but at a level which does not match Pantex). Finally, DOE

7/09.09

must account for the costs and safety risks associated with transportation of high explosives components between the labs and Pantex. There is no justifiable reason for initiating the unnecessary costs and increased risks associated with transferring HE functions to the labs.

C. New construction/stewardship activities at Pantex.

Until recently, DOE concentrated research and development functions at the labs and production functions at the industrial sites. It appears DOE is headed in a new direction. While the drafts propose to continue concentrating all stewardship functions

8/40.52

and to transfer particular industrial functions to the labs, the DOE overlooks the potential for Pantex to perform new stewardship functions complimentary to its current management functions. The scientific, technical, and managerial competence presently at Pantex, combined with additional technical resources from Mason & Hanger, Battelle, and the Higher Education Consortium, offer the human and material resources necessary for the future needs of the SSM Program.

Pantex has the necessary resources, with the required safeguards and security, to meet the goal to downsize and/or consolidate facilities while providing an effective and efficient production capability for a smaller stockpile. Facilities are currently in place to perform almost all the necessary mission elements of the stockpile management program, a fact that should not be overlooked as the DOE seeks to preserve the integrity of the nuclear stockpile under increasing budgetary constraints.

8/40.52 continued

The obvious advantage of Pantex is, by utilizing the facilities already in place, DOE could eliminate the capital cost for establishing the same capabilities elsewhere. The cost of unnecessarily duplicating facilities (*currently in place at Pantex*) at another site would cost the DOE tens of millions of dollars in infrastructure alone, notwithstanding the additional expense of related transportation, environmental remediation, start-up and training costs required at a redundant site which would cost taxpayers additional millions of dollars.

Another fact that should not be overlooked is that Pantex is the candidate site located nearest to the LANL, the preferred site for the Atlas facility, and the planned site for plutonium pit fabrication. This facility is key to DOE's ability to address stockpile reliability and safety issues by means other than nuclear testing due to the indefinite extension of the nuclear testing moratorium in July 1993. The conclusion to be drawn is that the location of SSM Program functions at Pantex would not only take advantage of current storage and dismantlement capabilities, but would also capitalize on the geographical proximity of Pantex and LANL that would be conducive to the exchange of technological information necessary for effective management of a smaller nuclear weapons complex.

In addition to Pantex, the Texas Panhandle also boasts of the Amarillo National Resource Center for Plutonium (ANRCP) which is taking a lead role in environmental and nuclear research. The ANRCP is operated by the Higher Education Consortium, comprised of three of the nation's preeminent university systems (The Texas A&M University System, Texas Tech University System, and The University of Texas System). Consistent with the SSM Program non-proliferation objectives, the Consortium is coordinating the U.S.-Russian Summit Working Group on the Disposition and Accumulation of Fissile Materials in order to ensure that the nation's arms-control objectives are met. The involvement of the Consortium adds an academic dimension of research excellence and third party monitoring that ensures continued competency of the people who must make the scientific and technical judgments related to the safety and reliability of nuclear weapons. We want to stress that we view the role of the ANRCP as complimentary to the labs, and supplementing, not supplanting, their functions.

The Consortium and the development of the ANRCP are logical extensions of the current allocation of functions within the U.S. nuclear weapons complex. In light of continuing changes in the national security picture for the U.S , and given the importance of resolving dismantling issues and issues related to the future stewardship of the nuclear stockpile, the *siting of research and technical functions at Pantex for the SSM Program is highly appropriate*.

The significant nuclear stockpile still present in the former Soviet Union under sometimes suspect surveillance makes our continued cooperation with Russia regarding management of the nuclear stockpile critical to international security. The key role the

Amarillo National Resource Center for Plutonium is playing for DOE in SSM and fissile materials activities with Russia argue for an expanded role for Pantex.

Accordingly, it is appropriate to consider Pantex as an alternative site for future defense missions. The location of new activities at Pantex would ensure that core technical capabilities are preserved at a location that can secure them at the most efficient cost to the American taxpayers.

II. S&D PEIS.

A. Fissile Materials/Plutonium Storage and Disposition at Pantex.

In addition to DOE's hesitation to name a preferred site for HE, we are also concerned that the Draft S&D PEIS did not list a preferred site for plutonium storage and disposition. Whether the decision reached is for "No Action" or "Consolidate," plutonium will continue to be present at Pantex through assembly/disassembly operations. President Clinton last year announced that he was declassifying 38.2 metric tons of weapon-grade plutonium as excess to national security needs. Of that amount, 21.3 metric tons are located at Pantex. For this reason alone, Pantex should be the preferred site for storage, disposition, and utilization. Doing so would avoid the economic and other attendant costs of transporting plutonium to a new site as well as the massive infrastructure costs of unnecessarily recreating a Pantex-like facility at another site.

1. Storage.

4/42.09 continued

As aforementioned, Pantex is already safely storing most of the weapons-usable surplus plutonium from the dismantled stockpile. Pantex presently has more than 8,500 plutonium pits stored on site and can easily be expanded to hold more than 20,000. We fully support the proposed action in the SWEIS to expand Pantex's storage capabilities to 20,000 pits. The plant is also scheduled to be upgraded to prepare the storage bunkers for receipt of plutonium pits relocated from Rocky Flats. This will increase further the plutonium stockpile present at Pantex.

One major concern is, as it is currently drafted, the S&D PEIS does not emphasize a continuation of the Strategic Plutonium Reserve necessary to meet continued national security needs. Once again, storage of the strategic reserve is a logical mission at Pantex as an extension of its assembly/disassembly functions and long-term plutonium storage consideration. Neither the SSM PEIS nor the S&D PEIS takes the logical next step by naming Pantex as the site for storage of strategic and surplus plutonium. At the hearing, Earl Whiteman of DOE said at the hearing "it made sense" to collocate strategic storage and assembly/ disassembly to minimize transportation, and to collocate strategic storage with surplus storage, since the strategic stockpile may be declared surplus at some point. Mr Whiteman said that Pantex has a facility which is "exactly the right size" for strategic storage, and that there was sufficient space at Pantex for all functions. DOE should not

only recognize that storage should follow disassembly, but also that certain disposition options should follow storage to minimize transportation and other costs. It is important that a stockpile of strategic reserve remain a stated objective of S&D functions included in either plutonium storage or pit fabrication duties. Since Pantex also is in close proximity to LANL, the preferred site for pit fabrication, designating Pantex as the alternative site for a strategic reserve would be the most cost-effective choice.

With regard to storage, the focus should be squarely on the issue of storing the pits safely, and we fully support storage of plutonium and other fissile materials at Pantex under both the "no action" and "long-term" alternatives, given adequate assurances that such storage is safe and environmentally sound. In addition to extensive environmental safety protections already in place, Pantex has built an elaborate security system to protect stored plutonium from potential theft. Safe storage is critical for maintaining the integrity of the stockpile and our commitment to international safety. Pantex is the only site currently capable of this level of protection to prevent possible proliferation of stolen weapons-grade plutonium.

Ensuring safety and accountability of our surplus plutonium stockpile can best be accomplished through the construction of a new consolidated storage and staging facility at Pantex. Such a facility would:

4/42.09 continued

- Strengthen national and international arms control efforts by fostering continued and enhanced cooperation with Russia on transparency issues, and bilateral agreements to monitor dismantlement and maximize options for the disposition of surplus weapons-usable fissile materials;
- Ensure that storage and disposition of weapons-usable fissile materials is carried out in compliance with environment, safety, and health (ES&H) standards,
- Consolidate all nuclear materials which would provide significant cost savings for surveillance, storage, and disposition.

Siting a new consolidated storage facility at Pantex also would further the "stored weapons standard" which envisions the same high standards of security and accounting applied to storage of nuclear weapons being maintained for weapons-usable fissile materials throughout the process of dismantlement, storage and disposition. Pantex has put in place, and is accustomed to maintaining, the high security and accounting standards for nuclear weapons storage for decades as the Complex' sole site of disassembly.

Siting long-term storage at Pantex also will help us achieve the Administration's nonproliferation goals. No current treaty requires us to disassemble nuclear warheads, but only to disable the delivery vehicle; the warheads can remain intact under treaty, and the U.S. is disassembling voluntarily and unilaterally. If the U.S. is to strive for reciprocity, and encourage Russia and other countries to "go the extra mile" and disassemble nuclear arms as opposed to merely "dismantling" them, Pantex, being the sole U.S. site for disassembly, would be the consummate site for storage of fissile materials.

4/42.09 continued

We disagree with DOE's findings that under either the "No Action Alternative," or the "Long-Term Storage and Disposition Alternatives," that Pantex has the greatest potential to experience adverse cumulative impacts. This conclusion is almost wholly based on what DOE terms as the "small, compact area" in which Pantex is sited. This conclusion fails to take into consideration the fact that DOE already owns the 10,000 acres on which Pantex is located, and that more land is available for any new or upgraded facilities, at no cost to the federal government. Further, Pantex is located 14 miles from a central city; the finding that cultural, socioeconomic (such as level of road service in the event of construction), and public and occupational health and safety impacts would be greater at Pantex is incorrect. For example, to imply that intersite transportation impacts would be greater at Pantex is absurd, since (1) Pantex currently houses the vast majority of plutonium pits, thus avoiding the lion's share of any transport (and the appurtenant budgetary, environmental, and political costs related thereto) if it was selected as the preferred alternative for S&D; and (2) is the site closest to LANL, the proposed site for pit fabrication. Even if one were to accept such a finding regarding Pantex, the differences between candidate sites would be so small to demand that they not be seriously considered as an accurate or meaningful criterion on which to base selection.

If DOE chose not to construct a new consolidated storage facility, we would support the upgrade of Pantex storage capability necessary to comply with current design and environment, safety, and health requirements.

2. Disposition Alternatives.

DOE has not yet decided on the preferred alternative for disposition or the sight for disposition, but whatever decision is reached, Pantex should be the preferred site since it is already the current storage site for plutonium removed from dismantled weapons and the site of strategic plutonium reserve.

While the *implementation* of any disposition option must be environmentally sound, the *ultimate decision* of which options will be chosen will be *based largely on national security considerations*, especially the success or failure to reach accord with Russia on these issues.

While the U.S. should take any unilateral actions it deems appropriate if its national security interests are maintained, the volatility of the former Soviet republics and the changing world scene dictate that *reciprocity* guide our actions. The Draft S&D PEIS identifies three major alternatives as reasonable for plutonium disposition: immobilization in glass or ceramic form; burning in reactors as MOX fuel; or deep burial in boreholes either directly or in immobilized form.

How do these options fit into reciprocity? The White House Fact Sheet on Nonproliferation contains the policy statement that the U.S. should "seek to eliminate...the accumulation of stockpiles of ...uranium and plutonium," including those from civil nuclear

4/42.09 continued

programs. It is unrealistic to believe that any disposition decision by the U.S. which does not contemplate the use of plutonium as fuel will cause other countries - either with or without nuclear weapons - to abandon the use of plutonium in reactors. For example, Russia, with its large investment in its nuclear infrastructure, and its lack of financial means to convert to other forms of energy, is highly unlikely to forego the use of nuclear power, including the use of plutonium. Also, European nations like France, which lack the vast natural resources of oil, gas, and coal which the U.S. enjoys, have little incentive to give up their reliance on nuclear power. If that is the case, and in full recognition that reactor-grade plutonium can easily be used in weapons, the U.S. will be compelled for "reciprocity" and national security reasons to maintain plutonium in pits for some period of time and plan to utilize it through the mixed oxide fuel option. The U.S. cannot lead by positing unacceptable or unfeasible options; it must recognize the circumstances which it and other nations face, and pursue a course which will benefit its national security goals, and possibly other goals as well.

We are not convinced that plutonium is more of a liability than an asset. Why can't we make swords into plowshares, and utilize these resources - which took so much time, effort, and money to develop - and examine the peaceful uses of these materials? Examination of possible beneficial uses is one of the primary purposes of the research being conducted at DOE research facilities across the country. We strongly support, as part of this research, the review of long-term options for plutonium disposition, including environmental considerations. This review can involve research and policy study on the best forms of plutonium for storage, disposition, and utilization, storage options, security and safeguards and other issues.

Further, we believe that this option, with its emphasis on education and research, will help reverse the "brain drain" which could adversely affect the Nuclear Weapons Complex as its primary function changes. The Defense Nuclear Facility Safety Board has said that the government is losing most of its veteran experts. While DOE has attempted to address this problem through instituting a program to attract new young scientists to the Complex, we believe that more young scientists will have the incentive to develop and maintain expertise in these disciplines if the types of serious research which the "beneficial use" option offers is available through DOE.

The questionable efficacy of the "irreversibility" of vitrification or boreholes argues for use in reactors, at least for pits and other "MOX-able" plutonium. While we recognize that some plutonium "scrap" can only be disposed through avenues other than MOX, the extraordinary advances in science, especially in this important area, render naive the notion that sometime in the near future the technology to "reverse" vitrification, boreholes, or any other such "waste generating" process will be readily available to those who desire it.

Accordingly, we support a course which will provide a tangible demonstration to the affected citizens that there exist long-term disposition options which both fit our national security interests as well as a common sense desire to reap a beneficial use from these materials. The Administration should consider a joint program between Russia and

4/42.09 continued

the U.S. (and perhaps other countries) which actually would take a plutonium pit apart, make plutonium oxide, fabricate mixed oxide fuel, and burn the fuel in a commercial light water reactor

Such a policy would meet the "spent fuel standard" by making the plutonium as inaccessible for weapons use as the plutonium in spent nuclear fuel from commercial power reactors. It also recognizes the fact that the only course to safe disposition is to separate the atom through fission. It also looks beyond the spent fuel standard by maximizing the options available to DOE and the Administration with regard to disposition.

3. Environmental Safety and Health Criteria.

a. Airplane Crash Risk Analysis:
The 1994 "Finding of No Significant Impact" arising from the Environmental Assessment found an airplane crash/accident occurring at Pantex to be an "incredible event" not justifying the preclusion of additional storage at Pantex. Even so, the plant subsequently worked with the Department of Defense and the FAA to reduce flights paths over Pantex, and took other steps to ameliorate the situation. However, the Draft SWEIS does not account for the reduced flights thereby exaggerating the probability for airplane accidents at Pantex and their resulting impacts, and, incredibly, *increases* the probability of a crash from the 1994 "FONSI." In the recent hearings, Nan Founds responded to this concern by saying that DOE is formulating its own analysis not dependent on FAA data, but also stated there were serious problems with DOE's analysis, which would be addressed. In its initial analysis, DOE is ignoring not only credible work already completed, but also the obvious reduction in accident potential for use in determining the ES&H of siting new functions at Pantex. This undermines the perceptions for fair and equal criteria for use in accurately comparing the various sites under consideration. We urge DOE to correct the analysis and avoid the wrongful preclusion of Pantex for consideration of additional functions.

b. Environmental Impacts of Potential Increased S&D Functions:
In the Draft S&D PEIS, DOE characterizes Pantex as having the "greatest potential" to experience adverse cumulative impacts from an increased role in plutonium storage and disposition. However, this characterization is way beyond the means of DOE's cursory analysis. NEPA regulations require that environmental impact statements discuss "significant" impacts and support these with evidence. DOE has taken license to ignore these regulations by discussing potentiality and susceptibility without basing these in fact. We object to this type of characterization which unfairly and inaccurately misrepresents Pantex's ability to handle an increased role in S&D. These conclusions also totally contradict those contained in the SWEIS which characterize the impacts as "minimal" and "negligible." It is imperative that DOE correct the inaccurate mischaracterizations before making its final decisions for plutonium storage and disposition missions.

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4. Cost savings due to avoidance of transport of special nuclear materials.

Regardless of the final decision for storage and disposition, DOE must make accurate budgetary comparisons a primary consideration in its analysis of where to site these functions. *DOE should insist that budgetary comparisons between Pantex and other sites are accurate, and include capital and transportation costs, and also take into consideration the political consequences of transfers from Pantex.* We also urge DOE to compare on a "side-by-side" basis all six candidate sites for: (1) Conduct of operations; (2) Implementation thereof; (3) Security; (4) Relationship between management, unions, community; (5) Quality system programs; (6) OSHA/ ES&H envelope; (7) Engineering systems; (8) Radiation safety; (9) Applied technology; (10) Training programs; (11) Explosive and nuclear safety programs; and (12) Employee involvement in daily operations.

Accurate comparisons between all sites under consideration should once again make Pantex the preferred site. Maintaining and expanding the interim storage facilities at Pantex would all but eliminate the significant transport costs, and the attendant environmental and political risks involved with moving these functions to another site. Eliminating the unnecessary transportation of radioactive materials, will translate into less cost and greater public safety and protection. Ignoring or miscalculating the risks and costs associated with weapons materials would be a serious omission.

We are confident that any fair comparison of economic and political costs will favor Pantex over the other sites included in consideration, since recreating this infrastructure at another site would be cost-prohibitive.

5. Economic factors.

Pantex is perhaps the most cost-effective alternative for any new construction of SSM and S&D facilities if DOE pursues that course. First, labor costs are low. The existing work force in the Amarillo area has the skills necessary to meet the construction and operation requirements for any new functions and to do so at highly competitive wage rates. With a civilian labor force of 110,200, the Amarillo Metro Area can provide the project with a large, well-educated, and comparatively inexpensive labor pool. Average wage costs for manufacturing employment in Amarillo are 18% below the national average. Second, utility costs are highly competitive. According to the Utility Data Institute, the SPS industrial rate currently ranks in the lowest 11 percent among U.S. investor-owned utilities. SPS has a long history of low rates and presently offers the lowest rates among investor-owned utilities in Texas. If new facilities were operational now, SPS's standard rate for this class of firm service at 80 percent load factor would average 3.2 cents per kWh. Also, land to house new construction is readily available. The Department of Energy presently owns the 10,000 acres on which the Pantex plant is located. More land is available for any new facility, at no cost to the federal government.

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Finally, the City of Amarillo has excess water capacity to an extent enjoyed by no other candidate site, without depleting the Ogallala Aquifer.

6. Public and political support.

In addition to the economic factors listed above, local support for the Pantex Plant, and its expansion, is extraordinarily strong. A Shipley and Associates poll of the four county area surrounding the plant (Armstrong, Carson, Potter, and Randall) found that 99% of the respondents believe that Pantex is important to the local economy, 88% said that Pantex is a facility that they can be proud of, 79% favored Pantex expansion, and 88% agreed that Pantex is safe. In May 1991, a Lance Tarrance poll showed that 85% of area residents supported an expanded Pantex. Also, a July 1991, poll conducted by the Amarillo Globe-News showed that almost 75% of the respondents favored expansion of Pantex. Consideration of the results of the 1991 Tarrance poll (Republican) and the Shipley poll (Democratic) reveals that regardless of party affiliation of the pollster or time the poll is conducted, Pantex enjoys the overwhelming support of Panhandle residents, at a level perhaps unsurpassed by any other Complex site.

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Area and state elected public officials are virtually unanimous in support of current and expanded plant operations. Essentially the entire 32-member Texas Congressional Delegation has pledged support for expansion and will be active in the effort in the future, as well as the Governor, Lieutenant Governor, area legislators, and other public officials. Thus, the message is clear from the nation's elected representatives that the role that Pantex plays in the future of the weapons complex is vital to the nation's nuclear deterrent and the safety and reliability of nuclear weapons.

III. Conclusion.

On all accounts, Pantex clearly is the best and most cost-effective alternative to DOE for stewardship and management, storage and disposition, and other defense-related missions. We respectfully urge DOE to designate Pantex as the preferred alternative site for all existing and new functions in DOE's Final PEISs and Records of Decision. Thank you for the opportunity to share our thoughts and concerns with you.

Yours truly,

Jerry Johnson
Co-Chair, Panhandle 2000

Wales Madden, Jr.
Co-Chair, Panhandle 2000

Peace Action TEXAS

Jay Rose
Office of Reconfiguration, U.S. Dept. of Energy
1000 Independence Ave., S.W.
Washington, D.C. 20585

April 24, 1996

Dear Mr. Rose,

Please find here comments on the PEIS's that have recently been issued related to the reconfiguration of the Nuclear Weapons Complex. It is with great seriousness and concern that I am writing.

The comments are limited and incomplete due to the complexity of the subject, the voluminous nature of your "dictionary-size" reports, and the shortness of the time to comment.

I represent, in principle, the positions taken by the statewide group of which I am chair, Peace Action Texas, and of the national organization, with which we are affiliated with the same name. Together we are the largest grass roots peace organization in the country, we are an NGO to the United Nations and cooperate and support similar peace organizations in others countries.

As a peace activist who has been for years an advocate of nuclear disarmament, a Comprehensive Test Ban and a world treaty for Non Proliferation, I am celebrating the fact that we are finally on the path. Indeed, we are now living through a time of historic opportunity. Our actions, our policies will effect generations throughout the world for thousands of years to come. I hope and pray that we have the will and the moral courage to grasp this opportunity.

The United States can and must lead the world on a path to peace—peace with one another and peace with our fragile planet. Our decisions and actions related to our Nuclear Weapons Complex will be a major part of that journey for mankind.

Sincerely,

Jan Sanders
Chair, Peace Action Texas

Peace Action Texas is a grassroots based organization whose mission & purpose is to educate the public in order to recruit members and organize them into a nonviolent citizens' movement with the sustained political power to reverse the world arms race, abolish nuclear weapons, teach and practice non-violent resolution of conflict and construct a world of peace & justice.

Jan Sanders, Chair 7326 Malabar Lane Dallas, TX 75230 (214)369-9388

Comments
by Jan Sanders
re the Draft Programmatic Environmental Impact Statement for the Stockpile Stewardship and
Management of Nuclear Weapons and
the Storage and Disposition of Nuclear Materials

Process for public comment: I called the DOE one week prior to the Amarillo meetings to get the schedule and format so that I could meet the deadline for air fares to travel from Dallas. The schedule, as told to me, changed in that week. Indeed local members said that had been a problem throughout the lead time for this meeting.

I am concerned about all three of the PEIS's, but I needed to be four places at once Monday evening, which was impossible. Because I was told that everything would be over by noon on Tuesday I was not able avail myself of the additional sessions on Tuesday afternoon.

1/41.01 I would encourage the Dept. in planning future meetings, hearings or workshops to automatically notify those who have participated in the past and to notify national offices of groups that would be interested in providing public input on the topics at stake.

The message? Public input, questions, and comments are not really being sought in this round of reviews.

Questions and Requests:

2/40.05 1) I would like to have sent to me the documents, memorandum or legislation from the President and the Congress that directs the DOE "to maintain the safety and reliability of the enduring nuclear weapons stockpile." p S-1 What is the number of warheads that the Dept. is being asked to maintain in the ready arsenal? How was this number determined? Was there public debate on this?

I was surprised to be told in Amarillo that the number (NWSP) was classified as a matter of national security. Is the number so small that the touted "nuclear deterrence" would be questioned? In light of the collapse of the Soviet Union, the signing of the NPT treaty extension and the discussions of a CTB, and the fact that we do indeed live in free and open society--I plan to request a Freedom of Information request for this information. It is impossible to respond to the issues of safety and environmental impact when the numbers range in the thousands.

2/40.05 continued "Stockpile stewardship and management capabilities are independent of foreseeable future stockpile sizes." S-3 It is hypocritical to say that we will lead the world toward nuclear disarmament, our NPT position, but we want to keep on the ready the capability of putting a bomb together tomorrow.

3/40.14 2) In light of the negotiations for a CTB and the Testing Moratorium that has been in effect under both a Republican and Democratic President, why is the Nevada Test Site being maintained and funded?

4/40.22 3) Why must an alternative to underground nuclear testing be developed to verify the "safety and reliability of weapons"? S-1 Our arsenal has been tested, repaired, & maintained for years. We have accumulated a huge stockpile and an incredible amount of knowledge. Didn't we learn how to do it? How can the additional expense be defended?

4) In light of the knowledge (an lack of it) that we have acquired in the 50 years of the atomic era, why would we even consider the continuation or the new construction that would result in the

5/40.07 creation of more low and high level waste? We are struggling with the waste we already have! To construct new facilities that would provide the plutonium processing that formerly was at Rocky Flats in this era of nuclear disarmament seems to make a mockery of our treaties, it insults the intelligence of the American taxpayer and is an incredible threat to the environment.

6/04.05 5) In the alternative to consolidate the "capability", translate that the ability to build new nuclear bombs, that moves the Rocky Flats plutonium processing to Pantex, I would like to ask if any or all of the other DOE facilities are located over an aquifer?

7/08.20 6) Clarify for me the level of importance placed on the impact of jobs lost or jobs gained in any particular area in making your recommendations.

I hope to receive answers to the above questions. In light of these questions, I would like to take some clear positions on the issues.

Positions and urgings:

8/40.27 1) Develop a program that would continue the orderly disassembly of our nuclear arsenal. Use this disassembly action to lead and provide an incentive to the other nuclear powers to do the same. Concentrate our research and considerable technical expertise on the safe disposal of the lethal material.

Use the nuclear labs and our trained and dedicated workers throughout the complex in a collaborative way to assist other nuclear powers in safely disposing of the nuclear arsenals over a period of time, with open inspections and exchange of expertise.

9/41.03 2) Provide American citizens with information that will enable them to participate in the development of a sound and safe nuclear public policy. The removal of the "classified for national security" blanket will set the stage for transparency in dealing with our international global neighbors.

6/04.05 continued 3) If other DOE sites are not over aquifers of the size and importance as the Ogalalla, I would urge the storage of plutonium or the vitrified or ceramic treatments of the waste at any of these other sites. There is no good location, but we do know that if radio-active material from plutonium enters the water supply it will be there for what number of years?--25,000? or just a few hundred?

10/40.50 4) I strongly oppose the use of surplus plutonium by the nuclear energy companies here or abroad. It continues the waste stream, threatens the environment at every movement and handling of the material, and it leaves plutonium in the spent fuel that could be diverted to nuclear weapons. I know it is hot, difficult, etc., but the plutonium is still there and plutonium is a crucial component of the bomb.

11/42.13 5) Shut down the Nevada Test Site. Convert it to a solar energy testing site or is the area to hot?

12/40.15 6) Shut down one of the labs. Does the myth of the "competition" still rein? When I learned that Nagasaki bomb was from the 2nd lab it made me grieve with shame that we might have used Nagasaki as a test. Convert the remaining lab into an all out effort to do the research on waste disposal or neutralization of radio-active materials.

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2/40.05 continued — 7) Stop the connection between technological research and development and war and killing. If our scientists would benefit from the development of a super computer, fine. Place it in one of our great universities or hospitals or at the Peace Institute not for new bomb making.

13/40.12 — 8) Peace Action has as one of its four program areas its support for economic conversion from a war-defense contracted economy to a peace economy. It includes job conversion and/or re training of workers loyal to and dependent as their localities have also been on the large government defense contracts. We would not turn our backs on their needs, nor would we ever support the continuation of bomb making as a jobs program. The DOE should not allow the boosterism of the Chamber of Commerce of one area (Panhandle 2000) dictate these decisions of national and international import. And finally,

14/40.06 — 9) Peace Action has taken a position in support of Abolition 2000, a worldwide movement to abolish nuclear weapons by the year 2000. Therefore, I urge that you consider the Start II treaty as just that, a start toward the very attainable goal of Abolition 2000. To allow the Start II treaty to limit in anyway our leadership in the Non Proliferation work (p S-7) would be wrong

Some further observations, questions and comments:

15/40.60 — With a stockpile numbering in the thousands, which was built over a period of years, I would make the logical assumption that it will age over a period of time as well. What if we cannibalized parts from one to another to make repairs and to maintain as many as possible, how long would it take for us to drop to zero? If, during this wear down period, we took a leadership role in the Non-Proliferation movement, we could produce a much safer and secure world, than we would have it were bristling with new weapons "capability".

16/43.12 — In recent years the military genius of this country has produced modern, non nuclear weapons that approach the destructive power of a nuclear warhead. As a peace advocate, I'm not particularly proud of that, but I would point out that the environmental risks from the raw materials, the transport, the manufacturing, the assembling and the deployment of those weapons are not as great or as long lasting as those associated with nuclear bombs. How can we put our own people and our own environment at this level of health and safety risk when we have in hand safer alternatives? Have we, in the build-up and now in the prospects of the "stewardship" of an arsenal capable of blowing up the world, deterred the bomb from being dropped on us by others, but instead have we not dropped it on our selves?

10/40.50 continued — The power, the near worship of the power of the nuclear bomb is evil. It undermines the moral character of this country that we are willing to continue to possess weapons of mass destruction of this magnitude and by the possession threaten the peoples of the world with their use.

During the height of the arms race during the Cold War the Bishops of the Catholic church challenged the bomb making and then the Bishops of the Methodist church in their "In Defense of Creation" pastoral letter challenged even the possession.

I intend to [illegible] these comments to the President, the Secretaries of Defense and [illegible] and to my elected representatives to Congress -

Thank you - Jan Sanders

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Comment Letter
Page 1 of 1

U.S. Dept. of Energy

1/40.12 — I am concerned about the use of $4.5 billion of taxpayers money for the building of the National Ignition Facility. It seems that the money would be much more wisely spent for the many needs facing this Country - specifically in the areas of education, where 30% of our students are dropping out of school before graduating from high school. Efforts should be made to train and hire teachers who spend the time to educate our students in todays world

2/40.07 — At the same time, with the reduction of nuclear arms as national and worldwide policy - this procedure seems to be contrary to this policy - as it appears to enhance production of nuclear weapons.

Seems to me if we are intent in deficit reduction, then there would be a place to [illegible] use 20% in education and cut $2 billion from the national debt.

Sincerely,

Duncan [illegible]

CPE STUDENT CONFERENCE
96

CONTROL & MANAGEMENT OF NUCLEAR WEAPONS:

The Imperative for Nuclear Testing!

Lorin D. Higley
391 Stillman, Apt. B
Upland, CA 91786-7081

A nuclear test ban does not equate with arms control, management of arsenals, safety and reliability of stockpiles; nor can it result in either peace or national security.

The current comprehensive test ban poses a threat to the security of the free world as also the United States. This paper proposes a need for weapon and weapon-delivery systems testing; as also stockpile reliability, modernization and safety tests for the sake of national security policy of the West led by the United States. First, why nuclear weapons.

1/40.04

Nuclear deterrence provides common security the world over. Nuclear war-fighting capacity leads to deterrent capacity. Now the technology or the know how, the knowledge, and the materials are out there. Were utopian peace dreams realized by the destruction of all nuclear arsenals, how does one keep pariah development in check? If the West does not have the capability, any revisionist country may hold the west hostage to its demands simply by covert development. In short, once Pandora's box has been opened, allowing its evil essences to escape, there can be no trapping of those evil essences once they are loose upon the world. Nuclear weapons are force multipliers par excellence; therefore unauthorized maverick development will always loom over the horizon for just such an asset

I submit that any test ban has the consequence of keeping the United States and the West from nuclear war fighting capacity. Without such, there goes hegemony, deterrence, and force multipliers along with any hope to control nuclear development elsewhere.

The International Atomic Energy Agency (IAEA) is tasked with measures of verification to assure that nuclear materials are-not subverted to terrorist or "have not" developments. It assures compliance to treaties and for prevention of proliferation. With no nuclear weapons in the West to back up it program with force, the guts will be torn out of any IAEA capabilities.

Nuclear technology along with the physics pertaining to it so commonly pervades science, engineering, and medicine that even if the Pugwash Conference were able to eliminate all such weapons, they can readily spring to life again, much as a hardy garden weed. In short, there is no hope of containing the knowledge and means to build the nefarious things, even if none presently existed. Forfeiting United States nuclear capability via test bans will do nothing to control weapons proliferation elsewhere!

Last, any megalomaniac who opportunistically gains an atomic bomb will find the use of it irresistible in order to demonstrate just what kind of power the maniac has in hand

WHY TEST?

This paper postulates controlled underground, fully contained, environmentally safe and secure testing modules for the purpose of maintenance or status quo, without

1/40.04 continued

build up of nuclear stockpiles. Linear updating and maintenance pertains only to management of existing stockpiles without increasing arsenals.

1 Reliability Tests: To ensure that calculations and laboratory premises have reliability —will work as designed. Applied research cannot be separated from experimental validation. There are two general types.

(a) Performance Tests, to validate basic weapon physics and technological applications, both for design and system components. Systems pertains to command and control, management, support, delivery components resources and/or technological components.

(b) Effects Tests, to evaluate the impact of electromagnetic pulse radiation upon critical components of military, security, space, or missile assets. How well can components function in a nuclear environment; or can critical space assets function given exposure to nuclear detonations? How well will satellites and communications work after exposure to Gamma or hard X-ray radiation? Can scientists evaluate the impact of electromagnetic pulse radiation in both waves and particles upon critical components of military, security, space, or missile assets without testing? How do critical space assets act given exposure to nuclear weapons detonations? Can communications, command, and control plus intelligence (C^3+I) links maintain integrity given a nuclear battle field? Because computers cannot model such, newly developed national security, and military systems need to be exposed to effects of nuclear detonations. What about nuclear-boosted lasers or particle beam weapons? These are pumped with the effect of small controlled nuclear detonations in a vacuum pipe, insulated from blast, heat, or debris. The major thrust of tunnel horizontal tests work strictly from effects from a detonation.

1 Modernization: Pertains to linear development of new designs in old systems, or new systems altogether. Replacing old stock with the more efficient and reliable, derives less radioactive fallout. Modernization requires development, thus needing testing. Low yield, point-target warheads especially require validation, given current technological sophistication. The country requires test-proof data. Otherwise, larger, dirty, area warheads result given a lack of ability to test. In short, testing results in smaller and better managed weapons.

2 Proof Test Stockpile: Nuclear weapons have limited shelf life. Neutron enhancement detests plutonium. So, for how long past predicted shelf life can one expect to operate from old stockpiles? Can aged warheads be repaired, or reconfigured? How to build a confidence curve without testing? When the moratorium began, the United States commonly featured a ten-year lag in modernization. Some weapons were then approaching 40 years, even though meant for 20-25 years (Kulchuck) How soon before attrition from age renders the American capability negligible? How can a state build a confidence curve without testing? What About component oxidization in such a highly corrosive environment? Are old weapons even safe for the user?

3. Safety & Safeguards Tests: More reliable and secure safety features are improved constantly, including tamperproof mechanisms that can prevent unauthorized use. Redundant safety features cause the arming and firing trains to be more complex. Will a new design work? Will slow high explosives (HE) work rather than sensitive? A nuclear warhead crashed and burned in an aircraft will not

1/40.04 continued

detonate with slow HE. Slow HE is desirable if it can be engineered to work given a warhead configuration How does one validate without test data?

4. New technology: Why should the USA test? Other than for reasons enumerated, add the need to guard against the United States being technologically surprised by new weapon concepts. Any nation that tests can readily develop new horizons from older research in laser, particle beam, and/or plasma physics weapons.

5 Pariah Development: Testing allows design of cleaner, safer, smaller, more reliable, and predictable weapons within an arsenal, especially given new development. Any state just beginning nuclear weapons has a need to test in the best interest of the world. As one said, "Man if they got 'em, let 'em clean 'em up and size 'em down with some safety and reliability! That, or else take 'em away from 'em!" Further, testing means that it is known who has developed and at what stage.

6. Verification: Testing allows perfection in the means of mutual joint verification of all nuclear powers. A centralized nuclear test site equates with measures of control and management of weapons development for compliance world wide. To ignore the fact of nuclear weapons does not make them go away. Worse, denial in the form of "Nucs equal nuclear winter"—so out of the public domain, out of mind, by just forgetting them, will eventually accumulate latent problems. Joint or mutual verification places pressure on maverick states that would try to test, for it could be monitored and verified from a number of sites around the world

7 Without Testing: Russia falls back on previously tested heavy warheads with higher radioactive yields with simpler area-targeted warhead designs (counter value). China, India, Pakistan, Israel, along with any emerging nuclear powers have no opportunity to size down, clean up, or rise up the technological curve toward reliability and safety. The USA relies on technology-optimized warheads, but remains stuck with a ten-year lag in applications of design, effects and reliability Add to that ten years another five years since moratorium.

8. Spin offs: Aside from stockpile reliability, managed testing yields spin offs. Field tests allow scientist to investigate basic physics, with every package fully subscribed with experiments. This becomes impossible without small device nuclear pumping; i.e., lasers, particle beams, plasma physics, and electromagnetic spectrum physics as revealed in a controlled nuclear detonation. This is the physics of which the stars or astronomy are made.

Therefore, I contend that the comprehensive test ban currently being touted is born of deficient and counter productive assumptions or irrational fear. This ill-advised political move plays on an uninformed public opinion without relevance to military doctrine or military strategies, defense policy, or national security policy. A nuclear test ban does not equate with arms control, cannot be equivalent to peace or security, and neither does it enhance the safety or the reliability of existing nuclear weapon stockpiles. A test ban simply denies a nuclear power the ability to maintain and modernize its nuclear assets while building down, if in that mode as is the United States. If in a build up mode, testing becomes a more urgent imperative in the general interest of the earth's commons. What then, might this paper suggest as a resolution to the nuclear conundrum?

4 CALL FOR AN INTS

2/40.46

If nuclear weapons, exist; then equations cannot not balance without the imperative to engage in nuclear testing. I propose an International Nuclear Test Site (INTS) for the collective security and good of the world at large, in spite of deniers. Control and management may be achieved with an INTS.

This paper recommends a world-wide multinational testing program at a single given site, at which all nuclear nations may test their own nuclear devices under close supervision and control of the IAEA Each state could provide its own security, diagnostics, and evaluation for its own purposes as desired The sanctity of classified nuclear technology given national sovereignty would not be jeopardized at an INTS. Testing would be in accordance with treaty provisions of the NPT—a collective security program

Professor Kugler, The Claremont Graduate School, states that if one has nuclear weapons, one should test, especially if down the technological curve. He states that the USA does not need testing because the country has climbed so far up the curve. I submit, the United States has an equal imperative, for different reasons, for testing, even beyond stockpile reliability. By enumerating the ten reasons for nuclear testing one may derive basic suppositions concerning maintenance of nuclear assets in a safe and reliable mode. In the Appendix, information concerning international treaties to which the United States subscribes is also pertinent. I direct attention in particular to the "Proposed Comprehensive Test Ban Treaty" sponsored by the USA.

Opponents to nuclear testing confuse means with policy ends. Weapons of themselves do not make war (Gray). People make war, whether the instruments may be a club, bow/arrow, flintlock, artillery, or the superbomb. Atomic weapons are, however, different in kind rather than just be degree. A whole new sphere of strategy instrumental to policy should adhere to atomic technology, as argued by Gray Nuclear weapons are different by their sheer destructive capacity, in small increments of time, over large areas if desired and if the weapon may be so designed. Pugwash and deniers turn away from what empirically exists; that which requires management, supervision, policy, and effective storage. Without testing, the world has neither management, system, nor policy—just utopian oblivion heedless of national security interests.

In so arguing, the author flies in the face of pervasive popular aversions to force of which atomic weapons are a totem. Unfortunately, as Osgood notes, aversion nullifies the calculated management of force as an instrument of policy (100). This is why my plea sounds anachronistic. Peaceniks presume that without nuclear testing the issues goes away simple because it no longer impinges on the consciousness—for now.

THEORY: I assume universalism or common international systems structural controls, under the IAEA and NPT supervision as a public good. This proposal applies to a balance of interest on behalf of every nuclear power, given centralized IAEC monitoring at a common test site. For the United States, its policy interests and national objectives as the nuclear hegemon demands preponderance in means of nuclear force projections in reserve against the time it may be required. This further requires a nuclear weapons strategy offensively and deterrence defensively. The American objective should pertain to both a war fighting contingency along with defense and/or deterrence.

2/40.46 continued

Empirically nuclear weapons exists. More nations will acquire them. China and France currently test. Great Britain already tests on the American's Nevada Test Site, and desires further testing, particular for SLBM applications. Israel, India, Pakistan and China are under tested. Their warheads are probably large, dirty radioactively, and laced with low-technological applications that can only be cleared up with controlled tests. In fact, they may not even be safe from unauthorized use. As Gray states, "Nuclear weapons can be deterred only by nuclear weapons" (160), so why wait until things get out of hand and have to catch up? The USA needs the best inventory, because nucs are there, and nucs deter nucs. In addition, if the Americans are to keep their lead as the premier nuclear power, they need to get on with modernization and upgrading

AN INTS PROPOSED

I propose for an International Nuclear Testing Site, the existing one on the Nevada Test Site (NTS) where the reservation has been withdrawn from public domain as a result of contamination, with all necessary support services in situ. The NTS features all required services, support, maintenance, and insularity in place for such an international venture. For small yields, Yucca Flats. For yields of 100-150 kilotons, Pahute Mesa. Tunnels for horizontal effects tests as also for physics packages are in place Their tunneling moles can cut an 18 foot face. The NTS features large-hole drilling/tunneling, along with proven containment/ stemming procedures for a shot, supported by super-heavy life equipment, all of which is mobile

A SINGLE WORLD TESTING SITE HAS MANY ADVANTAGES. It standardizes international testing while lowering the cost per user (the British already use this site). More important, it allows the definition of a legitimate nuclear club. The regime could corral mavericks engaged in opaque development; that is, unannounced and covert buildup of unproved assets The IAEA's jurisdiction over an INTS allows a measure of control over users; i.e., states owning nuclear weapons. It could help pinch off a black market, for there exists a regularized channel for development of warheads with secure facilities for weapons-grade special nuclear materials. The IAEA on an INTS would share certain vital technology with users so as to insure higher standards of safety or reliability of weapons, such as PALS for example. PALS are passive action links in the arming and firing train of a nuclear weapon requiring two knowledge persons in order to activate along with access to computer codes so as to unlock classified codes. This preserves a weapons from unauthorized access or use. Further the INTS increases confidence in treaty compliance. But what about the United States specifically?

The Las Vegas Sun, 4 May 93, "The Pentagon affirms that the NTS is necessary for the United States. John Deutsch, the Undersecretary of Defense for Acquisitions and Chairman of the Nuclear Weapons Council told a House panel, 'Underground nuclear testing at the NTS is necessary to ensure the safety of the nuclear stock pile'." If this is true, it holds more urgently for other nations farther down the technology curve. "An option proposed is that five powers, USA, Russia, France, China, and GB allow tests...."(p.5). The Article stops short of proposing a common joint site option

Obvious, the nuclear hegemon needs to guard against being technologically surprised by new weapons concepts that can be uncovered by the nations that continue to test. Modernization is linear. "We have stopped mid-stride," states Kuckuck. "The LLL lab continually disassembles and examines nuclear weapons and conducts non-nuclear tests on components. But LLL requires detonation tests.

WHO IS WHO?

Who supports and who stands against nuclear testing? Those opposed to testing currently have their way, and it affects the laws of war, for opposition prevails. The Pugwash oppose, as also the UN General Assembly Let us consider the UN. In Henkin, under the use of force, any use of nuclear weapons is considered contrary to customary International law (1022). In 1961 the General Assembly passed a resolution declaring the use of nuclear weapons a violation of the United Nations charter and of international law. Henkin, allows big powers the deterrent value of such, conceding that it is not illegal or immoral to own such arsenals (ibid.). The use draws the line. Later in Henkin, Cot & Boniface, on Disarmaments and Arms Control, International Law, Achievements and Prospects Opinion, 811-12 (Bedjaoui, ed.1991) has a section stating that the goal of arms control is thus to safeguard peace, which is not automatically endangered by the existence of arsenals (1040). This legal opinion allows managing and making predictable as also controlling weapons—precisely the arguments in support of testing. The opinion makes a distinction between laws of war pertaining to outlawing a weapon and arms control referring to regulating a weapon (1040). The point here, deniers and opponents are on the side of outlawing nuclear weapons long after they are securely in the arsenals of many powers and slowly proliferating. This paper opts for Cot & Boniface's prospects of regulating and limiting a weapon and its application. It is revealing to see who else currently opposes. Obviously environmentalists, and their extremist greens and Green Peace, along with peace activists. The Roman Catholic Church remains actively hostile to testing without questioning how one can rule something illegal that will not go away. Politicians who note public averseness fall into line, along with the uninformed. There exists no public relations for or on behalf of regulations and controls over nuclear weapons or the technology. Without an advocate, the public remains ignorantly averse. Then follows Hollywood types and other weirdoes. Liberal students generally hop onto the deniers bandwagon. There a certain learned Professor, Moffitt states that nuclear weapons equal nuclear winter–end of story and out of the public domain—as if that completely finishes this issue (167-170). Do you suppose that if I ignore my mother-in-law, she too might simply disappear?

So, who supports nuclear testing, thereby opting for arms control rather than outlawing such weapons? Obviously the Departments of Defense and of Energy. The UN Security Council if forced to a vote. Laboratories and agencies such as LLL, LNL, Sandia, EG&G, Bechtel for example. The United States' Army, Navy, and Air force. Craft unions, for their livelihood is soundly bound up in the continual operation of defense and D.O.E. sites. Country wise, we know France, and China currently test. Great Britain would like to. India has only one known test. Pakistan none. In addition, Japan and Germany would, inasmuch as they will have to go nuclear if ever the United States pulls out of NATO and the Pacific, leaving each up to own resources for defense capability. Authors, if pinned down, such as Gray, the Tofflers, and Zacheim and Ranney would certainly see the logic of testing in the national security interests. Zacheim & Ranney's "constant force modernization" splits between operations & support costs and operations & maintenance. Both of these are missing in the present nuclear program of the USA. These authors note the current defense deficiencies in nuclear and delivery programs.

CONSEQUENCES OF MORATORIUM

3/40.01 The United States as the leader of the Western world in military and nuclear capability, faces attrition and diminishing assets as a consequence of the lack of testing The moratorium in 1992 saw the country with a ten-year lag time in modernization.

3/40.01 continued

Every five years the natural attrition of the stockpile diminishes our assets in a sharply downward curve. Therefore in some 20 years time the viable capability of warheads will diminish so drastically that some other nation will become the premier nuclear power. The American prevailing nuclear capability will see either parity or becomes second best with an increasing attrition curve. Any state that test will easily over take the USA. Currently that will be either France or China. The critical point of power transition will be very dangerous. Why?

The "Power Transition Theory of Organskl and Kugler (The War Ledger) on that attrition curve of diminishing assets, somewhere between 20-25 years, will find another nation prepared to challenge American hegemony. The power transition theory addresses great power, systemic wars. When this comes, the United States will have a very questionable and weak nuclear means at hand. What country will test and challenge? Try France allied with Russia! Or consider China. The consequence of the current moratorium becomes the outlawing of nuclear weapons for the United States by default. It means the demise of American hegemony. Of course with the continuing weakness of the United States, both Germany and Japan will have to go nuclear in their national security interests because the Americans have the folly to fall into a decrepit condition. Worse, our delivery systems at all ranges may be in no better shape than our warheads. Only the SLBMs remain truly viable at this time. We no longer have short or intermediate (theater) range assets. Our ICMB strategic assets lack policy, strategy, and constant force modernization. All in all, a bleak picture resonates with proponents of moratorium—aimed at the heart of American capability. Can you believe it? We participate gullibly in our own demise? For the sake of some utopian idealism Americans gut their strength for some amorphous universal goods packaged as "peace".

CONCLUSIONS

I TAKE THIS STAND BECAUSE I AM A PATRIOT. For the love the United States of America, its flag, and principles, it requires my attention to our own national security policy. Given the moratorium, the USA has no modernization of systems, delivery, or war needs. Neither have we maintenance of deterrence. Defensively we have no options. Why not opt for some defense if we allow our offense to deteriorate? Without strength through arms, a new ABM treaty seems advisable. Any sort of space anti-satellite and anti-missile system seems as important to me as was the Patriot to Israel and the Gulf War forces facing scuds. If we allow our offensive to go down the drain, then had we not best pull in some defense? It takes very little defense to give pause to an aggressor as to whether a "go-for-broke-attack" may succeed or not. Defense helps some, but creates a lot of doubt in an enemy unless he has overwhelming superiority. Vulnerability is last thing I personally want. If you personally face a double barreled .12 gage shotgun, you will opt for cover and concealment first, and offense last.

Those who mindlessly support a comprehensive nuclear testing moratorium certainly do not rationally know the disservice they do to the national security interests of the West and the United States. In a "Security Studies" journal, World Politics, David A. Baldwin warns that "American security is now threatened more by domestic problems than by external military threats (131). This applies to domestic affairs and the trade off between security and other vital national interests. But it also applies to attitudes towards and denial of nuclear testing as a means of national security policy. Certainly neither nuclear weapons nor the military, ought to be ends in themselves. Rather they serve the overall interests of policy. Without testing, nuclear deterrence or defense capacity will not be there to serve at all unless the issue can be rationally re-thought. Hence the lack of balanced strategic thinking The "no nuc testing" club believes in no use, no first use, prohibition of using or owning viable nuclear weapons, and by eliminating testing, can have the results of prohibition, for nucs cannot then be maintained. Right now, is their field day. Personally I prefer to stand foursquare, true and blue for arms control, management, regulated arsenals, predictability with increased safety and reliability. Thus I stand for nuclear testing and NPT. I am not talking about some normative peace utopia or politics. I speak for national survival by considered management!

APPENDIX I

TREATIES

The United States adheres to, and when it conducts underground nuclear tests, it does so in compliance with existing international agreements. Major agreements to which the United States subscribes follow.

The Limited Test Ban Treaty, signed in Moscow, 5 August 1963, which prohibits testing in outer space, underwater, or in the atmosphere. This ended the era of atmospheric testing.

The Threshold Test Ban Treaty of 1974, which limits underground nuclear weapon explosions to a maximum yield of 150 kilotons (one kiloton=1000 tons conventional explosives).

The Peaceful Nuclear Explosives Treaty of 1976, which places a 150 kiloton limit on nuclear detonations with peaceful applications.

NPT, or Nuclear Non-Proliferation Treaty, extended in April 1995 in conjunction with a proposed Comprehensive Test Ban Treaty.

IAEA (International Atomic Energy Agency): The IAEA "International Safeguards" refer to verification measures to assure that nuclear material is not subverted for weapons development by the "have not" nations, for compliance to treaties, or for prevention of proliferation.

Proposed Comprehensive Test Ban Treaty: According to this paper, an ill-advised political move playing on public opinion without relevance to security policy or strategic relevance.

I submit this constitutes an erroneous policy born of deficient and counter productive assumptions. A nuclear test ban does not equate with arms control, cannot be equivalent to peace or security, and neither does it enhance the safety or the reliability of existing nuclear weapon stockpiles. A test ban simply denies a nuclear power the ability to maintain and modernize its nuclear forces while building down--if a state runs on a build-down track. If in a build up mode, testing becomes a more urgent imperative in the general interests of the earth's commons.

Joint Verification Agreement: The USSR and the USA, worked out effective verifiable arms control agreements. This issue centers on "verifiable" along with common safety, reliability, and controllability over international nuclear testing. In the early 1990's, the USA and the USSR were present at one another's underground nuclear tests, each verifying and validating an independent system that allows both dependable and reliable means to detect, evaluate, measure, and locate any underground nuclear tests in the world. Verification measures magnitude as also a typology of weapon designs. Verification pertains to compliance of treaty provisions for those who join this exclusive club of nuclear power holders.

Incidently, the two superpowers were able to finally see how the other side did it. That is, drill, design LOS pipe, rack a device and subscribed experiments, implant, contain, and shoot a device. This, along with the vast support services the enterprise requires, found both doing the same thing, but in different ways.

RESOURCES

Baldwin, David A., October 95. Review Articel "Security Studies and the End of the Cold War, in World Politics, Vol 48, No. 1. Pp117-141

Gray, Colins S., 1993. Weapons Don't Make War: Policy, Strategy, & Military, Technology. Lawrence, Kansas: University Press of Kansas.

Henkin, Louis, et al, 1993. International Law: Cases and Materials, 3rd ed. American Casebook Series. St. Paul, Minn: West Publishing Co.

Kuckuck, Robert W., 1986. Deputy Assoc. Dir. for Nuclear Testing, Lawrence Livermore Laboratories, Mercury, NV. LLL manual, Nuclear Test Program, UCID-20873, US Government Printing Office. Also by security briefing, SAS for WSI on the NTS Dr. Kuckuck and staff covered the reasons for nuclear testing, differently as there was then no test moratorium I force.

Kugler, Jacek, 1995. Center for Politics & Policy, The Claremont Graduate School, on "Nuclear Proliferation: Testing and Other Issues." International Place of the Claremont Colleges, 5 October. (Lunch & Conversation), Claremont McKenna. From notes.

Moffit, Leonard C. 1990. Global Positioning for the Twenty-First Century: Rethinking Strategic Planning, Ch 10, "Conclusions & Questions", pp167-170. East Lansing, Michigan: Michigan State University Press. His Ch 8, "The military Dimension of Strategic Power" completely ignores the nuclear arsenal and delivery systems of the United States, an attitude labeled herein as "denial."

Organski, A. F. K. & Jacek Kugler, 1980. The War Ledger. Chicago: University of Chicago Press.

Pugwash Conferences on Science and World Affair: Refers to information taken from network media broadcasts concerning the 50th anniversary of the founding of Pugwash. The British physicist, Joseph Rotblat, heads an anti-nuclear weapons group he helped found in 1957. Rotblat was originally part of the Manhattan Project, developing the first atomic bomb during WWII. He resigned when it became clear Germany was not developing nuclear weapons. Pugwash recommends doing away with nuclear weapons per se. If so, then testing becomes a moot point. Such utopian hopes subvert rational or strategic thinking, as if Pandora can close her box after allowing its essences to spill out. However, Rotblat has reportedly asserted the need for nuclear testing so long as weapons do exist. I note that if the nuclear moratorium extends beyond 25 years, those countries that do test (France or China) will become the nuclear hegemons of the 21st century. Why? Simply because America forfeits its assets through a lack of proper management; e.g., nuclear testing.

Osgood, Robert E., 1967. "The Expansion of Force," in Robert S. Art & Kenneth N. Waltz, eds, The Use of Force: International and Foreign Policy, 2nd ed., New York University Press of America.

Watkins, Admiral. 3 June 92. A letter to House Speak Thomas S. Foley, published in the NTS News & Views, Vol 3, No. 7, of July 1992, for federal and contractor employees of the DOE, pp2&8. Admiral Watkins, at the time, fully sustains the reasons for testing as enumerated within this study. His letter was sent over the issue of nuclear moratorium.

SSM-M-012
COMMENT LETTER
PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: [illegible] M.I.: [illegible] Last Name: [illegible]

Street Address: [illegible]

Street Address 2:

City: [illegible] State: [illegible] Zip Code: [illegible] -

Organization: [illegible]

Telephone: [illegible] Fax: - -

Comments:

1/40.06 If the US is serious about stemming the spread of nuclear weapons, it must take leadership in ending the international nuclear double standards & make disarmament, dismantlement & international expectations for a Comprehensive Test Ban Treaty a reality.

Nonproliferation requires unconditional, irreversible disarmament. The SS&M Program is antithetical to this approach.

2/40.12 Many organizations in another communication since are citing the likely effect the economic, environmental & national security costs of the SS&M Program described in the draft PEIS.

I do not believe in the name of the nation & all life that we cannot continue nuclear weapons research, testing & production. Life systems need the funds!

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

[redacted]

SSM-M-013
COMMENT LETTER
PAGE 1 OF 2

Alfred A. Brooks • 100 Wiltshire Drive • Oak Ridge, TN 37830-4505 • (423) 482-1559

April 8, 1996

Office of Reconfiguration
US Department of Energy
PO box 3417
Alexandria, VA 22302

Dear Sirs:

I request that the following two questions with comments be included in the Stockpile Stewardship and Management PEIS review and to have specific answers to them.

Question 1

How does the current plan ensure the timely up-sizing of the nuclear weapons system should it become necessary?

1/40.40 One of the stated objectives has been to retain the ability to up-size the nuclear weapons in the event that the international situation worsens making the down-sized level too small. It is stated that this objective is to be reached by increasing production from a one-shift basis to a full-time basis using the same production equipment. This proposed action seems to ignore the fact that the additional training needed by capable machinists to properly and safely engage in the highly demanding efforts of weapons production is about five years. This seems to be an unreasonable delay in response to an urgent threat.

Given the above it would seem that the only way to accomplish a rapid scale-up of nuclear weapons production is to establish a sufficient level of comparable machine work at the production site to employ a staff adequate to go to full-scale production. The technical staff including machinists could then be rotated between the weapons work and the equivalent work to maintain their skills at the proper level.

In the past the Y-12 machine shop capabilities were always in demand for prototype work although this activity was never seriously pursued as a strategic course of action. If this tactic were deliberately pursued it should be possible to employ a staff adequate to ensure a rapid scale-up should it become necessary.

Question 2

2/40.53 How does the current plan minimize the impacts on weapons performance due to inadvertent or unavoidable changes in production methods?

Given that the new nuclear weapons program will not permit weapons testing the problem becomes how to maintain a weapons stockpile without testing. In addition, one of the givens is that there is to be no new weapons design. It is stated that surrogate testing will be used to keep the weapons data base current but I believe that this statement is a bit misleading in the following manner. The weapons data base comprises two parts: 1) the weapons test data and 2) the supporting physical properties and design data. The weapons test data will not change and while surrogate testing may be successful in improving the physical properties data and the computational models there will always be the question: As the production methodology slowly changes do these improvements in data and computations truly reflect the performance of the untested weapons in the stockpile? One method to ensure a positive answer is to devote a new effort to document the details of the current production methods and to establish procedures which will minimize the changes in weapons performance resulting from inadvertent or unavoidable incremental changes in the weapons stockpile.

I do not see in the planning where such an effort exists. On the contrary, the plans seem to stress the down-sizing of the production facility and a considerable upgrade in the surrogate testing methods. In fact, if there were a method of ensuring a completely stable weapons stockpile then no surrogate testing

2/40.53 continued would be needed. On the other hand, if the weapons, for any reason, start to undergo significant changes then surrogate testing, while useful, does not ensure unpredicted changes in performance will not take place. I believe that a better balance between surrogate testing and weapons stabilization would be desirable.

It may be that any definitive actions in these matters lie beyond the time frame of the plans but I would point out that if they are now ignored the current skills and knowledge required will be lost.

Thank you for your attention to this matter.

Sincerely,

Alfred A. Brooks

Testimony Given At The April 1,1996 Hearing On The Draft PEIS For The SSMP ,In Oak Ridge, TN

I am Frank Bruce, a retired Associate Director of the Oak Ridge National Laboratory. I reside at 116 Euclid Circle, Oak Ridge, Tennessee 37830.

The purpose of the Draft PEIS should be to present to the public a plan that assures, beyond any doubt, the safety and reliability of the nuclear stockpile. Since the size of the stockpile is being reduced, the public also

1/40.05 has a right to expect a"peace bonus". In this Draft PEIS there is little assurance of the continuing safety and reliability of the stockpile. Neither is there any saving offered by the so-called science based stockpile surveillance plan.

2/40.13 I request answers to two questions. First, what is the annual cost [capital and operating,but without underground testing] for the next decade, for the SSMP.How does that cost compare with that of a conventional surveillance program [rigid inspection and recertification but no underground testing], such as been used successfully for the last 50 years.

3/40.06 Secondly, in the May 1995 SSMP the DOE itself said: "Science based stewardship and management of the stockpile has never been done before. Meeting this challenge will be neither inexpensive nor without risk." Please explain how we, the public, should feel comfortable with a plan that is very, very costly and gives us less,not more, nuclear deterrent?

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: JOHN M.I.: K Last Name: WALTER

Street Address: 7001 COMANCHE NE

Street Address 2:

City: ALBUQUERQUE State: NM Zip Code: 87110-

Organization: RETIRED SNL EMPLOYEE

Telephone: 505-884-4282 Fax: (same number after telephone notice)

Comments:

SEE ATTACHED

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

Receiver's Initials: ______

Comments
Stockpile Stewardship and Management
Draft Programmatic Environmental Impact Statement
John K. S. Walter, Jr
April 17, 1996

Although I am presently a private citizen, nearly all of my engineering career was in various organizations involved in national security. Just over a year ago, I retired from Sandia National Laboratories. From 1960 through 1994, I worked for an AEC Weapons Production Agency, the Los Alamos Scientific Laboratory, and Sandia National Laboratories in widely varying engineering assignments and at various levels. The laboratories particularly had (and have) many brilliant, dedicated, and patriotic scientists and engineers, and I have been a strong advocate for the weapons programs, the labs, and DOE plants. In the early 1990s, I was assigned for a year to DOE Headquarters in Washington, D.C., to assist in planning the reconfiguration of the DOE Weapons Complex, under a program that has been redirected.

My comments are based on my personal experiences, my personal contacts with many others in the same general business, and a few notes that I have kept during my career. My comments follow the following general outline:

1) Positive reaction to public hearing and summary document.
2) Expression of negative opinion concerning the overall policy direction.
3) Discussion of planned major facility installations at laboratories.
4) Comments on nuclear testing.
5) Sampling of unmet needs in national security.
6) Summary of recommendations.

1/41.05 It is appropriate to comment positively on the outstanding briefing at the public hearing on March 28, 1996, in Albuquerque, New Mexico, and the documentation available to the interested public. The *Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management-Summary* is well written and understandable. The briefing by Steve Guidice was well prepared, and his responses to many varied questions and comments (some hostile) were professional, polite, and respectful.

2/40.54 However, I believe that the overall policy direction is fatally flawed and leading completely in the wrong direction. In fact, the overall policy direction leads the environmental study to worry about such minutiae as "...Statistically, this equates to one fatal cancer every 5 million years at Pantex from operation of the A/D Facility." Since we are concerned with the nuclear safety and security of the world involving real weapons of mass destruction, literally tons of plutonium, and an environmental mess, the overall policy directions for the program are extremely important.

The summary document mentions several major facility installations either previously authorized or in the advanced planning stages. It is at least implied that these facilities are

3/41.18 justified for "science based stockpile stewardship". The DARHT facility, for example, is an advanced, very capable flash X-ray machine that will allow dynamic evaluation of the high explosive implosion process of a simulated nuclear explosive primary. It is, of course, not possible to take a real primary and test it in the DAHRT facility, so it would appear to be a design tool. It is undoubtedly already established by nuclear testing at NTS that the primaries in the enduring stockpile, as built to specifications, will operate as desired. To the citizenry and to potential adversaries, the DARHT facility appears to be a design and development tool, hardly to be justified by stockpile stewardship. So is it also for the National Ignition Test Facility to be installed somewhere-perhaps at Livermore.

4/21.15 The NIF will use high power lasers to generate conditions for thermonuclear reactions, that is, similar to the reactions that take place in the secondary of a nuclear explosive. However, it is already known and certified through nuclear tests that the secondaries will operate as designed, if driven by the test certified primary. It is certainly not obvious why the NIF is required for stockpile stewardship. If the facility is required for the design of new weapons, then it would appear the US is still involved in the design and development of new weapons-which seems to counter stated policy. If the facility is required for basic fusion research, then it has no business in the weapons program.

With respect to nuclear testing, several years ago Robert N. Thorn gave testimony to the House Committee in Armed Services. At the time, Thorn was a Deputy Director at the Los Alamos National Laboratory. Previously, he had been the head of a group that was responsible for the thermonuclear design of Los Alamos nuclear explosives for weapons applications. Although Robert Thorn is no longer living, his concern over the importance of nuclear testing to provide confidence in the nuclear deterrent are pertinent to today's issues. During Thorn's career, he exerted a major influence on what has become the enduring stockpile. In his testimony he described in unclassified terms incidents where temporary test moratoriums resulted in weapon certification without the benefit of nuclear tests and basically resulted in temporary situations where portions of the stockpile were inoperable. In the event that new weapons are required through unanticipated international developments, it is unrealistic and perhaps foolhardy to assume that we as a country would commit military forces with untested weapons, particularly when we have a stockpile that is certified through nuclear tests.

5/40.01 Still on the subject of nuclear testing, in my direct experience at Los Alamos, I participated in the mechanical design of three different test devices for nuclear tests. Although the nuclear designs were exhaustively analyzed, not one of the devices worked as intended. Although the current design tools are more capable than those available in the late 1960s, it is unduly arrogant to believe that future designs can be attained without nuclear testing. In a crunch, we would depend on existing tested designs, make a mad scramble to drill holes in Nevada, or commit forces to military action with weapons which may or may not operate.

In these considerations, it is significant to consider the relationship between the DoD and DOE. Although I am now a private citizen without current access and my knowledge is limited, I did attend a Stockpile Improvement Conference in early 1993. The participants

primarily included operational planning officers at the colonel level, DOE representatives, and DOE Laboratory personnel. The general attitude was hostile, or at least a negative, toward any stockpile improvements suggested by the DOE laboratories, unless the DOE representatives had direct evidence that existing weapons were unsafe or inoperable. Suggested DOE improvements to the stockpile not only impacted the DOE financially but also required significant resources on the part of the DoD. This DoD budget impact seemed to be a significant deterrent for taking any action with the stockpile unless weapons were known to be unsafe or inoperable. In fact, there were facetious remarks about the lack of any market pull whatsoever! The DoD representatives cited decreasing budgets and DoD base closings as significant restraints to budget commitments for improving the nuclear weapons in the stockpile. There are some that believe that the myriad of complex nonnuclear subsystems and components require continual evaluation, updating, and refurbishment, since their effective lifetimes are essentially unknown. At least the process should not be restrained by multi-agency budget overlap. In addition, the non-nuclear subsystems were optimized for their military effectiveness and not necessarily for extended lifetimes.

Some of my contacts at Sandia Laboratories have indicated that there are very few stockpile improvement projects underway and have facetiously indicated that the current mission statement at Sandia Laboratories is 1.2 billion dollars and 8000 people. This state of affairs must be doubly true for the nuclear laboratories.

6/42.08 There are many expensive programs facing the DOE, or the country, that need funding before undertaking unneeded installations that have a strong appearance of tools for the design and development of new weapons. Examples include the cleanup of the weapon sites, the storage of low level waste, the long term storage and safe keeping of plutonium, the development of theater ABMs, and the storage and reprocessing of spent reactor fuel. It would even make more sense to drill contingency holes in Nevada in case an unexpected international situation demanded a special nuclear weapon response for which a test would be required.

Although congressional delegations from affected states have done an excellent job of protecting budget levels for the local DOE facilities, I believe that the nuclear deterrent issues are important enough to transcend institutional protection. The Galvin Commission essentially recommended that the nuclear national labs should tend to their knitting and only work in other arenas when the basic national security mission is supported.

7/40.27 However, the lab leaders ended up meeting and "splitting up the pie", and the institutions remain essentially unchanged. If the federal government and/or private industry do not have real and important work for the labs, they need to be consolidated, downsized, or "right-sized".

8/40.26 In summary, the issues are important enough to justify another review, prior to building a widely scattered, expensive set of facilities designed to understand the basics physics of nuclear explosives. The concept of science based stewardship looks like, feels like, and quacks like a set of facilities for proceeding with the development of new weapons while

SSM-M-015
COMMENT LETTER

PAGE 5 OF 5

8/40.26 continued | there are so many other unmet needs. The stockpile needs continual refurbishment, modernization, and remanufacture in order to survive long term dormant storage. The relationship between DOE and DoD must be modified in order to assure cooperation and the availability of resources to carry out a long term program. The country needs a facility to build replacement pits, when pits go bad or are consumed in surveillance.

I am sending these comments under a cover letters to appropriate members of congress.

SSM-M-016
COMMENT LETTER

PAGE 1 OF 2

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: MYRON M.I.: L Last Name: HUANSLY

Street Address: 110 OUTER [illegible]

Street Address 2:

City: OAK RIDGE State: TN Zip Code: 37830-

Organization: Anderson County [illegible]

Telephone: 423-481-0586 Fax:

Comments:

1/08.19 | My review of the PEIS [illegible] indicated far too little attention was paid to local socio-economic impacts. The DOE representatives indicated in the public meeting that the PEIS showed that "the Oak Ridge area has a significant [environmental] [on Oak Ridge] since all actions involve downsizing Oak Ridge."

Yet the PEIS identifies [illegible] as an impact that was [illegible] to be minimized.

Substantial local public & private money was put into building infrastructure to support the DOE operation (roads, schools, utilities). The infrastructure improvements were made with very little federal money. They involve more local than [illegible].

The PEIS does not consider the total negative impact on local surroundings (ie [illegible] cuts at the [Oak Ridge] site, expansion at [illegible] non[illegible]). The PEIS [illegible] to

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

Receiver's Initials: ______

SSM-M-016
COMMENT LETTER

PAGE 2 OF 2

1/08.19 continued

Comments (cont'd):

Account for and Assess their "[illegible] (Stranded) Costs."

SSM-M-017
COMMENT LETTER

PAGE 1 OF 2

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: THOMAS M.I.: H Last Name: Peek

Street Address: 5211 Hightop Trail

Street Address 2:

City: Knoxville State: TN Zip Code: 37923-

Organization: Union UA Local 718

Telephone: 423-693-4974 Fax:

Comments:

4/2/96 As of 4/4/96, I will have been a pipefitter at Y-12 for 17 years.

My question is on the Draft PEIS Stockpile Stewardship and Management and I request that the question be answered in writing in the final PEIS.

1/08.18 The Draft PEIS states in the Summary on page S-35 that the proposed plan is to cut Y-12's manufacturing capability from the current 2350 Defense Program workers to 870. The kind of employees making up this 870 total are reported in the Appendix, Volume 2, on Page A97.

Please identify the skill mix that makes up the proposed 131 craft workers

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

Receiver's Initials: ______

Comments (cont'd):

1/08.18 continued

And the 93 operatives. Without the breakdown of direct Labor skills the public cannot evaluate the feasibility of this Level for meeting the proposed production requirements.

Thank You
[signature]

CHAMBLISS & BAHNER, PLLC

CHATTANOOGA, TENNESSEE

April 5, 1996

The Honorable Hazel O'Leary
Secretary of Energy
Forrestal Building
1000 Independence Avenue S.W.
Washington, D.C. 20585

Dear Ms. O'Leary,

I am the Democratic candidate for Congress from the 3rd District of Tennessee. On April 1st of this year I attended the DOE public hearing on the Programmatic Environmental Impact Statement for Stockpile Stewardship and Management as both a concerned citizen and a candidate for Congress. After participating in that public hearing I wish to advise you personally of my deep concern that this administrative proceeding is seriously flawed.

At the risk of stating the obvious, this entire proceeding is about downsizing of DOE's mission in an entirely new geopolitical context. It is obvious that there are several sites, notably including both Los Alamos and Oak Ridge, competing for the stockpiling and stewardship functions which will remain once downsizing is completed.

1/41.03

It is also apparent that a downsizing which simply involved a reduction of existing stockpiling and stewardship activities at existing sites would require no new environmental impact statement. That a PEIS has been prepared at all speaks eloquently to the fact that the DOE plan from the outset has been to perform stockpile and stewardship activities either at new locations and/or to a much greater extent than previously.

2/41.10

The documents ostensibly comprising the underlying administrative record in the PEIS amount to more than five inches of reading material of a highly complex and technical nature. Participants at the public hearing, and especially public

The Honorable Hazel O'Leary
April 5, 1996
Page 2

2/41.10 continued officials were highly critical of DOE's procedure of making these background documents available only a matter of days before the hearing seriously impairing the public's ability to familiarize themselves with the data and assumptions which underlie the PEIS.

3/41.05 The proceedings were compromised further by the combination of the hearings on stockpile and stewardship PEIS with the hearings on the Storage and Disposition of Weapons PEIS with all of its attendant administrative record. And, although the underlying documents were only available at the last minute there was an abundance of visual aids and even subject specific video which obviously had been prepared well in advance of the Oak Ridge hearing.

4/41.06 The net impression was that DOE was not proceeding even-handedly to obtain informed input on a question still undecided. Rather the impression was that DOE was attempting to overwhelm Oak Ridge with paper and slick presentations in an attempt to sell a preordained conclusion which favored Los Alamos without regard for critical facts and factors which favor Oak Ridge.

In this context it should hardly be surprising that the PEIS hearings have been viewed with public skepticism and not inconsiderable resentment. DOE has further compounded an already acute credibility problem by assigning major responsibility for development of the PEIS administrative record to Los Alamos personnel when it is obvious on its face that Los Alamos is one of the sites competing for future stewardship activities. This action destroys any illusion of fairness or objectivity, and instead conjures up visions of foxes designing henhouses.

It is my feeling that the administrative record of this proceeding so abundantly demonstrates a lack of even-handedness that a defensible conclusion to this proceeding is impossible. I urge you to put an immediate end to the travelling road show presenting the Stockpile and Stewardship PEIS and the Storage and Disposition of Weapons PEIS and instead develop a process whereby each of the competing locations can be objectively evaluated in a fair and objective process.

Based on my own participation and first hand observation, I would find it impossible to defend DOE's decision making process in this proceeding as it has unfolded.

The Honorable Hazel O'Leary
April 5, 1996
Page 3

I would appreciate your personal response to this letter at your earliest opportunity and would further request that a copy of these remarks be placed in the administrative record of both the Stockpile and Stewardship PEIS and the Storage and Disposition of Weapons-Usable Fisible Materials Draft PEIS.

Very truly yours,

Charles N. Jolly

cc: U.S. Department of Energy
Office of Reconfiguration
PO Box 3417
Alexandria, Virginia 22302

SSM-M-019
COMMENT LETTER

PAGE 1 OF 1

THE B. R. BARFIELD CO.
INCORPORATED
P O Box 9510 Amarillo, Texas 79105 (806) 376-5588

April 10, 1996

U. S. Department of Energy
Office of Reconfiguration
P. O. Box 3417
Alexandria, Virginia 22302

U. S. Department of Energy
Office of Fissile Materials
P. O. Box 23786
Washington, DC 20026

Over one hundred years ago, my great-grandparents came to Amarillo. My grandfather was the first president of the Amarillo Board of Trade (predecessor of the Amarillo Chamber of Commerce) in 1906, my father was on the board of the Chamber in the 1936, and I served as president of the organization in 1961. With deep roots and a large investment in Amarillo, involvement and a strong interest in community affairs has always been a commitment.

1/40.52 I respectfully urge DOE to designate Pantex as the preferred alternative for all existing and new stockpile management and stewardship functions as well as consolidation of all plutonium storage and disposition and any related functions.

Sincerely yours,

B. R. Barfield

Continuing a Tradition of Service Since 1889

SSM-M-020
COMMENT LETTER

PAGE 1 OF 1

Amarillo Globe-News
SouthWestern Newspapers Corporation

GARET VON NETZER
PUBLISHER

April 8, 1996

U.S. Department of Energy
Office of Reconfiguration
P.O. Box 3417
Alexandria, VA 22302

To Whom It May Concern:

I may be unable to attend the Department of Energy's public hearings in Amarillo on April 22 and 23, but wanted to comment on the Programmatic Environmental Impact Statements (PEISs) on Stockpile Stewardship and Management (SSM) and Storage and Disposition (SDD) of Weapons-Usable Fissile Materials.

1/40.52 The Pantex Plant has always received strong support from Amarillo and the region, and we strongly urge the DOE to designate Pantex as the best site for any new construction/stewardship activities.

By building and expanding on facilities that are already here, DOE could eliminate the costs of duplicating facilities elsewhere.

2/34.01 Pantex would also seem to be the best site to continue High Explosives fabrication. The cost to transfer these functions to another site would be prohibitive and should the emphasis in our country shift from deterrence to production of nuclear weapons, the Pantex Plant is already in position to quickly and cost-efficiently begin production.

1/40.52 continued Because of our strong community support and the cost-effectiveness of utilizing and expanding already existing facilities, I urge the DOE to designate Pantex as the preferred alternative site for all existing and new stockpile management functions as well as consolidation of all plutonium storage and disposition functions.

Sincerely,

Garet von Netzer
Publisher

Amarillo Daily News | Amarillo Globe-Times | Amarillo Sunday News-Globe
900 Harrison • P.O. Box 2091 • Amarillo, Texas 79166 • Phone (806) 376-4488

SSM-M-021
Comment Letter
Page 1 of 1

Testimony Given At The April 2, 1996 Hearing, In Oak Ridge, TN On The Draft PEIS For The SSMP

I am Frank Bruce, a retired Associate Director of the Oak Ridge National Laboratory. I reside at 116 Euclid Circle, Oak Ridge, Tennessee 37830.

On June 14,1995 the DOE published a Notice of Intent in the Federal Register announcing its intent to prepare a SSM PEIS.The PEIS contained brief descriptions of the eight major facilities in the nuclear weapons complex. On page 8 of the document, descriptions of the programs at Lawrence Livermore National Laboratory [LLNL] and Los Alamos National Laboratory [LANL] appear. They are identical to the letter.

1/40.27

The DOE appointed Galvin Committee reviewed the effectiveness of the DOE's National Laboratories. It recommended that LLNL be phased out of the weapons business.

Please explain how the DOE justifies the continued operation of LLNL as a weapons laboratory in light of the fact that it duplicates LANL, and in light of the Galvin Committee's recommendation.

SSM-M-022
Comment Letter
Page 1 of 2

April 22, 1996

U.S. Department of Energy
Office of Fissile Materials
P.O. Box 23786
Washington, DC 20026

RE: Pantex

To Whom It May Concern:

1/30.01
2/34.01
3/40.52

Greg Lair, Inc., of Canyon, Texas, supports the selection of Pantex for weapons assembly and disassembly activities. We strongly endorse the continuation of high explosives (HE) functions at Pantex, and oppose any plan to move these functions to the national laboratories. Since Pantex is the most cost-effective Department of Energy (DOE) facility and enjoys the strongest local support, we endorse the addition of other environmentally sound stewardship and management functions at Pantex. Furthermore, we believe that Pantex should be chosen as the location for fissile materials storage and disposition functions.

2/34.01 continued

Pantex must retain HE capabilities to process the inventories already onsite from dismantling. Millions of tax payers dollars have been spent recently at the site to ensure that all the functions are safe and efficient. It is the only cost-effective choice available. Moreover, it would be highly advantageous to have all HE functions situated on the site to upgrape existing weapons systems; In the event of weapons production, onsite HE functions will be a necessity. High Explosives functions must remain at Pantex.

3/40.52 continued

Since Pantex is the most cost-effective DOE facility and enjoys the strongest locall support, it is appropriate to consider Pantex as an alternative site for all future defense-related facilities to complement activities at the national laboratories. The location of additional defense-related activities at Pantex would ensure that core technical capabilities are preserved at a location that can secure them at the most efficient cost to the tax payer. The Department of Energy must view accurate budgetary comparisons between Pantex and other sites. Life-Cycle analysis would assist in these comparisons to ensure the inclusion of all capital, transportaion, training, remediation, and all costs.

GREG LAIR, INC.
CANYON E-WAY & BUFFALO STADIUM RD. • P.O. BOX 510 • CANYON, TEXAS 79015 • 806-655-2583

SSM-M-022
COMMENT LETTER

PAGE 2 OF 2

April 22, 1996

Greg Lair, Inc.
P.O. BOx 510
Canyon, TX 79015

Page -2-

We believe that Pantex should be chosen as the location for plutonium storage. It seems that Pantex is the only facility that has handled assembly and disassembly operations in a safe and efficient manner. If cost savings are considered, Pantex is the only choice for plutonium storage. The facility is already storing plutonium on-site, and has strived significantly to ensure not only safety but environmentally sound practices as well. Not only has the facility made recent upgrades to storage facilities, storage container usage and reconfigurement, and security enhancement, Pantex could also upgrade facilities for any and all storage options being considered by the DOE using processes already in place with minimal cost and difficulty. It makes little sense to re-create storage facilities at another site and then unnecessarily transport large amounts of plutonium across the country from Pantex. The cost and possible consequences of this decision would be enormous. Pantex also should be designated the preferred site for any disposition options and related function. It makes sense to site deposition where storage already exists. Furthermore, it is not feasible, from any perspective, to site strategic storage at one site and surplus at another. Pantex has the necessary safety, security, and surveillance capabilities to accommodate an expanded role with minimal costs, and it is the production site closest to Los Alamos, the planned fabrication site.

3/40.52 continued

Based upon the above reasons and for the continued benefit of the entire community, Greg Lair, Inc. urges the Department of Energy to designate Pantex as the preferred alternative site for all existing and new stockpile management and stewardship functions as well as consolidation of all plutonium storage and disposition and any related functions.

Sincerely yours,

Greg Lair

GL/es

SSM-M-023
COMMENT LETTER

PAGE 1 OF 1

Dear

1/40.27

I'm opposed to nuclear research and development at Livermore Laboratories

4·8·96

SSM-M-024
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: DONALD M.I.: W Last Name: MOATS

Street Address: 1678 [illegible]

Street Address 2:

City: LIVERMORE State: CA Zip Code: 94550 -

Organization: [illegible]

Telephone: 510-447-4062 Fax: - -

Comments:

attended NIF Hearings Today 4/11/96

Conclusions:

1. Nuclear weapons are part of our national defense

2. Until they are eliminated by treaty We need to maintain the [illegible] of our present stockpile

3. NIF will do this without atmospheric testing

1/21.06 4. I am in favor of NIF.

5. NIF will also supply data on nuclear fusion energy which is of great importance to mankind.

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

SSM-M-025
COMMENT LETTER

PAGE 1 OF 1

April 9, 1996

Department of Energy
Office of Reconfiguration
Box 3417
Alexandria, VA 22302

To Whom It May Concern,

1/21.04 I am writing to voice my opposition to the proposed National Ignition Facility (NIF), scheduled to be constructed at the Lawrence Livermore Laboratories. With the Cold War long since over, the last thing our nation needs is a $4 billion facility for nuclear weapons research and development.

2/21.16 Please take a leadership role in preventing the NIF from polluting
3/21.17 the Bay Area and undermining international disarmament efforts.

Sincerely,

Kathy M. Aftab

Kathy M. Aftab
1623 Beverly Place
Berkeley, CA 94707

SSM-M-026
COMMENT LETTER

PAGE 1 OF 2

For: Hearing Record,
DRAFT PROGRAMMATIC ENVIRONMENTAL
IMPACT STATEMENT (SSM PEIS)

We fear for the future of the children of the earth in a world of increasing nuclear weapons.

Our own children were born & brought up during the days of atmospheric testing. At the time our family was living on the East Coast where the wind and rain were the delivery systems for fallout from bombs tested thousands of miles away in the Nevada desert.

It took us some time to realize that parents could actually bring about policy changes, but such a change did take place in 1963 after thousands of mothers, fathers and others wrote and marched for an end to nuclear testing--a campaign that resulted in the Partial Test Ban Treaty under President John F. Kennedy.

However, in order to conclude that treaty, an agreement was struck with the national nuclear labratories and their advocates in Congress and the administration, that testing would continue underground.

Indeed, testing continued for thirty years and today the nuclear arsenal stands at a far more sophisticated level than it did in 1963.

1/40.07

In 1993, to his credit, President Clinton put a stop to underground testing and began to press for a Comprehensive Test Ban Treaty. But history tends to repeat itself and is doing so today when once again the pressure from the national labs--Sandia, Los Alamos and Lawrence Livermore Labratory, is being felt in Washington. As a result, the Comprehensive Test Ban Treaty sought by the administration will be undermined by continued testing of bombs both in-lab and at the Nevada Test Site, so that new, miniaturized, ever-more powerful and woefully expensive models will become possible.

In other words, the Comprehensive Test Ban will be far from comprehensive and Stockpile Stewardship will hardly be the benign effort it purports to be.

Once again a multi-billion dollar sop is being thrown to the national nuclear labratories that will surely trigger another nuclear arms race worldwide.

What sort of message are we sending to the nuclear have and have-not nations now negotiating in Geneva?

It is high time the United States stood firm on the force of international law, especially on Article VI of the Non-Proliferation Treaty renewed just last summer which states, "Each of the Parties to the Treaty undertakes to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament..."

SSM-M-026
COMMENT LETTER

PAGE 2 OF 2

2/40.06

The date is certainly not early, but there is still time to negotiate an end to the nuclear arms race in good faith, not the beginning of a new and more dangerous race. The United States spearheaded the nuclear race originally. It is high time we took the initiative in ending that race, and in leading the world out of the nuclear morass, rather than more deeply into it!

It is also high time that the mothers and fathers of this planet no longer have need to fear for their children's future on account of more prevalent, more powerful, more deliverable nuclear weapons.

Alice Cox

Dr. William P. Cox

SSM-M-027
COMMENT LETTER **PAGE 1 OF 2**

Statement to the Department of Energy
April 11, 1996
Stockpile Stewardship and Management PEIS Hearings
by Patrice Sutton, MPH
311 Douglass Street, San Francisco, CA 94114

I am a member of the Board of Western States Legal Foundation. I am also a Research Scientist working in public health and an active member of the American Public Health Association Peace Caucus. The Department of Energy's (DOE's) Stockpile Stewardship and Management (SSM) Programmatic Environmental Impact Statement (PEIS) is an outrage and affront to my responsibilities in both of these integrally related roles of public health and peace.

1/40.12

Amidst public squalor, DOE is proposing spending billions of dollars to perpetuate nuclear weapons research, testing and development well into the 21st century. In the minutes that I have to comment on DOE's plans for a nuclear future, 600 children will die or be permanently and severely disabled by preventable illness. Yet DOE proposes the plunder of vast resources that could improve living conditions and lessen real social, economic and environmental risk. To our national disgrace, a much higher proportion of the US population lives in poverty than in other wealthy industrialized nations -- one in 5 children in America live in families with incomes below the poverty line. Federal funds for housing, corrected for inflation, were reduced by 75% during the period 1981-1992, and we now accept the unacceptable — the sight of homeless families sleeping on the street. I am here to say to the DOE that we need a program to re-build a public health infrastructure that has been devastated, not a program to reconfigure the nuclear weapons complex.

2/40.06

Yet the choice between continuing the production of nuclear weapons and a world free of nuclear weapons has been disallowed by DOE — dismissed in less than 100 words on page S-23. How can the DOE seriously suggest that the environmental impact of maintaining research, design, testing and production capabilities of nuclear weapons can be fairly assessed if the most basic and crucial issues to the discussion, namely, do we need nuclear weapons and what is the impact of their use are not permitted?

DOE's PEIS statement regarding "denuclearization" is that, "under this approach, nuclear weapons would be eliminated worldwide." *This is exactly why this alternative should be considered.* The US' newly affirmed Non-Proliferation Treaty (NPT) obligations require that the US pursue an end of the nuclear arms race at an early date and a treaty on general and complete nuclear disarmament. Indeed, the intended meaning of a zero-yield Comprehensive Test Ban Treaty (CTBT) is to stop the production of nuclear weapons — to herald the beginning of the end of nuclear weapons. In stark contrast to the US' treaty commitments, the PEIS is a harbinger of a nuclear weapons filled future.

Replacing underground nuclear testing with an expanded laboratory infrastructure exemplifies a continued commitment to nuclear weapons as core instruments of national policy. That commitment legitimizes nuclear weapons which in turn affects other countries assessment of their desirability. Aggressively maintaining and developing nuclear weapons design and production capabilities allows the nuclear weapons States to rekindle the arms race at any time, a message that endangers the long term viability of the non-proliferation regime. If the US is serious about stemming the spread of nuclear weapons, it must take leadership in ending the international double standard and make disarmament and eventual abolition of nuclear weapons a top priority. The SSM plan are antithetical to this approach.

SSM-M-027
COMMENT LETTER **PAGE 2 OF 2**

2/40.06 continued

Despite the apparent appeal for public input at this time, DOE has constrained that input to issues of *how* we will maintain nuclear weapons capabilities, not the consequences of their maintenance. The logic of nuclear weapons is that if they are built it is possible for them to be used. Nuclear weapons are a cardinal feature of US military strategy, which embraces a comprehensive integration of conventional and nuclear weapons. US military strategy is based on the principle of escalation dominance, which briefly summed up, directs the US maintain military superiority at every progressive level of violence. As the PEIS states, "a safe and reliable US nuclear weapons stockpile has been the cornerstone of maintaining a credible nuclear deterrent." Nuclear weapons must be credible, you do not make them if you are not willing to use them. I would invite the authors of the PEIS to view the pictures of Nagasaki and Hiroshima, visions that have clearly depicted that we cannot *ever* be willing to use nuclear weapons again. So when we are talking about "reliability", the critically important questions, *"how reliable"*, and *"why"*, remain unanswered, particularly in regard to what purposes a "robust" arsenal serves for projecting US power globally.

1/40.12 continued

Over the last 50 years, the US has squandered over $4 trillion dollars on nuclear weapons. More difficult to assess are the costs to the environment and public health: Some 235,000 atomic veterans, nearly 4,000 human radiation experiments involving tens of thousands of individuals, at least $230 billion to clean up the nuclear weapons complex, national sacrifice zones and the possibility of total annihilation. The continued production of nuclear weapons, as part of a renewed commitment to militarism, steals resources that could be used to protect the lives of the 40,000 children who die each and every day for lack of food, clean water and immunizations. It steals resources that could provide education for the one billion people who will mark the turn of the century without being able to sign their name or read a road sign. An honest PEIS would show an alternative, that rather than embarking on building US nuclear weapons capabilities, would turn our attention to reweaving the social fabric of our communities, and to promoting our stated goals of nuclear non-proliferation. Contrary to the PEIS, the only "rightsizing" consistent with the NPT and CTBT is a one size fits all — no nuclear weapons for anyone future.

SSM-M-028
COMMENT LETTER

PAGE 1 OF 1

April 9, 1996

Dear friends,

I'm very much against the contemplated SS&M Program. We should be working to have a <u>zero</u> stockpile of nuclear weapons.

1/40.12

The money saved is needed for programs helping our citizens to have a better life — not used to destroy the earth.

Sincerely,

Russ Curtis

SSM-M-029
COMMENT LETTER

PAGE 1 OF 1

Dear persons concerned,

1/40.07

I am writing because I wish for ~~to~~ halt nuclear weapons development and design. The DOE squanders billions of dollars in the name of military madness. As a ~~tax payer~~ and concerned world citizen I demand that you cease development [illegible] make a commitment not to jeopardize our lives.

SSM-M-030
COMMENT LETTER

PAGE 1 OF 1

April 2 96

Dept of Energy -

1/40.06 Please in considering the so-called Stockpile Stewardship Program that the reasonable alternative is clearly ABOLITION and DENUCLEARIZATION. A continued commitment to nuclear weapons will be maintained if we do anything short of total ABOLITION - dismantle (take bombs off missiles and put in molasses) the weapons as soon as possible and make the 21st Century possible for our children and future generations. Sincerely

Cynthia Johnson

SSM-M-032
COMMENT LETTER

PAGE 1 OF 1

My name is John M. Napier

I live at 113 Dartmouth Circle, Oak Ridge, TN 37830.

My question relates to the Draft Program Environmental Statement for Stockpile Stewardship and Management.

1/10.14 The uranium production processes generate waste nitrate liquids that are treated in permitted facilities at the Y-12 plant and LANL will also generate nitrate liquids if the uranium processes are moved to LANL. How does LANL treat their current nitrate waste liquids and are they planning any new treatment plants f... future nitrate liquids wastes?

Please include the answer to this question in the final Stockpile Stewardship and Management Environmental Impact Statement.

SSM-M-033
COMMENT LETTER

PAGE 1 OF 2

Bill Wolfe CUSTOM HOMES

Bill K. Wolfe
President

(806) 358-6441

4425 Tiffani Drive
Amarillo, Texas 79109

April 5, 1996

U.S. Department of Energy
Office of Reconfiguration
P O Box 3417
Alexandria, Virginia 22302

U. S. Department of Energy
Office of Fissile Materials
P O Box 23786
Washington, DC 20026

Re: Comment on Stockpile Stewardship and Management (SSM) and Storage and Disposition (S&D) of Weapons-Usable Fissile materials Draft Programmatic Environmental Impact Statements (PEISs).

Thank you for the opportunity to comment on the U. S. Departments of Energy's (DOE) Programmatic Environmental Impact Statements (PEISs) on Stockpile Stewardship and Management (SSM) and Storage and Disposition (S&D) of Weapons-Usable Fissile Materials. Please also consider this my comment on the Pantex Site-Wide Draft Environmental Impact Statement, since most of the issues addressed in these documents are identical.

1/40.52

First and foremost, I maintain that any current and future functions at Pantex must be conducted in a safe and environmentally sound manner. Any expansion at Pantex must be implemented in a way that does not impair the health or safety of area residents or have an adverse affect on the environment.

Second, I maintain that the history of Pantex and the Texas Panhandle communities have been one of lower cost than other facilities, a safer and more environmentally sound operation and of overall strong community support for the operation.

SSM-M-033
COMMENT LETTER

PAGE 2 OF 2

1/40.52 continued

Third, I further maintain that the movement of any existing functions from Pantex to other locations are not cost effective uses of our (yours and mine) tax dollars. The high cost of new facilities would far outweigh any other theorized savings that come from a facility with historically higher costs.

Finally, I maintain that if any movements of operations are to be considered, the operations that have provided safe, cost effective and productive performance over the years should receive additional work rather than having any work removed. Therefore, Pantex should be the natural location for expanded functions. Because of its performance record and its available facilities, Pantex should be the preferred location for any weapons work.

Sincerely,

Bill K. Wolfe

April 8, 1996

U. S. Department of Energy
Office of Fissile Materials
P. O. Box 23786
Washington, DC 20026

RE: Comment on Stockpile Stewardship and Management (SSM) and Storage and Disposition (S&D) of Weapons-Usable

Sirs:

Thank you for the opportunity to comment on the U. S. Department of Energy's (DOE) Programmatic Environmental Impact Statements (PEISs) on Stockpile Stewardship and Management (SSM) and Storage and Disposition (S&D) of Weapons-Usable Fissile Materials. Please also consider this response as my comment on the Pantex Site-Wide Draft Environmental Impact Statement.

1/40.52

As a public official, and more importantly, as an employee at the Pantex Plant for more than twenty years, I am confident that all current and any future functions at the Pantex Plant will be conducted in a safe and environmentally sound manner. Best industry practices are routinely exercised at Pantex. Speaking as an elected official, an employee of Mason & Hanger, and as a citizen of the of the Amarillo community, our first priority is to ensure that any operations, including expansions, at Pantex will be implemented in a way that does not impair the health or safety of area residents or that have an adverse affect on the environment.

2/30.01

It is gratifying to know that the DOE has selected Pantex as the preferred alternative for assembly/disassembly activities, which appeared to many persons in our community, to be the only legitimate choice. However, the failure to ascertain Pantex as the preferred candidate site for new and/or consolidated stockpile management facilities, leaves one wondering if the DOE hasn't overlooked the obvious; that the Pantex Plant provides the best solution as a site which affords the DOE the capability to maintain the integrity of the U. S. nuclear stockpile in a most cost-effective manner.

Much of the assets at Pantex represent a major investment of tax dollars that have already been expended or that is being expended to modernize and update facilities and equipment. In a day when downsizing and cost-cutting is a common cry of the federal government, is seems the only logical course of action is to utilize as much readily-available resources without having to reinvent the wheel; Pantex offers that kind of realization.

2/30.01 continued

To enumerate why I believe Pantex is the obvious preferred choice in the SSM and PEIS consideration. First, because of labor costs, utility rates, and water and land availability, Pantex is perhaps the most cost-effective alternative for any new construction of 'SSM facilities. These tangibles in this area are more amenable to doing business here than those at any other Complex site. It is appropriate to consider Pantex as an alternative site for all future defense-related facilities to complement activities at the national labs, such as the planned Atlas Facility and plutonium pit fabrication site at Los Alamos National Laboratory. In view of the past and present primary mission at the Pantex Plant, that of assembly/disassembly of the nuclear weapons and high explosive functions, is logical, as pointed out in the PEIS, that an ample plutonium reserve be also located at Pantex. If, in its deliberations, DOE insists that budgetary comparisons between Pantex and the other sites are accurate, and include capital, transportation, training, remediation, and other costs, the choice of Pantex will be evident.

3/34.01

Secondly, as previously noted, high explosives (HE) functions are a well-established facet of the work done at Pantex. Because the production assembly/disassembly functions remain at Pantex, the HE functions should also remain at Pantex. After all, the SSM Draft admits that Pantex must retain HE capabilities to process the inventories already on site from dismantling. Therefore, the least expensive alternative is to maintain HE functions at Pantex. When all costs, including capital outlay, are considered, the transfer of HE functions from Pantex would cost taxpayers from $40 million to $50 million.

As the sole DOE-authorized facility for assembly and disassembly of nuclear weapons, Pantex has handled these functions in a safe and efficient manner for more than 40 years. One of the challenges faced after dismantling a significant portion of the nuclear stockpile is processing or disposal of the by-products of the dismantlement efforts. While the DOE considers it's options, from a cost savings standpoint, a viable option would be to continue storing plutonium at the Pantex Plant at present while planning for the future. When additional needs arise, upgrades of existing facilities for any and all storage options being considered by DOE at a minimal cost and with minimal difficulty, could be accomplished with the least overall impact of any other facility, not the least of which is community support. It makes little sense to re-create storage facilities at another site and then unnecessarily transport large amounts of plutonium across the country from Pantex. The budgetary and political costs for such a decision would be enormous. Because of these costs, Pantex also should be designated the preferred site for any disposition options and related functions.

1/40.52 continued | Based upon these reasons, I respectfully urge DOE to designate Pantex as the preferred alternative site for all existing and new stockpile management and stewardship functions as well as consolidation of all plutonium storage and disposition and any related functions. Thank you for the opportunity to comment on these documents.

Sincerely,

Manny Perez Villasenor
Potter County Commissioner

MV:mv

4/30/96

Dear Mr. Rose,

1/40.50 | In the real world, not the human contrived egocentric one; but the real one of natural law. When a part of the system gets interrupted & displays abberant behavior, the other systems have to work overtime to compensate for the errant dangerous system run amuk. It is difficult to get ones voice heard when it is being drained by those who are so far removed and the energy just seems to be being sucked off at an alarming rate & the source can become so diseased that it can not produce.

Question?

Who derives the most benefit (i.e. dollars in pocket.)?

Those who derive the benefit are responsible to clean up the mess. Those who receive the most, owe the most.

Question?

Who would be most a risk in case of a catastrophe at the site & there would be no fast fix?

(over)

1/40.50 continued

Question?

How much of Mason Hangers profit is devoted to clean up?

I do hope some reason pervails in the money mongering manipulative maneuvering. It is not only the lives of the living organisms in the Texas panhandle; but everyone that has breakfast & lunch & dinner, or that depends on oxygen to survive.

Please remember economy & safety first.

Sincerely,
Kila Mills-Rekdal

Comment Form

These comments apply to the following documents:
✓ Storage and Disposition Draft PEIS
✓ Stockpile Stewardship and Management Draft PEIS
Pantex Site-Wide Draft EIS

United States Department of Energy

NAME: (Optional) Maurice Bryson DOE/NN-42 (LANL)
ADDRESS: Forrestal GA 097
TELEPHONE: (202) 586-4901

1/41.05

Very good job of handling an improbable range of interests. The presentations were very well done — you got two of your very best presenters to do it. This is a fulluva way to make policy sometimes, but I think it's working. Slowly, all this forced transparency is re-establishing some DOE credibility that was at rock bottom.

SSM-M-038
COMMENT LETTER

PAGE 1 OF 1

4/2/96

Dear DOE folks,

Regarding the PEIS for the nuclear weapons Stockpile Stewardship and Management program: I object to any EIS that dismisses out of hand any consideration of alternatives based on a
1/40.60 stockpile of less than 1000 weapons, let alone the alternative of planning for zero nuclear weapons. NEPA requires inclusion of all reasonable alternatives. In fact, on political, social, economic,
2/40.26 ethical and environmental grounds, denuclearization is the only reasonable alternative. A National Ig-
3/21.17 nition Facility or other lab upgrade is not acceptable.

Sincerely, Larry Turk, RN

SSM-M-039
COMMENT LETTER

PAGE 1 OF 1

ELLEN RODDICK 2313 Las Casitas Santa Fe, NM 87505-5480
E-mail: roddick@ix.netcom.com Fax: 505.473.1831 Tel: 505.473.9159

May 2, 1996

US DOE
Office of Reconstruction
Alexandria, VA 22302

Future Mission of Los Alamos National Lab. (LANL)

The forest fire that is burning near the lab (as I write this) dramatically demonstrates how important it is not to have any materials in Los Alamos that, if released into the air by an out-of-control fire, would threaten the health of residents in Los Alamos, Espanola, or Santa Fe.

1/43.18 The environmental impact of forest fires that occur in the area have the potential to be tragic and to destroy the reputation of the United States in the eyes of the world. No decent government takes the kinds of risks involved in making LANL the premier nuclear weapons facility for the country. Since our government is decent, and since forest fire is an environmental hazard to LANL, you need to redesign the Lab's mission radically to eliminate all inflammable materials that would get into the air and water here in a fire.

Ellen Roddick

SSM-M-040
COMMENT LETTER **PAGE 1 OF 1**

Dear Sir/Madam:
While I support and applaud passage of a
comprehensive test Ban treaty, that is not enough.
1/40.06 We need to work hard until we achieve complete
denuclearization. Simultaneously and for
as long as necessary to rework the threat,
we need to clean up the nuclear mess
2/40.15 we've created. Research should be addressed to
clean up nuclear waste of all kinds —
storage is not a long term solution. We owe
this to future generations!

Kelly Sandlin Williams

SSM-M-041
COMMENT LETTER **PAGE 1 OF 1**

Mr. president.

1/40.14 Pleas stop the nuclear teasting.
for the feutuR of the earth
and the futur of the children

SSM-M-042
COMMENT LETTER **PAGE 1 OF 1**

To DOE,

Denuclearization is the only choice for our future. You must work towards abolition of all nuclear weapons, mining, testing, dumping, and anything related to nuclear productions. 1/40.06

Get out of Native lands. 2/07.02

Kalamaokaaina - 'Ohana Koa
Nuclear Free and Independent Pacific

SSM-M-043
COMMENT LETTER **PAGE 1 OF 1**

4-2-96

Comments re SS+M PEIS -

The DOE should include in this PEIS the alternative of zero nuclear weapons. This is certainly a reasonable alternative, given the terrible destruction that use of these weapons would bring, and the environmental hazards of continued weapons testing and production. 1/40.60

Thomas M. Rauch
THOMAS M. RAUCH
675 S. NEWPORT ST.
DENVER, CO 80224

SSM-M-044
COMMENT LETTER **PAGE 1 OF 1**

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: ELLEN M.I.: Last Name: RODDICK
Street Address: 1704-B Llano St. #196
Street Address 2:
City: Santa Fe State: NM Zip Code: 87505-
Organization: Self
Telephone: - - Fax: - -

Comments:

1/09.02 Please send me a copy of your evacuation plan for Los Alamos, Espanola, and Santa Fe — to go into effect in the case of a major nuclear/toxic/radioactive accident not only in connection with Stockpile Stewardship but in connection with any and all Los Alamos Lab. activities.

Also inform me about when the evacuation plan will be available and distributed to all citizens of these towns.

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

Receiver's Initials: ____

SSM-M-045
COMMENT LETTER **PAGE 1 OF 2**

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: LINDA M.I.: M Last Name: SEESE
Street Address: 730 COLUMBIA ST E
Street Address 2:
City: SANTA FE State: NM Zip Code: 87505-
Organization:
Telephone: 505-988-8202 Fax: - -

Comments:

1/40.12 I am a 54 yr old grandmother who lives 4 houses from St. Francis Dr. I am very tired of fighting this issue. Plutonium is very dangerous & we don't need to have any more! We can already kill every person & other living thing many times over. When are we going to wake up & use these $ billions for education, renewable resources — Solar & Wind, health etc. for the people of the U.S. I am ashamed to live in a country where our priorities are so backwards. Please stop this project so our grandchildren & great grand-children can have a future.

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

Receiver's Initials: ____

SSM-M-045
COMMENT LETTER

PAGE 2 OF 2

Surely this [illegible] Los LANL alone should end any discussion of more plutonium there.

SSM-M-046
COMMENT LETTER

PAGE 1 OF 2

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: JOHN M.I.: A Last Name: MATTSON
Street Address: 2021 SOMBRERO DR
Street Address 2:
City: SANTA FE State: NM Zip Code: 87501-1540
Organization: RETIRED
Telephone: [redacted] Fax:

Comments:
I attended a recent LANL Stockpile Stewardship and Management EIS "able presentation by Barry Lawson and Steve Guidice, the latter from DOE's Albuquerque Office. Unlike many of the "antis" in attendance, I, as a retired naval officer understand the needs for nuclear deterrent and maintaining a reliable inventory. I do, however, question the selection of LANL as a site for additional "pit" production and for DARHT's "non-destructive testing."

1/40.32

I have read earlier reports of security deficiencies at LANL indicating a general laxness in readiness to accept a five-fold increase in pit production. Similar media articles reveal an adversarial relationship between the DOE and LANL (micromanagement indicated) which may only lead to disharmony and loss of efficiency. Added to these are allegations of sexual harassment at Albuquerque DOE from years past and more recently, pornographic Internet "play" at Sandia, a sister facility to LANL: a lack of professionalism within the DOE complex indicated.

2/32.03

3/40.72

Plutonium "leaks" pursuant to pit production and DARHT activities

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

Receiver's Initials: ________

Comments (cont'd):

2/32.03 continued

megastar the environment. It is my understanding that traces of plutonium have been found in the Rio Grande and hazardous wastes including cadmium, stored in several LANL sites, including approaching the aquifer (tritium) — more (plutonium) is not better.

• Population centers around and downwind of LANL are affected by inadvertent releases — these include Los Alamos, the Española Valley, and Santa Fe. It is coincidental, yet timely, that smoke from a fire at Bandelier, adjacent to LANL, is drifting over Santa Fe at this writing (4/27); plutonium releases could be expected to follow a similar course — and produce equal more profound effects.

3/40.72 continued

• Concluding, I question (doubt is a better term) the prudence of siting further plutonium activities at LANL; I concur with many that other, more remote sites merit more realistic considerations.

Cordially,

[signature]

Cy:

WESTERN STATES LEGAL FOUNDATION
1440 BROADWAY, SUITE #500 • OAKLAND, CA 94612
PHONE (510) 839-5877 • FAX (510) 839-5397

ABOLITION IS THE *ONLY REASONABLE* ALTERNATIVE;
PLAN FOR ZERO!

Comment on the Department of Energy (DOE) Draft Stockpile Stewardship and Management Programmatic Environmental Impact Statement (SSAM PEIS)

Contrary to global expectations that a Comprehensive Test Ban Treaty (CTBT) will halt nuclear weapons development and lead inexorably to disarmament, as we await the signing of the treaty this year it appears that nuclear weapons research, development and testing by the United States will continue unabated. The National Ignition Facility (NIF), planned for the Lawrence Livermore National Laboratory, is intended to produce miniature thermonuclear explosions to provide data for the "advance" of nuclear weapons science. Slated to go on line in 2002, *ten years after the end of the Cold War*, the NIF represents the single largest military program ever planned for the Livermore Lab. The NIF, which will cost more than $1 billion to build, with a projected lifetime cost of over $4.5 billion, is the most expensive element of a vast laboratory-based infrastructure to preserve the capacity to maintain, test, modify, design and produce nuclear weapons well into the 21st century — *with or without underground testing*. The Department of Energy's (DOE) multi-billion dollar "Stockpile Stewardship and Management" (SS&M) Program includes an elaborate system of high-tech laboratory facilities consisting of explosives testing installations as large as sports stadiums, extensive new manufacturing capabilities, and the world's fastest supercomputers.

When President Clinton announced his support for a "zero-yield" CTBT last August, he strongly endorsed the SS&M Program as a necessary means of maintaining the U.S. "nuclear deterrent" without underground testing. This coupling is strikingly reminiscent of the deal struck during negotiation of the 1963 Partial Test Ban Treaty (PTBT) which banned nuclear tests in the atmosphere, in space, and under water. At that time, the nuclear weapons establishment and its allies in Congress and the Administration insisted as a condition for ratification that the U.S. pursue an extensive underground nuclear weapons testing program while maintaining the nuclear weapons laboratories and the capacity to speedily resume atmospheric testing. In the years immediately following conclusion of the PTBT U.S. nuclear testing increased and the weapons labs grew stronger. Thirty-three years later, the U.S. nuclear arsenal far exceeds that of 1963 in sophistication. *The SS&M Program anticipates maintenance of thousands of these weapons of unspeakable mass destruction for the foreseeable future.* (DOE's "base case" planning scenario assumes maintenance of at least 3,500 "strategic" nuclear weapons plus an estimated 5,000 non-strategic and reserve weapons.)

By allowing for the preservation, indeed, expansion of U.S. nuclear weapons capabilities through underground testing, the 1963 PTBT represented a lost opportunity to pursue nuclear disarmament. This suggests that the substitution of a laboratory-based infrastructure for underground testing proposed by the SS&M Program will recapitulate the profound failure of the PTBT to end the nuclear arms race. Replacing underground nuclear

1/40.07

testing with an expanded laboratory infrastructure exemplifies a continued U.S. commitment to nuclear weapons as core instruments of national policy. The Nuclear Non-Proliferation Treaty (NPT) -- signed in 1970 and reaffirmed by the U.S. and 177 other countries in 1995 -- forbids non-weapons states from acquiring nuclear weapons, in exchange for which nuclear

1/40.07 continued

powers pledge eventually to disarm. Article VI of the NPT states: *"Each of the Parties to the Treaty undertakes to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament . . ."* The S&M Program poses a threat to international security by perpetuating the legitimacy of nuclear weapons. This, in turn, may encourage other countries to abandon their NPT obligations.

2/10.11

The U.S. has squandered more than $4 trillion on nuclear weapons over the last 50 years, *an amount roughly equivalent to the national debt.* Including new or upgraded tritium facilities and production, SS&M Program operating costs are likely to exceed $40 billion within a decade. Moreover, the fifty year U.S. embrace of the atom as an instrument of military technology and an energy panacea has created an enormous environmental burden in the form of contaminated air, land, and water, and vast quantities of radioactive wastes. As a byproduct of the SS&M Program, DOE projects staggering rates of more nuclear waste generation for at least the next two decades.

1/40.07 continued

If the U.S. is serious about stemming the spread of nuclear weapons, it must take leadership in ending the international nuclear double standard and make disablement, dismantlement, and eventual abolition of nuclear weapons a top priority. *Nonproliferation requires unconditional, irreversible disarmament.* The SS&M Program is antithetical to this approach.

3/40.60

The National Environmental Policy Act, the statute under which the SS&M Programmatic Environmental Impact Statement (PEIS) is being prepared, requires a comparative analysis of *all* reasonable alternatives. Yet, despite the NPT obligation to disarmament and international expectations for a CTBT, the draft PEIS rejects consideration of *any* alternative based on indefinite maintenance of a hypothetical stockpile of less than 1000 nuclear weapons, or *any* alternative scenario based on "passive" maintenance of the existing stockpile through inspection and identical remanufacture of parts (as opposed to building and operating a massive array of sophisticated experimental facilities that can be used for continuing nuclear weapons design). It also dismisses any "denuclearization" option out of hand, despite an avalanche of public comments, since 1991, demanding inclusion of a "plan for zero" stockpile option. *In fact, denuclearization is the only reasonable alternative.*

4/40.12

The undersigned organizations agree that as a nation we cannot afford the economic, environmental and national security costs of the SS&M Program described in the draft PEIS. Continued nuclear weapons research, testing and production cannot be justified. The SS&M Program is a budgetary black hole; it endangers public health and the environment and drains resources badly needed for more constructive purposes such as environmental restoration, education, health care and affordable housing. By providing a means for nuclear weapons designers to continue their deadly pursuits and supporting the maintenance of a huge nuclear

1/40.07 continued

arsenal well into the 21st century, the SS&M Program undermines the stated U.S. goal of encouraging nonproliferation by sending a hypocritical message to other nations: "Do as we say, not as we do." We call on the DOE to listen to what thousands of U.S. citizens have been telling them for years: nuclear weapons make us *less* secure -- let's get rid of them! The draft SS&M PEIS is wholly inadequate. DOE, go back to the drawing board and plan for the elimination of nuclear weapons. It's the *only reasonable alternative.*

Comment on the Department of Energy (DOE) Draft Stockpile Stewardship and Management Programmatic Environmental Impact Statement (SS&M PEIS)

Submitted by:

- 20/20 Vision, 7th, 9th, 10th and 13th Congressional Districts
- 20/20 Vision of Washington State
- Abalone Alliance Safe Energy Clearinghouse, San Francisco, CA
- American Friends Service Committee, Pacific Mountain Region
- American Friends Service Committee, Denver, CO
- Atomic Reclamation and Conversion Project of the Tides Center, Oakland, CA
- Bay Area Pax Christi, CA
- Berkeley Gray Panthers, CA
- Buddhist Peace Fellowship (national)
- California Peace Action
- Citizen Alert, Las Vegas, NV
- Citizens Opposing a Polluted Environment (COPE), Berkeley, CA
- Committee to Minimize Toxic Waste, Berkeley, CA
- Common Agenda Network of Northern California
- East Bay Peace Action, CA
- East Bay Ecumenical Peace Institute, CA
- Economists Allied for Arms Reductions (international)
- Franciscan Friars, Saint Barbara Providence, CA
- Grandmothers for Peace International

SSM-M-047
COMMENT LETTER PAGE 4 OF 5

- Greenpeace USA
- Hayward Area Peace and Justice Fellowship, CA
- Livermore Conversion Project, Oakland, CA
- Los Alamos Study Group, Santa Fe, NM
- Montclair Presbyterian Church, Oakland, CA
- Mound Residents for Environmental Safety and Health, Franklin, OH
- Movement for Nuclear Safety, Chelyabinsk, Russia
- Mt. Diablo Peace Center, Walnut Creek, CA
- National Association of Radiation Survivors
- Neighbors in Need, Englewood, OH
- Northern California Psychologists for Social Responsibility
- Northwest Disarmament Coalition of Seattle, WA
- Oakland Catholic Worker, CA
- Physicians for Social Responsibility, San Francisco Bay Chapter
- Plutonium Free Future, US and Japan
- Rocky Mountain Peace Center, Boulder, CO
- Sacramento-Yolo Peace Action, CA
- San Carlos Foundation, Berkeley, CA
- San Jose Peace Center, CA
- Seattle Women Act for Peace, WA
- St. Joseph the Worker Church, Berkeley, CA
- Third Millennium, Auburn, WA

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COMMENT LETTER PAGE 5 OF 5

- Tri-Valley Citizens Against a Radioactive Environment (CAREs), Livermore, CA
- Western States Legal Foundation, Oakland, CA
- Women for Peace - East Bay, CA
- Women's International League for Peace and Freedom, Berkeley - East Bay Branch, CA
- Women's International League for Peace and Freedom - Sacramento Valley Branch, CA
- Women's Strike for Peace, USA

Submitted on behalf of the above-listed groups by Western States Legal Foundation, 1440 Broadway, Suite 500, Oakland, CA 94612. Phone: (510)839-5877. Fax: (510)839-5397

VICTORIA WOODARD
2012 Tenth Street
Berkeley CA 94710
(510) 841-8952

May 7, 1996

U.S. Department of Energy
Office of Reconfiguration
P.O. Box 3417
Alexandria VA 22302

Re: DPEIS for Stockpile Stewardship and Management

Dear DOE:

As I read the DPEIS for Stockpile Stewardship and Management I realized that you and I live in two completely different paradigms. The DPEIS explains the new mission that DOE sees for itself in the post Cold War 21st century. As I understand it, you intend to keep us safe from the threat of nuclear attack by assuring that our existing stockpile of nuclear weapons will work and by staying ready to build new weapons if needed. Since you can't test the weapons anymore, you plan to build new facilities where you can assess and certify their performance through computer simulation and experiments under conditions similar to those in a thermonuclear reaction. According to the DPEIS, your plans will have virtually no environmental or health impacts, so the only decision to make is which parts of the country to favor with the jobs that you will create.

1/40.06 In my paradigm, the production of nuclear weapons and nuclear waste is an extreme threat to the future of life on earth and must cease immediately. I feel no benefit from the nuclear deterrence. I believe the U.S. greatly jeopardized our security by amassing a bloated stockpile of weapons, while indicating every readiness to use them. That forced other countries to create their own stockpiles, and bankrupted the Soviet Union when they tried to keep up with us. Had we instead been friendly neighbors, we would not be faced with the specter of several countries in the former Soviet Union where organized crime now controls hundreds of nuclear weapons.

But it is looking ahead at the future millennia that causes me to seek the abolition of all nuclear production. This genie should not have been let out of the box. Every DOE site is grossly contaminated. You haven't solved the waste problem because it is unsolvable. Your projects have already created enough highly toxic materials to kill everything on earth for the next several thousand years. That is not a legacy to be proud of.

No caring human being would knowingly perpetrate such horrors onto their children, so I can only conclude that you choose not to see my paradigm. Unfortunately I don't have the same choice. Because you carry such a big stick you get funding to perpetuate your vision, and the voices of people like me are dismissed as fringe. Time will tell whether your paradigm will sustain itself or whether your disastrously expensive projects will bankrupt this country too.

Based on that introduction, I'm sure you have already filed my letter in your "beyond the bounds of reason" category. I hope that is not the case, for I represent a large and growing number of people who justifiably fear all things nuclear and who (justifiably) do not trust DOE. It would be inadvisable to ignore us.

I will now comment on specific parts of the DPEIS because I feel morally bound to do so, not because I think my comments will have any effect. I know from past experience that you probably won't change your plans based on my feedback.

Livermore Lab

2/40.27 It looks like the labs lobbied so successfully that they might survive even if the rest of the Complex goes belly up. It isn't intuitively obvious why we need not one, not two, but three R&D labs when we aren't building any new weapons. In fact, you considered phasing out LLNL based on the Galvin report. That must have motivated their staff of 35 taxpayer-paid Public Relations personnel! Now they'll not only be around to do peer reviews of LANL, they may also get NIF plus fabrication of secondaries, cases, high explosives, and non-nuclear parts.

Well, the people in the Bay Area don't want any of those dangerous, polluting industries. We want LLNL converted to peaceful, non-nuclear research such as solar energy. We don't want extremely hazardous HEU here, or the very toxic chemicals that are used in high explosives. We don't want Livermore or Site 300 to become any more contaminated than they already are. The local citizens group Tri-Valley CAREs, the internationally-known law institute Western States Legal Foundation, and the well-researched Livermore Conversion Project have already indicated these concerns to DOE. It is very disrespectful of you to ignore their vision for the future in your DPEIS.

Environmental Justice at the Nevada Test Site

3/07.02 Your plans for the Nevada Test Site are truly onerous. That land belongs to the Western Shoshone Nation, who are adamantly opposed to the nuclear testing and waste disposal that have already decimated their beautiful desert. To relocate weapons assembly/disassembly there or build NIF there would add insult to injury. This is an environmental justice matter of the highest priority. The Western Shoshone people have already suffered

SSM-M-048
COMMENT LETTER
PAGE 3 OF 3

3/07.02 continued | enough living downwind from your testing activities. DOE should contain the waste it has already brought onto the site, stop bringing in more, and clear out - immediately.

Environmental and health impacts

4/40.21 | Your statistics on health risks to the public are truly laughable. Assembly/disassembly at NTS would result in only one fatal cancer every 645 million years? In 645 million years there could be hundreds of earthquakes, volcanoes, ice ages and perhaps even an inland sea at the Nevada Test Site. Please give us some believable figures. We know radiation causes a much higher incidence of cancer than that. We know DOE covers up its data on the health effects of its projects. But we would like you to treat the readers of the DPEIS as intelligent, thinking human beings, and sincerely try to assess the risk to workers and people living near your facilities.

It is also very hard to swallow the DPEIS's repetitive mantra "No significant impacts are expected." Couldn't you at least find one or two token significant impacts so we could believe you actually considered something real? Given the environmental catastrophes at Hanford, Rocky Flats, Fernald, and Mound, why should we trust any DOE project to be environmentally benign? The mess at Rocky Flats must be understood and contained before plutonium fabrication is re-established, so that a similar disaster can be averted in the new location.

5/42.12 | The Environmental Restoration and Waste Management PEIS is entirely relevant to the Stockpile Stewardship and Management PEIS, and the findings of the former should be discussed in the latter.

6/10.15 | Your statements that LANL and SRS have adequate existing waste management facilities worries me a lot. Both of those sites are still practicing shallow land burial of radioactive wastes, including many very dangerous, long-lived elements. This practice must be stopped, not continued and increased as contemplated in this DPEIS.

If you read this whole letter, I appreciate your attention and I hope you consider my comments seriously.

Sincerely,

Victoria Woodard

Victoria Woodard

SSM-M-049
COMMENT LETTER
PAGE 1 OF 1

Friends of Oak Ridge National Laboratory
P.O. Box 6641
Oak Ridge, Tennessee 37831-6641

April 29, 1996

US Department of Energy
Office of Reconfiguration
PO Box 3417
Alexandria, VA 22302

Sirs:

The Friends of Oak Ridge National Laboratory, and organization comprised of former and current staff members of ORNL and of other citizens of the area who are interested in the future welfare of the Laboratory and the community, wishes to comment on the Draft Programmatic Environmental Impact Statement on Stockpile Stewardship and Management.

1/33.01 | An aspect that did not seem to receive attention in the Draft nor the public meeting is the strengthening of other local organizations by the existence of the superb capabilities of the Y-12 Plant shops. Many people at ORNL can attest to occasions when construction of special equipment was feasible only because of our neighbors in Bear Creek Valley. Many important national programs were made possible by the geographic juxtaposition of the two organizations.

We feel that the increase in capabilities arising from the synergism of ORNL and Y-12 is an important national asset. It should be weighted in future decisions about assignments of weapons and non-weapon work to Y-12 to maintain its unique capabilities.

Sincerely,

William Fulkerson
President

LOC INC
Oak Ridge Reservation
Local Oversight Committee

May 2, 1996

U.S. Department of Energy
Office of Reconfiguration
P.O. Box 3417
Alexandria, VA 22302

RE: DRAFT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT FOR STOCKPILE STEWARDSHIP AND MANAGEMENT (DOE/EIS-0236, FEBRUARY 1996)

The Oak Ridge Reservation Local Oversight Committee, Inc. (LOC) has reviewed the Stockpile Stewardship and Management Draft Programmatic Environmental Impact Statement (SS&M PEIS) and submits the following comments and recommendations:

Comments

1/41.10
1. Local governments and citizens have been overwhelmed by DOE's timing in releasing major National Environmental Policy Act documents. While the agency may save money by holding multiple hearings in two days, cost savings do not outweigh the negative aspects of a concurrent process.

2/40.53
2. The statement of the problem in the PEIS does not adequately focus on two fundamental aspects of stockpile stewardship and management: (a) resources need to be devoted not only on surrogate testing, but also on the stabilization and preservation of manufacturing capabilities; and (b) the programmatic decision must be based on the inclusion of weapons production experts in the process.

3. The current plan does not consider the need to minimize impacts on weapons performance due to inadvertent or unavoidable changes in production methods. The PEIS states that surrogate testing will be used to keep the weapons data base current; however, this is somewhat misleading. The weapons data base consists of two parts: (a) the weapons test data; and (b) the supporting physical properties and design data. The weapons test data will not change, and while surrogate testing may be successful in improving the physical properties data and the computational models, there will always be the question: As the production methodology slowly changes, do these improvements in data and computations truly reflect the performance of the untested weapons in the stockpile?

4. The PEIS does not evaluate the impacts associated with the loss of specialists currently employed at the Y-12 facility. Even though employees are highly skilled craftsmen when hired, they undergo a long period of specialized training to perform HEU tasks. This invaluable expertise will be lost if work is transferred elsewhere, and workers will have to be trained. This investment in human capital needs to be included in the cost of alternatives.

Anderson • Meigs • Rhea • Roane • City of Oak Ridge • Knox • Loudon

136 S. Illinois Avenue, Suite 208 • Oak Ridge, Tennessee 37830 • Phone (615) 483-1333 • Fax (615) 482 6572

3/40.40
5. The PEIS does not demonstrate an ability to implement the timely up-sizing of the nuclear weapons system should it become necessary. The PEIS states that the objective can be reached by increasing production from a one-shift basis to a full-time basis using the same production equipment. Again, this proposed action seems to ignore the fact that the additional training needed by capable machinists to properly and safely engage in the highly demanding efforts of weapons production is about five years. This is an unacceptable delay in response to an urgent threat.

6. The DOE has not provided cost estimates for the proposed alternatives. It is not likely to be economically feasible to replicate Y-12 facilities at the western labs, especially when it may be necessary to enlarge the facility at a future date.

7. The PEIS does not explain how some of its proposed consolidated configurations would affect national security in the event of a terrorist act.

4/40.13
8. The DOE needs to factor the costs of decontamination and decommissioning facilities into the PEIS alternatives, as well as state the source of funding for these and other environmental management activities. Funds to transfer ownership, maintenance, and D & D of facilities are not included in the DOE's proposed budget for FY 97.

9. The scope of the PEIS is too broad, by its inclusion of NEPA analyses for three of the six proposed new facilities.

Recommendations

1/41.10 continued
1. The DOE should work with host communities to provide assistance for an independent evaluation of cumulative socioeconomic and environmental impacts of this and other major DOE actions. Each of the three host governments at the ORR site (City of Oak Ridge, Anderson and Roane counties) have requested and been denied assistance.

2/40.53 continued
2. The DOE should devote a new effort to document details of the current production methods, and to establish procedures which will minimize the changes in weapons performance resulting from inadvertent or unavoidable incremental changes in the weapons stockpile.

1/41.10 continued
3. The DOE should avoid issuing major documents within days of one another and expecting stakeholders to comment within a short time frame. Likewise, concurrent meetings should not be held on such important topics as these.

5/40.27
4. The DOE should reexamine the Galvin Committee report, especially the recommendation to consolidate potentially duplicative design lab activities as a cost saving measure.

6/40.23
5. For national security purposes, the bulk of weapons design and production capabilities should not be co-located.

7/08.21
6. The DOE must more fully analyze the socioeconomic impacts associated with each of the proposed alternatives, including impacts associated with loss of employment and population, as well as other financial impacts on the region's economy. Local government representatives should be included in this more detailed analysis.

SSM-M-050
COMMENT LETTER **PAGE 3 OF 3**

The LOC appreciates the opportunity to comment on the PEIS, and looks forward to a timely response to these issues.

Sincerely,

Amy S. Fitzgerald, Ph.D.
Executive Director

cc: Earl Leming, Manager, TDEC DOE-Oversight Division
Jim Hall, Manager, Oak Ridge Operations Office

SSM-M-052
COMMENT LETTER **PAGE 1 OF 1**

My name is John M. Napier

I live at 113 Dartmouth Circle, Oak Ridge, TN 37830.

My question relates to the Draft Program Environmental Statement for Stockpile Stewardship and Management.

1/04.02 Section 4.6.2.4 states that the LANL water resources will be used up by about 2000. If water from the San-Chama supply is added, the supply will last until about 2020. If the water requirements are larger than have been estimated, (Tables 3.4.3.3-2 and 3.4.4.2-2 shows that Y-12 uses 96% more water than estimated to be used at LANL for the same amounts of work load), how will LANL be able to produce the required number of weapons with this very limited water supply?

Please include the answer to this question in the final Stockpile Stewardship and Management Environmental Impact Statement.

RESOLUTION NUMBER 96-2

WHEREAS, the Oak Ridge Reservation Local Oversight Committee (LOC), being comprised of elected officials and citizen representatives of Anderson, Knox, Loudon, Meigs, Rhea, and Roane Counties and the City of Oak Ridge, was created to provide local input into decisions affecting the continued operation of the U.S. Department of Energy's (DOE) Oak Ridge Reservation; and

WHEREAS, the DOE has issued the Draft Programmatic Environmental Impact Statement (PEIS) for Stockpile Stewardship and Management which recommends a technical program for maintaining the safety and reliability of the nuclear stockpile; and

WHEREAS, the DOE has simultaneously issued the Storage and Disposition of Weapons-Usable Fissile Materials Draft Programmatic Environmental Impact Statement; and

1/41.10 **WHEREAS**, the DOE unduly restricted local government and public involvement on these important topics by issuing the documents at the same time and by holding concurrent public hearings in Oak Ridge; and

WHEREAS, decisions based on the Stockpile Stewardship and Management PEIS may result in numerous, adverse impacts on Oak Ridge and the surrounding communities; and

WHEREAS, the PEIS does not focus sufficiently on the stabilization and preservation of manufacturing capabilities, nor has it adequately involved weapons production experts in program development; and

WHEREAS, this document cannot support a Record of Decision based on the DOE's analysis of socioeconomic impacts, environmental consequences, schedule, and technology;

WHEREAS, the citizens of LOC jurisdictions are entitled to assurances that the impacts associated with the DOE's preferred alternatives are thoroughly analyzed; therefore, be it

2/40.87 **RESOLVED** that the Board of Directors of this Committee request that DOE implement the No Action alternative until further analyses are performed and until additional public hearings are held; and be it further

3/40.13 **RESOLVED** that the DOE make available detailed cost information which compares the costs associated with the implementation of alternatives; and be it further

4/13.01 **RESOLVED** that the DOE engage in a collaborative process with host states, local governments, and communities to improve understanding of interrelationships between, and cumulative impacts of potential DOE actions; and be it further

RESOLVED that this resolution and attached comments shall be submitted to the U.S. Department of Energy for consideration in its preparation of the Programmatic Environmental Impact Statement for Stockpile Stewardship and Management, and that the Executive Director send a copy of this resolution to the Tennessee Congressional delegation and other relevant federal and state officials.

This, the 2nd day of May 1996.

Edmund A. Nephew
Edmund A. Nephew, Chairman
Board of Directors
Oak Ridge Reservation Local Oversight Committee

Amy S. Fitzgerald
Amy S. Fitzgerald, Ph.D.
Executive Director

SSM-M-054
COMMENT LETTER
PAGE 1 OF 2

women for peace – east bay
2302 Ellsworth Street
Berkeley, California 94704 849-3020

DRAFT PROGRAMMATIC ENVIRONMENTAL
IMPACT STATEMENT FOR
STOCKPILE STEWARDSHIP AND MANAGEMENT

COMMENTS 4/16/96

Sometimes I picture in my mind a meeting at the Department of Energy at which staffers are preparing the revision of the 1991 Programmatic Environmental Impact statement titled "Reconfiguration of the Nuclear Weapons Complex."

"Let's change the title," says one staffer. "Nuclear weapons are very unpopular. Let's give this PEIS a title that sounds smart and safe and doesn't mention nuclear weapons."

"I like the sound of the two S's," says a second staffer. And then he has an inspiration. "How about Stockpile Stewardship?" "I like that," says a third staffer. "We could call it Scientific Stockpile Stewardship and then we would have three S's."

Another staffer says, "I think the title should cover weapons research and development. I suggest the word, management."

Voila! The title for the revised PEIS is born -- Stockpile Stewardship and Management.

There are brilliant scientists and publicists at the Department of Energy, but I sometimes wonder if they are really idiot savants. They all know that a nuclear war could mean the end of the world or at least the end of human beings. But they fail to see the connection between their work and the continuation of nuclear arsenals in this country and in other countries.

1/41.08

They insist that our nuclear weapons must be "Reliable," but they don't face the fact that a reliable nuclear missile could destroy a city, kill thousands of civilians, and wreak untold, lasting damage on the environment. Are they really willing to use genocidal weapons?

The irony of a nuclear attack is that the attacking nation would also be a victim since the fallout cloud could circle the earth.

Each of the nations with a nuclear arsenal claims that its arsenal is needed as a deterrent. But it is also a temptation for those in power.

SSM-M-054
COMMENT LETTER
PAGE 2 OF 2

Women for Peace
4/16/96
Page 2

1/41.08 continued

I fear what other nations might do, but I also worry about our own military establishment. Just about two weeks ago Secretary of Defense William Perry said that if any country would use chemical weapons against the U.S., our response could include nuclear attack.

The nations of the world are giving awesome power to their military leaders.

Occasionally nuclear weapons scientists do think through to the results of their work. For example, the noted physicist, Theodore B. Taylor, who was a leading designer of nuclear weapons, now speaks out against both nuclear weapons and nuclear power.

Women for Peace urge others to take up the vital, life-preserving challenges of our time.

2/40.12

Instead of lobbying Congress and the Administration to spend billions on esoteric laboratory equipment, they could lobby for negotiations for an international treaty to ban all nuclear weapons.

They could apply their brilliant minds to the challenge of developing non-polluting, cheap sources of energy. Finally, what may be the most difficult task of all, they could devise means for dealing with the vast amount of radioactive and hazardous waste now accumulating all over the world as a result of nuclear programs.

Women for Peace urge the Department of Energy to tear up their PEIS and plan a different and truly beneficial role for the Department.

WOMEN FOR PEACE, EAST BAY

Lillian Nurmela
Disarmament Committee

SSM-M-055
COMMENT LETTER

April 28, 1996

Peg and Bob Marland
819 E. 72nd St.
Kansas City, Mo. 64131

USDOE
Office of Reconfiguration
P.O. Box 3417
Alexandria, VA 22302

To Whom it May Concern:

1/40.07

It is my understanding that the Department of Enery has plans to design and build new nuclear weapons into the next century under the guise of "Stockpile Stweardship". If this is true, I believe that these plans threaten international efforts for a Comprehensive Test Ban Treaty and call into question the United States' committment to the Non-Proliferation Treaty.

I am unable to attend the Draft Stockpile Stewardship and Management Hearings and I am writing to voice my protest to plans for "Stockpile Stewardship". I believe our country needs to be leaders in showing support for the Comprehensive Test Ban.

Thank you for your consideration of this matter.

Sincerely yours,

Peg Marland and Bob Marland

SSM-M-056
COMMENT LETTER

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: LINDA M.I.: H Last Name: SCHLEHMOER

Street Address: RT 1 BOX 9RIG

Street Address 2:

City: Santa Fe State: NM Zip Code: 87501 -

Organization:

Telephone: - - Fax: - -

Comments: Dear Ms. O'Leary:

I have grave concerns about the SSM program + I resent the fact that you have used the word "Stewardship" in the name of this. What does Stewardship have to do with the manufacture of plutonium pits???

1/09.11

I don't care if it's a "small" operation — I don't want ANY radioactive material coming through the middle of Santa Fe. I urge you to NOT approve this plan. It only adds to the continued destruction of this Earth, our precious home. Please do not think like a man. Use your heart, feel connected to life, and stop abusing the Earth and ~~her~~ the powerful elements she provides.

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

Receiver's Initials:

SSM-M-057
COMMENT LETTER
PAGE 1 OF 2

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: SHEILA M.I.: M Last Name: BUONAIUTO

Street Address: 131 SAN JUAN ST

Street Address 2:

City: SANTA FE State: NM Zip Code: 87501-

Organization:

Telephone: 505-983-2143 Fax:

Comments:

① Nuclear weapons are not needed
② they are useless as instruments of war.

1/40.06 ③ they poison the environment, cause illness in the people, waste money & resources and contribute to the malaise of the US Economy

2/40.08 ④ They are continually created not for national security but to enrich the weapons producers

3/40.21 ⑤ The labs are notoriously unsafe & have demonstrated continued disregard for the health of their workers & the community.
⑥ WE ARE RESPONSIBLE TO FUTURE GENERATIONS

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

SSM-M-057
COMMENT LETTER
PAGE 2 OF 2

Comments (cont'd):

2/40.08 continued

SANTA FE will not allow the DOE to poison us & destroy our community for the enrichment of the already rich & morally corrupt weapons producers & military –

WE ARE RESPONSIBLE for our children, the earth & the future –

3/40.21 continued

LANL IS NOT SAFE & is too corrupt to become SAFE

Buonaiuto
131 San Juan St
Santa Fe NM
87501

U.S. Department of Energy
PO Box 3417
Alexandria, VA 22302

22302-3417

SSM-M-058
COMMENT LETTER **PAGE 1 OF 2**

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

4-20-96

COMMENT FORM

Please print clearly

First Name: Eleanor M.I.: G Last Name: Salkind
Street Address: 3829 Forest Hill Ave
Street Address 2:
City: Oakland State: CA Zip Code: 94602-
Organization: Women for Peace
Telephone: 510-849-3029 Fax: - -

Comments:
I found the hearing stimulating from the viewpoint of many, many "lay" people. The [illegible] for LLL was also excellent.

1/40.07
My main concerns are that ① despite excellent testimony LLL will continue in the direction it wants to go at the risk of destroying the possibility of a successful conclusion to the Nuclear Test Ban Treaty. How can the other nations sign a NTBT with us when we plan to continue testing for "better" weapons and they can not? ② just as important the

2/40.12
money for the labs is [illegible] when we citizens lack funds for schools, hospitals and other

3/41.05
necessities. ③ I do not believe the public will ever know about our concerns. ④ The only answer to

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

SSM-M-058
COMMENT LETTER **PAGE 2 OF 2**

Comments (cont'd):

4/40.15
the waste problem is to stop testing altogether. There is no other way to handle it.

SALKIND
3829 Forest Hill Av.
Oakland 94602

U.S. Department of Energy
PO Box 3417
Alexandria, VA 22302

SSM-M-059
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: ANGELA M.I.: M Last Name: TORRES

Street Address: PO BOX 2641

Street Address 2:

City: LIVERMORE State: CA Zip Code: 94550-

Organization: LU 342 STEAMFITTERS

Telephone: 510-999-7697 Fax: - -

Comments:

DEAR D.O.E.,
I AM A SINGLE, FORMER A.F.D.C. MOTHER OF TWO CHILDREN, MY CHILDREN & I ATTEND SCHOOLS IN THIS COMMUNITY, WE ~~PAY~~ PLAY IN THE PARKS, WE DRINK THE WATER, WE ALSO BREATH THE AIR HERE, I AM VERY CONCERNED ABOUT THESE ISSUES.

BUT....

1/21.06 I AM ALSO CONCERNED ABOUT BEING ABLE TO CONTINUE TO MAKE A LIVING FOR MY FAMILY, I WOULD LIKE TO BE ABLE TO ~~BE~~ CONTINUE TO FEED & HOUSE MY CHILDREN WITHOUT GOVERMENT HELP. I WOULD LIKE TO BUY A HOME SOME DAY, I BELIEVE THIS PROJECT COULD BENEFIT LIVERMORE AND AM IN FAVOR OF IT.

Sincerely
Angela M. Torres

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

[redacted]

SSM-M-061
COMMENT LETTER

PAGE 1 OF 1

On the front is only 10% of the 2000+ sites..

LOVE 32

Dear Sir:
1/40.12 I attended the Stockpile Stewardship program in Santa Fe on 4/25. Over 99 44/100 % of the people want an end to making Bombs & would like to see the $ go for ~~Social~~ Programs. Northern

2/40.69 ~~New Mexico~~ does NOT trust DOE ~~LANL~~ LANL!! Lies!!

DOE
Office of Reconfig
Jay Rose
1080 Independence Av. S.W.
Wash. D.C. 20585
Attn: SSM PEIS

SSM-M-063
COMMENT LETTER

PAGE 1 OF 1

My name is John M. Napier

I live at 113 Dartmouth Circle, Oak Ridge, TN 37830.

My question relates to the Draft Program Environmental Statement for Stockpile Stewardship and Management.

1/04.13

Relative to section 4.2.3.4, is the statement correct that says the phaseout of work at Y-12 would reduce the flow in the East Fork of Poplar Creek to zero and would have no impact on the water quality in the creek? Are there no natural springs beneath some buildings in the plant that run continously into the East Fork of Poplar Creek (very low flow rates)?

Is it not correct that the City of Oak Ridge must have a flow in the East Fork of Poplar Creek in order to discharge the treated severage water from the City and if the flow from Y-12 is zero, would the City of Oak Ridge be allowed to continue to discharge the treated water into the creek?

Please include the answer to this question in the final Stockpile Stewardship and Management Environmental Impact Statement.

SSM-M-064
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT DRAFT PEIS COMMENT

NAME: William J. Wilcox, Jr.
ADDRESS: 412 New York Avenue, Oak Ridge, TN 37830
PHONE: (423) 483-4990

COMMENT AND QUESTION:

A stated objective of the DOE in reconfiguring the complex was to "achieve significant cost reductions to make the cost of operations consistent with a smaller stockpile." (Preferred Alternative Report, Feb.1996, page 2, line 1).

1/40.24

The PEIS considers at length and in depth a wide range of alternatives for downsizing the production complex. For instance, the discussion of "Stockpile Management Alternatives" in Chapter 3 of Volume I requires 81 pages (pp.3-23 to 3-104) to present all the cases considered for downsizing the production complex. All of the projected budget reductions result from chopping the production complex.

The discussion of the stockpile Stewardship alternatives does not mention a single alternative for trimming Lab budgets in accordance with DOE's stated objective, only the needs to build up and add to the experimental capabilities of the Labs! And the Stewardship part of the SSMP is treated in just 7 pages (3-15 to 3-22) of the PEIS, yet this is the area where all future DP budget increases are required.

Question: Why was "downsizing/rightsizing" of the Weapons Labs not also included by DOE as a perfectly logical "Stockpile Stewardship Alternative" that should have been looked at in drafting this PEIS; belt-tightening should apply to all parts of DOE accountability in times of budget pressures such as DOE will be under in the years ahead. The SSMP at its root is lop-sided, deeply chopping the production side, building up the research side under the plea of needing even more science after 50 years of aggressive programs. The U.S. knowledge pool is arguably broader and deeper than that any of our potential enemies and yet the DOE(Labs) contends we need still more, is not willing - apparently - to even include as a PEIS alternative one of looking at the possibilities of trimming of any weapons programs of the three weapons Labs.

SSM-M-065
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT DRAFT PEIS COMMENT

NAME: William J. Wilcox, Jr.
ADDRESS: 412 New York Avenue, Oak Ridge, TN 37830
PHONE: (423) 483-4990

COMMENT AND QUESTION:

A stated objective of the DOE in reconfiguring the complex was to "achieve significant cost reductions to make the cost of operations consistent with a smaller stockpile." (Preferred Alternative Report, Feb.1996, page 2, line 1).

1/40.24

The PEIS considers at length and in depth a wide range of alternatives for downsizing the production complex. For instance, the discussion of "Stockpile Management Alternatives" in Chapter 3 of Volume I requires 81 pages (pp.3-23 to 3-104) to present all the cases considered for downsizing the production complex. All of the projected budget reductions result from chopping the production complex.

The discussion of the stockpile Stewardship alternatives does not mention a single alternative for trimming Lab budgets in accordance with DOE's stated objective, only the needs to build up and add to the experimental capabilities of the Labs! And the Stewardship part of the SSMP is treated in just 7 pages (3-15 to 3-22) of the PEIS, yet this is the area where all future DP budget increases are required.

Question: Will the loss of the new weapons design mission not have some effect on the budgets of the three weapons Labs which have had major programs in the past to design new weapons and to improve the old ones? What will be the effect on the Labs programs and budgets of the decision to stop any further work on the design of new nuclear weapons ?

SSM-M-066
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT DRAFT PEIS COMMENT

NAME: William J. Wilcox, Jr.
ADDRESS: 412 New York Avenue, Oak Ridge, TN 37830
PHONE: (423) 483-4990

COMMENT AND QUESTION:

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1/40.24

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Question : How many people were supported at the Labs in Cold War Days - say 1985- by underground testing and weapons design and weapons improvement programs and what will those people be doing in 2003 ?

SSM-M-067
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT DRAFT PEIS COMMENT

NAME: William J. Wilcox, Jr.
ADDRESS: 412 New York Avenue, Oak Ridge, TN 37830
PHONE: (423) 483-4990

COMMENT AND QUESTION:

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Question: Will the large reduction in the weapons stockpile which has been used to leverage the major downsizing of the production complex not have any effect on the three weapons labs? What will be the effect on the Labs programs and budgets of the large reduction in our stockpile?

SSM-M-068
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT DRAFT PEIS COMMENT

NAME: William J. Wilcox, Jr.
ADDRESS: 412 New York Avenue, Oak Ridge, TN 37830
PHONE: (423) 483-4990

COMMENT AND QUESTION:

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1/40.24

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Question: Will the loss of the underground testing mission not have some impact on the budgets of the three weapons labs which have had large dollar programs in the past on testing facilities, test devices, and analysis/evaluation? What will be the effect on the Labs programs and budgets of the decision to stop underground testing?

SSM-M-069
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT DRAFT PEIS COMMENT

NAME: William J. Wilcox, Jr.
ADDRESS: 412 New York Avenue, Oak Ridge, TN 37830
PHONE: (423) 483-4990

COMMENT AND QUESTIONS:

Major emphases appear in the SSMP of May 1995, in this draft PEIS, and in Dr. Hecker's testimony before the Senate Armed Services subcommittee meeting in March 1996 on the vital importance for the Labs to be able to attract new and top quality scientists to assure the Labs future viability.

No mention is made in the PEIS as to the importance of Y-12 Plant maintaining their cutting edge by hiring the kind of top flight production and development specialists that have solved so many of the NWComplex technology problems in the past. The Preferred Alternatives Report, Feb. 1996, now even refers to Y-12 as "The Secondary Factory", and says nothing about the importance of the technical support specialists who are critical members of the production team.

1/33.10 First Question: Does DOE plan to operate Y-12 over the longer term future at the $100 million level shown for 2008 in the Preferred Alternatives report, page 41 ?

2/40.24 Second Question: How does DOE expect Y-12 to maintain the ability to attract and retain the kind of top quality talent that DOE seems to want so badly for their Labs ? Making weapon parts is just as important as designing them (ask our potential international antagonists), sometimes as difficult and more time consuming.

SSM-M-070
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT DRAFT PEIS COMMENT

NAME: William J. Wilcox, Jr.
ADDRESS: 412 New York Avenue, Oak Ridge, TN 37830
PHONE: (423) 483-4990

COMMENT AND QUESTIONS:

In DOE's Preferred Alternatives report of Feb. '96, in the chart at bottom of page 39, the schedule for downsizing Y-12 is shown with workforce reductions completed by the end of 2002 and steady state operations commencing at the beginning of 2004 and continuing (to the end of that graph) in 2011.

In the PEIS Manning Levels Graph on page 4-51 of Vol.I, however, the employment levels for Y-12 is first shown for the year 2000 and rather than ceasing to fall in 2008, it shows a Y-12 employment level which continually drops beyond 2003 each third year for which the data are plotted out to the last year on the graph which is 2030 !

1/08.13 Question: Are the PEIS financial and socioeconomic impacts reported in DOE's Draft PEIS based on:

[a] these PEIS data given on page 4-51 of Volume I, or

[b] on the data shown on the page opposite, i.e. page 4-50 of PEIS Volume I, or

[c] are they based on the still different data presented by Mr. Whiteman in his Introduction to the Hearing Apr 1 in Oak Ridge which are still a different set of numbers for the downsized Y-12 ?

The choice may not be critical in impacting the ORR ROI, but surely will matter for the impacts on the City of Oak Ridge.

SSM-M-071
Comment Letter

STOCKPILE STEWARDSHIP AND MANAGEMENT DRAFT PEIS COMMENT

NAME: William J. Wilcox, Jr.
ADDRESS: 412 New York Avenue, Oak Ridge, TN 37830
PHONE: (423) 483-4990

COMMENT & QUESTIONS:

The Science-Based Stockpile Stewardship and Management Program marginalizes the role of the Production Plants, proposing trading the expertise and facilities proven to be a vital part of the Nation's nuclear weapons system over four and a half decades for a science-based approach which has DOE with admirable candor themselves admit is risky in the final summarizing paragraph of the SSMPlan (May 1995, page 13):

"Science-based stewardship and management of the U.S. stockpile has never been done before. Meeting this challenge will neither be inexpensive nor without risk."

1/40.33 Where is the Draft PEIS is such an admission of these shortcomings and their potential environmental impacts?

Why was the surer and less expensive approach of manufacturing enough weapons every year (say 10%) to keep the average stockpile age within limits accepted in the past as reasonable not given full consideration as a very credible alternative rather than accepting an SBSS&MP which "has never been done before" which is "neither inexpensive nor without risk"?

SSM-M-072
Comment Letter

STOCKPILE STEWARDSHIP AND MANAGEMENT DRAFT PEIS COMMENT

NAME: William J. Wilcox, Jr.
ADDRESS: 412 New York Avenue, Oak Ridge, TN 37830
PHONE: (423) 483-4990

COMMENTS & QUESTION:

Why has DOE chosen to take unnecessary risks and forgo the more direct, less risky, and less expensive way to give the DOD the confidence it needs by remanufacturing the downsized number of weapons required to proven, tested specifications using the historic partnership between the Labs and Y-12? Is attracting brilliant scientists to duplicate weapon labs worth that added risk and cost to the public? In the DOE SSMP of May 1995, the pre-eminence of that motivation is revealed when DOE says (page 8, column 1, line 27):

"Perhaps most important, remanufacturing would not retain the required breadth and depth of nuclear weapon expertise and judgment that will be needed to address future concerns about the safety and reliability of an aging stockpile."

1/40.24 The Public notices that this DOE SSMP concern is for maintaining general nuclear weapon "expertise" at the Labs and is quite willing to do so at the expense of expertise in manufacturing technology at the production sites. A vigorous remanufacturing emphasis would require a vigorous Y-12, hardly provided by the Preferred Alternative (given to us in charts at the PEIS Hearing Apr.1&2, but not in the Draft PEIS) which cuts Y-12's Defense Programs supported employment from 3,126 in 1996 to 1,080 in 2003, a cut of 70%, while building up the Labs stockpile management program by a combined 30% (Pref. Alt. Report, Feb. 1996, pp.26&30).

The persistent argument raised by the Labs and some DOE staff that remanufacturing to old specifications will not be possible for the longer term future is not a sound one for secondaries and case parts. Y-12 has been doing remanufacturing for years, working with the Labs to solve the substitution problems that have arisen, solving them successfully and meeting all the specifications.

Furthermore the "remanufacturing" option is miscast perjoratively in this SSMP and PEIS which uses it in the narrow sense of rebuilding "to original specs when defects arose" (see PEIS Volume I, page 3-6, column 2, pp.2), whereas the best use of remanufacturing would be to keep the average age of the stockpile at a reasonable minimum.

2/40.33 Question: Why was remanufacturing not been given a fairer, more widespread debate in the development of the SSMP (not the PEIS) including inputs of outside production and DOD experts rather than adopting the SBSSMP (incl.NIF) approach which clearly and admittedly is driven by goals of protecting the Labs and attracting and holding top rank scientists to LANL and LLNL?

SSM-M-073
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT DRAFT PEIS COMMENT

NAME: William J. Wilcox, Jr.
ADDRESS: 412 New York Avenue, Oak Ridge, TN 37830
PHONE: (423) 483-4990

COMMENT AND QUESTIONS:

A cadre of process development, technical support specialists at Y-12 over the past 40 years has been a vital part of the production team, available immediately to help solve problems and answering questions arising in HEU and Li processing, machining, and in secondaries surveillance. The SMPref.Alt.Report, (Feb.96 page 5&6), details the DOE decision to give "explicit responsibility for oversight of surveillance" and "for assurance of continued competence in weapons technology" to the weapons laboratories". This has never called for or been needed in the past. It will result in duplication of staffs and facilities and divided accountability.

1/33.01 Question: What is the intention of DOE for downsizing of the process development/technical support function at Y-12 which is a vital part of the production team? The PEIS does not address this crucial issue of Process Development/technical support except for announcing DOE's intention to try to overcome LLNL's obvious lack of competence in the areas DOE has already paid Y-12 to become competent in by doubling the expenditures on process development at LLNL (Pref. Alt. Rept.page 30 !

SSM-M-074
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT DRAFT PEIS COMMENT

NAME: William J. Wilcox, Jr.
ADDRESS: 412 New York Avenue, Oak Ridge, TN 37830
PHONE: (423) 483-4990

COMMENT AND QUESTIONS:

In DOE's Preferred Alternatives report of Feb. '96, in the chart at bottom of page 39, the schedule for downsizing Y-12 is shown with workforce reductions completed by the end of 2002 and steady state operations commencing at the beginning of 2004 and continuing (to the end of that graph) in 2011.

In the PEIS Manning Levels Graph on page 4-51 of Vol.I, however, the employment levels for Y-12 is first shown for the year 2000 and rather than ceasing to fall in 2008, it shows a Y-12 employment level which continually drops beyond 2003 each third year for which the data are plotted out to the last year on the graph which is 2030 !

1/08.13 Question 1: Where are these PEIS Volume I, page 4-51 chart data discussed ??

Question 2: What is the source of the numbers plotted and what is the significance of the trends shown for the ORR Downsize, given in the lower half of Figure 4.2.3.8-1 on page 4-51 of PEIS Volume I ? This is the only place in the PEIS which shows data for Y-12 out to the year 2030, and this shows a continuously decreasing employment level and level of EM support discussed nowhere else. These PEIS data are directly contradicted by the cost table for downsizing shown in the Analysis of Pref.Alt. report, Feb. '96, page 9-22 which shows no decline in funding after 2008. Which is right ?

SSM-M-075
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT DRAFT PEIS COMMENT

NAME: William J. Wilcox, Jr.
ADDRESS: 412 New York Avenue, Oak Ridge, TN 37830
PHONE: (423) 483-4990

COMMENT AND QUESTIONS:

The Draft PEIS says that three alternative plans for secondaries and case manufacturing were considered along with that of "no action".

1/33.05 The Y-12 proposal as stated in the PEIS is to downsize Y-12's manufacturing capability from the current
2350 direct DP workers to 870 workers. (See Summary, page S-35). Los Alamos's proposal (Ibid) is that
they could do the job with 321 directs, a seventh as many. Livermore's proposal (Ibid) was that they
could do the job with 290 directs, an eighth as many. But Livermore's proposal is on a very different
basis as stated in the Appendix on page A-82, 2nd column, line 4; namely the weapon parts production
capacity of the LLNL proposal is only one third of that of the for the Y-12 and LANL proposals.

Please explain how and why DOE considers these very different proposals to be *credible* alternatives for the nation's crucial secondaries and case manufacturing mission in evaluating and comparing the environmental impacts in the PEIS.

SSM-M-076
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT DRAFT PEIS COMMENT

NAME: William J. Wilcox, Jr.
ADDRESS: 412 New York Avenue, Oak Ridge, TN 37830
PHONE: (423) 483-4990

COMMENTS, REQUEST & QUESTIONS:

1/08.17 The Draft PEIS states in the Summary on page S-35, 1st column bottom, that the proposed plan is to cut
Y-12's manufacturing capability from the current 2350 current Defense Program workers to 870. The
kinds of employees making up this 870 total are reported in the Appendix, Volume 2, on page A-92.

But the data presented by Mr. Whiteman in his Introductory remarks to the Hearings April 1 & 2 in Oak
Ridge, were not these numbers, but 3126 current DP workers at Y-12 to be cut to a downsized level of
1080 in the year 2003, a cut of 2046 employees. The numbers given by DOE in their PEIS, on the other
hand, show a reduction in DP supported workers at Y-12 for the same years and for the same Case from
2350 to 870, a cut of only 1480 employees.

Question: The financial and socioeconomic analyses that constitute the heart of this PEIS were presumably
based on the downsizing data given in the PEIS, a decrease of 1480 DP workers. What then are the
financial and socioeconomic impacts of the new data presented in the Introductory Charts which call for a
cut of 2046 workers, 38% higher than those described in the PEIS on page S-35, and in Volume I on page
4-50 ?

2/08.18 Question 2: Please identify the skill mix that makes up the proposed 131 craftworkers. Without the breakdown of direct labor skills the Public cannot evaluate the feasibility of this level for meeting the proposed manufacturing requirements nor the reasonableness of the cross-over flexibility assumption.

SSM-M-077
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT DRAFT PEIS COMMENT

NAME: William J. Wilcox, Jr.
ADDRESS: 412 New York Avenue, Oak Ridge, TN 37830
PHONE: (423) 483-4990

COMMENT AND QUESTION:

1/40.23

Our Nation's defense posture recognizes the need to preserve nuclear weapons expertise. Just as important as preserving the capability of designing weapons is the importance of preserving the expertise of manufacturing them. The SBSSMP plan is built around a *science-based* future for maintaining our Nation's nuclear weapons capability rather than being the balanced plan the Nation needs which also is *manufacturing-based*. It has taken years to develop the capability to produce the kind of quality weapons we have in our stockpile in addition to developing the science.

How can the public and Congress have credibility in DOE's *science-based* plan which strips Y-12 (with decades of experience in manufacturing secondaries and cases) by 70% of present levels (see Pref. Alt. Report, Feb. 1996, page 39), but which surprisingly then provides for increases in the staffs of the 2 Weapon Labs by 30% in this same area of stockpile management (see ibid. page 26 & 30); areas in which neither Lab has any historic production capability. The public understands that knowing the *science* of building an airplane or a weapon is one thing, knowing how to *manufacture* them to demanding specs is something quite different

SSM-M-078
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT DRAFT PEIS COMMENT

NAME: William J. Wilcox, Jr.
ADDRESS: 412 New York Avenue, Oak Ridge, TN 37830
PHONE: (423) 483-4990

COMMENTS AND QUESTIONS:

1/40.23

When the experts at the Labs think about taking over and doing the Y-12 manufacturing function they focus on the science and know-how involved in producing secondaries and case parts. However, they may have an inadequate appreciation for what is involved in manufacturing spec-meeting weapons parts in the regulatory world DOE must operate in today. Certification of weapons parts for DOD in a Defense Nuclear Safety Board and regulation dominated world requires a world of discipline far different than one of just cutting metal parts on a fancy milling machine in the back of someone's laboratory to small tolerances. Understanding the science or technology (some which the Labs know or can learn from Y-12) is only one part of doing DOE's job.

2/33.05

The statements reflected by the Los Alamos and Livermore proposals on page S-35 of the PEIS Summary suggest some lack of appreciation for what is involved. They say they can do the downsized production job with only 321 people at LANL and only 290 at LLNL. Y-12, which has been doing that work for decades says it will require 870 people and that PEIS number is wrong - the correct number, given by Mr. Whiteman at the start of the April 1 hearing is that Y-12 will require 1,080 people, 3 to 4 times as many as the Lab proposals contend.

1/40.23 continued

Not only has Y-12 over the years had to master the science, technology, and art of making parts to weapons quality specs, but it has had to meet and conform to many other demands in so doing, demands which the Labs may be hard pressed to deliver in the context of their new, untried "science-based stockpile management" paradigmatic approach; requirements such as Conduct of Operations, OPSEC, DNSB, NIOSH, NEPA and other environmental requirements, waste management, etc. the rigid nuclear materials accountability system, nuclear criticality system, etc.etc. These are real requirements and real costs of manufacturing in today's world. DOE has chosen the Y-12 proposal as the Preferred Alternative over the two Lab proposals, but the public will puzzle over this unexplained preference - over and beyond the obvious stretch capacity advantage that Y-12 offers.

2/33.05 continued

Question: does DOE really believe that the Labs proposals spelled out in the PEIS (e.g. Summary page S-35) are credible alternative proposals? A real concern is that some future DOE management team or other oversight group on the look-out for even more cost savings, seeing these "alternatives" and assuming they are comparable, may be misled (by the apparently large savings to be made) into assuming the Labs can do the job as well as Y-12 with the result that DOE closes down Y-12 and moves secondaries/case production to the Labs. This would be a major loss to the Nation, not just in abandoned stretch capacity, but very likely in overall eventual cost, safety and quality.

SSM-M-079
COMMENT LETTER

PAGE 1 OF 2

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: DEBORAH M.I.: M Last Name: BRINK
Street Address: 623 ALTO #14
Street Address 2: PO BOX 8138 87504
City: SANTA FE State: NM Zip Code: 87501 -
Organization:
Telephone: 505-982-4574 Fax: - -

Comments:

1/40.19 I am opposed to the manufacture of plutonium pits at Los Alamos National Laboratories. I lived downwind from the Rocky Flats Plant in Denver, Colorado for over 20 years. As you well know, Rocky Flats was raided by the FBI and shutdown, leaving behind a highly contaminated "superfund" site. The communities immediately surrounding Rocky Flats were left with polluted water supplies, diminished property values and unexplained illnesses.

Since then, I have had grave doubts about the ability of the Nuclear Weapons Complex to conduct its business with integrity and responsibility to the citizens of this country. And I question the DOE's ability to "oversee" such an industry.

2/40.78 As I write this, I believe there is still no site-wide EIS available for LANL. I believe that we, the citizens,

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

[redacted] Receiver's Initials: ______

SSM-M-079
COMMENT LETTER

PAGE 2 OF 2

Comments (cont'd):

2/40.78 continued are entitled to know the current environmental condition of Los Alamos Nat'l Labs, so that we can know whether the University of California has been a good steward to the hazardous materials already being handled there.

Thank you for your consideration.

Deborah Brink

SSM-M-080
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: MARION M.I.: Last Name: SEYMOUR
Street Address: 2300 WEST ALAMEDA ST
Street Address 2:
City: SANTA FE State: NM Zip Code: 87501-
Organization:
Telephone: 505-438-9693 Fax: - -

Comments:

1/11.06 I understand that the incidence of thyroid cancer has quadrupled in the last decade. Are there not concerns for the health of residents at Los Alamos? Is the New Mexico Health Dpt given the responsibility and the opportunity to investigate incidence of thyroid cancer and possible causes?

2/40.15 I am concerned that there will be 12 times more nuclear waste and we are unable to deal with the nuclear waste we are now generating.

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

Receiver's Initials: ______

SSM-M-081
COMMENT LETTER

PAGE 1 OF 2

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: KAY M.I.: Last Name: MATTHEWS
Street Address: PO BOX 872 PENASCO NM 87553
Street Address 2:
City: State: Zip Code: -
Organization: RIO PUEBLO RIO EMBUDO COALITION
Telephone: 505-687-2290 Fax: - -

Comments:

1/40.07 We are writing to express our opposition to the Stockpile Stewardship and Management Program Draft EIS. The new and upgraded facilities called for in the draft are a threat to the Non-Proliferation Treaty, which we support in its attempts to eventually disarm nuclear powers. The rationale purported in the Draft — that these upgrades are necessary to safeguard the nuclear stockpile — is without merit. It is the informed opinion of experts that aging only affects reliability, not safety.

2/40.15 The additional funding called for in the Draft should be earmarked for clean-up and environmental programs.

3/10.10 Our coalition is primarily concerned with the health and vitality of our Penasco Valley watershed and communities, and feel an increased stockpile, and resulting waste disposal problems at LANL are a direct

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

Receiver's Initials: ______

SSM-M-081
COMMENT LETTER

PAGE 2 OF 2

Comments (cont'd):

threat to our communities. It became obvious to all of us from the Dome Fire which recently burned thousands of acres near Los Alamos, the fallout from Los Alamos reaches our valley as well as the more populated communities of Santa Fe and Española. [illegible] can remain viable without this concentration on nuclear stockpiling.

Rio Pueblo/Rio Embudo Watershed Protection Coalition
Box 32[illegible]
Peñasco, NM 87553

U.S. Department of Energy
PO Box 3417
Alexandria, VA 22302

SSM-M-082
COMMENT LETTER

PAGE 1 OF 2

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: Victoria M.I.: Last Name: [illegible]
Street Address: [illegible]
Street Address 2:
City: Santa Fe State: NM Zip Code: 87505
Organization: [illegible]
Telephone: 505-[illegible]-[illegible] Fax:

Comments:

1/04.06

I am deeply concerned with the safety of our waters!! If nuclear waste is buried [?]!! Please do not ruin our beautiful land. People speak out - please [illegible]!

THIS IS NOT OKAY!!!

Wake up stop lying to us!!

Please continue on the other side if you wish to use additional space. THANK YOU—your thoughts are important to us.

SSM-... 082
COMMENT LETTER

PAGE 2 OF 2

Comments (cont'd):

Think about the future of our Children
I would like to know your
comments

[illegible]
5 Calle [illegible]
Santa Fe, NM
87505

U.S. Department of Energy
PO Box 3417
Alexandria, VA 22302

SSM-M-083
COMMENT LETTER

PAGE 1 OF 1

Ms. Jean Markosen
840 47th Street, #2
Oakland CA 94608

Jeani Markosen
Assistant, Cancer Response System

I am shocked and dissappointed to learn of your plans to develop new nuclear weapons. Who are we fighting next? The world's wars should not be settled w/wide-scale destruction. I object to future expansion of this dangerous, polluting, wasteful program. — 1/40.50

Jeani Markosen

California Division, Inc.
1710 Webster Street, Oakland CA 94612
P.O. Box 2061, Oakland CA 94604
(510) 893-7900 FAX (510) 835-8656

AMERICAN CANCER SOCIETY.

SSM-M-084
COMMENT LETTER

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: [illegible] M.I.: [illegible] Last Name: [illegible]

Street Address: [illegible]

Street Address 2:

City: [illegible] State: [illegible] Zip Code: [illegible] -

Organization: [illegible]

Telephone: [illegible] Fax:

Comments on the DOE hearing on April 11, Livermore, CA:

1/40.44 In the absence of underground tests the SS&M program is absolutely vital for maintaining the basics of nuclear weapons physics and keeping track on the condition of the weapon stockpile. In my view, a superpower like the United States must have the leading edge of nuclear weapons know-how, irrespective of the winds of day-to-day politics. This is not "nuclear madness". Who should have it? Perhaps Mr. Sadam or the Peoples' Republic of China?

During the years of the Cold War design projects always had to be done in an atmosphere of hurry and many aspects of weapons physics were left so to speak "unresearched". Precisely, because the Cold War is over, the conditions are suitable to conduct weapons research in a relaxed atmosphere with no pressing time limits. The proposed NIF superlaser seems to be an excellent tool to create conditions reminiscent to that of nuclear explosives in a microscopic scale.

2/21.07 In addition, the NIF superlaser will be an excellent research tool for the study of controlled themonuclear fusion, which is vital if civilization is to survive the energy crunch of the 21-st century. It is my understanding that the NIF superlaser will create high temperature conditions only in a microscopic scale and intends to study fusion not fission, therefore no nuclear waste is involved.

The dual purpose NIF facility is perhaps the best investment of taxpayers money. I want to register my full support.

Balazs Rozsnyai
Livermore.

SSM-M-085
COMMENT LETTER

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: VIRGINIA M.I.: W Last Name: MILLER

Street Address: 1125 CALLE DEL NORTE

Street Address 2:

City: SANTA FE State: NM Zip Code: 87501 -

Organization:

Telephone: 505-986-8676 Fax:

Comments:

1/40.06 DOE's proposed Stockpile Stewardship and Management Program at LANL is totally injustified and dangerous to the health and well being of the people of NM and the world. Experts agree that the safety and reliability of the U.S. nuclear weapons stockpile can be maintained by existing surveillance programs and replication of parts as needed. The Stockpile Stewardship and Management Program simply provides LANL with the continuing capacity to design, produce, and test new nuclear weapons at a time when the rest of the world is grasping at worldwide nuclear disarmament on the eve of the signing of two significant global treaties—the Nonproliferation Treaty and the Comprehensive Test Ban Treaty. The Stockpile Stewardship Program will undermine the full acceptance of both these critical treaties, thus undermining the global security of us all.

2/40.15 Nuclear weapons have already cost us close to $4 trillion about equal to the national deficit—this is obscene—and now billions more will be wasted, on unnecessary facilities, while new nuclear waste will be generated.

1/40.06 continued And yet funding for cleanup, environmental restoration, and technology transfer is being cut. Even funding for the NM Environment Department LANL Monitoring Bureau is in danger of being axed as it becomes more effective. I would call this downright irresponsible. It seems to me the only safety DOE and LANL are concerned about is the safety of the weapons, not the safety of the people (Turn to back of page.)

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

1/40.06 continued | who live in this beautiful state. And don't count on WIPP—the people of NM are determined to keep WIPP closed for the safe, long term future of the ground water and of our beloved state. New Mexicans deserve good, safe jobs, not jobs at any cost. The SSAM Program must never be implemented. We must not continue to legitimize nuclear weapons. It's not OK. Thank you.

Virginia J. Miller

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: JEAN M.I.: G Last Name: NICHOLS
Street Address: PO BOX 237
Street Address 2:
City: PENASCO State: NM Zip Code: 87553-
Organization: LA COMUNIDAD
Telephone: 505-587-2209 Fax: - -

Comments:

1/40.07 | The Draft SS&M PEIS is totally unacceptable. It contradicts everything that the NonProliferation Treaty stands for and undermines the Comprehensive Test Ban Treaty. For years we have been told that LANL would not take over the work of Rocky Flats and that no new nuclear weapons would be designed + produced. We wanted to believe it because it is the sane thing. Who would continue this nuclear madness? at this point in history. Apparently the DOE has lost all reason.

2/40.12 | The cost of nuclear weapons in dollars is the cost of our national defict. In human health the cost has been beyond counting – nuclear weapons and their toxic waste is the biggest threat we have. If we have enemies still, post cold war, it is due to the nuclear proliferation

3/40.36 | that we are still spreading. Responsibile Stewardship demands that the DOE consider a passive, caretakers role in which weapon reliability be maintained through identical

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

[redacted] Receiver's Initials: ______

SSM-M-087
COMMENT LETTER

PAGE 2 OF 2

Comments (cont'd):

4/40.33 Replication of parts, or to consider eliminating nuclear weapons altogether (which is preferable) The proposed upgrade of facilities & production plans are totally unacceptable. The recent Dome fire which threatened Los Alamos, released some radioactivity (according to monitors in Santa Fe) from old dumpsites?) Even though the fire

5/43.18 did not reach LANL itself, it is a warning to the Lab. We cannot afford to risk a Chernobyl incident here, especially when it has never been proved that nuclear weapons are necessary. We need to keep all scientists working into the next century cleaning up waste that we already have, not making more.

LANL needs to come into compliance with environmental law, stop all plans + projects, hold a site-wide EIS on the whole picture, and start working on the real problems that we have created — ozone depletion and the rest. It is insane that we have to worry for our lives + our health from our own Government. We are losing all faith in our leaders and many of the ills of our society are direct results of this. Show our

6/40.50 kids some hope and reverse this trend. Rewrite the SSM PEIS to include the caretaker option + the elimination of nuclear weapons altogether.

Jean Nichols
La Comunidad
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Penasco NM 87553

U.S. Department of Energy
PO Box 3417
Alexandria, VA 22302

SSM-M-088
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM 5/7/96

Please print clearly

First Name: KRISTIN M.I.: [illegible] Last Name: HANSEN
Street Address: 2350 PLAZA VERDE
Street Address 2:
City: SANTA FE State: NM Zip Code: 87505
Organization: AMERICAN CITIZEN
Telephone: 505-473-9456 Fax:

Comments:

1/40.42 I was compelled to attend this presentation to see why "stockpile stewardship" is [illegible] [illegible] [illegible] [illegible] security. [illegible] subject [illegible] lines. [illegible] I thought Dr. Giddens [illegible] [illegible] career and our lives [illegible] [illegible] by not allowing any academic freedom. [illegible] important. But in light of things like the Oklahoma City Bombing — [illegible] [illegible] a nuclear terrorist attack [illegible] would the stockpile [illegible] [illegible] to ??? [illegible] Dr. Giddens did an [illegible] presentation — I

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

Hope he's more honest about the [illegible] at LANL, so that maybe I can believe him. [illegible] LANL is [illegible]

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Natural Resources Defense Council
NRDC

1350 New York Ave., N.W.
Washington, DC 20005
202 783-7800
Fax 202 783-5917

May 7, 1996

Mr. Jay Rose
Office of Reconfiguration
U.S. Department of Energy
1000 Independence Ave., S.W.
Washington, D.C. 20585
Attention: SSM PEIS

Dear Mr. Rose:

The Natural Resources Defense Council, Inc. ("NRDC") submits the following comments on the Department of Energy ("DOE" or the "Department") Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management (the "Draft PEIS").

1/40.85

I. THE DRAFT PEIS FAILS TO CONSIDER ADEQUATELY THE ENTIRE RANGE OF CURRENT AND PROPOSED ACTIONS CONNECTED WITH THE WEAPON STOCKPILE STEWARDSHIP AND MANAGEMENT ("WSSM" or "SS&M") PROGRAM AND REASONABLE ALTERNATIVES TO SUCH ACTIONS.

A. Because of the Substantial Changes in the Nature and Purpose of DOE's Atomic Energy Defense Activities, as Reflected in the Design and Implementation of a Long-Term Weapon Stockpile Stewardship and Management Program, the PEIS Must Consider in a Comprehensive Manner All Related, Connected, Cumulative and Similar Actions Designed to Achieve the Goals of Stockpile Stewardship and Management, Including Activities Asserted to be Ongoing.

1. The National Environmental Protection Act ("NEPA") requires preparation of an environmental impact statement ("EIS") on every proposal for major federal action significantly affecting the quality of the human environment. 42 U.S.C. § 4332. The Council on Environmental Quality ("CEQ") and DOE NEPA regulations provide guidance on when and how EISs should be prepared at the program level.

2. The CEQ Regulations state that a "proposal" exists at that stage in the development of an action when an agency "has a goal and is actively preparing to make a decision on one or more alternative means of accomplishing that goal and the effects can be meaningfully evaluated." 40 C.F.R. § 1508.23. In this case, DOE's stated stockpile stewardship and management goal is to "maintain the core

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Fax 213 934-1210

1/40.85 continued

intellectual and technical competencies of the U.S. in nuclear weapons including research, design, development, testing, reliability assessment, certification, manufacturing and surveillance; to maintain all three nuclear weapons labs and the capability to resume nuclear testing if needed, and to maintain a safe and reliable U.S. nuclear weapons stockpile." Draft PEIS, p. 2-7. DOE is actively evaluating alternative means of accomplishing these goals.

3. The CEQ Regulations define "major federal action" to include the "adoption of programs, such as a group of concerted actions to implement a policy or plan; systematic and connected agency decisions allocating agency resources to implement a specific statutory program or executive directive." 40 C.F.R. § 1508.18(b)(3). DOE's NEPA regulations require preparation of a programmatic EIS to support a DOE programmatic decision in these circumstances. 10 C.F.R. § 1021.330. In this case, DOE is expressly considering a group of concerted actions to implement current national security policies for nuclear deterrence, arms control and nuclear proliferation, and determining how to allocate scarce agency resources to implement these policies. See Draft PEIS Chapter 2. Thus, this group of concerted actions together constitute a major DOE program for which a PEIS is clearly required.

In preparing an environmental impact statement, agencies shall make sure that the proposal which is the subject of the EIS is properly defined. Agencies shall use the criteria for scope (40 C.F.R. § 1508.25) to determine which proposal(s) shall be the subject of a particular statement. (See comment 13 below.) **Proposals or parts of proposals which are related to each other closely enough to be, in effect, a single course of action must be evaluated in a single impact statement.** 40 C.F.R. § 1502.4.

4. In evaluating the overall impacts of its Stockpile Stewardship and Management Program, DOE cannot ignore the effects of a large number of activities and projects that are integral parts of this program simply by claiming that they are "ongoing." It is well settled that NEPA applies to ongoing as well as new activities. 40 C.F.R. § 1508.18(a); see Andrus v. Sierra Club, 442 U.S. 347 n. 21 (1979)("'[M]ajor Federal actions' include the 'expansion or revision of ongoing programs.'"). Programmatic impact statements are "particularly appropriate" when an agency has an ongoing program that continues to have a significant effect on the human environment. NRDC v. Energy Research and Development Administration, 451 F.Supp. 1245 (D.D.C. 1978) (referring to programmatic EISs prepared by DOE's predecessor agency on ongoing waste management practices at the Hanford and Savannah River sites).

1/40.85 continued

5. The operative test is whether there is a "change in the status quo." Committee for Auto Responsibility v. Solomon, 603 F.2d 992, 1003 (D.C. Cir. 1979), cert. denied, 445 U.S. 915 (1980). In other words, significant changes in programs rising to the level of major federal actions which have or will change the status quo must be studied under the procedures outlined in NEPA. Public Service Co. of Colorado v. Andrus, 825 F.Supp. 1483, 1500 (D. Idaho 1993). A determination under this test is based to some extent on whether the proposed agency action and its environmental effects were within the contemplation of the original project when adopted or approved. Westlands Water Dist. v. U.S. Department of Interior, 850 F. Supp. 1388 (E.D. Cal. 1994); see Upper Snake River v. Hodel, 921 F.2d 232, 235 (9th Cir. 1990). As shown below, the changes to DOE's nuclear energy defense program lie far beyond the contemplation of the original program, and thus require a comprehensive PEIS in order to reexamine the entire program as a whole, not just individual parts.

6. In the recent case of Public Service Co. of Colorado v. Andrus, supra, the court found a number of changes in the status quo with respect to the management of nuclear waste at the Idaho National Engineering Laboratory ("INEL"). First, the court found that the volume of nuclear waste being brought to INEL and the frequency of shipments is increasing dramatically under the existing or "ongoing" programs at INEL. Id. Second, the court found a "significant change in the status quo" in the fact that the waste is no longer being reprocessed for further use, but simply being brought to INEL to be stored indefinitely. Id. The court said that this change "signaled a potentially significant change in the entire purpose of INEL, which for most of its history has served as an advanced research facility." Id. at 1501.

Third, the court noted that existing facilities at INEL are nearly filled to capacity and/or are nearing the end of their useful lives. These facilities are experiencing problems with corrosion, environmental contamination and other problems which call their continued use into serious question. Id. at 1500. Fourth, the court found that DOE is proposing to expand and reconfigure certain facilities, and will most likely have to build additional facilities, in order to accommodate all of the waste the agency wishes to bring to INEL. Id. at 1501. Finally, DOE announced its intention to develop and apply new technologies at INEL to reprocess the spent fuel into forms suitable for permanent storage in a geologic repository. Id.

7. In light of all these changes and new proposals, the court held that DOE must prepare a comprehensive, site-wide EIS addressing all nuclear waste activities at INEL. The court specifically stated that this EIS must review not just the "more recent proposals" but also "what DOE characterizes as 'ongoing'

1/40.85 continued

activities." Id. at 1502. The court characterized DOE as "seeking to evade NEPA review" by "characterizing all of its activities as ongoing" and "fractionalizing and segmenting its proposals." Id. at 1501. The court also required the EIS to include an analysis of all previous and proposed shipments of waste to INEL and all related activities, including the expansion and revision of storage facilities, as well as DOE's proposals to develop new processing technologies.

8. The purpose of a programmatic EIS is to trigger a comprehensive consideration of an entire program and a broader look at alternatives. Jones v. Lynn, 477 F.2d 885, 890-91 (1st Cir. 1973). A programmatic statement permits a "questioning or restatement of basic objectives and value judgements, assessments of progress and projections of future program directions, and a taking stock of what all this activity and expenditure has meant." W. Rogers, Environmental Law 937. In NRDC v. Administrator, Energy Research and Development Administration, 451 F. Supp. 1245, 1257 (1978), for example, the court cited an unpublished decision by the Eastern District of Washington that approved the Hanford programmatic waste management EIS:

> The [PEIS] reassessed and reevaluated the current waste management program at Hanford, including current storage and disposal practices. That [PEIS] provided [ERDA] with an environmental disclosure sufficiently detailed to aid in the decision as to whether and how to proceed with the current Hanford radioactive waste management program, and made available information to the public information concerning the environmental impacts of the current program and encouraged public participation in the development of that information.

In contrast, by fragmenting and segmenting its WSSM program, as it did in the INEL case, DOE cannot possibly analyze the overall program and consider relevant alternatives to the program as a whole.

9. In light of the NEPA requirements described above, DOE is not justified in its apparent belief that by merely designating large portions of the WSSM program as "continuing activities," it has been relieved of its responsibility under NEPA for making a thorough and comprehensive assessment of the broad impacts of the SS&M program as a whole, including an assessment of reasonable alternatives for accomplishing the program's substantially revised mission objectives. Nor can this requirement for comprehensive programmatic review be satisfied by sweeping virtually the entire existing base program into a supposed "No Action" alternative,

1/40.85 continued

or by relegating detailed consideration of ongoing activities to occasional review in a site-specific EIS. On the contrary, as explained above, the Courts have recognized that changed circumstances, particularly on the dramatic scale of those leading to the creation of the WSSM program, can make the major restructuring of a longstanding federal activity, such as nuclear weapons research, development, testing and production, a proposal for major federal action significant enough to trigger the preparation of a comprehensive PEIS.

10. Ironically, the existence of such dramatically changed circumstances has been repeatedly cited by DOE itself as the principal justification for the creation of the WSSM Program. In its FY 1997 Atomic Energy Defense Activities congressional budget request, submitted March 1, 1996, DOE explicitly links the emergence of the WSSM program to specific changes in the policy environment that took place between July 1992 and January 1996:

> Over the past several years, the United States policy governing the nuclear weapons stockpile *has undergone profound change* to reflect the new and evolving geopolitical and military structures of the post Cold War world. In 1992, the United States announced a halt in the production and design of new nuclear weapons and a moratorium on underground nuclear testing. In 1993 and 1994, the President and Congress directed the Secretary of Energy to establish a stockpile stewardship program to ensure the preservation of the core intellectual and technical competencies of the United States in nuclear weapons.
>
> In February, 1995, the Secretary of Defense submitted to the president and the Congress the Nuclear Posture Review, which established requirements for the Department of Energy related to maintaining nuclear weapons infrastructure and capabilities....In August, 1995, the President announced that the United States would pursue a true zero yield Comprehensive Test ban Treaty (CTBT) as a means of reducing the danger posed by nuclear weapons proliferation. The President outlined a series of safeguards that define the terms under which the U.S. would enter a CTBT. Safeguard A directs the conduct of the Stockpile Stewardship program to ensure the safety and reliability of the stockpile.
>
> In January, 1996, the Senate gave overwhelming approval to the START II Treaty. The treaty ratification text highlighted the nation's commitment to proceed with a robust stockpile stewardship

1/40.85 continued

> program,...*The Defense Programs Stockpile Stewardship and Management Program* is a single highly integrated technical program for maintaining the safety and reliability of the U.S. nuclear stockpile that *has evolved in response to these many new policies* (emphasis added). DOE Budget Request, Vol. 1 at 21-22.

11. In a similar vein, the Draft PEIS states:

> In response to the end of the Cold War and changes in the world's political regimes, the emphasis of the U.S. nuclear weapons program *has shifted dramatically over the past few years* from developing and producing new weapons to dismantlement and maintenance of a smaller enduring stockpile. Accordingly, the nuclear weapons stockpile is being significantly reduced, the United States is no longer manufacturing new nuclear weapons, and DOE has closed or consolidated some of its former weapons industrial facilities. Additionally, in 1992 the United States declared a moratorium[1] on underground nuclear testing, and in 1995 President Clinton extended the moratorium and decided to pursue a "zero yield" Comprehensive Test Ban Treaty (emphasis added)" PEIS at 1-1.

12. A recent DOE Final EIS, issued in August 1995, explicitly links the above developments to the creation of the WSSM program:

> For almost 50 years, nuclear tests were key to gathering data used for developing nuclear weapons and certifying their safety, reliability, and performance. Nuclear tests were also used to evaluate the effectiveness and certify performance of weapons that were redesigned. Since the 1992 moratorium on nuclear tests, *DOE has recognized that a new approach, based on scientific understanding and expert judgement, is needed* to ensure confidence in a nuclear deterrent and the U.S. stockpile....*DOE now intends to accomplish this [Atomic Energy Act] mission through the SS&M program....This new approach must rely on scientific understanding and judgement, not on nuclear testing and the development of new weapons, to predict, identify, and correct problems affecting the*

[1] Actually, in 1992 the United States Congress enacted a nine month moratorium and other restrictions on U.S. underground nuclear tests which President Bush very reluctantly signed into law.

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safety and reliability of the stockpile (emphasis added)." DARHT Final EIS at 2-5,6.

In all our years of reviewing EISs and litigating NEPA claims, we cannot recall a stronger case for comprehensive programmatic review of an ongoing federal activity based on radically changed circumstances. Because the WSSM program is an acknowledged, deliberate, and carefully planned response to these dramatically changed circumstances, all federal and federally-sponsored activities proposed for continuation pursuant to this program, as well as reasonable alternatives to these activities, must be considered fully in the PEIS.

13. In preparing EISs, including programmatic EISs, agencies must include all connected, cumulative and similar actions, 40 C.F.R. § 1508.25, whether they be new or continuing. 40 C.F.R. § 1508.18(a). Connected actions are defined as actions which are "closely related" and therefore should be discussed in the same impact statement. 40 C.F.R. § 1508.25. Actions are connected, among other things, if they "are interdependent parts of a larger action and depend on the larger action for their justification." 40 C.F.R. § 1508.25(a)(1)(iii). Actions are also connected if they "cannot or will not proceed unless other actions are taken previously or simultaneously." 40 C.F.R. § 1508.25(a)(1)(ii).

Agencies must also include in the EIS all cumulative actions, which are actions which, when viewed with other proposed actions, have cumulatively significant impacts. 40 C.F.R. § 1508.25(a)(2). Agencies should also include in a single EIS all "similar actions" when the best way to assess adequately the combined impacts of similar actions or reasonable alternatives to such actions is to treat them in a single impact statement. 40 C.F.R. § 1508.25(a)(3). "Similar actions" are defined as actions which, when viewed with other reasonably foreseeable or proposed agency actions, have similarities that provide a basis for evaluating their environmental consequences together. Id.

In evaluating the intensity of a proposed action to determine its significance, the CEQ regulations at § 1508.27(7) require agencies to consider whether "the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts." The regulations further define "cumulative impact" as "the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (federal or non-Federal)or person undertakes such other

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continued

Mr. Jay Rose
May 7, 1996
Page 8

actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Id. See NRDC v Hodel. 865 F.2d 288 (D.C.Cir. 1988).

There can be no doubt about the highly interdependent, similar, connected and cumulative quality of the actions now underway and proposed to be undertaken pursuant to the Stockpile Stewardship and Management Program. The FY 1997 DOE Budget request refers to "intensive Stockpile Stewardship and Management planning processes [that] we have had underway for the past two years. Budget Request at 22. As described by DOE:

> the SS&M Program *is a single, highly integrated technical program* for maintaining the safety and reliability of the U.S. nuclear stockpile in an era without nuclear testing and without new weapons development and production (emphasis added). DARHT Final EIS at 2-5.
>
> The Defense Programs Stockpile Stewardship and Management Program *is a single, highly integrated technical program for maintaining the safety and reliability of the U.S. nuclear stockpile....all stockpile stewardship and management activities have achieved a new, closer linkage to each other* as evidenced in the *draft Stockpile Stewardship and Management Plan* and the ongoing Programmatic Environmental Impact Statement process. DOE FY 1997 Budget Request, Vol. 1, at 22.
>
> FY 1997 will be year in which we begin to look forward to what needs to be done, as opposed to the last four to five years during which the focus has been on responding to major policy shifts such as the implementation of the moratorium on underground nuclear testing and cessation of design and production. *The primary focus of activity will be on implementation of the Stockpile Stewardship and Management Plan, currently being drafted, which provides a highly integrated program plan consistent with current policy guidance.* Id. at 44.
>
> In the *new paradigm of closer integration between Stockpile Stewardship and Management activities*, there are also issues that will be addressed jointly. The Stewardship program will play a major role in reducing the vulnerability of the smaller stockpile to single-point and common-mode failures, principally through research

1/40.85 continued

> *base support of the new Enhanced Surveillance Initiative* funded in the Stockpile Management decision unit. The Stewardship and Management programs *also have shared responsibilities in advanced manufacturing and systems engineering studies to integrate technological drivers such as advanced computing into an efficient and effective production complex of the future*. The Dual Revalidation program, managed by Stockpile Management, *will encompass both laboratories and plants in a new joint process for validating the safety, reliability, and performance of the stockpile over time*. Finally, the Radiological/Nuclear Accident Response program, funded by Stockpile Management, *utilizes capabilities throughout the weapons complex, including weapons expertise at the laboratories and specialized capabilities resident at the DOE facilities in Nevada*. Id. at 22.

Clearly, a NEPA-compliant programmatic analysis of such a "highly integrated" and "intensively planned" program would not seek to unbundle it, and thereby attempt to disguise the vast majority its proposed actions either as "continuing activities" in a falsely labeled "No Action" alternative, or as prospective future actions that "cannot be defined to the degree necessary" to be fully considered as part of the proposed action. Draft PEIS at 3-21.

B. The Draft PEIS Has Not Considered The Full Range of Proposed and Potential Stockpile Stewardship Activities That Is Required by NEPA.

DOE has characterized a number of potential stockpile stewardship facilities as not "ripe" for NEPA review because "they have not reached the stage of development and definition that is necessary for evaluation and decision making." Draft PEIS at 1-5. This claim has no basis in law and is not supported by the facts.

2/41.17

1. (a) "Agencies shall prepare statements on broad actions so that they are relevant to policy and are timed to coincide with meaningful points in agency planning and decisionmaking." 40 C.F.R. § 1502.4(b).

   (b) "Environmental impact statements shall serve as the means of assessing the environmental impact of proposed agency actions, rather than justifying decisions already made." 40 C.F.R. § 1502.2(g).

   (c) "Agencies shall integrate the NEPA process with other planning <u>at the earliest possible time</u> to insure that planning and decisions reflect environmental values, to

avoid delays later in the process, and to head off potential conflicts. 40 C.F.R. § 1501.2.

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2. The PEIS contains brief one-paragraph descriptions, and cursory generic environmental impact analyses, of the following so-called "Next Generation Stockpile Stewardship Facilities:" the Advanced Hydrotest Facility, the High Explosives Pulsed Power Facility, and the Advanced Radiation Source (X-1) and Jupiter Facility. PEIS at 3-20,21,22, and 4-517,518,520,521.

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3. On the one hand, DOE appears to be laboring under the misapprehension that because the above projects have not yet entered the stage at which they receive congressional "line item" funding for construction, that they may be excluded from a programmatic impact analysis. On the other hand, DOE also excludes from programmatic consideration a large number of other WSSM projects and facilities on the basis that, "as a general rule," they had "broken ground" prior to September 1995. The systematic application of these two artificial constructs reduces what is supposed to be a "programmatic" analysis into a brochure for three site-specific projects for which no reasonable alternatives to DOE's preferred alternative have been identified, much less honestly and competently analyzed and compared.

2/41.17 continued

4. According to DOE, "the next generation of potential stockpile stewardship facilities cannot be developed and described to the degree necessary to perform detailed environmental impact analysis in this PEIS." Draft PEIS at 4-517. Whether or not this statement is true -- and in some cases we doubt that it is -- it is irrelevant. The ability to perform detailed (i.e. site-specific) environmental impact analysis is <u>not</u> the relevant standard for inclusion of project in a PEIS. Site-specific analysis can come later. 40 C.F.R. § 1508.28. <u>See</u> <u>NRDC v. ERDA</u>, 451 F.Supp. 1245 (D.D.C. 1978):

> As a general rule, the preparation of a PEIS does not obviate the necessity of preparing a particularized impact statement for individual major federal actions that are components of a subject program. Because programmatic statements are primarily concerned with analyzing the cumulative or synergistic environmental impacts of a program as a whole, they generally are unable to reflect a considered analysis of the particularized actions of individual federal actions. Yet such analysis of particularized aspects of individual federal actions must be performed under the mandate of section 102(2)(C). Thus,

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> "site-specific" EISs will usually be necessary to supplement the environmental analysis of a programmatic impact statement.

451 F. Supp. at 1258 (emphasis added). The Ninth Circuit also required a programmatic EIS to consider reasonably foreseeable similar projects that are part of the overall development plan:

> Where there are large scale plans for regional development, NEPA requires both a programmatic and site-specific EIS....This court has held that where several foreseeable similar projects in a geographic region have a cumulative impact, they should be evaluated in a single EIS....There, emphasizing the likelihood of future development, the court remanded to the agency for further consideration of cumulative impact because the agency had examined single projects in isolation without considering the net impact that all the projects in the area might have on the environment.

City of Tenakee Springs v. Clough, 915 F.2d 1308 (9th Cir. 1990).

The relevant standard is whether these facilities are under active investigation as part of the WSSM program, such that their inclusion in a broad programmatic analysis of environmental impacts and reasonable alternatives would assist in ensuring that these statements are "relevant to policy," "timed to coincide with meaningful points in agency planning and decisionmaking," and "serve as the means of assessing the environmental impact of proposed agency actions, rather than justifying decisions already made."

5. As exemplified by the current draft PEIS, DOE's current approach virtually ensures that the primary function of the PEIS will be to justify decisions already made, thereby placing the Department in violation of NEPA. In its FY 1997 Budget Request, the Department itself admits:

> The impact of the announcement of the preferred alternative [construction and operation of the National Ignition Facility and Contained Firing Facility at LLNL and the ATLAS Facility at LANL] on the FY 1996 and FY 1997 budgets is minimal. Funding for the three Stockpile Stewardship facilities highlighted above *has been programmed into the FY 1997 and outyear budget*

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continued

> *requests* (emphasis added)." FY 1997 Budget Request, Vol 1. at 28.

In NEPA terms, this candid admission of the irrelevance of the SS&M PEIS and ROD for the Department's own planning and budgeting is the proverbial "smoking gun." Unfortunately, this gun isn't merely a smoking pistol. In preparing this draft PEIS, the Department has trained an M-16 on the National Environmental Policy Act, and set the trigger on automatic fire.

6. DOE claims that it is in a position to provide only "a broad description of what these three facilities might look like." PEIS at 3-21. This is a transparent falsehood. There is considerable documentary evidence that the design and engineering of these "next generation" facilities are under active exploration by DOE and its national laboratory contractors (see below), and no one disputes that these facilities are components of a highly integrated long-term plan for Stockpile Stewardship and Management. Indeed, some of these "next generation" facilities may actually be available sooner, at considerably less expense, and with lesser aggregate environmental impact, than the National Ignition Facility (NIF) which is treated in the PEIS as a preferred alternative for proposed action at a preferred site.

7. Also, DOE should reacquaint itself with the EIS requirement for federal and federally-assisted research, development, and demonstration programs involving new technologies that, if applied, could significantly affect the quality of the human environment:

> Statements shall be prepared on such programs and shall be available *before the program has reached a stage of investment or commitment to implementation likely to determine subsequent development or restrict later alternatives* (emphasis added)." 40 C.F.R. § 1502.4(e)(3).

8. The Advanced Hydrotest Facility (AHF) - Conceptual designs of this facility were circulating in the DOE weapons community more than three years ago, and NRDC is persuaded that considerable additional design work on the facility has been accomplished in the interim. Under the heading "Core Stockpile Stewardship-Core Research and Advanced Technology, and under the "Programmatic Category" entitled "Design Assessment and Advanced Technology, the FY 1997 DOE budget request contains the following information regarding development of the Advanced Hydrotest Facility:

2/41.17
continued

MEASURABLE PERFORMANCE ACTIVITIES:
FY 1995: ....
- Tested technology for an Advanced Hydrotest Facility, including a full inductive adder power modulator.
FY 1997: ....
- Continue Advanced Hydrotest Facility development activities including development of physics design requirements and research of potential pulse power machine technologies. FY 1997 DOE Budget Request, Vol.1 at 77.

Under a more detailed "Programmatic Subcategory" entitled "Design Assessment and Advanced Technology/Physics Detail" the following descriptions of work are provided:

MEASURABLE PERFORMANCE ACTIVITIES:
FY 1995: ....
- Tested technology necessary for an Advanced Hydrotest Facility, including the development of a full inductive adder power modulator, and development of an electromagnetic code for simulating electron beam propagation in non-linear lines.
FY 1996: ....
- Continue Advanced Hydrotest Facility development activities.
FY 1997: ....
- Continue Advanced Hydrotest Facility development activities including:
-- Development of initial physics design requirements for the potential facility.
-- Preliminary design activities for advanced research pulse power machines required to evaluate competing technologies for inclusion in facility design. Id. at 79.

The FY 1997 DOE Budget Request also notes that while the "Stockpile Stewardship and Management Plan, currently in draft, will provide *the primary programmatic guidance for FY 1997*", other important planning documents "include ... *the developing advanced hydrodynamics program plan* (emphasis added)." Id. at 57.

Under the heading "SIGNIFICANT CHANGES FROM FY 1996," the budget request lists the following: "Enhance the support of activities to investigate the

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potential of advanced facilities to replace underground nuclear testing: + $9.5 million." Id. at 57.

Under the Heading "Highlights of the FY 1997 Budget Request - Program Increases," there is the following explanation: "Increases for advanced hydrodynamic research and development contained in the Physics subprogram (net + $9.5 million) is *for technology development needed for the next generation advanced hydrodynamics facility* (emphasis added)." Id. at 25.

In sum, the Department has both broad programmatic and more specialized plans for the design and development of the Advanced Hydrotest Facility, and is devoting increasing budgetary resources to these tasks. The exclusion of the AHF from the analysis of proposed actions in the PEIS is not supported by the facts, and is a violation of NEPA.

9. The High Explosives Pulsed Power Facility (HEPPF) - This "next generation" facility is misleadingly presented in the PEIS as though it were *sui generis*, when in fact it is the direct outgrowth of the longstanding Athena program at the Los Alamos National Laboratory that uses pulsed-power technology "to explore high-energy density physics in support of the nuclear weapons program." Los Alamos Science, No.21, 1993, p. 64.

The Athena program uses two methods to generate intense electrical pulses: a large capacitor bank called Pegasus II and a high-explosive pulsed power generator called Procyon. Just as the Atlas facility at Los Alamos (one of three new facilities that make up the DOE's "preferred alternative" in the draft PEIS) is the prospective follow-on facility to Pegasus II, the HEPPF is the prospective follow-on to Procyon. As noted by a former director of High Energy Density Physics at Los Alamos three years ago,

> Each of our capabilities can be extended to higher energies for even more interesting applications. The next advance in Laboratory capacitor banks is Atlas, a 25-megajoule machine that will permit us to study high energy densities over tens of cubic centimeters. The Procyon high-explosive pulsed-power generator will be followed by a more advanced system that will deliver in excess of 200 million amperes. Id. at 69.

High-explosive pulsed power is also currently the subject of an unprecedented program of scientific cooperation involving the Los Alamos National Laboratory and the Russian Institute of Experimental Physics, better known by its former

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Soviet code name, Arzamas-16, the former Soviet Union's first nuclear weapon design laboratory, which has done extensive work on the development of high-explosive pulsed power machines. The draft PEIS provides none of this essential background, and provides absolutely no factual or analytical basis for its grossly uneven treatment of what are in effect *parallel projects within the same program at the same national laboratory*! Far from justifying the exclusion of HEPPF from the proposed action, what scanty data there is the draft PEIS strongly suggests that HEPPF could well be made available sooner and far more cheaply than, for example, the NIF.

> HEPPF would probably be sited at NTS because of the amount of high explosives and an existing infrastructure is already available. A likely candidate site would be the Big Explosives Experimental Facility (BEEF) at NTS....The facility has the capability to support many of the sophisticated diagnostic techniques needed for the evaluation of hydrodynamic and pulsed power experiments containing large amounts of HE. Existing facilities at NTS would be used, to the extent practical, to develop HEPPF. Draft PEIS at 4-520, 521.

The exclusion of high-explosive pulsed power generally, and the HEPPF in particular, from the programmatic analysis of proposed SS&M actions in the PEIS is not supported by the facts, and is a violation of NEPA.

10. <u>The Advanced Radiation Source (ARS [X-1]) and Jupiter Facility</u> - Aside from a passing reference in a one-paragraph summary of the No Action alternative for Stockpile Stewardship, the Sandia National Laboratory's longstanding and extensive program to develop ever more powerful advanced pulsed-power x-ray sources is omitted from the descriptions of the SS&M program contained in the PEIS. Similarly, the prospective role of this program in science-based stockpile stewardship is relegated to a one paragraph discussion of the ARS(X-1) as a "next generation" stockpile stewardship facility. Draft PEIS at 3-22.

However, publicly available documentation suggests that this characterization of the ARS(X-1) project is misleading and unsupported by the facts. According to news reports, recent breakthroughs in controlling the symmetry of implosion in Sandia's Saturn pulsed power accelerator have more than quadrupled Saturn's x-ray output, to about 85 trillion watts (terawatts). According to Don Cook, Director of Sandia's Pulsed Power Sciences Center, this success means that it now appear possible to reach 150 terawatts on Particle Beam Fusion Accelerator II

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(PBFA II), rather than the 50-100 terawatts that it was originally designed to produce.

> In the coming months, as Labs researchers achieve those output levels on PBFA II, Sandia will begin preparations to build its next generation X-ray source, the X-1 Advanced Radiation Source. The X-1 ARS would provide four times the peak X-ray output of PBFA II, quadrupling the Labs' X-ray generation capabilities from 2 million joules per shot (PBFA's peak output) to 8 million joules (megajoules). "Until recently, our objective with the X-1 was to produce up to 200 trillion watts in a lab here at Sandia," Don says. "But the recent breakthrough on Saturn suggests that the X-1 might go even higher, possibly to 400 trillion watts."
>
> By continuing to scale up Sandia's accelerator capabilities, he says researchers in the "laboratory" can continue to close in on approximating the extreme conditions found inside a weapon as it detonates. Future accelerators also will help validate three-dimensional computational models that simulate nuclear detonations. *Construction of the X-1 ARS, to be located in Area 4, would begin in 2000 and be completed by 2003.* The pulsed power team hopes to reach the accelerators maximum output levels by about 2005. Then, if results on the X-1 warrant scaling up further, construction of a new super accelerator currently known as Jupiter would produce as much as 32 megajoules of energy by around 2015. Because of the amount of X-ray energy it would produce, 16 times that of the building-booming PBFA II, Jupiter would likely be located at the Nevada Test Site ....to explore the possibility of "high gain" with Inertial Confinement Fusion (ICF) at the level of 100 to 1000 megajoules of fusion energy, the output level needed to make fusion energy sources practical in a power plant....
>
> He [Sandia scientist Juan Ramirez] adds that *one of Sandia's goals in planning the X-1 is to keep the costs of the facility manageable* (less than $100 million to build) "so that the decision to construct it remains a technical and programmatic decision rather than a political one," he says. No formal decision has been made to build the X-1, he says. *Sandia has begun setting technical specifications and performing feasibility studies and cost determinations.* "Turn-of-the-

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century X-1 Advanced Radiation Source to succeed PBFA II." *Sandia Lab News*, March 29, 1996, at 4.

Another recent article emphasized the important connections between Sandia's pulsed power accelerators and the broader objectives of the SS&M program:

> Data generated inside Labs accelerators are being used to test three-dimensional computer codes being developed within the nuclear weapons complex that simulate what happens inside a nuclear weapon when it detonates, such as the radiation flow and radiation coupling between the primary and secondary portions of a nuclear weapon, explains Don [Cook]. Such simulations are becoming increasingly important as the US seeks a worldwide ban on nuclear testing. "Nuclear weapons are huge sources of X-rays," he says. *"Part of Sandia's science-based stockpile stewardship mission requires us to scale up both our laboratory x-ray sources and our computational capabilities so that we can do the job we used to do in Nevada, but must now learn to do without ever actually detonating a weapon.* That will require simulations on very good computer codes, tested against data produced in part inside Sandia accelerators....*The increased radiation outputs will also help Labs weapons researchers study radiation hardness issues and ensure that electronics and other components in nuclear weapon arming, fusing, and firing systems will continue to work as expected in hostile environments*..."Labs' pulsed power team achieves record breaking x-ray outputs on its Saturn accelerator." Id. at 1, 5.

In sum, the X-1 ARS is being developed to support stockpile stewardship objectives on a schedule that parallels that of the NIF (i.e. startup by 2003), and yet neither the X-1 nor Sandia's already extensive current accelerator pulse power program are included in the programmatic analysis and discussion of proposed SS&M actions and reasonable alternatives.

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C. As a Result of Its Fragmented and Segmented Approach, The Discussion of the Entire Stockpile Stewardship Program Has Been Unreasonably Narrowed Down to a Discussion of Three Specific Projects.

1. The three specific projects that comprise the Department's preferred alternative in the draft PEIS represent only a small fraction of the total facilities, activities, and environmental impacts involved in the SS&M program. As shown in the

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preceding pages of these comments, DOE has achieved such an anomalous result in the draft PEIS by violating some of CEQ's best known regulations governing the preparation of such statements. Another, and simpler, way of demonstrating the overwhelming inadequacy of what has been produced is simply to list the publicly acknowledged major components of the SS&M program that are not adequately discussed, or in many cases, even mentioned, in the current draft PEIS:

--Dual-Axis Radiographic Hydrotest Facility (DARHT). According to a recent Memorandum Opinion and Order in the United States District Court for the District of New Mexico, the parties to the DARHT NEPA suit (which delayed DARHT construction for over a year pending completion of an adequate EIS) "agree that DARHT will have significant environmental effects and will be covered by the SS&M PEIS and the [site-wide] EIS." Civil Action No. 94-1306-M at 9 (D.N.M. 1996). However, this "coverage" in the draft PEIS consists of the following: "for the purposes of this PEIS, DOE includes DARHT as an existing facility at LANL because DOE has reached an independent decision to construct and operate the facility." Despite DARHT's construction being only 30% complete at the time the draft PEIS was issued, and despite the fact that a Federal Court found that DOE had acted illegally in beginning construction of DARHT without first preparing an EIS, the draft PEIS mistakenly treats DARHT as a facility that had legally broken ground prior to September 1995, and therefore includes it as part of the "No Action" alternative without further consideration of programmatic impacts and reasonable alternatives. DARHT's status as an independently justified interim action supported by its own site specific EIS does not relieve DOE of the obligation to include DARHT in a broad programmatic assessment of the SS&M program.

--Processing and Environmental Technology Laboratory (PETL) This $49 million dollar facility, scheduled to begin construction in the first quarter of FY 1997, and to be completed by the first quarter of FY 2001, will be used "for the development of advanced stockpile surveillance technologies, the assessment of age-related defects identified during routine surveillance, and the development of cost-effective manufacturing technologies for retrofit and replacement [nuclear weapon] components." The Stockpile Stewardship and Management Program, DOE Office of Defense Programs, May 1995, at 15. *"The PETL will replace a number of existing facilities distributed throughout Sandia, some of which would require modification to meet current safety standards in order to used for planned stockpile stewardship activities* (emphasis added)." Id. at 15. Despite its obvious programmatic and site-specific environmental impacts, the PETL is not discussed in the SS&M PEIS.

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–<u>The Chemistry and Metallurgy Research (CMR) Building Upgrades Project</u> - Despite being the largest structure at the Los Alamos National Laboratory (LANL), this $204 million, 10 year project to upgrade the main building used for analytical work with toxic plutonium, uranium, and their alloys, is not mentioned in the PEIS and also lacks its own independent EIS. The project began during the third quarter of FY 1993 and is scheduled for completion at the end of 2002. Given the critical importance of this project to the ability of LANL to safely perform its SS&M program missions, its exclusion from the PEIS is untenable and a violation of NEPA.

–<u>The Accelerated Strategic Computing Initiative</u> - Considered by many experts to be the technical core of the science-based stockpile stewardship program, this large (approximately $120 million annually) 15-year program (FY1996-2010) is not even mentioned, much less meaningfully discussed in the PEIS, but it is intended to "create 3-D, full systems virtual testing and [nuclear weapon and weapon component] prototyping ability based on advanced weapon codes and high performance computing." DOE FY 1997 Budget Request at 68. "*With the President's decision to pursue a Zero-Yield Comprehensive Test Ban Treaty, computational simulation of nuclear events has become the critical core element of weapon predictive capability and Science-Based Stockpile Stewardship.*" Id. at 81. The global security and nonproliferation impacts on the human environment of any nation, agency, or subnational group achieving the capability confidently to conduct full system tests of nuclear weapon prototypes in "virtual reality" are both varied and profound, and yet remain unanalyzed in the draft PEIS.

– <u>The Los Alamos Neutron Science Center (LANSCE)</u> - In FY 1996, a major change in the purpose and need for this facility occurred when DOE Defense Programs assumed management of LANSCE from Energy Research. According to DOE, "the LANSCE facility provides *a new source of critical data in the detection of small-scale material defects which might serve as indicators of weapon component aging (deterioration/damage) and in the prediction of material performance* (emphasis added)." DOE offers no basis for excluding the continued operation and proposed upgrading of this facility from the PEIS discussion of SS&M alternatives. The LANSCE upgrade is expected to cost $172 million through FY 2000. LANL Institutional Plan, 1996-2001, p. 20.

– <u>The Weapons Experimental Tritium Facility</u> (WETF) - Located at LANL, this facility received Sandia's Tritium Research Lab inventory in FY 1995, and is scheduled in FY 1997 to "perform experiments...to meet Stockpile Stewardship programmatic needs." Despite its obvious environmental impacts and

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programmatic role, DOE offers no justification for excluding continued operation of this facility from consideration in the PEIS.

– <u>The Los Alamos Critical Experiments Facility</u> - these experiments are highly proliferation sensitive, and potentially dangerous, even lethal, to accidentally exposed personnel. Consideration in the PEIS of the continued operation of this facility in support of the SS&M program is highly appropriate, indeed, mandatory, given its obvious environmental and programmatic impacts.

– <u>The Low-Yield Nuclear Explosives Research</u> (LYNER) Facility - completed only in FY 1995, LYNER is a tunnel complex at the Nevada Test Site that is scheduled to be the site of a continuing program of "subcritical" nuclear experiments beginning in FY 1996. Neither the LYNER facility nor the program of subcritical experiments slated to be conducted there under the aegis of the SS&M program are considered in the draft PEIS. As shown below, the conduct of these tests underground at the LYNER facility, and the programmatic purpose and need for subcritical experiments of any kind, wherever conducted, are both controversial issues that must receive full and fair analysis in the PEIS, including consideration of reasonable alternatives to the proposed action.

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II. THE DRAFT PEIS FAILS TO CONSIDER THE PROGRAMMATIC DECISION ON WHETHER TO PROCEED WITH PROPOSED SUBCRITICAL HYDRONUCLEAR EXPERIMENTS AS PART OF THE STOCKPILE STEWARDSHIP AND MANAGEMENT PROGRAM, AND IF SO, WHERE TO CONDUCT SUCH EXPERIMENTS

A. The Proposed Subcritical Tests are Clearly Part of DOE's Stockpile Stewardship and Management Program

1. DOE's planned subcritical tests clearly fall within the scope of DOE's proposed stockpile stewardship and management program. DOE considers these proposed tests one means of achieving its stockpile stewardship goals. They are part of the agency's group of concerted actions to achieve US national security policies. DOE plans to allocate scarce agency resources to these tests rather than to alternative actions. These tests are clearly connected to the Stockpile Stewardship and Management Program, since they are interdependent parts of the overall program and depend upon that program for their justification.

2. There seems to be no dispute that the proposed subcritical tests are part of DOE's Stockpile Stewardship and Management Program. To the contrary, the agency has

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expressly characterized these tests as "an important element of Science Based Stockpile Stewardship." Memorandum for the Secretary from Victor H. Reis, Asst. Secretary for Defense Programs 1 (Oct. 17, 1995). The Draft PEIS also notes: "Other aspects of stockpile stewardship activities at NTS include ...subcritical dynamic experiments". Draft PEIS at A-43. Yet except for this passing reference, there is no reference at all in the entire draft PEIS to these proposed tests.

B. There Is No Justification for Failing to Analyze the Proposed Subcritical Tests in the Draft PEIS

1. These proposed tests cannot be considered part of DOE's self-styled "next generation" of facilities that are not discussed in the Draft PEIS because, according to the agency, "they have not reached the stage of development and definition that is necessary for evaluation and decision making." Draft PEIS at S-5. We have challenged above the application of this standard to a number of proposed facilities that are the subjects of DOE-sponsored research and development activities leading to deployment within roughly the same time period as the National Ignition Facility, the principle component of DOE preferred PEIS alternative. Similarly, with respect to subcritical tests, DOE has already approved such tests in principle and carried out preparatory activities, including mining of the test site. In fact, DOE had originally scheduled these tests to begin next month.

2. Nor is DOE is justified in characterizing the proposed tests as continuing activities that need not be discussed in the PEIS. As explained in NRDC's comments on the draft EIS for the Nevada Test Site (which are incorporated herein by reference), ongoing non-nuclear hydrodynamic testing and dynamic experiments are a completely different type of activity than the subcritical nuclear tests now proposed. Similarly, previous underground nuclear weapons testing was qualitatively and quantitatively different from the proposed subcritical testing, was carried out in support of vastly different national security policies, and was halted by a moratorium in 1992. DOE did not even begin mining activities for the LYNER test site until March 1993, well after the passage of the Hatfield-Exon-Mitchell Amendment instituting a nine-month moratorium on U.S. underground nuclear tests, which President Clinton subsequently extended indefinitely. Moreover, DOE did not announce the approval in principal of such tests until October 1995, after DOE was in receipt of the President's announced zero-yield test ban policy and had largely formulated the main elements of its SS&M program in response to specific Congressional and Presidential Directives received

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prior to that date. For these reasons, the subcritical tests must be viewed as integral part of DOE's proposed SS&M program, rather than a "business as usual" continuation of previous testing activities.

3. Courts have considered restart of a DOE production reactor to be a proposal for major Federal action significant enough to trigger preparation of an EIS. NRDC v. Vaughan, 566 F. Supp. 1472 (D.D.C. 1983). In Vaughan, the court required DOE to prepare a comprehensive EIS addressing all potential environmental impacts from restart of the L-Reactor, not just, as DOE argued, the incremental impacts of restart as compared to previous operation. Id. at 1475-76. The resumption of underground nuclear tests, while in theory not nuclear test "explosions," should nevertheless be considered a proposal for major Federal action requiring a comprehensive analysis in the PEIS(especially in a case such as this where the circumstances have changed so dramatically), because they pose a risk of violating the President's "zero yield" policy, they are highly controversial, and their compliance with the impending Comprehensive Test Ban Treaty may not be susceptible to confident determination by other treaty parties, weakening support for the treaty and potentially obstructing its ratification by certain countries.

4. Even if the testing were appropriately characterized as an ongoing activity, as explained above, courts have required agencies to prepare EISs where an ongoing project or program undergoes changes which themselves amount to major Federal actions. Public Service Co. of Colorado v. Andrus, 825 F. Supp. 1483, 1500 (D. Idaho 1993); see also 40 C.F.R. § 1508.18(a) (major Federal action can include new and continuing activity)). In Public Service Co., the court characterized DOE as "seeking to evade NEPA review" at the INEL facility by "characterizing all its activities as 'ongoing,' by fractionalizing and segmenting its proposals, and by its strenuous opposition to the NEPA positions advanced by the State of Idaho." Id. at 1501-02.

In the present case, DOE must admit that the proposed subcritical tests represent a major change in the status quo from previous testing, since prompt critical or supercritical tests involving fissile materials and high explosives are still prohibited by the moratorium.

5. The proposed subcritical tests pose potentially significant effects that require discussion in the PEIS. The CEQ NEPA regulations define the term "significantly" to include, among other things, consideration of the following:

a. The degree to which a proposed action affects public health or safety;

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b. The degree to which the effects on the quality of the human environment are likely to be highly controversial;

c. The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks;

d. The degree to which the action may establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration;

e. Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.

40 C.F.R. § 1508.27(b). In addition to potential environmental impacts from the proposed subcritical tests, any discussion of which seems to be completely absent from the PEIS (EIS), the proposed tests would be highly controversial and involve unique and unknown risks from a nonproliferation standpoint. Because of the ongoing CTB treaty negotiations, they could also establish a precedent for future testing activity by other nations with significant and potentially unwelcome effects. The first round of tests could also represent a decision in principle about the long-term prospects for such tests. The subcritical tests, therefore, represent a proposal for major Federal action with significant environmental effects that should be discussed in the PEIS.

6. Unlike the decision on tritium supply (see Draft PEIS at 1-9), DOE has not determined that a decision on whether to conduct subcritical nuclear tests is an interim action that may proceed in advance of the Stockpile Stewardship and Management PEIS. The CEQ Regulations state that:

While work on a required program environmental impact statement is in progress and the action is not covered by an existing program statement, agencies shall not undertake in the interim any major Federal action covered by the program which may significantly affect the quality of the human environment unless such action (1) is justified independently of the program; (2) is itself accompanied by an adequate environmental impact statement; and (3) will not prejudice the ultimate decision on the program. Interim action prejudices the ultimate decision on a program when it tends to determine subsequent development or limit alternatives.

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40 C.F.R. § 1506.1(c). DOE has made no representations that the subcritical tests comply with these requirements. As explained above, these tests, which by themselves constitute major Federal action with significant environmental effects, are an integral part of the stockpile stewardship program, for which a PEIS is required, and have no independent justification. The planned tests are not covered by any existing programmatic or site-specific EIS statement and NRDC has raised serious questions about the adequacy of the draft NTS EIS.[3] In addition, any decision on the tests in advance of a final PEIS will tend to determine subsequent development and limit other alternatives, thus prejudicing the ultimate decision on the program.

C. **The PEIS Should Analyze the Programmatic Decision on Whether to Proceed with the Subcritical Tests and If So, Where to Conduct Such Tests**

1. "Agencies shall prepare statements on broad actions so that they are relevant to policy and are timed to coincide with meaningful points in agency planning and decisionmaking." 40 C.F.R. § 1502.4(b).

2. "For projects directly undertaken by Federal agencies the environmental impact statement shall be prepared at the feasibility analysis (go-no go) stage and may be supplemented at a later stage if necessary." 40 C.F.R. § 1502.5.

3. "Agencies are encouraged to tier their environmental impact statements to eliminate repetitive discussion of the same issues and to focus on the actual issues ripe for discussion at each level of environmental review." 40 C.F.R. § 1502.20.

In the PEIS, DOE admits that the PEIS strategy is to "identify the effects of U.S. national security policy changes on Stockpile Stewardship and Management program missions and determine the configuration (facility locations) necessary to accomplish the Program missions. Draft PEIS at S-5. It further specifies that, for the few projects it has chosen to analyze in the PEIS, the programmatic statement will support the programmatic decision on whether to proceed with the facility and if so, where to site the facility. Id. The "go-no go" decision on whether and where to proceed with a stockpile stewardship project is certainly an "actual issue ripe for discussion" at this programmatic stage. The same decisions should be analyzed at this stage for the proposed subcritical tests -- whether to proceed with the tests or to choose some other alternative, including the no-action alternative, and if so, where to site those facilities. The PEIS should give serious consideration to the alternative of conducting such tests at the weapons

[3] NRDC hereby incorporates by reference its May 3, 1996 comments on the Draft EIS on the NTS.

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laboratories instead of the NTS. Only by considering such programmatic decisions at this stage can the PEIS be timed to provide meaningful input into agency planning and decisionmaking, as required by NEPA.

4. The possibility exists that the site-specific EIS on the NTS facility does discuss the proposed subcritical tests at the LYNER facility in a classified appendix. The one-sentence description of this classified appendix provides virtually no information as to its purpose and scope. As we discussed in our comments on the NTS Draft EIS, there is a wealth of publicly available information on the proposed tests that should be made available in the unclassified portion of the EIS. Even if such information were made available, however, the discussion of alternatives to the proposed tests, and a decision on whether and where to proceed, should first be made at the programmatic level in the PEIS and associated ROD. If in fact, the agency then decides to proceed with the tests at another location, a project-specific EIS should then be prepared in connection with that location.

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III. THE PROJECT SPECIFIC ANALYSIS OF THE NIF IS CONSISTENT WITH THE MAIN BODY OF THE PEIS – BOTH MAKE A MOCKERY OF THE NEPA PROCESS. THE DISCUSSION OF NIF IS SO WOEFULLY INADEQUATE BOTH IN SCOPE AND CONTENT THAT IN ORDER TO COMPLY WITH THE LEGAL OBLIGATIONS OF NEPA, DOE HAS NO ALTERNATIVE BUT TO REVISE AND RECIRCULATE THE DRAFT PEIS, RATHER THAN GOING DIRECTLY TO A FINAL PEIS.

Deficiencies in the NIF Project Specific Analysis (hereafter referred to as "DRAFT PEIS") are as follows:

A. The discussion of alternatives is inadequate.

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Other than location the only alternatives examined in the Draft are the Conceptual Design, the Enhanced Design, and the No Action Alternative. The Conceptual Design and the Enhanced Design differ only in the flexibility of NIF, that is whether it will be designed to accommodate direct drive targets as well as indirect drive ("hohlraum") targets. Aside from site selection DOE in effect has limited discussion to two alternatives: build NIF or nothing. The Enhanced Design option, now the preferred option, has been included recently in recognition that the indirect drive alternative is in deep trouble because achieving ignition using hohlraum targets at NIF can no longer be assured. Even the Enhanced Design does not include a reasonable design alternative proposed by a JASON review panel, namely the construction of separate target chambers for classified and unclassified research.

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The DRAFT PEIS contains no discussion of alternative means of obtaining each of the categories of data that the NIF is intended to provide for stockpile stewardship. For example, in *Energy Daily*, May 6, 1996, pp. 1-2, there is reference to a Sandia Laboratories breakthrough in target technology for generating intense X-rays with a pulsed power accelerator. The article states,

> ...Tight congressional budgets could mean NIF will not get the $191 million the Department of energy wants for construction of the facility in FY 1997. Should Congress fail to provide the $130 million increase in the NIF budget, support for building the machine could crumble in the nuclear weapons research community and in Congress, ...
> But Sandia's advances in pulse-power accelerator target performance now hold the promise of developing an alternative way to tackle at least some of the weapons physics issues that NIF would address, according to Sandia officials.

In addition, the DRAFT PEIS should include a thorough discussion of the following alternatives:

1. Defer NIF and place a greater emphasis upon meeting the short-term objective of transferring the manufacturing facilities and skills from nuclear weapon production complex plants that have been or are being shut down to the weapon laboratories, and establishing surveillance and maintenance procedures for the enduring stockpile weapons. In NRDC's view the enduring stockpile can be maintained through surveillance, maintenance, and refabrication of warheads to design specifications that are within well established parameters for predictable nuclear performance, without any reliance on NIF. The notion advanced by the PEIS that weapon remanufacture is a viable option only if permits manufacture of exact replicas is nonsense. Obviously, a number of subsystems in a warhead can be replaced with new subsystems without significantly affecting nuclear performance. The test record shows that U.S. nuclear weapon designs have not displayed any great sensitivity to small changes in materials and manufacturing tolerances that typically exist between R&D and production versions of a weapon, indicating that not all warhead production parameters are sensitive, and that DOE's caricature of precise replica remanufacture is not required to maintain a reliable nuclear weapon stockpile in the future, with or without NIF, which is basically irrelevant to the practical dimensions of the stockpile stewardship problem.

   The DRAFT PEIS contains no discussion of the balance in funding between program elements designed to meet the short-term objectives and program elements designed to improve understanding of the science of nuclear weapon performance.

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2. Build an ICF machine that has a higher likelihood of achieving the goal of generating economically competitive fusion energy. Everyone agrees that NIF cannot serve as the basis for commercial ICF reactor because of its high cost, low driver efficiency, and the fact that the needed repetition rate of target implosions cannot be obtained with the Nd:glass lasers employed in NIF due to the time needed to cool the lasers between shots. The NIF shot rate is expected to be average only one or two shots a day when it is up and running. A commercial machine will require a shot rate of a five per second, or on the order of 200,000 times greater.

The four ICF driver concepts that have received significant attention in the U.S. are solid-state lasers, of which the Nd:glass lasers used in NIF are but one type, KrF lasers, light-ion accelerators and heavy ion accelerators. There are some in the technical community that believe that the KrF and the heavy ion programs are the two most promising ICF drivers for a reactor because they have a potential for a high repetition rate, a relatively high efficiency, and lower cost. Both drivers are under development by DOE, but at low budget levels. The DRAFT PEIS should discuss: i) enhancing the KrF program; ii) enhancing the heavy ion beam program; and iii) enhancing the light ion beam program as alternatives to NIF. The scientific uncertainties associated with each of these concepts should be thoroughly discussed. When comparing an enhanced KrF program alternative to the NIF basic and enhanced alternatives, DOE should discuss the implications of the fact that the needed laser beam uniformity requirements for direct drive implosions have already been met for the KrF laser and are not even close for NIF's glass laser. Similarly, when weighing an enhanced heavy ion beam alternative against the NIF alternatives, DOE should provide a detailed technical analysis of the current status of heavy ion target design, and how DOE proposes to develop the heavy ion target with NIF. In each case DOE should provide detailed time and cost schedules for the program alternatives.

3. Select an alternative driver that has a higher probability of achieving ignition, even if it meant stretching out the ICF program schedule.

4. Modify the NIF design to increase the driver energy to a higher level to give greater confidence that ignition can be achieved.

5. Delay construction of NIF until there is high confidence that the primary goal of NIF, achieving ignition, can be achieved using NIF. The DRAFT PEIS fails to discuss the controversy over whether ignition can be achieved (see discussion below). In light of the fact that DOE cannot demonstrate at this time with high confidence that ignition can be achieved with NIF, the DRAFT PEIS should

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consider as an alternative, delaying the construction of NIF until additional experiments can be performed on the NOVA and OMEGA ICF machines, and until the results of this additional research has been understood, peer reviewed and published.

The CEQ Regulations refer to the discussion of alternatives as "the heart of the environmental impact statement." 40 C.F.R. 1502.14 § 1502.14. Agencies must "rigorously explore and objectively evaluate all reasonable alternatives," (§ 1502.14(a)) including reasonable alternatives not within the jurisdiction of the lead agency. § 1502.14(c). They must devote substantial treatment to each alternative considered in detail so that reviewers may evaluate their comparative merits. § 1502.14(b). They should present the environmental impacts of the proposal and alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among options by the decisionmaker and the public. § 1502.14.

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When a very large number of alternatives are potentially available, the agency need only consider a reasonable number of alternatives, but they must cover the full spectrum of alternatives. CEQ, "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations," Question 1, 46 Fed. Reg. 18026, 18027 (1981) (emphasis added). The existence of a viable but unexamined alternative renders the EIS inadequate. Idaho Conservation League v. Mumma, 956 F.2d 1508 (9th Cir. 1992).

Each of the proposed alternatives described above is reasonable and feasible and represents an alternative means for achieving the objectives of DOE's NIF proposal. They must be included in the PEIS in order for it to include the full spectrum of possible alternatives. As a result, DOE must prepare and circulate a revised DRAFT EIS that rigorously analyzes these alternatives in detail. To proceed directly to a Final EIS would deprive government reviewers and members of the public the opportunity to comment meaningfully on the analysis of these reasonable alternatives and would be in violation of the requirements of NEPA.

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B. The DRAFT PEIS fails to acknowledge that DOE cannot demonstrate with high confidence that ignition, the primary goal of NIF, can be achieved with NIF as it is currently designed.

Whether NIF as currently envisioned can achieve ignition is controversial, and there is a wide range of expert opinion on the subject. The final report of the DOE's Inertial Confinement Fusion Advisory Committee (ICFAC) – dated February 21, 1996 – DOE has since abolished the committee, states that "the probability of ignition has increased above 50%, and some believe that it is well above this level." When asked whether he was among

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those who now believe the probability is greater than 50 percent, one of the ICFAC members has stated privately to NRDC staff that on the basis of recent experimental results his estimate has moved from below 50 percent to "about 50 percent." We might add that some ICF experts apparently believe the probability of NIF achieving ignition is well below this level.

For example, Dr. Stephen P. Bodner gives a series of arguments why NIF is unlikely to achieve ignition. While there has been some progress on beam smoothing most of the issues raised by Dr. Bodner have not been resolved. "Time-Dependent Asymmetries in Laser Fusion Hohlraums," *Comments on Plasma Physics and Controlled Fusion*, 16, at 351-374. Moreover, there is no peer reviewed technical report that sets forth the theoretical and experimental basis that supports a conclusion that there is high confidence that NIF will achieve its primary goal.

In its final report before being abolished, the ICFAC committee was unable to conclude that the NIF should be constructed, and instead limited its recommendation to completing the NIF design phase, stating, "The committee recommends that as far as ignition is concerned there is sufficient confidence that the program is ready to proceed to the next step in the NIF project, that is to go to the final design phase in FY 1997."

ICFAC gives NIF only about a 50-50 chance of achieving ignition, and it endorsed only proceeding to the design phase. DOE then abolished ICFAC and no new review body has been announced either by DOE or the National Academy of Sciences. DOE calls for a backup direct drive option. This is no ringing endorsement for the construction of NIF. Rather it is a clarion call to go slow and not to commit to construction until there is high confidence that ignition can be achieved. The DOE claims that it is important to complete the construction of NIF by the year 2002 and ignition by 2005, because by then the stockpiled warheads will have "aged beyond their design lifetime." DRAFT PEIS, at I-8. To suggest that the needs of the weapons program places a time constraint on the completion of NIF is nonsense, when some in the ICF program are questioning whether NIF should be built at all. There are a number of bona-fide nuclear weapon experts who doubt that NIF will make any significant contribution to the resolution of real world nuclear stockpile problems.

The CEQ NEPA regulations state that "NEPA procedures must ensure that environmental information is available to public officials and citizens before decisions are made and before actions are taken. The information must be of high quality. Accurate scientific analysis... [is] essential to implementing NEPA. 40 C.F.R. § 1500.1. Specifically, the regulations require agencies to "insure the professional integrity, including scientific integrity, of the discussions and analyses in environmental impact statements." 40 C.F.R. § 1502.24.

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As CEQ stated, "Ultimately, of course, it is not better documents but better decisions that count. NEPA's purpose is not to generate paperwork -- even excellent paperwork -- but to foster excellent action. 40 C.F.R. § 1500.1(c). To ensure that DOE makes a fully informed decision on NIF, particularly a decision based on whether NIF can achieve its primary objective of ignition, the unresolved technical issues that are still a matter of considerable controversy need to be set out and addressed, via a thorough technical exposition in a revised DRAFT PEIS.

C. The discussion of the non-proliferation risks associated with proceeding with NIF is inadequate.

In NRDC's view the non-proliferation risks associated with proceeding with NIF are by themselves, justification for selection of the No Action Alternative. This has been made abundantly clear to DOE in past interactions we have had with DOE and LLNL staff. It has also been a major issue raised by the Congress. The DRAFT PEIS makes passing reference to the recent study--*The National Ignition Facility and the Issue of Non-Proliferation*--prepared by the DOE Office of Arms Control and Non-Proliferation and has quoted its two conclusions that (1) the technical proliferation concerns at NIF are manageable and therefore can be made acceptable, and (2) NIF can contribute positively to U.S. arms control and nonproliferation goals. [DRAFT PEIS, pp. I-5,6] These self-serving conclusions by DOE are unsupported by the detailed analysis in the body of the DOE report.

10/21.17

With regard to the first conclusion, we would like to know why DOE believes that "transparency measures and access screening procedures" can serve to "manage" the proliferation risks associated with other weapon states and non-weapon states in cases where these states point to the DOE program as justification for beefing up their own ICF programs. And if a non-weapon state shares DOE's objectives of obtaining weapons physic data and maintaining a cadre of scientists experts with the skills needed to design and understand the performance of nuclear weapons, how will DOE "manage" this latent proliferation risk through "transparency and screening," if the non-weapon state objective is long-term and undeclared?

It is noteworthy that the European Science and Technology Assembly (ESTA) Working Party, in its report, "Inertial Confinement Options to Control Nuclear Fusion," March 27, 1996, has recommended that the European Union beef up its ICF research, taking advantage of DOE's rapidly evolving process of declassification of weapon related ICF research. The ESTA recommended, "Advantage should be taken where possible of active collaboration with the extensive declassified US programmes;" and "Special action should be taken to ensure *crucial access* for European researchers to a small-scale programme on the French and US laser-driven ignition facilities." (Emphasis supplied)

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The second conclusion of DOE's Office of Arms Control and Nonproliferation, that "NIF contributes positively to U.S. arms control and nonproliferation policy," simply reflects DOE's belief that the Administration's support of NIF was part of the price that it had to pay to entice DOD and the weapon labs to go along with CTBT. This is nothing more than evidence of the political weakness of DOE and the White House in gaining political support for a CTBT, for there is not a scintilla of evidence that anything positive will flow directly from the NIF program in terms of achieving U.S. arms control and nonproliferation policy objectives.

D. "Where is the beef?"

The discussion in the DRAFT PEIS of the need for NIF and alternatives to it is contained in a patently inadequate section that is devoid of any technical analysis addressing whether NIF can achieve its primary objective of ignition, and devoid of any detailed cost and schedule data. The discussion of the benefits and risks of proceeding with NIF is filled with unsubstantiated DOE and LLNL dogma and ex cathedra pronouncements and void of facts.

11/21.12

Take, for example, the issue of mixing of the plutonium and DT in the primary. How important is improving one's understanding of the mixing in primaries to stockpile stewardship? What scenarios related to warhead degradation will require an improved understanding of mixing? With respect to each scenario, will the lack of understanding translate into concern over whether any of the warheads that are to remain in the stockpile will work at all, or will the uncertainty only be reflected in a small change in the range in the predicted yield? Which of these scenarios can be addressed with NIF? Can the issue of significant yield uncertainties due to mixing be more directly addressed through more frequent tritium reservoir replenishment? Precisely how will NIF be used to resolve this subset of issues?

What will the experimental protocol look like? What alternative means does DOE have, or could DOE develop, for improving ones understanding of mixing in general, and the subset of issues in particular? Can these issues be resolved if NIF cannot achieve ignition? How can a useful set of mixing experiments be constructed if ignition is barely achieved, or rarely achieved, or if the gain is very low so that a any mixing leads to ignition failure? How important would the issue of improved understanding of mixing be to the development of new nuclear weapon types in the absence of testing, if U.S. policy toward development of new warhead types were modified to permit such development?

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There is a similar set of questions with respect to each of the other technical issues the NIF purports to address. These also should be developed and answered in the DRAFT PEIS.

E. There is no programmatic discussion of the ICF program or the possible follow-on facilities to NIF.

NIF is just one more step in DOE's ICF program. Both for weapon research and civil energy applications, higher yield ICF facilities are desired by the ICF community. The DRAFT PEIS contains no discussion of the follow-on facilities to NIF or the other ICF programs now in operation. In this regard, the DRAFT PEIS utterly fails to lay out the full ICF program applicable to stockpile stewardship, including the elements at the University of Rochester, the Naval Research Laboratory, Sandia National Laboratories, Los Alamos National Laboratory and General Atomics, much less reasonable alternatives to it. The DRAFT PEIS will have to be revised and reissued if it is to serve as a *programmatic* EIS covering stockpile stewardship issues.

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IV. DOE SHOULD NOT PROCEED WITH THE STOCKPILE STEWARDSHIP PROGRAM UNTIL IT HAS PREPARED AND CIRCULATED A NEW DRAFT PEIS, CONSIDERED AND RESPONDED TO ALL COMMENTS, AND ISSUED A FINAL PEIS AND RECORD OF DECISION

A. The CEQ Regulations

1. "Agencies shall not commit resources prejudicing selection of alternatives before making a final decision." 40 C.F.R. § 1502.2

2. "Environmental impact statements shall serve as the means of assessing the environmental impact of proposed agency actions, rather than justifying decisions already made." 40 C.F.R. § 1502.2(g).

3. "If a draft statement is so inadequate as to preclude meaningful analysis, the agency shall prepare and circulate a revised draft of the appropriate portion." 40 C.F.R. § 1502.9(a).

B. Summary of Draft PEIS Deficiencies

1. The Draft PEIS for DOE's SS&M Program suffers from the following major deficiencies:

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a. It relies on an arbitrary and capricious criterion ("ground-breaking before September 1995")to exclude important ongoing SS&M projects from consideration as part of the Proposed Action;

b. It arbitrarily omits discussion of a wide range of continuing and highly interconnected SS&M activities, amounting to the bulk of the SS&M program, from consideration as part of the Proposed Action, despite the fact that significant changes are occurring in these SS&M program activities, and in the program as a whole, in direct response to radically changed circumstances in the global and national security environment.

2/41.17 continued

c. It arbitrarily excludes programmatic consideration of certain facilities on the strength of an unsupported contention that such facilities belong to an undefined "next generation" of stewardship facilities that cannot be characterized sufficiently for programmatic environmental impact analysis;

4/41.18 continued

d. The combination of a, b, and c above effectively reduces the Stockpile Stewardship portion of the PEIS process to one designed merely to ratify three site-specific project decisions already made, without any consideration of the broad impacts arising from the extensive, highly integrated DOE SS&M program (of which the proposed action is but one component) and without exploration of reasonable programmatic alternatives to the proposed action. Indeed, the scope of the programmatic review has been so narrowed as to thoroughly disqualify the present draft as the basis for an adequate final PEIS.

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e. Even when the PEIS did consider a specific project in detail -- the NIF -- it did so in a woefully inadequate manner.

V. CONCLUSION

As we noted above, in all our years of reviewing EISs and litigating NEPA claims we cannot recall a stronger case for comprehensive programmatic review of an ongoing Federal activity based on radically changed circumstances. We were, frankly, shocked and dismayed by the extent of the evasions and inconsistencies in the present draft PEIS. Beyond its

numerous technical inadequacies, it appears to have been assembled with a raw contempt for the spirit of NEPA and the philosophy of meaningful public involvement and agency decisionmaking which imbues this landmark statute of environmental protection.

7/40.87 continued

It is our considered view that the current draft PEIS cannot serve as the basis for an adequate final PEIS and subsequent record of decision. It must be withdrawn and a new draft prepared and circulated that fully complies with both the letter and the spirit of NEPA's requirements for programmatic analysis of major Federal actions affecting the quality of the human environment. The new draft must reflect a good faith effort to include in the analysis all ongoing SS&M activities as well as projects in research and development that are included in long-range program plans but not yet formally approved for site-specific construction activity. The definition of proposed action must faithfully reflect the broad range and highly integrated character of SS&M program activities, and the draft PEIS must seriously consider all reasonable alternatives to the proposed action for accomplishing the program's essential missions.

Sincerely,

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COMMENT OF THE WESTERN STATES LEGAL FOUNDATION ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR STOCKPILE STEWARDSHIP AND MANAGEMENT

Submitted May 7, 1996

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INTRODUCTION

Western States Legal Foundation (WSLF) is a non-profit, public interest, environmental and peace organization which, since 1982, has participated in administrative proceedings, litigation, and grassroots activities to further the end of the nuclear arms race and related technologies and promote nuclear disarmament and the cleanup of federal facilities engaged in nuclear weapons research, testing, and production. WSLF is a member of the nation-wide Military Production Network (MPN) and a founding member of Abolition 2000, a Global Network to Eliminate Nuclear Weapons (originally known as the NGO Abolition Caucus).

In 1994 and 1995 WSLF participated as an observer in its capacity as a registered Non-Governmental Organization (NGO) in four sessions of international negotiations in Geneva and New York on the Comprehensive Test Ban Treaty (CTBT) and the Nuclear Non-Proliferation Treaty (NPT). Last spring WSLF executive director, Jacqueline Cabasso and WSLF attorney John Burroughs spent a month at the United Nations in New York monitoring the NPT Review and Extension Conference. In November 1995 they observed the hearings before the International Court of Justice in the Hague on the (il)legality of the threat or use of nuclear weapons.

WSLF has participated in numerous administrative proceedings under both the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA) concerning proposed defense programs, energy related activities, and environmental restoration and waste management projects at the Lawrence Livermore National Laboratory (LLNL) and the Los Alamos National Laboratory (LANL). For purposes of this comment, the most relevant proceedings include:

The 1986 LLNL Environmental Impact Report (EIR) prepared by the University of California pursuant to CEQA. WSLF filed suit to set aside the EIR and successfully obtained a settlement which compelled preparation of the 1992 LLNL site-wide EIS;

The 1991 Programmatic EIS on Reconfiguration of the Nuclear Weapons Complex (scoping);

The 1991 Programmatic EIS on the Environmental Restoration and Waste Management Program (scoping);

The 1992 LLNL site-wide EIS;

The 1993 rescoping of the PEIS on Reconfiguration of the Nuclear Weapons Complex;

The 1995 EIS on the Dual Axis Radiographic Hydrodynamic Test (DARHT) Facility;

The 1995 study on the National Ignition Facility and the issue of Nonproliferation;

The 1995 Programmatic Environmental Impact Statement of Stockpile Stewardship and Management (scoping);

The 1996 Draft Waste Management Programmatic EIS (WM DPEIS)

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In our estimation, the Department of Energy's (DOE's) Draft Programmatic Environmental Impact Statement (PEIS) for Stockpile Stewardship and Management (SS&M) is fatally flawed. Despite the NPT obligation to pursue nuclear disarmament and international expectations that a CTBT will preclude the modernization or improvement of nuclear weapons, the DPEIS fails to analyze any programmatic alternative based on maintenance of a hypothetical stockpile of less that 1000 nuclear weapons, any alternative based on "passive" maintenance of the existing stockpile through inspection and identical remanufacture of parts (as opposed to building and operating a massive array of sophisticated experimental facilities that can be utilized to continue nuclear weapons design activities) or any "denuclearization"/"zero" option. Instead, the analysis in this DPEIS begins, in essence, with the conclusion that the policy debate over Stockpile Stewardship and Management is over, and that the program alternative has already been determined. In effect, the DPEIS merely considers siting options for pre- selected activities and the legally mandated "no action" alternative.

The DPEIS fails on at least three counts: its lack of analysis of a range of reasonable programmatic alternatives to meet the goal of maintaining the U.S. nuclear stockpile safely as the nation fulfills its treaty obligations; its failure to describe the "no action" alternative in a comprehensible manner; and its failure to describe the only programmatic alternatives actually considered, namely SS&M and "no action", in a way that allows useful comparison. These are not merely technical flaws, but fundamental structural problems of sufficient magnitude to prevent meaningful participation by the public and other agencies and obfuscate informed analysis by decisionmakers.

For the foregoing reasons the DOE should withdraw this draft PEIS and prepare a revised draft PEIS, while all programmatic decisions and activities are put on hold. The revised draft should analyze the programmatic alternatives demanded by the public but excluded from the present draft, namely: "maintenance"; "remanufacturing"; and "denuclearization". The PEIS should also analyze a "zero" stockpile case -- both with and without the capability to reconstitute the arsenal -- which is based upon a scenario of global reduction and elimination of nuclear weapons in compliance with NPT Article VI over time periods ranging from 15 years to the projected lifetime of the proposed facilities (on the order of 40 years).

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THE PEIS SHOULD INCLUDE ALTERNATIVES EXAMINING THE IMPACTS OF A POLICY COURSE OF REDUCTION OF NUCLEAR WEAPONS, ULTIMATELY RESULTING IN THEIR ELIMINATION PURSUANT TO U.S. OBLIGATIONS UNDER ARTICLE VI OF THE NON-PROLIFERATION TREATY

The DPEIS purports to examine three possible stockpile sizes: 1) indefinite maintenance of an arsenal of 3500 warheads deployed in long-range systems (plus nonstrategic nuclear forces, DOD operational spares, spares to replace weapons eliminated by DOE surveillance testing, and weapons to reconstitute to the START I level; the post-START II arsenal); 2) an arsenal of larger size (START I plus; the "hedge" option); and 3) a smaller arsenal reflecting post-START II reductions of about 1000 warheads (While the DPEIS states that "the size of the nation's nuclear stockpile is being considerably reduced" and refers to the "remaining weapons" in the U.S. stockpile as if it is rapidly dwindling to almost nothing, a nuclear arsenal of 1000 weapons represents an unspeakably destructive force, 100 times the size of an arsenal of 1 to 10 weapons that Herbert York has said would provide deterrence.[1] However, the three cases have minimal effect on the facilities and configurations proposed by DOE, so that there is no true programmatic review. This is demonstrated by DOE's rejection of real programmatic alternatives, strongly supported by public commenters: 1) denuclearization; 2) remanufacturing; and 3) maintenance. DOE's analysis in support of refusing to examine a zero option and true programmatic alternatives is fundamentally flawed, as shown below. To comply with NEPA, DOE must examine a zero case and the true programmatic alternatives

<u>NPT Article VI and the zero option</u>: As we have consistently maintained, a zero option is based upon U.S. fulfillment of its obligation under Article VI of the NPT to negotiate the reduction and elimination of nuclear weapons. That option is well within the universe of reasonable alternatives the PEIS should examine to inform decisionmaking by DOE itself, other agencies, the President, Congress, and the public. Further, it will broaden and enrich the comparative examination of environmental and proliferation impacts. The differing impacts of possible futures are themselves one relevant factor in planning the complex, yet if DOE does not study a zero option the range of comparison will be narrow

The zero option is official, recently reaffirmed U.S. policy. The NPT entered into force in 1970. Its article VI requires declared nuclear weapons states including the United States "to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament". In a resolution at the Conference on Disarmament at Geneva on April 6, 1995, anticipating the NPT extension conference, the United States, the United Kingdom, France, and Russia declared that "we welcome the fact that the nuclear arms race has ceased". CD/1308, 7 April 1995. At the

[1] Although there is no precise, objective number that can be cited, Herbert York has argued that the number of warheads needed to maintain a credible minimum deterrent is "somewhere in the range of 1, 10, or 100" survivable, deliverable warheads, "closer to 1 than it is to 100." Herbert York, <u>Remarks about Minimum Deterrence</u>, Lawrence Livermore National Laboratory, CTW-12-90, January 25, 1991

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NPT Conference, these states took the position that they have now fulfilled one prong of Article VI, "cessation of the nuclear arms race" That leaves the second prong, "nuclear disarmament", i.e reduction and elimination of nuclear arsenals. At the conference, the nuclear states reaffirmed their commitment to pursue nuclear disarmament. In connection with the decision extending the NPT indefinitely, the parties, including the United States, adopted a set of "Principles and Objectives for Nuclear Non-Proliferation and Disarmament" which included a "programme of action" calling for " systematic and progressive efforts to reduce nuclear weapons globally, with the ultimate goal of eliminating those weapons". NPT/CONF.1995/L.5, 9 May 1995. This program is intended to implement Article VI and indeed constitutes an authoritative interpretation by the NPT parties of what Article VI requires U.S. representatives at the Conference independently affirmed that the ultimate goal of the United States is the elimination of nuclear weapons. Also, in a post-Conference interview, Ralph Earle, Deputy Director of the Arms Control and Disarmament Agency and one of the U.S. representatives to the Conference, stated regarding the Principles that "we are prepared now to begin their implementation as if they had the same standing as the Treaty itself". BASIC Reports, June 1, 1995, p. 3

The nuclear weapons states' fulfillment of Article VI obligations will continue to come under close scrutiny by NPT parties. For example, at the NPT conference itself the claim by the nuclear weapon states that the arms race has ended was disputed. Nonnuclear states including Indonesia asserted that while the quantitative arms race may have ended, the qualitative arms race is continuing through laboratory-based simulated testing programs. Fundamental disagreement on this point prevented completion by the conference on a final document reviewing operation of the Treaty over the past 25 years with regard to Article VI. Another element of the extension decision was to agree "to strengthen the review process for the operation of the Treaty with a view to ensuring that the purposes of the preamble and the provisions of the Treaty are being realized" NPT/CONF.1995/L.4, 10 May 1995.[2] Review Conferences will be held at five year intervals, with the next conference set for the year 2000. In addition, Preparatory Committee meetings will be held, at a minimum, in each of the three years prior to the Review Conference. The purpose of the Preparatory Committee meetings is to "consider principles, objectives and ways in order to promote full implementation of the Treaty, as well as its universality, and to make recommendations thereon to the Review Conference. <u>These include those identified in the Decision on Principles and Objectives for Nuclear Non-Proliferation and Disarmament</u>". Id. (emphasis added).

The provision for a strengthened review process recognizes that NPT parties - in particular, the nuclear weapons states - must be dynamic in meeting their obligations if the regime is to be viable in the long run. As the President of the Conference, Ambassador Jayantha Dhanapala of Sri Lanka, observed in a post- Conference interview: "Unless there is

[2] WSLF provided copies of the NPT documents referenced here as attachments to our scoping comments We will provide additional copies on request

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substantial progress evidenced in the nuclear disarmament field, we are going to have very serious erosion of the confidence of states parties to the Treaty This could be quite dangerous for the future . . ." BASIC Reports, June 1, 1995, p 2.

DOE rejects the zero option based upon the NPT obligation for several alleged reasons One is that expanded laboratory testing "will enable the United States to enter into [a CTBT, a central element of the NPT obligation] while maintaining a safe and reliable nuclear weapons stockpile consistent with U.S. national security policies". (S-19). This is assertion, no more. There is informed opinion that a "safe" and "reliable" arsenal can be maintained using the existing, very extensive, laboratory infrastructure, without additional facilities. But, DOE has foreclosed analysis of this debate, so essential to policy choices, by refusing to consider programmatic alternatives of "denuclearization", "remanufacturing", and "maintenance". In effect, DOE has analyzed its preferred alternative, SS&M, as the only reasonable alternative to no action, rather than analyzing several reasonable alternatives. In other words, SS&M is not an alternative at all; the choice is presented simply as "go" or "no go". This approach is not acceptable under NEPA, certainly not where there are in fact alternative courses of action which many in the public and government regard as eminently reasonable. DOE has also failed to analyze separately "safety" and "reliability", which is

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essential to reasoned appraisal of the proposed facilities See generally our scoping comment on this PEIS.[3] For example, if "safety" is given a higher priority than "reliability", a different mix of facilities might result To the extent, as was blatant in the NIF non-proliferation review, that DOE is referring to a political deal struck within the United States government, this is simply a bootstrap, circular argument, whose very premises were created by DOE's promotion of laboratory testing. To understate the matter, such self-serving analysis is not appropriate to such important issues

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DOE then asserts that "[o]ne benefit of science-based stockpile stewardship is to demonstrate the U.S. commitment to NPT goals". (S-19) Just the reverse is true: the effect of SBSS is to undermine confidence in the U S. commitment to NPT goals. To take one important example, India is now reluctant to enter into a CTBT that does not prohibit laboratory development of nuclear weapons because of the announced aim of the U.S. and other nuclear weapons states to maintain and improve their arsenals without test explosions, and to preserve the ability to design nuclear weapons. In its argument to the International Court of Justice, October 30, 1995, concerning the question referred to the court by the General Assembly of the legality of the threat or use of nuclear weapons, Australia, a close U.S. ally, squarely rejected the premise of SS&M, namely the ability indefinitely to maintain the nuclear arsenal.

The argument of the Australian Minister of Foreign Affairs, Gareth Evans, began with the point that "nuclear weapons are by their nature illegal under customary international law,

[3] "Comment of the Western States Legal Foundation on the Scope of the Stockpile Stewardship and Management Programmatic Environmental Impact Statement," August 11, 1995, Attachment A

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by virtue of fundamental general principles of humanity. It is illegal not only to use or threaten use of nuclear weapons, but to acquire, develop, test, or possess them. The right of states to self- defense cannot be invoked to justify such actions." Evans continued, "Second, it follows that all States are under an obligation to take positive action to eliminate completely nuclear weapons from the world. To implement this obligation, States which do not possess such weapons cannot lawfully acquire them, and States which do possess nuclear weapons cannot add to, improve, or test them. States which possess nuclear weapons must, within a reasonable time-frame, take systematic action to eliminate completely all nuclear weapons in a manner which is safe and does not damage the environment." (pp. 41-42) (emphasis added)

Evans' remarks directly pertinent to the NPT and SS&M were as follows:

Article VI of the Nuclear Non-Proliferation Treaty imposes an obligation the nuclear weapon States, and on all other parties to the Treaty, to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control. At this year's Non-Proliferation Treaty Review and Extension Conference, the nuclear weapon States reaffirmed "their commitment, as stated in Article VI, to pursue in good faith negotiations on effective measures relating to nuclear disarmament", and the ultimate goal of eliminating those weapons was also reaffirmed.

Mr President, Members of the Court, during this transitional phase, all States, including the nuclear weapon States are prohibited by customary international law from engaging in any action inconsistent with this commitment. They cannot introduce new nuclear weapons. They cannot refine their existing stockpiles. They cannot engage in action intended to ensure maintenance of their nuclear arsenals indefinitely into the future.

In particular, the testing of nuclear weapons under any circumstances must now be prohibited. Not only is testing a "use" of nuclear weapons, and therefore subject to the primary obligation I have identified, but tests for the purpose of developing new nuclearweapons or for refining existing weapons would clearly be illegal, as they are directed to enhancing nuclear armaments, rather than eliminating them. However, even testing for the purpose of maintaining existing stockpiles would be inconsistent with the obligation, since such conduct is aimed at extending the period in which the status quo can be maintained. (pp. 66-67) (emphasis added) [4]

[4] See Verbatim Record (excerpt), Monday 30 October 1995, International Court of Justice in the case in Legality of the Use by a State of Nuclear Weapons in Armed Conflict and in Legality of the Threat or Use of Nuclear Weapons, Attachment B.

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As Evans made clear, "action intended to ensure maintenance of their nuclear arsenals indefinitely into the future" is contrary to the NPT Article VI obligation, as well as the general illegitimacy and illegality of nuclear weapons. Yet this is exactly what DOE is describing in its PEIS! DOE must analyze programmatic alternatives and a zero option which do not assume, in DOE's phrase, U.S. maintenance of a nuclear arsenal for the "foreseeable future".

22 states participated in the oral hearings before the World Court, and another 23 states made written submissions only. More than two-thirds of the states that participated in the written and oral proceedings argued for the illegality of the threat or use of nuclear weapons. (Release of an advisory opinion from the court is probable, though not assured, by June 1996. For background on the case, see John Burroughs and Jacqueline Cabasso, "Nukes on Trial", March/April 1996 Bulletin of the Atomic Scientists, pps. 41-45, Attachment C). Most states arguing for illegality, like Australia, emphasized the NPT Article VI obligation. For example, New Zealand's Attorney General, Paul East, stated, "The agreed premise of [the NPT] is that a world free of nuclear weapons would be a better place. The treaty held out the promise of that goal being reached without undue delay." The United States and other nuclear weapons states, while contending that threat or use of nuclear weapons may be legal depending upon the circumstances, acknowledged the NPT obligation. For example, State Department legal advisor Conrad Harper stated: "It is true that the Non-Proliferation Treaty affirms the commitment of nuclear-weapon States toward reducing the number of nuclear weapons and toward achieving the goal of disarmament."

Against this background, DOE's assertion that SS&M demonstrates the U.S. commitment to NPT goals is wholly implausible. DOE attempts to save this point by arguing that loss of confidence in the U.S. stockpile "could provide an incentive to other nations [which rely on the U.S. deterrent] to develop their own nuclear weapons programs". Again, this is an assertion based upon a dubious premise, namely that expanded laboratory testing is necessary to maintain the "safety" and "reliability" of the arsenal, which DOE has chosen not to subject to comparative analysis in the PEIS. Further, it avoids examination of an alternative path to global security, global elimination of nuclear weapons, which the NPT Extension and Review Conference and the World Court hearings demonstrated that many states - including many U.S. allies - regard as preferable to the current global regime. It also assumes what is increasingly in doubt, that the threat of mass destruction by use of technically reliable nuclear weapons is and will remain credible. NEPA does not require DOE to commit solely to fulfillment of the Article VI obligation within a reasonable time period. This depends on many factors outside of DOE's control. But NEPA does require DOE to consider that path as one reasonable and possible future.

DOE's next argument is that SS&M will not lead to direct proliferation, as by transfer of data or copying of technology (S-19). This argument is subject to many objections - what technology has not spread? - yet it is offered as if self- evident. In contrast, DOE's non-proliferation review of NIF non- proliferation impacts was clear that NIF's direct

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proliferation risks require careful management.[9] DOE must consider paths, i.e. not constructing new facilities, which pose less risk of direct proliferation. For extended discussion of this point, see, e.g., See generally "Comment of the Western States Legal Foundation on the National Ignition Facility (NIF) and the Issue of Nonproliferation, Draft Study," October 10, 1995, attachment E

DOE then argues that "proliferation drivers for other states, such as international competition or the desire to deter conventional armed forces, would remain unchanged regardless of whether DOE implemented the proposed action". (S-19) For reasons stated above, this is simply untrue U.S enhancement of its maintenance and design capability clearly will enter into other states' calculations regarding their actual or potential nuclear weapons programs, as is illustrated by India's attitude towards the CTBT.

In general, DOE's discussion of potential proliferation impacts fails to meet any reasonable standard for balanced, impartial analysis. Despite the continuing presence of a vigorous debate, both domestically and internationally, concerning the potential proliferation effects of continuing nuclear weapons research, testing, and production, the DPEIS does not, in actuality, include an analysis of potential proliferation impacts. Instead, the DPEIS stresses the benefits of its proposed actions for U.S. arms control and nonproliferation goals in its "Purpose and Need" section, dismissing any possible adverse proliferation consequences in conclusory statements bereft of analysis It is important to realize that nuclear weapons proliferation, in the long run, is likely to result in extensive, adverse environmental impacts on a global scale, even if the weapons never are used The disastrous legacy of Cold War nuclear weapons research, testing, and production in the current nuclear weapons states is far more than enough to demonstrate the environmental dangers of the proliferation of weapons testing and production, with aspiring nuclear states most likely conducting clandestine programs where public scrutiny and environmental controls are unlikely A Programmatic

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[9] Even the authors of the JASON Inertial Confinement Fusion (ICF) Review, who generally favor NIF, warned that its advisory committee should "be alert to activities by foreign users that might serve clandestine nuclear weapon development activities," and that "the difficulty of managing the tension between openness and credibility on the one hand, and assuring the utility of the ICF program to SBSS, on the other hand, is a serious issue and will require considerable attention by DOE/DP." JASON, the MITRE Corporation, "Inertial Confinement Fusion (ICF) Review," February 23, 1996, at 11-12. This demonstrates that within the mainstream scientific community, there is serious concern over potential negative direct proliferation impacts of Stockpile Stewardship. Over the relevant, decades-long time-scale for this Programmatic review, NIF may also pose other proliferation risks-- for example, the potential development of pure fusion weapons which eventually could allow states to produce nuclear weapons without needing to produce or otherwise obtain plutonium or HEU. See Theodore B Taylor, "Comment on the August 23, 1995 DOE Draft Study of the National Ignition Facility and the Issue of Nonproliferation" Attachment D DOE also states categorically in the DPEIS that "NIF is not a weapon and the ICF approach cannot be directly extended to become a weapon," (v.III, p.I-2). This assertion also is challenged by Dr. Taylor, a widely respected former nuclear weapons designer, who states that "possible directed energy weapons that use NIF-like technology to energize extremely high power narrow beams of microwaves...might be used for disabling or destroying electronic or other sensitive electronic components of military or civilian systems, in space or the atmosphere, at considerable distances form a weapon situated on the ground in friendly territory." (Taylor Comment)

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environmental review for the rebuilding of the nuclear weapons complex, which will have a fundamental impact on the international proliferation climate, should address these potential impacts

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DOE finally argues that the NPT "does not mandate stockpile reductions by nuclear states, and it does not address actions of nuclear states in maintaining their stockpiles." (S-19) This argument is sufficiently addressed by Australia's statement to the World Court The NPT contains an obligation to pursue reduction and elimination of nuclear weapons, and states understand this obligation to apply within a reasonable time period, as Australia and New Zealand made clear, not at a point in time beyond the "foreseeable future". DOE argues that "even relatively simple bilateral treaties, such as START I and START II, require more than 10 years to implement, not counting the years of negotiation". (S-10) This argument fails on several counts. In general, nothing prevents DOE from including within a zero option the possibility that elimination would take place within a longer time frame (say 30 years) as well as the shorter time frame we and others have proposed for analysis (15 years). DOE's no-action baseline begins in 2005, and proposed facilities have a 30-year life, so DOE is already analyzing a relatively long period Also, it is not true that we can only imagine a series of elaborate treaties, bilateral and multilateral, taking the global arsenal from tens of thousands to thousands to hundreds and below. It is perfectly feasible for reduction to very low numbers (say 1-10) or elimination to take place by means of an agreement that started with arsenals still numbering in the thousands. This is what is contemplated in some versions of the abolition convention now under study by several groups (see below). Further, it is not the case that reductions can take place only by means of elaborate treaties. Perhaps the most significant arms control measure ever undertaken, the withdrawal of short-range "tactical" nuclear weapons based in land forces and surface ships, was executed by means of coordinated unilateral steps taken by the United States and the Soviet Union under Bush and Gorbachev.

The feasibility of a global process consistent with NPT Article VI leading to the elimination of nuclear weapons is demonstrated by the fact that it is now under serious study In connection with several factors, including understanding of the need for a viable, permanent NPT; the altered global situation in the wake of the disintegration of the Soviet Union; and a reawakening to the intractable problems posed by nuclear weapons from the standpoints of both morality and security, there has recently been much serious discussion of paths to a nuclear weapons free world, all involving not "unilateral disarmament" but rather a global process This was evident at the NPT Conference

1) A caucus of non-governmental organizations (NGOs) eventually supported by more than 200 groups around the world, and including major international organizations like International Physicians for the Prevention of Nuclear War and Greenpeace, agreed upon a specific, 11-point statement calling for commencement of negotiations on a nuclear weapons convention, modeled on the biological and chemical weapons conventions, that would provide for the elimination of nuclear weapons and provide effective mechanisms of verification and enforcement for a nuclear weapons free

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regime. This plan envisages the convention setting out a time bound framework for the elimination of the weapons and other necessary measures, and calls for conclusion of the convention by the year 2000, with the elimination taking place in an unspecified number of years following that year. See Statement of the NGO Abolition Caucus.

2) The International Network of Engineers and Scientists Against Proliferation, including distinguished physicists, international lawyers, and others from around the world, presented a study that examined the elements of a nuclear weapons free world (control of weapons usable fissile materials, control of delivery systems, etc.). This study also contemplated a nuclear weapons convention being achieved at some point in the process. It included no specific time frame. See Executive Summary: Beyond the NPT: A Nuclear-Weapon-Free World, April 1995.

3) Another group of NGOS, including such groups as the Union of Concerned Scientists and the Lawyers Alliance for World Security affiliated with the tradition of "arms control" in the United States, presented a plan that called for a phased approach, first bilateral, then multilateral, leading to a stage in which all nuclear weapons states would have arsenals on the order of 200 warheads, with various mechanisms in place making use of nuclear weapons unlikely. Once this stage was achieved and stabilized, the plan assumes, the world would be in a position to take the final steps to eliminate the weapons. See NGO Recommendations for the Review of the NPT, Disarmament Times, 19 April 1995.[a]

4) The Pugwash group was also represented at the Conference, and presented its recent monograph A Nuclear-Weapon- Free World: Desirable? Feasible? (Boulder: Westview Press 1993). This book includes articles by well-known analysts, including "Technological Problems of Verification" by Theodore Taylor; "Nuclear Weapons After the Cold War" by Robert McNamara and others; the "Breakout Problem" by Marvin Miller and Jack Ruina.

5) Outside the NPT Conference, interest in paths to a nuclear weapons free world also is evident. For example, the Stimson Center based in Washington D.C. has a multi-year project to study "Eliminating Weapons of Mass Destruction." The Stimson Center recently released its study, "An Evolving US Nuclear Posture" (Washington, DC: December 1995), which proposes a phased approach leading to the elimination of nuclear weapons. Its authors include General (ret'd) Goodpaster (former Supreme Allied Commander in Europe), General (ret'd) Horner (former Commander-in-Chief, North American Aerospace Defense Command), Robert McNamara (former Secretary of Defense), and Paul Nitze (former arms control negotiator). See also Robert S.

[a] WSLF provided copies of the abolition proposals referenced here as attachments to our scoping comments. We will provide additional copies upon request.

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McNamara, "Free the World of Nuclear Arms", Los Angeles Times, August 7, 1995, Metro section, p. 5.

6) The Canberra Commission, established by the Australian government last fall at the close of the World Court case on the illegality of threat or use of nuclear weapons, is mandated to prepare a plan to eliminate nuclear weapons for presentation to the United Nations General Assembly in August 1996. The Commission, which is made up of well-known diplomats, generals, scientists, and others, from around the world, including, for example, former Prime Minister Michel Rocard of France, Robert McNamara, Joseph Rotblat (1995 Nobel Peace Prize winner and head of Pugwash), Maj Britt Theorin (former ambassador for disarmament, Sweden), General (ret.) George Lee Butler (former commander in chief, U.S. Strategic Air Command), and Jacques Cousteau, has already unanimously endorsed the goal of a nuclear weapons free world.

7) The Lawyers Committee on Nuclear Policy, Abolition 2000 - A Global Network to Eliminate Nuclear Weapons, the International Network of Scientists and Engineers Against Nuclear Proliferation, the International Association of Lawyers Against Nuclear Arms, and other groups have recently formed a committee to draft a model nuclear weapons abolition convention. While these approaches and others differ significantly as to legal and institutional mechanisms, they are united in projecting a global process of reduction and elimination of nuclear weapons that would involve multilateral negotiations and other initiatives on several fronts (e.g. commitments regarding non-use, control of "civilian" weapons usable material, etc.)

To examine a zero option within programmatic review, DOE will need to determine the facilities required to support phases of reduction and elimination and describe the environmental and proliferation impacts. While this is a question that deserves serious analysis, it appears a zero option would entail the "no action" alternative (no new facilities) plus elimination over time of existing facilities. The zero option would thus serve as a true "no action" alternative, yielding after zero is achieved a baseline of no infrastructure for design and production of nuclear weapons, and no waste output. This would serve as a baseline to assess the costs and any benefits of facilities operated under SS&M, or in the path of maintenance of the existing infrastructure, or in paths of "remanufacture" or "maintenance".

Illustratively, a path including the following consecutive stages could be studied: the post START II arsenal; an arsenal of 1000 warheads; an arsenal of 200 warheads; an arsenal of less than 10 warheads; a zero arsenal but including a residual capability to produce warheads; and finally, elimination of both warheads and the capability to produce them. At the same time this phased approach is pursued, the U.S. should negotiate the end phase, a nuclear weapons abolition convention, comparable to the Chemical Weapons Convention. This abolition regime could be injected into the phased approach at any point; thus we do not mean to imply that elimination of nuclear weapons must necessarily await the

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completion of several distinct phases of reduction. Within the zero option, DOE will need to examine a range of timelines for reduction toward and achievement of zero, with their associated facilities and impacts. These timelines should include a schedule of no more than 15 years for elimination of nuclear weapons, and others DOE determines to be reasonable. DOE could consult with the above-mentioned groups and others concerned with these issues, as well as with the Arms Control and Disarmament Agency, under whose aegis such planning should be taking place. We urge the inclusion of a timeline of no more than 15 years on the basis that the process cannot be so long as to seem illusory, as this would erode the NPT regime and squander the historical opportunity now presented by the end of the Cold War and the relative cooperation now prevailing among the major world powers.

Other elements of U.S. policy and law. In addition to its dismissal of the NPT Article VI obligation, DOE relies on other elements of U S. policy and law to support its decision not to analyze a zero option and true programmatic alternatives. (S-7, S-10, 11) While these may in some degree support the examination of DOE's preferred alternative of an ambitious SS&M Program, they do not support ignoring an alternative based upon compliance with NPT Article VI, which itself is the law of the United States, having at least equal stature with statutes (see Constitution, Art. VI, cl 2) We are of course aware that the Nuclear Posture Review does not set forth any paths to a nuclear weapons free world, and indeed seems inconsistent with the recent U.S reaffirmation of its Article VI obligation. Again, however, the purpose of NEPA review is to enable the examination of a range of reasonable alternatives, and the zero option is certainly a reasonable alternative, in view of Article VI as well as the fact that a nuclear weapons free world in the view of many would be highly desirable for the United States even in terms of a relatively narrow definition of "national security". Further, the DOE has an obligation independent of its relationship with the DOD to comply with NEPA and with national law and policy including the NPT. In addition, individuals working in DOE themselves have moral and legal obligations with respect to issues as grave as those posed by planning the future complex. Finally, a large portion of the informed public that has been monitoring DOE planning and the PEIS has consistently and strongly advocated that DOE include a zero option.

Concerning START I and II (S-7, 10), while they are the present framework for arms reduction, there is no reason to take them as an indefinite framework, as explained above. Concerning the CTBT (S-10), again it must be stated that whether SS&M is necessary to maintain "safety" and "reliability" in the absence of test explosions is a matter of controversy, which must not be assumed. Further, U S. Director of ACDA, John Holum, justified the CTBT at the test ban negotiations in Geneva on January 23, 1996 on the ground that it will serve to prevent nuclear states from further development of their arsenals (vertical proliferation) as well as the spread of nuclear weapons (horizontal proliferation). Holum stated, "So the CTB's Fundamental effect is less to preclude the acquisition of nuclear weapons as such, which the NPT addresses, than to constrain the advancement of nuclear weapons capabilities by any country." (Text released by ACDA, as delivered.) Consistent with this justification, many states are supporting the inclusion of preambular language that the principal objective of the CTBT to halt qualitative improvement of nuclear weapons.

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Whether or not such language is included, this will be the global expectation for a CTBT. Thus to the perhaps large extent that SS&M is aimed at preserving design and development capabilities, it will be contrary to the CTBT as the U.S has justified it to the world.

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A DOE Office of Research and Inertial Fusion (ORIF) document, which WSLF pulled off the DOE's Defense Programs INTERNET homepage in January 1996, describing Core Research and Advanced Technology Program Elements including Concept Design and Assessment activities ranging from "relatively minor modifications in the components of existing weapons to major changes in warhead subsystems or to entirely new candidate designs for proposed or candidate weapon". The document also states, "at such time that a new concept matures [it] would be transferred into a program .. such as a Stockpile Stewardship Program" It further states that "examples of this work include .. concept design studies, arising out of the experiences during and after the Gulf War that indicated potential military utility for types of nuclear weapons not currently in the stockpile".[7] Remarkably, DOE has claimed that this document does not reflect current plans. However, the program elements set forth in the ORIF document are mirrored in the FY 97 DOE Defense Activities Congressional Budget Request At vol 1, p 78, the request describes "Conceptual Design and Assessment" as including a "limited amount of prototyping or experimentation" and lists areas of interest as including advanced electromagnetic radiation and stealth as well as safety features. (emphasis added) The DOE also is continuing to make militarily significant modifications to existing design types, for example the modification of the B-61 for use as an earth penetrator, a weapon which the government apparently intends to deploy without underground testing. All of this supports the conclusion that DOE is currently engaged in design and development of nuclear weapons, though "new types" of weapons are not being manufactured, and further supports the inference that the enhancement of design and development capabilities is a principal aim of SS&M[8]

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The entire structure of the PEIS is designed to foreclose evaluation of the alternatives for the future of the Nuclear Weapons Complex. Rather than engage in a reasoned comparison of different means to assure, separately or together, the safety and the reliability of the existing arsenal, the PEIS authors sometimes descend to a level of argument that is little better than veiled threat in order to dismiss all options other than their proposed action. For example, the DPEIS warns that without the NIF, "Alternatives to achieve higher temperatures and pressures than are presently available may eventually be proposed, but they would not be available when several of the remaining types of nuclear weapons age beyond their original design lifetime, between 2005 and 2010 Thus, issues may arise that decrease

[7] DOE, Office of Research and Inertial Fusion, "Core R&AT Program Elements (Detail)." Attachment F Also included in attachment F are the Office of Research and Inertial Fusion Home Page document, bearing the legend "Last Modified: Wednesday, 11-Sept-95," with which the "Core R&AT Program Elements Documents" is cross-linked, and the "Programmatic Overview," with which it also is cross-linked

[8] See generally "Comment of the Western States Legal Foundation on the National Ignition Facility (NIF) and the Issue of Nonproliferation, Attachment E

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confidence in the reliability of these weapons and increase the probability that the United States may need to invoke 'supreme National Interest' and withdraw from any Comprehensive Test Ban Treaty in effect". (Vol. III, I-S.4.2) Statements of this kind are particularly

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disturbing in a context where the responsibility for certification of nuclear weapons rests solely in the hands of the weapons laboratories, with no outside review by parties who do not have a direct interest in the advancement of weapons design and the construction of extremely expensive new facilities.

Finally, concerning Presidential Decision Directives and the 1994 Defense Authorization Act (S-11), the same considerations apply as noted above with respect to the Nuclear Posture Review. Further, whether SS&M as planned by DOE is necessary to objectives they set forth is, once more, debatable. Also, these are policy determinations that can change and that are supposed to be informed by the environmental review DOE is undertaking. That review will have failed its purpose if it assumes one policy course among the several possible.

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The DPEIS seems to conflate the concept of reasonable alternatives with the concept of a preferred alternative. "The 'agency's preferred alternative' is the alternative which the agency believes would fulfill its statutory mission and responsibilities, giving consideration to economic, environmental, technical, and other factors." "Memorandum: NEPA's Forty Most Asked Questions Concerning CEQ's NEPA Regulations," ("40 Questions") 4a, 46 Fed. Reg. 18026 (March 23, 1981) The DPEIS states that its planning assumptions limit alternatives to those "that are consistent with, and supportive of, national security policies" pV.I p.3-1. The difficulty here is that "national security policies" are unclear and in some cases contradictory. There is an inherent tension between U.S. obligations under the NPT and stated intentions to enter into a meaningful Comprehensive Test Ban Treaty, on the one hand, and those policies which DOE claims support a proposal to modernize the nuclear weapons research, testing, and production infrastructure on the other. The purpose of an EIS, and particularly of a Programmatic EIS, is to inform decision makers and the public about the benefits and potential environmental risks and effects of various "national security policies" which might be chosen and the means to achieve them -- not merely to examine the impacts of the means for accomplishing a choice already made. Otherwise reasonable alternatives should not be omitted from detailed analysis, even if they are beyond the jurisdiction of the agency conducting the review, or not fully consistent with current policy.

"Alternatives that are outside the scope of what Congress has approved or funded must still be evaluated in the EIS if they are reasonable, because the EIS may serve as the basis for modifying Congressional approval or funding in light of NEPA's goals and policies." 40 Questions 2b. Addressing alternatives which may not be current Administration or Congressional policy is particularly appropriate here, where the environmental review is for decisions with a time horizon of at least several decades, and where U.S. treaty obligations would point toward, at the very least, serious consideration of policy alternatives to indefinite maintenance of a large nuclear arsenal, and of "all historical capabilities of the weapons laboratories, industrial plants, and NTS." See DPEIS S-2. It is impossible to weigh the

impacts against the purported benefits of a huge, complex program of action, which will shape the international nuclear proliferation context for decades to come, cost tens of billions of dollars, and which will build facilities which will use large quantities of radioactive and hazardous materials and generate large quantities of radioactive and hazardous waste at sites across the nation, without comparison to a substantially different range of alternative approaches to an appropriate nuclear weapons policy for the 21st century.

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Meaningful programmatic environmental review requires programmatic alternatives - not simply a collection of site-specific reviews combined with a decision process for locating functions and facilities among sites. Yet DOE has eliminated programmatic alternatives from consideration. The "denuclearization" option must be considered for all the reasons stated above relating to NPT Article VI (this would also apply to "dismantling the nuclear weapons complex"). "Remanufacturing" and "maintenance" must also be considered, because they are technically plausible, less expensive alternatives, with lesser environmental impacts. Note that these alternatives do not assume a path toward zero, though they are more consistent with this path than SS&M. Consideration of the two

6/40.27

laboratory alternative and location of laboratory testing at manufacturing facilities is required because, while not "programmatic" in the sense of the above alternatives, they involve considerably more policy choices within the reasonable universe of options than does DOE's SS&M analysis. In particular, the two laboratory option merits consideration for reasons stated by the Galvin Commission report. Moreover, the two laboratory option appears more consistent with the programmatic alternatives excluded from consideration, "remanufacture," "maintenance", and, to a lesser extent, "denuclearization."

The analysis in this DPEIS begins, in essence, with the conclusion that the policy debate over Stockpile Stewardship and Management is over, and that the Program alternative already has been chosen. The purpose of a Programmatic environmental impact statement should be to provide environmental analysis to accompany and inform the policy analysis which will shape the program. Like any other EIS, a PEIS is supposed to be done early enough in the decision making process to actually have some meaningful role in the decision to be made.

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IN ADDITION TO ANALYZING A RANGE OF ALTERNATIVES WHICH IS TOO NARROW TO ALLOW MEANINGFUL EVALUATION OF THE PROPOSED ACTION, THE ALTERNATIVES DISCUSSED ARE NOT ANALYZED IN A WAY WHICH ALLOWS FOR COMPARISON OF THEIR RESPECTIVE IMPACTS.

No true alternatives to the Program, aside from a no action alternative, are actually analyzed. "All of the existing basic capabilities of the laboratory and industrial base continue to be needed even though there have been changes in national security policy since the end of the Cold War. These changes do not affect the standards for stockpile safety and reliability." p.2-10 The "reasonable alternatives" analyzed in detail by the PEIS for rebuilding the nuclear weapons complex for the next fifty years are largely limited to various locations for siting facilities to accomplish one particular approach to the modernization of DOE's

1/40.60 continued — nuclear weapons research and testing facilities. The legally mandated "no action" alternative is under analyzed. Even the stockpile "cases" DOE employs to provide a narrow, partial substitute for an alternatives analysis, all of which are based on the assumption one or another combination of DOE's proposed facilities will be built, are treated unevenly.

7/40.36 — For stockpile stewardship experimental capabilities, DOE proposes building three expensive new facilities, the NIF, ATLAS, and the CFF facility at the FXR. The only alternative to building these facilities analyzed in detail is a "no action" alternative continuing operation of existing facilities with the same function. the PEIS stresses that these facilities "are complementary in nature and are not alternatives to one another." For NIF, the PEIS provides an analysis of alternative sites, but no program alternatives besides "no action" are provided for any of the facilities, for their specific program roles, or for their broader, separable functions of assuring weapons safety and reliability. Despite requests in scoping comments, the DPEIS does not analyze whether individual stockpile stewardship facilities are

8/40.22 — needed to diagnosis safety problems, on the one hand, and reliability problems, on the other.[9]

1/40.60 continued — For "Stockpile Management," the only "program alternative" considered in detail aside from "no action" is "to rightsize functions to provide an effective and efficient manufacturing capability for a smaller stockpile." The analysis is somewhat more elaborate here, because two alternatives are considered for each function in addition to no action. "downsizing in place" at the current location, or transfer to a new laboratory and NTS-centered complex. The alternatives analyzed still are limited mainly to where facilities will be located, and do not include alternatives other than "no action" to building what will be the modern nuclear weapons production capacity in the world. The analysis of the environmental impacts of stockpile management levels other than the preferred alternative "base case" is conducted principally via a "sensitivity analysis of the differences, if any, from the base case alternatives for the high and low case stockpiles." DPEIS v.I 3-1.

9/40.26 — The DPEIS continues that "Since it is assumed that the annual workload will be very close to the base case capacity assumptions, the base case is analyzed in the greatest detail." PEIS v.1 3-1. This approach reveals the extent to which the PEIS is narrowly focussed on a single, pre-chosen alternative. There is no separate analysis of the "high" and "low" stockpile cases in which the impacts of these "alternatives" can be comprehensively compared to the "base case" alternative. Indeed, it is not clear that the different "stockpile cases" really represent "alternatives" in the traditional NEPA sense at all, since they apparently will require construction of the same facilities and will have, according to this document, very similar impacts (although we do not share DOE's apparent confidence that operating its new weapons complex at "surge capacity" can be done largely without waste management and

10/11.16 — capacity difficulties, and more than proportionally increased risk of both routine and accidental releases of radioactive and hazardous materials and of worker exposures).

[9] See "Comment of the Western States Legal Foundation on the Scope of the Stockpile Stewardship and Management Programmatic Environmental Impact Statement," August 11, 1995, Attachment A

9/40.26 continued — The DPEIS also does not analyze whether the "low" stockpile case could be supported with a different set of facilities or with differently designed facilities. In the "Comparison of Alternatives" section (3-86 et seq.) there is no comparative analysis of stockpile cases. If the stockpile cases are in fact intended to function as "alternatives," this approach also contravenes the requirement an EIS "[d]evote substantial treatment to each alternative considered in detail including the proposed action so that reviewers may evaluate their comparative merits." 40 CFR 1502.14.

Pit fabrication and re-use is treated slightly differently, because there is no functioning large-scale production facility now operating. Here too, however, the only alternatives analyzed in detail are alternative sites. The "no action" alternative of relying on existing R&D capabilities at LANL and LLNL receives little actual analysis; the way the "no action" alternative is treated here manifests fundamental deficiencies in DOE's analytical approach.

11/40.19 — The description of the "base case" for pit fabrication, to start with, is confusing. Section 3.4.3 , at 3-50, states that the "base case production rate is approximately 20 pits per year." In the same paragraph, the single shift capacity of the proposed facility is given as 50 pits per year. The 20 pits per year corresponds not to the base case, but to the "low case" in the "Stockpile Management Facility Sizing assumptions (Annual Activity on Single Operating Shift) table 3.1.1.1-1, p.3-3, which describes the "base case" as 50 pits per year. The table itself is unclear, since it does not state whether greater than one shift operation is necessary for the "high case" numbers. The accompanying text refers to a "bounding analysis" for three shift operation (at 3-3), but the "high case" numbers in table 3.1.1.1-1 do not seem high enough to reflect three shift operation, unless information is provided for why additional production drops off dramatically with added shifts. The table for resource requirements (table 3.4.4.2-2) for LANL pit fabrication is labeled "Surge Operation Annual Requirements," but no pit figure is provided for "Surge operation." Table 3.4..3.2-3, "Los Alamos National Laboratory Pit Fabrication Facility Waste Volumes," is based on an 80 pits per year figure for "surge capacity," but this does not match the 100 pits per year "High Case" in table 3.1.1.1-1. The parallel Savannah River table is based on a 120 pits per year surge capacity. (table 3.4.4.4-3)

12/32.18 — In addition, the description of the proposed Pit Fabrication and Intrusive Modification Pit Reuse Alternatives states that "nonintrusive modification pit reuse... is an inherent capability of the pit fabrication facility..." Table 3.1.1.1-1 cites a "High Case" figure for nonintrusive pit modification of 200 per year. There is no mention in Table 3.4..3.2-3, "Los Alamos National Laboratory Pit Fabrication Facility Waste Volumes," of whether waste volumes include nonintrusive pit reuse operations. There is no analysis of whether the pit fabrication and nonintrusive pit reuse activities can be carried out simultaneously so that the impacts are cumulative.

A better explanation of these programs is provided in v.II, Appendix A, but this Appendix is referenced for the Savannah River discussion, and not in the discussion of locating the facilities at Los Alamos. The Appendix does not provide further information

12/32.18 continued

concerning whether impacts of nonintrusive pit reuse and new pit fabrication are cumulative. In general, the description of the proposed action alternatives for pit fabrication and reuse is confusing, omits important information, and the Appendices are inadequately summarized and referenced in the text

13/32.07

The "No Action" alternative for pit fabrication and reuse, furthermore, is virtually invisible. The entire "No Action" alternative description for "Pit Fabrication and Intrusive Pit Reuse Alternatives" for LANL consists of one paragraph, 12 lines, which informs us that "LANL maintains a limited capability to fabricate plutonium components using its Plutonium Research and Development Facility.." and that there are "less extensive capabilities at LLNL to support material and process technology development. Under No Action, DOE would not have the capability to perform pit fabrication to meet the requirements described in section 3 1 for the base case." There is no further description of existing facilities, of their capacities, or of their requirements or impacts; the alternatives for DOE's proposed action receive seven and three quarters pages of text, maps, and tables

14/40.90

There is also no discussion of what facilities are expected to be built as part of the "no project" alternative by the baseline year of 2005. This is of particular importance at LANL, where ongoing projects include, for example, the upgrade of the Chemistry and Metallurgy Research Facility (CMR). Presumably, the CMR will provide part of the "no action" capability for pit fabrication, modification, and reuse at LANL. The DOE FY 1997 Congressional Budget Request v.I indicates that Phases 1 and 2 of the CMR upgrade are expected to be complete by 2002, and hence may be encompassed in the PEIS "No Action" alternative. (at v I p.138 et seq.) The FY 1997 Budget request states that "Phase 3 scope, cost, and schedule are contingent upon future programmatic requirements based upon the results of the Programmatic Environmental Impact Statement (PEIS) and Sitewide Environmental Impact Statement (SWEIS). Therefore, detailed scope, cost, and schedule for Phase 3 are not specifically addressed." at 146a.b. It is unclear, for example, whether a PEIS decision to choose the "no action" alternative would result in more or less extensive renovations of the CMR, or at other LANL facilities, and hence whether DOE's 2005 "no action" plan consists of expanded pit fabrication and reuse capabilities at the laboratories, or only the capabilities which currently exist. This obviously is a key consideration in attempting to evaluate the nature of the "no action" alternative and its potential impacts

13/32.07 continued

Unfortunately, the impacts of the "No Action" alternative for pit fabrication and reuse are not analyzed separately They are aggregated together for all impacts in the general LANL "no action" baseline (deficiencies of which are discussed further elsewhere in this comment) Impacts of the proposed pit fabrication and reuse facility are not compared with a separately analyzed "No Action" alternative, but only with the aggregated site wide "No Action" baseline This has several consequences which detract severely from the usefulness of this document for comparison of alternatives, "the heart of the environmental impact statement 40 CFR1502 14. It makes it impossible to compare the impacts of existing pit modification and reuse capabilities with proposed new capabilities. This problem is exacerbated by the fact that existing capabilities are split between LANL and LLNL, and by

13/32.07 continued

the failure of DOE to detail what capabilities it envisions constituting the "No Action" alternative for pit fabrication and reuse in 2005. There is no separate discussion of impacts of "No Action" pit fabrication and reuse activities at LLNL. In the analysis of impacts for pit fabrication and reuse at SRS, there is no comparison with the "no action" alternative for pit fabrication and reuse, only with the baseline no action conditions for SRS. For LANL, the PEIS compares impacts for its proposed pit fabrication and reuse alternatives only with aggregated total site activities under a "no action" alternative.[10] In the "Comparison of Alternatives" section, the two proposed action alternatives are compared to one another, but only to aggregate "No Action" baseline conditions at the affected sites, rather than to "no action" pit fabrication and reuse activities. p.3-89.

The "no action" alternative must be included in an EIS, whether or not an agency thinks it is reasonable. 40 CFR 1502.14.(d) It must, furthermore, actually be analyzed; an EIS must "[d]evote substantial treatment to each alternative considered in detail including the proposed action so that reviewers may evaluate their respective merits." 40 CFR 1502.14 (b). The PEIS provides no separate treatment of the "no action" alternative for pit reuse and modification, much less one which is "substantial." The failure to provide a separate "No Action" alternative analysis makes any meaningful evaluation of the particular alternatives for pit modification and reuse impossible The absence of any alternatives in which pit fabrication and reuse will not continue, or will be phased out over time, further impedes any useful understanding of the environmental impacts of the DOE's proposed action

THE NO ACTION ALTERNATIVE IN GENERAL

15/40.56

The "no action" alternative in general is so poorly described that it is difficult to understand what it really is. It is important to keep in mind that the "no action" alternative does not describe currently existing operations and facilities at DOE sites-- rather, it is an arbitrarily chosen set of "not stockpile stewardship and management" activities, some of them in fact part of the stockpile stewardship and management programs, which are expected to be in operation almost a decade from now. It is difficult to discern from the PEIS exactly what the "no action" set of facilities constitutes at any given site. The PEIS tells us that "As a general rule, projects which had begun actual construction (i.e., ground breaking) prior to September 1995 are considered in the No Action alternative." at 3-7. At another place, we are told that "The no action alternative includes all existing site facilities plus all facilities for which Congressional Budget 'line item' construction was started by the end of fiscal year 1995 (September 30, 1995)." p.3-4 The impact comparisons for No Action and the site-

[10] The impact comparisons also seem implausible in places, see, e.g., Table 4 6 3.9-1 where the "Potential Radiological Impacts to the Public Resulting from Normal Operation" of a three shift pit fabrication facility, aggregated with other emissions site-wide, at Los Alamos are calculated to be identical, down to the last decimal place, with the "No Action" alternative A footnote to the same table states that the "Total Site" figure "[i]ncludes impacts from No Action." Hence the radiological impacts to the public of normal operation at surge capacity of a nuclear weapon pit fabrication facility apparently were calculated as zero, or incalculably small

15/40.56 continued

specific variations of the proposed action in some places refer to the "no action" alternative as "no action" and in other places as "2005 no action." Accident analyses, we are told, "are based upon facility conditions expected to exist in 2005" 3-4. The "No Action" project description concludes with a broad summary of programs which will continue at affected sites. It states that "no further rightsizing or consolidation beyond *currently planned initiatives* would take place." (p.3-8. emphasis added), but does not tell us what those initiatives are or whether they would be part of the 2005 "no action" baseline.

16/41.17

Some projects may have the paradoxical status of being both too remote to receive detailed analysis and included in the 2005 baseline. One example is the Advanced Radiation Source (ARS [X-1]), which is part of the set of "next generation" facilities that "cannot be defined to the degree necessary to perform detailed environmental analysis," but which apparently is slated to be completed by 2003.[11]

15/40.56 continued

So how does one figure out what DOE expects to exist in 2005? Section 3.2 contains sketchy descriptions of each site as currently constituted, with no way to tell what will exist in 2005, or what is a "currently planned initiative," or what has broken ground, (depending on which "no action" version DOE really is using). The descriptions of the "affected environment" at each site in the "affected environment" section refer us back to the cryptic site descriptions in Section 3.2 (e.g.,the entire project description of the "no action" alternative in Section 4 for LANL reads: "LANL would continue to perform the missions in section 3.2.6" at 4-232) Descriptions of particular impacts in section 4 use 2005 as the "no action" year, without further elucidation of what facilities and operations the impact estimates are based on. An Appendix in v.II (not referenced in the site descriptions) provides somewhat more information on currently existing site operations, but no further illumination of DOE's plans for 2005.

The cumulative impacts section also states that "The No Action alternative takes into account existing site operations and includes the impacts resulting from planned changes to operations until the year 2005. Projects planned for beyond the 2005 No Action baseline would be in such a preliminary stage as to make analysis speculative." 4-532. This section provides us with a list of 12 NEPA documents, including 10 EIS's, which were "eliminated from further study because they do not contribute to cumulative impacts or had impacts that were already included in the 2005 No Action alternative." 4-531 It does not, however, state what projects or programs "were already included in the 2005 No Action alternative."

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[11] "Construction of the X-1 ARS, to be located in Area 4, would begin in 2000 and be completed by 2003 The pulsed power team hopes to reach the accelerator's maximum output levels by about 2005 Then, if results on the X-1 warrant scaling up further, construction of a new super accelerator currently known as Jupiter would produce as much as 32 megajoules of energy by around 2015" "Turn-of-the-century X-1 Advanced Radiation Source to succeed PBFA II," Sandia Lab News, March 29, 1996

15/40.56 continued

In sum, the "no action" description is confusing, and does not provide information sufficient to inform the reader of the actual activities it encompasses. This renders it virtually useless for comparison with the already too narrow range of alternatives. The alternatives analysis is "the heart of the environmental impact statement" (40 CFR 1502.14), and the no-action alternative is "a benchmark, enabling decisionmakers to compare the magnitude of environmental effects of the action alternatives" (Forty Questions, no.3). The deficiency of the no action alternative alone is sufficient reason to withdraw this PEIS and republish the draft.

17/40.58

THE STOCKPILE STEWARDSHIP AND MANAGEMENT PROGRAM IS NOT DESCRIBED IN A MANNER WHICH WOULD ALLOW FOR MEANINGFUL COMPARISON WITH OTHER TRUE PROGRAM ALTERNATIVES.

Even if true program alternatives had been examined, the "stockpile stewardship and management" program itself is defined in a manner which does not allow meaningful comparison with other program options. Major parts of the program, including facilities and actions which either are incomplete or have not been started, have been eliminated from consideration, including, for example, DARHT and tritium production facility options. In this regard, it is important to note that DOE initiated the environmental review for rebuilding its nuclear weapons complex almost five years ago In the interim, DOE has initiated or completed hundreds of millions of dollars worth of new facilities and facilities upgrades throughout the nuclear weapons complex, apparently implementing portions of the program which the reconfiguration PEIS was supposed to review (Most prominent among these facilities is the DARHT, initiated without an EIS, but see also, for example, the various non-maintenance projects encompassed in "CMR Upgrades Projects" and "Nuclear Weapons Research, Development, and Testing Facilities Revitalization, Phases II, II, and V, U.S. DOE, FY 1997 Congressional Budget Request, pp. 129 et seq.) It is likely that the commitment of extensive resources over the past five years to the refurbishment of the weapons complex in the absence of programmatic review has substantially narrowed the range of options which DOE is likely to conceive as feasible.

Throughout this period, citizens groups consistently have asked for a programmatic environmental review of the reconfiguration of the nuclear weapons complex which included alternatives in which testing and production of nuclear weapons is phased out DOE has refused to broaden the scope of its environmental review in any substantive way, instead steadily fragmenting its Programmatic review into an ever more confusing welter of inconsistent NEPA documents whose relationship to one another is obscure, meanwhile continuing to rebuild the complex in bits and pieces, apparently seeking to provide the lowest possible level of environmental review for every project. DOE blames its constant rescoping on changes in the international policy context, but DOE has failed repeatedly to listen to a public which has consistently been ahead of its government in recognizing that a broad reevaluation of nuclear weapons policy is necessary. The end result of this five year process is the presentation to the public of a fait accompli, with the fundamental policy decisions already made and major program components (e g the DARHT) already underway

17/40.58 continued

If the DOE had responded more substantively to scoping comments five years ago, it might have begun a comprehensive, public, environmental and policy analysis of the real program alternatives for the nuclear weapons complex for the next fifty years. Instead, it has chosen at every turn to limit debate to policy options which, unsurprisingly, will keep most current major program elements funded; and so we stumble blindly onward into another half century of nuclear weapons research, design, production, and threatened use. It has chosen to use this PEIS as a document of administrative convenience to consolidate and accelerate environmental review for site selection for facilities which are part of a program already largely decided on. The public would have been far better served by using this PEIS for a comprehensive look at the environmental impacts of the full stockpile stewardship and management program, the weapons complex of the future as envisioned by DOE, in comparison with other programmatic options for managing the nuclear arsenal.

RADIATION RELEASES AND WASTE MANAGEMENT

18/11.32

The analysis of radiological impacts is, to begin with, too limited. It omits entirely the impacts of radioactive releases on aspects of the biosphere other than human health, stating that "Impacts on biotic resources from the release of radionuclides would be expected to be less than on the human population, and, therefore, are not evaluated." 4-5 NEPA does not require analysis only of the worst impacts, or only of impacts on human health. "Effects includes ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative" 40 CFR 1508.8.

The analysis for radiation releases for normal operations of the proposed stockpile stewardship and management facilities is difficult to follow, and appears to be based on assumptions which may substantially understate potential impacts. The explanation of the health effects calculations in Appendix E states that source terms for radiological releases are for "stockpile management alternatives," there is no reference to or data for releases from stockpile stewardship alternatives provided in that section Section E.2.3. The source terms include "only atmospheric releases," we are told, "because liquid radiological discharges are not expected from any of the alternatives at any of the sites." p. E-10. There is no explanation of why this is so. One possibility is that emissions analyzed have been limited to direct emissions from proposed new stockpile management facilities, and that the calculated impacts do not include the total impacts of radioactive materials handling to serve stockpile management alternatives, and of treatment, storage, and disposal of stockpile management waste.

19/42.12

The DPEIS waste management analyses for each site for the proposed stockpile stewardship and management alternatives do not provide impacts of waste management, but rather impacts on waste management facilities, being largely limited to descriptions of waste quantities which will flow in or out of waste management facilities. There is no analysis of health and environmental impacts of waste management activities which will be attributable to the individual stockpile management alternatives, despite the fact that much of the contamination of air, soil, and water resulting from the past decades of nuclear weapons research and production have been the direct result of waste management operations--

19/42.12 continued

emissions from waste processing, leaks from tanks and underground containments, spills, releases in public sewer systems and releases to waterways.

It is not sufficient to point to the Waste Management PEIS as the solution to these problems, as this document still would require that data from that PEIS be adequately summarized and incorporated by reference to allow meaningful comparision of the alternatives offered here. In addition, due to the continuing fragmentation of the Nuclear Weapons Complex reconfiguration environmental review, the programs whose waste is addressed in the Waste Management DPEIS and this DPEIS are different in scope, and the Waste Management DPEIS does not break down data or waste stream information in a way which allows meaningful comparison of the Stockpile Stewardship and Management DPEIS alternatives Finally, it is unclear how the DPEIS year 2005 "No Action" baseline is related to the organization of data and analysis in the WM DPEIS. DOE's approach to the relationship between its NEPA review for its rebuilt nuclear weapons complex and for management of waste from that complex seems to be to simply assume in this DPEIS that all waste management problems will be solved through the WM DPEIS, and in the WM DPEIS it is assumed that all potential conflicts with the WM DPEIS will be resolved in the Stockpile Stewardship and Management PEIS ("The Stockpile Stewardship and Management DPEIS will assure that all wastes generated as a result of stockpile stewardship and management activities are compatible with treatment, storage, and disposal decisions resulting from the WM PEIS." U.S. DOE, <u>Draft Waste Management Programmatic Environmental Impact Statement</u>, v.I p.1-34).

20/41.16

The result is that the analysis needed to determine some of the most critical impacts of programmatic alternatives for rebuilding the nuclear weapons complex falls through the cracks. There is no analysis in any document which allows citizens or policy makers to compare the aggregate environmental impacts of the various programmatic alternatives for the future of the U.S. nuclear weapons complex, no document that provides for any program alternative or comprehensive picture of that alternative's impacts from materials handling and use in manufacturing, through waste management, to long-term storage or disposal This is precisely the outcome we hoped to avoid when we raised concerns, almost five years ago, about the initial division of the programmatic review of weapons complex reconfiguration into separate analyses for weapons research and production, on one hand, and waste management, on the other.[12]

21/10.03

This compartmentalization of environmental review has had results which are puzzling, and which compromise the usefulness of the Stockpile Stewardship and Management DPEIS as a serious analytical document. The descriptions of cumulative impacts for several of the affected sites state that "Cumulatively, the increased waste production from the Stockpile Stewardship and Management alternatives would be a minor contribution to waste

[12] See generally "Comment of the Western States Legal Foundation Regarding the Proposed Scope of the Programmatic Environmental Impact Statement for the Department of Energy's Proposed Reconfiguration og the Nuclear Weapons Complex," September 30, 1991.

21/10.03 continued

management cumulative impacts when compared to potential Waste Management PEIS impacts." (LANL cumulative impacts, 4-545, see also LLNL, 4-550, SRS, 4-538). This implies that the wastes addressed in the WM PEIS come from some other program entirely. The WM DPEIS, however, states that its focus is the waste management facilities needed to "treat, store, and dispose of existing wastes and wastes that will be generated in the future as a result of DOE nuclear weapons stockpile stewardship and research programs." WM DPEIS Summary, p.13. A WM DPEIS table, which specifically excludes environmental restoration wastes, indicates that a major portion of the waste addressed is expected to be generated in the future -- presumably by "nuclear weapons stockpile stewardship and research programs."[11] "Quantities of Waste," WM DPEIS Summary, p.11. In effect, the Stockpile Stewardship and Management DPEIS seems to be saying that stockpile stewardship and management waste streams will be minor compared with waste streams generated in substantial part by the stockpile stewardship and management programs themselves. This result is either absurd, or, if the Stockpile Stewardship and Management programs which will generate most of this waste are not addressed in the Stockpile Stewardship and Management DPEIS, a strong indication that this DPEIS has been improperly scoped.

CUMULATIVE IMPACTS

22/13.04

The discussion of the cumulative impacts of waste management demands from stockpile stewardship and management programs also typifies the defects in the DPEIS cumulative impacts analysis. First, the DPEIS "cumulative impacts" analysis really is not, in many instances, a cumulative impacts analysis, but rather an incremental impact analysis. The purpose of a cumulative impacts analysis is not to illustrate the relative insignificance of the proposed action's contribution to ongoing, similar degradation of the environment; rather, it is to determine the aggregate, or "cumulative," effects of related impacts, to determine whether, taken together, those impacts are significant.

21/10.03 continued

In discussing waste management impacts, for example, the approach taken in each instance is to claim that wastes added from the DPEIS alternatives will be small in relation to existing waste management operations at each site or in comparison to additional waste management loads expected from additional alternatives, e.g., regional consolidation of certain types of waste management at sites slated for stockpile stewardship and management programs. There is no real analysis of whether the proposed DPEIS alternatives, in combination with other foreseeable activities in the same area, will have significant waste management impacts. More important, the environmental impact of waste management is not merely that quantities of waste will be managed; that is a fiscal and bureaucratic, not an environmental, impact. Rather, the environmental impacts of waste management are the use of resources and impacts on the biosphere and on human health from routine and accidental releases from waste management facilities, none of which are analyzed in the waste

[11] Presumably, from the waste volumes, "stockpile stewardship and research programs" here also include "stockpile management" as defined in the Stockpile Stewardship and Management DPEIS

21/10.03 continued

management cumulative impacts discussion for each site. It is also noteworthy that the contribution from the WM PEIS alternatives, the main standard of comparison used to render Stockpile Stewardship and Management Waste insignificant, in the narrative discussion, is not analyzed quantitatively In most instances, in the spaces in tables where waste management alternative waste should be represented, there is only a footnote reference indicating that a facility "could receive waste as a result of the Waste Management PEIS." see, e.g., Table 4.13.1.2-6, p. 4-540; Table 4.13.1.5-6, p. 4-546 (Waste Management Cumulative Impacts for SRS and LANL)

22/13.04 continued

The cumulative impacts analysis also is not done on an alternative by alternative basis, so it is difficult to compare alternatives to one another. This is undoubtedly due in part to the fact that there really is little variation in the alternatives DOE has chosen to present, and is a manifestation of the inadequacy of the alternatives analysis -- the alternatives which DOE has permitted within its narrow view of what is "reasonable" do not vary enough, at least given the kind of analysis done in this DPEIS, to allow for very meaningful comparison of environmental impacts. Another factor is the cursory and conclusory character of the cumulative impacts analysis itself. The cumulative impacts analysis is so sketchy that it would not be likely to differ from alternative to alternative. The main cumulative impacts

23/13.05

analysis for non-accident radiological impacts for rebuilding the nuclear weapons complex at sites which bear fifty years of contamination from past nuclear weapons operations, and where a number of other activities continue which handle large quantities of radioactive materials and generate large quantities of radioactive waste, is one paragraph long. p 4-533 It consists entirely of conclusions -- that "all program totals would be within radiological limits to the public and the effects to workers would be small," and that "[c]umulatively, radiological impacts are expected to be within radiological limits." There is no supporting analysis, and no indication where such analysis could be found

24/13.06

The individual site cumulative impact discussions of radiological impacts provide only accident analyses for earthquakes affecting multiple facilities; we are told we can add these together ourselves with data presented in the general impacts analysis for each site to derive cumulative impacts. see, e.g., 4-538. The accident analysis data provided cover only radiological releases, there is no mention of other hazardous materials. see, e.g., 4-538-9, text and table 4.13.1.2-5; 4-541, 4-545, etc.. In effect, we are told to assemble the cumulative impacts analysis ourselves by combining "beyond design basis earthquake" release impact projections with routine release data presented in an earlier section (which themselves may have deficiencies -- see discussion of radiation release analysis above). These are the components of the DPEIS cumulative impacts analysis on this issue of perhaps the greatest concern to the public-- the continuing, long-term health and ecological effects of releases of radioactive materials: one paragraph of unsupported conclusions, and site by site sets of mismatched parts for an uncompleted analysis.

25/40.15

Viewed against the background of a nuclear weapons complex for which the cleanup bill may run to hundreds of billions of dollars, and which still has not resolved fundamental issues of waste stabilization, cleanup, and long-term disposition, the DPEIS cumulative

25/40.15 continued

impacts analysis clearly is inadequate. It manifests a cavalier attitude towards the complexity of the nuclear weapons enterprise itself, and towards the potential dangers of rebuilding the complex amidst the unsolved problems of the past, all the while creating wastes for which no permanent storage solutions have been found.

> Many factors have contributed to the current waste and contamination problems at the weapon sites: the nature of manufacturing processes, which are inherently waste producing; a long history of emphasizing the interest of national security, to the neglect of environmental considerations; a lack of knowledge about, or attention to, the consequences of environmental contamination; and an enterprise that has operated in secrecy for decades, without any independent oversight or meaningful public scrutiny. Congress of the United States, Office of Technology Assessment, Complex Cleanup: The Environmental Legacy of Nuclear Weapons Production (1991), p.4

The paucity of substantive, useful environmental analysis in this DPEIS, and the apparent lack of interest in creating a document which might be useful in comparing a range of truly different options for developing an appropriate set of nuclear weapons facilities for the coming decades, suggests that we have learned little from this history, and are likely to repeat it.

1/40.60 continued

In general, the impact analysis techniques used in this environmental review -- bounding analyses which aggregate the placement of the largest feasible number of facilities at each site, and which aggregate both maximum numbers of facilities and other actions when discussing cumulative impacts; detailed analysis of a most likely "base case" for stockpile management operation rates, with only a "sensitivity analysis" for the other stockpile cases, minimal explanation and analysis of the "No Action" alternative; all make it difficult for the reader to make meaningful comparisons even among the limited range of stockpile management alternatives analyzed (although it is doubtful whether the stockpile cases really can be characterized as alternatives). No program alternatives (as opposed to site alternatives) other than DOE's proposed facilities and "no action" are analyzed for the portion of the Stockpile Stewardship program addressed in the document. The very narrow range of alternatives considered -- essentially operating the existing weapons complex or operating the existing weapons complex with certain facilities upgraded or added --makes it hard to get any real sense of the relationship between the environmental costs and the purported benefits of the particular nuclear weapons policy DOE is advocating. Several of the program alternatives rejected by DOE, including, for example, denuclearization, maintenance, and the two laboratory alternatives, most likely would have very different environmental impacts than the proposed Stockpile Stewardship and Management program, and would have allowed the comparison of substantially different alternatives needed for effective environmental review.

The only kind of judgment which can be made on the basis of this DPEIS is an impressionistic, general up or down vote on DOE's stated intentions to modernize the complex. The combination of an extremely one-sided analysis of potential effects on the weapons nonproliferation climate, the elimination from detailed analysis of all substantive

1/40.60 continued

program alternatives to the proposed action, and technical analyses which conclude that a large nuclear weapons research, production, and testing complex can be rebuilt and operated with few significant health or environmental impacts at facilities with still unsolved waste and contamination problems, leave little doubt what our conclusions are supposed to be. This is a classic example of an environmental document whose purpose is "to justify decisions already made." see 40 CFR 1502.5

THE DPEIS SHOULD NOT INCLUDE SITE SPECIFIC ANALYSES FOR STOCKPILE STEWARDSHIP FACILITIES.

26/21.05

In regard to the site specific review of the various stockpile stewardship facilities, and the NIF in particular, we reiterate our scoping comment that we believe that it is inappropriate to include site-specific facilities review in this programmatic EIS. It is a further manifestation of the fact that the meaningful program decisions already have been made. Combining three separate site specific EIS's with a programmatic review of one of the most complex programs ever put forward by the government also places an insupportable burden on commenters. There is no way that citizens and public interest groups can be expected to examine this varied and complex a set of multi-level environmental review documents in the time allowed for comment. Given the inadequacy of the larger DPEIS and its necessary role in providing the programmatic context for the site specific decisions, we also believe that a meaningful evaluation of the adequacy of the stockpile stewardship site-specific portions of the DPEIS cannot be made. We would note that upon first impression, the NIF site specific review is similar in character to the larger DPEIS, in that it fails to address a reasonable range of other alternatives for achieving stockpile stewardship program goals, provides no substantial analysis of the ongoing controversy on potential proliferation impacts of NIF both independently and in combination with other Stockpile Stewardship and Management facilities, and discusses project benefits without analyzing concomitant environmental impacts.

27/21.17

In regard to proliferation effects, the NIF impact review here bases its short, conclusory discussion on DOE's The National Ignition Facility and the Issue of Nonproliferation (1995). We commented extensively on the deficiences in the draft of that report;[14] those comments remain relevant since there was little substantive change in the final document. Particularly relevant in the NEPA context is that The National Ignition Facility and the Issue of Nonproliferation did not analyze alternatives to the NIF.

26/21.05 continued

We note again that nuclear weapons proliferation poses the possibility of extensive adverse environmental impacts as the result of the proliferation of nuclear weapons research, testing, and production programs with their attendant multiplicity of environmental effects. Similarly, the NIF analysis in the DPEIS discusses other benefits of the facility, stating, for example, that "the most significant long-term civilian application of ICF is the generation of electric power." If benefits of a project are discussed, environmental impacts must be

[14] See generally "Comment of the Western States Legal Foundation on the National Ignition Facility (NIF) and the Issue of Nonproliferation, Draft Study," (October 10, 1995, attachment 1)

26/21.05 continued
discussed as well in order to provide the fair and impartial analysis NEPA requires. In our comment on the draft of the NIF Nonproliferation study we described the potential for nuclear weapons proliferation both in the spread of ICF technology and also in the successful deployment of fusion as a commercial power source. (at p.13 et seq.) In both instances, the spread of the technology necessarily entails the spread of knowledge applicable to nuclear weapons development, and also perhaps the building of numerous facilities which will have the potential for production of materials used in nuclear weapons. DOE cannot promote the long-term benefits of inertial confinement fusion without acknowledging these potential adverse impacts, and the potential impacts of commercial-scale fusion power plants as well

ATTACHMENTS

Attachment A "Comment of the Western States Legal Foundation on the Scope of the Stockpile Stewardship and Management Programmatic Environmental Impact Statement," August 11, 1995

Attachment B: Verbatim Record (excerpt), Monday 30 October 1995, International Court of Justice in the case in Legality of the Use by a State of Nuclear Weapons in Armed Conflict and in Legality of the Threat or Use of Nuclear Weapons

Attachment C: John Burroughs and Jacqueline Cabasso, "Nukes on Trial", March/April 1996, Bulletin of the Atomic Scientists, pps. 41-45

Attachment D: Theodore B Taylor, "Comment on the August 23, 1995 DOE Draft Study of the National Ignition Facility and the Issue of Nonproliferation"

Attachment E: "Comment of the Western States Legal Foundation on the National Ignition Facility (NIF) and the Issue of Nonproliferation, Draft Study," October 10, 1995.

Attachment F DOE, Office of Research and Inertial Fusion, "Core R&AT Program Elements (Detail)."

May 2 - 1996

U.S. Dept. of Energy
Office of Configuration
P.O. Box 3417
Alexandria, VA 22302

Dear Sir:

1/40.12
I am opposed to your Stockpile Stewardship and Management Program which will cost as much as $55 billion.

I agree with the Australian Prime Minister Paul Keating who said:

2/40.06
"What we need now is action to achieve the abolition of all nuclear weapons."

Sincerely,

Virginia Fabilli

Virginia Fabilli
851 Trestle Glen Road
Oakland, CA 94610-2317

SSM-M-092
COMMENT LETTER
PAGE 1 OF 2

Dear Ms O'Leary ①

1/40.06 We went to Santa Fe on Apr 25 to notify your agents that citizens of northern New Mex do not like your plans called "Stockpile Stewardship Myth" (SSM). It is not alright with us if you wish to proceed on the plan for global destruction. Nuclear war is not

2/41.03 a sane alternative. It ain't easy goin to your meetings. And though we talk, it's hard to believe anyone listens. Anyone from your side that is. [Your shur godsit is]

3/43.18 Now wild fires blaze around the Lab and yeah though we're asked for places for earthquake, volcano and evacuation route considerations, no real thought had been given to forest fires but now they may have to add another lie to the mitigation or improbable scenario blurb. This is real folks!

SSM-M-092
COMMENT LETTER
PAGE 2 OF 2

② At LANL they live in a dream world. "no significant impact upshure." The

4/40.21 impacts of nature be they earthquake, volcano, wildfire or flood are significant and you need to wake up to the danger that DOE risks to your own employees, neighbors and friends as well as those you regard as enemies. I spent much time reading and here's a quote I left out "You can't destroy an enemy by shooting him. That only creates more enemies. The only way to destroy an enemy is to make him your friend." Rescue Mission Planet Earth by Children of the world.

5/41.04 The way you've turned one PEIS into seven has fragmented this absurd program and never addresses a need for global sustainability,

6/40.07 implications to non-proliferation and test ban, nuclear terrorism and so many vital global issues. Stop this madness now!

Thanks Bennie Bennett

ECOLOGY - SANTA FE STYLE

Hearings on the Los Alamos National Laboratory - April 25

For hours I sat in the meeting room
Focused, mystified and shocked.

1/41.03

I heard teams of concerned citizens
Plead for national consciousness to protect
Our land from nuclear disaster.

I saw the DOE team pay polite attention,
With not a flicker of recognition
That we were of the same land
And of the same family of man.

The occasion was to allow free speech.
For citizens to voice choice,
(We chose "No")
To be recorded for the ears
Of Ms. O'Leary before her decision.

Yet, one citizen asked whether the DOE
Had already determined the lab's fate;
Making the hearing a charade.
(We will see, or will we?)

Some citizens have been speaking for the last
Thirty years against nuclear development
To deaf ears and blank faces.

Now he stands in his eighty years,
Fragile-voiced, but vehement:

"Wake up - to our unconscious addiction to
Expediency and denial of reality!"

Forest Fires in Santa Fe - April 26

2/43.18

For hours I watched through binoculars the dome fire.
Focused, alert and shocked.

I was awed by the density of the smoke
That almost blotted out the red sun,
That put our town in shadow;

By the red sunset carving fiery forms
From the smoky mass along the horizon.
The next day the horizon was gone.
The town hidden by haze.

I started to rage in helpless concern.
I started to ask questions.

The nursery owner laughed at my horror:
"It is natural - Ponderosa Forests
Need fire every five years."
Mary of Cerrillos, age 75, says:
"Natural? My foot!"

Thousands of forested acres lost in flames
Ignited by careless campers - natural?
Anna, permaculturist, concluded:
"Natural? Totally unnecessary!"
Is this season's dry climate an ecological alarm?

Is this potential too intense to be comprehensible?
"The dome fire's flames are two miles from the Los Alamos Lab"
Announced blandly by TV news.

Are there thorough decision-processes around the Lab?
" ...Weapons-grade plutonium is pyrophoric -
Meaning it can ignite in air...stored in PF-4 building...
Built to withstand four hours of intense burning." (!)

Yet New Mexico hesitates to call the National Guard.
" ...If flames were to burn into these buildings
(Abandoned buildings at TA-16 contaminated
With high explosive materials...)
Small explosions could result...chunks of high explosion
Materials at TA-16 could detonate if burned."

SSM-M-093
Comment Letter

I found dialogue and some conclusions.
We grieved over lost forests, wildlife, soil, water and Indian ruins.
We concluded that this drought is the worst since 1950.

I concluded earlier this spring.
That an "Arbor Initiative" could begin
A micro-climate-change to create rainfall.
A community tree-planting project
Could help heal land and hearts.

Maybe now, tree-aware community concern
Will be ignited?

We concluded that speeches do not convert minds.

We concluded that prayers with energy
Beamed on healing fearful minds
Could cause change.

Shall we begin?

LURA M. BROOKINS
500 N. GUADALUPE ST.
G-373
SANTA FE, N.M. 87501

CC: PRESIDENT CLINTON

SSM-M-094
Comment Letter

U.S. Department of Energy
Office of Reconfiguration
P.O. Box 3417
Alexandria, VA 22302

Dear Sirs:

Thank you for the opportunity to comment on the Programmatic Environmental Impact Statement for Stockpile Stewardship and Management Summary

1/40.52 Initially, I would like to say that Pantex has always been safe and responsible, and I have no doubt that they will continue to be so. I am in favor of Pantex being the choice for the Stock Pile Stewardship

My question and comments relate to S.4.1, page S-32. The second paragraph on the right side of the page states: "The loss of 3549 total jobs would cause . . . housing/rental vacancies and public finance expenditures/revenues would change by less than 1%."

Upon questioning this conclusion at the public hearings, basically the response was that the study took in such a large geographic area that this was an accurate number This area is large enough that if it was in the New England area, it would take in parts of all of several states. The true economic effect of Pantex's present existence has a great effect on a smaller area, but minimal or no effect on communities 1 to 2 hours away

With this logic, the study could have taken in the whole state of Texas, in that contractors from Dallas or Austin will feel the effects more than someone in Dalhart or Perryton This would have reduced the supposed impact even more

2/08.15

- Why was such a large geographic and economic area used for this study?
- Was there any attempt to qualify if this area was currently affected by Pantex's presence before it was used to determine the true economic impact?
- The first paragraph on the same page, S-32, tells us that an addition of 1282 jobs in the NTS Las Vegas area would have about the same (less than 1%) impact as the loss of 3549 jobs in the Amarillo area. Comparing the population and economic base of both areas, do you truly believe that the Amarillo area economy will be affected so slightly?
- If the impact study was supposed to take into account the cumulative economic effects, was the loss of the sight characterization in Hereford taken into account? Was the probable loss of the Helium Operations, or even the loss of Reese Air Force Base taken into account? Was there any comparison to the devastating effect of the loss of the Amarillo Air Force Base on Amarillo's economy?

It appears that these numbers were intentionally minimized to make the impact seem as small as possible. The loss of 3549 high-paying jobs would have great economic consequences Just the proposed down-sizing would have a much larger effect than is stated in the study

SSM-M-094
COMMENT LETTER **PAGE 2 OF 2**

Thank you again for the opportunity to make these comments. I urge the DOE to designate Pantex as the preferred alternative site for the Stock Pile Stewardship.

Sincerely,

Jerry Goebel
8412 Venice
Amarillo, TX 79110

SSM-M-095
COMMENT LETTER **PAGE 1 OF 2**

1747 Camino Corrales
Santa Fe, NM 87505
Apr. 30, 1996

USDOE
PO Box 3417
Alexandria, VA 22302

Dear Friends,

I attended the DOE hearing on Apr. 25, 1996 in Santa Fe, NM. regarding future nuclear weapons design, testing & production and its impact on Los Alamos National Laboratory.

I did not speak at that time but do now want to go on record opposing actions proposed by the DOE. The SS&M program is not a scaling down of nuclear weapons but an expensive proposal for new or upgraded facilities. The staggering possible cost of $30 billion & the generation of more nuclear waste is unacceptable to me & my family.

1/40.07

Experts agree that accidental detonation will not happen. Therefore I believe a passive caretaker role is sufficient and more in keeping with our international agreements.

I believe the SS&M program poses a threat to international security & may encourage other countries to abandon their treaty obligations

2/40.72 And I am particularly opposed to LANL becoming the "prime steward" of our nation's nuclear weapons arsenal. I believe the $4.5 billion in proposals for upgrading facilities there for research & testing, for plutonium processing and other activities, would be, if acted upon, a grievous error and a gigantic waste of our nation's resources. And it becomes additionally painful in view of the fact that lab clean-up & technology transfer programs are being cut and that LANL remains out of compliance with environmental law.

I am grateful to be a resident of New Mexico & cherish the beauty and tranquility this state offers. I fear that your actions threaten the health & safety of all of us who live near Los Alamos National Laboratory.

Sincerely,
Lorraine Schuster

AMERICAN FRIENDS SERVICE COMMITTEE

COLORADO OFFICE
1664 Lafayette Street
Denver, CO 80218
(303) 832-4789
FAX (303) 832-4823

May 3, 1996

U.S. Department of Energy
Office of Reconfiguration
P.O. Box 3417
Alexandria, VA 22302

<u>Comments on Stockpile Stewardship and Management DPEIS</u>

By: Thomas M. Rauch, Director, Disarmament/Rocky Flats Program, American Friends Service Committee, 1664 Lafayette Street, Denver, Colorado 80218

I appreciate the opportunity to offer comments on the Stockpile Stewardship and Management DPEIS.

1/40.60 1. <u>Assumptions about stockpile size</u>: the PEIS assumes three stockpile sizes: one that is consistent with the START II protocol; one that is consistent with START I Treaty but larger than 6000 weapons; one that is described as a "hypothetical low case" of approximately 1000 weapons. These assumptions are flawed because they do not consider a zero-option stockpile. An option of no nuclear weapons should be considered because the United States, by ratifying the Nuclear Non-Proliferation Treaty in 1970--a commitment renewed indefinitely in 1995--committed itself "to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international controls." (Article VI, Nuclear Non-Proliferation Treaty)

2/40.22 2. <u>Need for New Facilities</u>: the SS&M Program proposes the construction of new facilities to assure "safety and reliability" of nuclear weapons currently in the stockpile. The DPEIS does not argue convincingly that new facilities are needed for these purposes. In fact, the DPEIS downplays the conclusions of the Sandia Stockpile Life Study, which shows that currently stockpiled warheads, rebuilt to original specifications, will perform reliably without the need for new facilities. The alternative of using present

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An Affirmative Action Employer

2/40.22 continued

facilities to assure "safety and reliability" should be considered thoroughly in the DPEIS, with input from previous studies, such as the Sandia Stockpile Life Study, and from citizens' groups that work on these issues.

3/40.85

3. Scope of SS&M PEIS: this draft looks only at the potential impacts of three proposed facilities: the National Ignition Facility, the Contained Firing Facility, and the Atlas Facility. It does not consider other facilities being proposed and/or built as part of the SS&M program. The LYNER and BEEF facilities at the Nevada Test Site, and the DARHT facility at the Los Alamos National Lab were not evaluated in the draft SS&M PEIS. This is a serious omission. This PEIS should examine all of the facilities that are proposed or being built as part of the SS&M program. The PEIS should examine these facilities both as a whole and individually in light of true national security needs now that the Cold War is over.

4/40.36

4. Justification for SS&M program with its new facilities: this is one of the weakest parts of the DPEIS. The claim is made that this program, with all of its new facilities, is needed to assure the safety and reliability of the current nuclear stockpile in the absence of underground testing. Arguments opposing this claim are not taken seriously in the DPEIS even though experienced and reputable scientists assert that the SS&M program is not needed to assure the safety and reliability of the current stockpile. The PEIS should incorporate all the data supporting the position that the SS&M program is not needed for safety and reliability purposes, and then make conclusions as determined by the evidence.

5/40.50

5. New Weapons: the facilities proposed in the SS&M PEIS, though described as necessary to assure the safety and reliability of the current nuclear stockpile, in reality will enable the United States to continue research, development, testing, engineering and production of new nuclear warheads. This potential for the new SS&M facilities should be clearly laid out in the PEIS, and the pro's and con's considered thoroughly. Without presenting this potential of the SS&M program, the PEIS is very incomplete and seriously deceptive.

6/40.15

6. The Problem of Wastes: the United States is faced with the very challenging, very expensive task of stabilizing, storing and disposing of wastes from fifty years of nuclear weapons production. No final disposal site for the radioactive wastes has yet been found. But the SS&M program will, by DOE estimates, generate 1,370,000 cubic meters of additional low-level waste and 144,000 additional cubic meters of low-level mixed waste over the next 20 years. It is irrational to propose a program that will generate so much additional waste when the government has barely begun

6/40.15 continued

to deal with wastes already in existence as a result of past weapons production.

7/40.12

7. Costs of SS&M Program: Costs of the SS&M program for ten years are estimated at approximately $40 billion. The PEIS should examine a range of alternatives for use of $40 billion dollars in that time frame, including accelerated waste management and environmental restoration at DOE nuclear weapons facilities, decontamination and decommissioning of those facilities, economic conversion efforts for the communities surrounding those facilities, and verification activities to assure that disarmament treaties are being adhered to and proliferation of nuclear weapons is not occurring.

8/40.14

8. Nevada Test Site: the PEIS should seriously consider the option of closing the underground portion of the Nevada Test Site. Some experienced scientists see no technical justifications for keeping the underground part of the Nevada Test Site open. In addition, closure of this test area would be one demonstration of U.S. commitment to end weapons development, and so would give the U.S. a stronger position from which to work for the end of nuclear weapons development by all nations.

9/40.87

9. Another Draft SS&M PEIS: because the deficiencies of this draft PEIS--as indicated above--are so serious, I think it is important to the credibility of this process that a second Draft PEIS be produced which will incorporate these recommendations and those of many others who have also identified serious deficiencies. The publication of this second Draft PEIS should be followed by another round of public comment hearings and opportunities for written comments before a final PEIS is prepared.

Comment Form

United States Department of Energy

NAME: (Optional) CLYDE ALLEY
ADDRESS: 8 CAMBRIDGE ROAD AMARILLO TX 79124
TELEPHONE: (806) 353-8273

HE FABRICATION QUESTIONS

SSM PEIS
H.E. FABRICATION QUESTIONS

1/34.13

* The implementation schedule on page 36 of the Preferred Alternatives Report gives the impression that the decision to transfer the high explosives mission to the laboratories has been made.
  - Is this true ?
  - If not, on what basis will it be made ?
  - What part will cost and technical risk play in the decision ?

2/40.23

* On page 17 of the Preferred Alternatives Report the statement is made that the two-laboratory alternative (although more expensive) best preserves the DOE core competency in high explosives.
  - How does the transfer of the H.E. production mission to the labs preserved their R&D core competency ?
  - How has the laboratory H.E. core competency been preserved heretofore ?
  - Is the transfer of the H.E. production mission the most cost effective option to address the core competency issue ?
  - What other options were considered and how did their cost compare to the mission transfer option ?
  - How will the laboratories maintain core competencies in other components produced at the Kansas City and Oak Ridge plants ? Core competency is not mentioned as a consideration in the nonnuclear mission discussions on pages 20-22 of the Preferred Alternatives Report ?

1/34.13 continued

* How does the DOE propose to maintain the high explosives safety and health protection infrastructure required for assembly / disassembly at Pantex if the H.E. mission is transferred to the laboratories ?
  - On page 37 of the Preferred Alternatives Report the text says that this risk must be addressed by retaining

1/34.13 continued	the high explosives expertise at Pantex to support both the assembly / disassembly operations and the fabric-ation of high explosive components. This sounds like a slight of hand to both transfer the mission to the labs yet retain the expertise at Pantex. Please explain. - Was the cost to transfer the mission but not the key expertise considered in the cost comparisons ? • Sandia is not mentioned in the high explosives options. - Are they not invoved in the design and development of high explosives components ? - Will the production of such components be transferred to Sandia ? - If so, have the corresponding transfer costs and risks been evaluated for incorporation into the decision process ?
3/09.06	• If the H.E. mission is transferred to the laboratories what will be the resulting impact on the transportation of explosives between the laboratories and Pantex ? - Have the risks to the public and costs of the high explosives movements been determined for use in the decision process ? - Will scrap explosives be returned to the laboratories for disposal ? If not, will Pantex be responsible for disposition ?
2/40.23 continued	• Do the laboratories have the H.E. production surge capability in terms of facilities and equipment equal to that which exists at Pantex ? - How does the DOE propose to produce new weapons if the world situation changes and the production sites have been stripped of their capabilities ? - Several production plants such as Mound, Pinellas, and Rocky Flats are in the process of being closed. How well have the laboratories have performed in assuming the production capabilities of these plants ?

	-The DoD has attempted to combine some of their R&D and production operations . Is the DOE aware of the results of the DoD experience ?
4/40.13	• If the H.E. production mission is transferred to the laboratories, what will be the transition cost to move equipment and re-establish the production capabilities at the labs compared with keeping the mission at Pantex ?
5/08.24	• How many new employees will the laboratories hire for H.E. work if the mission is transferred ? How does this compare with the number of employees that will be associated with H.E. work at Pantex if the mission is not transferred ?
1/34.13 continued	• Discuss how the laboratory explosives facilities compare with those at Pantex ? - Since some were built in the 1950's do they meet the same safety criteria ? Explain.

United States Department of Energy

NAME: (Optional) CLYDE ALLEY
ADDRESS: 8 CAMBRIDGE ROAD AMARILLO TX 79124
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SOCIOECONOMIC QUESTIONS (ATTACHED)
PANTEX PLANT WATER USAGE (ATTACHED)

SSM PEIS and S&D PEIS SOCIOECONOMIC QUESTIONS

1/40.83
* Please explain why LLNL and LANL Stockpile Management budgets show projected increases from 1996 to 2004 since the US has terminated the development of new nuclear weapons ?
  Ref. SSM PEIS Preferred Alternatives Report, pp 26,30.

* Are these projected increases in Stockpile Management at the two labs based on transferring missions to them which have previously been done at the production plants ?

2/40.23
* Please elaborate on a statement made on page 34 of the SSM PEIS Preferred Alternatives Report that " personnel from the laboratories could perform assembly / disassembly for some weapon surveillance operations to improve the programmatic tie between Stockpile Stewardship and Stockpile Management ".
  - Would laboratory personnel replace Pantex personnel for this work ? If not, explain.
  - Would this add to the projected layoffs at Pantex ? If not, explain.
  - Would the laboratory personnel be trained and certified to perform this work ?

3/40.21
  - What organization(s) would be responsible for safety, safeguards, and conduct of operations associated with this work ?
  - Explain how this would improve Stockpile Stewardship and Management ?

* Under Phaseout (page S-21) of the S&D PEIS the statement is made " All of the regional economic areas surrounding the DOE sites would experience a loss in employment with

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COMMENT LETTER

phaseout. However, compared to total employment in these areas, the loss of jobs would have no or negligible impacts at all the DOE sites."

- For which sites would the impact be negligible ?
- For which sites would the impact be significant ?
- What is the basis for determining the significance of the impacts ?
- How does the DOE plan to use this significance in their selection process ?

4/08.25

• The socioeconomic analyses of the three EIS's are not consistent. The SWEIS (p. S-17) assumes 1.65 indirect jobs in the region for every job at Pantex. The SSM PEIS (p. S-32) assumes 1.16 and the S&D PEIS (p. 4-205) assumes 3.51.
  - Please explain these differences ?
  - Why didn't the DOE use the analysis of the Amarillo Economic Development Commission (AEDC) which is based on local knowledge of the area ? Their analysis gives a ratio of 2.87 to 1 (REF. Chamber Quarterly, 2nd Quarter, 1996, Amarillo Chamber of Commerce).

5/12.07

• Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, and President Clinton's February 11, 1994 Memorandum for the Heads of all Departments and Agencies requires an analysis of environmental effects on low-income and minority populations to include human health, social, and economic effects.
Why do the draft SWEIS, SSM PEIS, and S&D PEIS analyze only human health effects of the proposed actions and not the social and economic effects as required ?

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COMMENT LETTER

• In the draft SWEIS (p. S-17) it is stated that at the 500 weapon activity level Pantex " would support 2,400 direct jobs and 3,949 secondary jobs" and that " personal income additions to the economy would be reduced to $365 million annually ?
-Please explain why this degree of economic loss would not only be an adverse but a Significant Adverse Impact to the community.
- At the 500 weapon activity employment level what would be the impact to the revenues for the governing bodies within the Pantex ROI compared with the current revenues presented in Table 4.11.1.6-1 (p.4-165) ?

6/08.22

• In the draft SSM PEIS (I-4-450) please explain the statement
" The downsizing A/D and HE fabrication alternative would result in the addition of 280 workers at Pantex "
- If the statement is incorrect what would be the result ?

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COMMENT LETTER
PAGE 5 OF 5

WATER USAGE : PANTEX PLANT

- Plant used 230 million gallons in 1995.
  - Texas Tech Farms used 66 million gallons (29%) of the total plant water usage.
  - Nuclear weapons operations used 163 million gallons (71%).
- Amarillo Water District consumed 16 billion gallons in FY 1995.
- Pantex Plant including Texas Tech Farms used 1.4% as much water as Amarillo District.
- Nuclear weapons operations used 1% of the water used by Amarillo.
- Considering the water also used for irrigation, the Plant withdrew 0.6% of the regional withdrawal from the Ogallala aquifer.* Nuclear weapons operations consumed 0.43% of the regional withdrawal.
- Draft Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components, March 1996, page S-15.

SSM-M-099
COMMENT LETTER
PAGE 1 OF 2

Comment Form

United States Department of Energy

NAME: (Optional)
ADDRESS:
TELEPHONE: ( )

COMMENT (and background information):

1/04.15 NTS workers and their families associated with the 2,253 new jobs (p. S-32) would likely reside in Las Vegas, NV, which is one of the fastest growing areas in the country.

QUESTION:

Has an analysis been made of the impact of these additional residents on the Las Vegas municipal water supply?

COMMENT (and background information):

2/34.11 The preferred alternative for the location of explosives development has not yet been determined. Moving HE production from Pantex to one of the laboratories is under consideration. Note that there have been attempts to develop the land right next to LLNL's Site 300 fence for new housing.

QUESTION:

a. If the operation is moved to either LLNL or LANL, where would the buildings be placed and the testing be done?

3/01.03 b. What is the current and projected land use around LANL and LLNL (particularly, Site 300)?

DRAFT SSMPEIS

COMMENT (and background information):

4/09.06 **Separation of the explosive fabrication and assembly/disassembly missions would require that explosives be transported over long distances in order to be mated with the physics packages. In the case of LLNL, the extensive winter fogs of the San Joaquin Valley that create near zero visibility, sometimes for weeks-on-end, should be considered in any safety analysis.**

QUESTION:

a. Has an analysis been made of the additional hazards of transportation of HE from either of the national laboratories to where it would be used?

b. What would be the increased costs of intersite transportation?

My name is John M. Napier

I live at 113 Dartmouth Circle, Oak Ridge, TN 37830.

My question relates to the Draft Program Environmental Statement for Stockpile Stewardship and Management.

1/03.03 Table 4.6.3.3-1 states that LANL will be out of compliance for nitrogen dioxide release (24 hour basis) if the work from Y-12 is moved to LANL. What treatment is planned for the nitrogen dioxide release and is the costs estimated in this PEIS?

Please include the answer to this question in the final Stockpile Stewardship and Management Environmental Impact Statement.

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Comment Letter

Page 1 of 1

My name is John M. Napier

I live at 113 Dartmouth Circle, Oak Ridge, TN 37830.

My question relates to the Draft Program Environmental Statement for Stockpile Stewardship and Management.

1/02.02 Table 4.13.1.5-1 states that LANL will use 4,491,290 m3/y of natural gas but Table 3.4.4.3-2 states that LANL will use 0 amounts of natural gas. Which is correct?

Please include the answer to this question in the final Stockpile Stewardship and Management Environmental Impact Statement.

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Comment Letter

Page 1 of 1

My name is John M. Napier

I live at 113 Dartmouth Circle, Oak Ridge, TN 37830.

My question relates to the Draft Program Environmental Statement for Stockpile Stewardship and Management.

1/04.10 Why are the uranium in water values in Tables 4.2.2.4-1, 4.5.2.4-1 and 4.6.2.4-1 different (20 pCi/l and 20 ug/l)?

Also, why does the report in these tables state that the uranium value of 20 pCi/l or 20 ug/l is a National Primary Drinking Water Standard when it is only a proposed standard?

Please include the answer to this question in the final Stockpile Stewardship and Management Environmental Impact Statement.

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COMMENT LETTER

PAGE 1 OF 1

My name is John M. Napier

I live at 113 Dartmouth Circle, Oak Ridge, TN 37830.

My question relates to the Draft Program Environmental Statement for Stockpile Stewardship and Management.

1/02.01 Tables 3.4.4.2-2 and 3.4.4.3-2 states that the Y-12 plant will use 118,000 MWh with a peak of 19 MWe, 17 million ft3 of natural gas and 250,000 L of liquid fuel but LANL will only use 36,000 MWh, 5 MWe peak, 100,000 L of liquid fuel and 0 natural gas. Since the manufacturing processes require electrical and gas to operate and since each plant would produce the same number of parts, why is the energy requirements at LANL so low?

Please include the answer to this question in the final Stockpile Stewardship and Management Environmental Impact Statement.

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COMMENT LETTER

PAGE 1 OF 1

My name is John M. Napier

I live at 113 Dartmouth Circle, Oak Ridge, TN 37830.

My question relates to the Draft Program Environmental Statement for Stockpile Stewardship and Management.

1/33.09 Relative to Table 4.17-4, how is LANL going to use only 1,568,333 kg/y of chemicals when Y-12 plans to use 6,488,333 kg/y of chemicals (a 76% reduction) or is the LANL chemical use only an estimated amount?

Please include the answer to this question in the final Stockpile Stewardship and Management Environmental Impact Statement.

COMMENTS

ON THE

STOCKPILE STEWARDSHIP

AND MANAGEMENT

plan

James T. WABER	2651 Caminito Carlitos, Santa Fe, N. M. 87505	Tele: 986-6134
ER/WM Sub-Committee	Citizens Advisory Board	Fax: 986-9710

Many of the persons who chose to speak at the Meeting in the High Mesa Inn, seemed to think that now that the USSR has collapsed, that there is no longer any likelihood of a credible attack on the US. This is in my mind is a very myopic and short-sighted view of the world.

We live in a hostile world and even though we don't yet see it so clearly, it doesn't mean that it does not exist. We are induced to lay down our arms and live in peace and love. The argument is simply stated that by our moral example, we will induce the remainder of the nations to follow suite. I can reflect on this idea personally.

no page two

When I was living in England in the 60's, there were protest marches and public confrontation, People laid down in front of the laboratory gates, imploring the English to abandon their nuclear capabilities so as to induce the French to abandon their nuclear plans. The protesters had to be dragged away by the British police.

Did it work? NO. The French just went ahead with their **FORCE DE FRAPPE** and ignored these English protests.

One of the speakers towards the end of the session (nearing midnight) stated that Premier Chirac having suffered the voluble international protests over the tests in the Pacific, was going to abandon them. Perhaps so, but he will abandon only the tests. The **EDF** France's very large electricity combine, will continue to operate well into the forseeble future. The French simply need the electricity and hence will produce plutonium.. Further, the French continue, as far as I know, with their Pu Breeder reactor work to produce even more Pu.

The US researchers abandoned this idea several years ago, but not because it wasn't feasible. It is! But presumably because we did not as a nation lack sufficient plutonium, it was because we alredy had a surfeit.

So our moral persuasion, simply did not prevent other nations from making their own plutonium. I could cite Israel, China, Pakistan, North Korea and India as potential producers. I cannot personally assert that they have Pu based weapons. But I think the evidence is compelling that they have the necessary technologies to proceed whenever they feel that it is in their perceived national interests to finish the job.

Turning for the moment to my technical experience and background, I was graduated from IIT as a Ph.D. in Chemical Engineering and Metallurgy. I was second in command in a Corrosion Research Lab team. Then I took a job at Los Alamos for almost twenty years, working on the metallurgy of plutonium. Particularly, I studied the corrosion of uranium and plutonium as it pertained to storage problems. The last seven or eight of that period, I turned to computational physics, and did research related to the possibility that there could be additional elements.

I left the Lab in 1967 to teach Material Sciences at Northwestern University and conduct research particularly on surface related problems such as catalysis. The new element research noted above on unknown elements called *Superactinides* was completed at NU. The Periodic Table was extended well beyond a realisitic limit, beyond element 162.

After about 20 years, I became dissatisfied and when I was invited to join the Physics faculty of Michigan Technological University, I took it. There I concentrated on computationl chemistry and physics. But the writing was on the wall, namely conventional physics was a relatively dead field and I decided to pursue another more practical career, namely one in Hazardous Materials and Waste Management at the

Arizona State University. The degree requirements for a Master's degree are not yet quite complete. I have several long term papers yet to write and edit.

I have taken the required training (48 hours mandated by OHSA plus the yearly two day refresher course and the additional supervisor training) here in Santa Fe. The three day on-site training in handling hazardous wastes is still incomplete. But I think I can easily qualify by virtue of handling Pu, U, tritium and various other toxic substances for years. So I think I am qualified to have and voice an opinion on these matters.

Plutonium is abundantly available in the world. I have been invited to visit a small Pu laboratory in Sweden about twenty years ago when I was at Northwestern University. I had virtually nothing to say to them.

I have a friend in the Denver area who toured the uranium fabrication plants in western China, but they would not let him and his group into the higher level facilities or discuss any plutonium capability.

The situation in USSR is really dangerous. Typical salaries of even high ranking generals and similar officials are pitifully low. Perhaps they are **as low as fifty or a hundred dollars per month**. One of the late speakers at the session, indicated that the US was paying salaries of 200/month to such persons. I have no way to verify the idea. I had informally proposed a very much higher salary and to bring them to the US (where they might be useful in other ways), to various people including a Russian trained professor - a former Russian Lab director - employed by MTU, my University. His answer was that the Russians would never let such persons leave their country. But the nuclear scientist, Dr. Andrei Sakarov did. He was responsible for independently developing their thermonuclear device.

But why worry? The southern underbelly of the USSR consists of primarily Moslem nations. Those people are influenced by their religion to die as martyrs in the "service of Allah." Further, they have great animosity towards the US and Israel after the recent conflict with Iran and the continuence of the embargo. These various Arab states are wealthy with oil dollars. They can easily offer a Soviet citizen a 100,000 dollars a year to proceed with the development of good nuclear weapons. I don't think that we cannot stop this from happening, because Western experts do not understand the lure of martyrdom.

Dr. Theodore Taylor, (not the curremt DOE director for Waste Management) wrote a long *New Yorker* article about ten or fifteen years ago, pointing how relatively easy it would be with available declassified documents to make a poor nuclear device or even a good, low yield one. He was not an idle dreamer. He was one of the brilliant young bomb designers working for Carson MarK in T-Division along with Conrad Longmire and Marshall Rosenbluth. Fortunately, the IRA or other terrorist groups have apparently not followed his model.

1/40.04 Yes, I feel strongly that we need the continuing capability to use these safe weapons when threatened. Their mere presence is a deterrent to adventurous terrorist groups bent on glory to attempt to use nuclear weapons.

2/32.01 Granted that we need the availability of nuclear bombs, but do we need the increased Pu Pit production? The answer is, probably no. There are repeated references in the PEIS to repairing defects in the stockpiled weapons, to improve their safety. What are these undisclosed defects? There seem to consist of two classes, (one) defects within the devices manufactured in the 60's and (two) new (but unknown) defects which may occur in the near future in the enduring stockpile. Both of these, from my understanding, are now merged into the counts of defect problems, to indicate future potential problems. Those in the 60's were introduced with inadequate testing.

Quoting from a senior weapons scientist Ray Kidder in his 1987 study, his conclusions that

> "...(1) these resulted from rushing inadequately tested designs into the stockpile, and (2) that these problems are all lessons learned, i.e., of historical, but not predictive importance - still stand."

In his 1987 paper, Kidder wrote

> "During the past decade [1977-1986], new boosted primaries have been designed and developed by the weapons laboratories ... performed satisfactorily the very first time they were

2/32.01 continued

tested, the observed yield in no case falling short of the expected by ...."

Quoting from Conclusion 3 of the declassified summary and concluions of the Jason report JSR 95-320,

"(U) The individual weapon types in the enduring stockpile have a range of performance margins (see their footnote[1]), all of which we judge to be adequate at this time. In each case we have identified opportunities for further enhancing their performance margins by means that are straightforward and can be incorporated with deliberate speed during scheduled maintenance or remanufacturing activities. *However the greatest care in the form of self-discipline will be required to avoid system modifications, even if aimed at "improvements," which may compromise reliability.*" (emphasis is mine).

In Kibber's 1987 paper, one finds:

"During the last decade (1977-1986), new boosted primaries have been designed and developed by the weapons laboratories... performed satisfactorily the very first time they were tested, the observed yield in no case falling short of the expected by more than ....(see [his] tables H1 and H2 and Fig. H1) The one new primary that failed was a more complex. less predictive design than the others. This primary that failed was subsequently redesigned, tested and failed

[1] Defined as the difference between the minimum expected yield and the minimum needed yield of the primary,

2/32.01 continued

again. None of the primaries in the existing stockpile employ ..." (this principle).

In the September 22, 1994 briefing on Nuclear Posture Review, DOD requirements to DOE were to:

"- Demonstrate capabilty to refabricate and certify weapon types in the enduring stockpile

- Maintain capabilty to design, fabricate and certify *new warheads*" (emphasis is mine)

So the primary justification for the enhanced pit production is to develop NEW weapon designs undoubtedly without testing or with very minimal unrealistic testing, i.e., low yield experiments.

So in face of the strong *caveat* from the Jason panel, we, nevertheless, are going ahead with weapons modifications, According to the statement of Asst. Secretary Reis before the Energy and Water Development Subcommitte of the Senate Appropriations Committee on April 16, 1996.

"The Accelerated Strategic Computing Inititive will build on the core stockpile computing program ... [to develop] ...a predcitive aging capability to enable a focus on extending the lifetime of the current stockpile... [and] a r e absolutely essential for stockpile stewardship success."

" ...The development plans for these [weapons] codes include the delivery of initial capabilities needed to certify planned near-term stockpile modifications (e.g. W76 re-certification, W88 pit rebuild and B61 Mod 11.)

.... we can begin to interpret complex fluid instabilities near special weapon features, provided essential data on design changes to the W-87 warhead. This data was a significant factor in allowing us to proceed without testing."

But can we really be assured that sometime in the future, that some justification will not be found for carrying out more than some sub-crtical experiments, i.e., for proper certification. Will the DOD be satisfied with just computer testing?

Quoting again Asst. Secretary's statement,
"The Nevada Test Site is planning training exercises to practice the skills and functions necessary for nuclear testing which are not involved in either subcritical experiments or high explosives experiments..."

3/40.11 We need in the forseeble future to retain some nuclear weapon scientists - it is not clear that we need to retain thousands of them. It is proposed that we need to retain experienced people and advanced computer technology. We could retain the unique knowledge in sealed archives and involve a few staff members. There is sufficient current computer expertise in this country to handle large complicated weapons codes. So that is not a real problem, when they can easily become acquainted with the details. *The emphasis should be on uniqeness not on quantity.*

After all, the bomb was developed starting almost from scratch with a few theorists, with Monroe "hand

cranked" calculators, with well-trained machinists and with rather limited experimental facilities and in **27 months elapsed time.** Why can't we do it again and much faster, when and if we need to?

According to presentation by Larry Woodruf of LLNL to the Galvin panel in August 1994, there currently is "...the capacity of making 150 pits/yr in the [current] downsized complex, i.e., at LANL." *Source: Briefing Charts prepared for presentation to the Galvin Panel.* Why do we need more capacity now?

Turning back to aging problems, they do not affect safety. This was the first question posed to Dr. Kibber by the US senators and he made it clear that aging does not create safety problems. More specifically he said,

"Metals may corrode and organic materials such as plastics, adhesives and HE that are present in a nuclear warhead will deteriorate with age. Such aging effects degrade a weapon's reliability rather than its safety. (The sensitivity to impact or fire of the HE used in nuclear warheads does not increase significantly with age...The reliability, but not the safety of the warhead was [is] affected." *Source: UCRL 53820*

Dr. John Immele, director of Los Alamos Laboratory's Nuclear Weapons Technologies Program spoke to the same point in December 8. 1994 in a public hearing:

"<u>Audience</u>: ...They may age or crack. What does that mean, is there a risk to the public?
<u>Immele</u>: No. there's not a safety risk, There's a

performance problem...because insensitive high explosive is so insensitive that sometime if it's cracked it won't light on the other side when it is supposed to, so it's basically a performance problem.
<u>Audience</u>: A reliability problem?
<u>Immele</u>; That's right, it's a reliability issue. We have not found aging problems that affect safety, that make the explosive more sensitive."

Concerning accidental plutonum dispersal, according to a safety report of the ****** Los alamos Study group, plutonium

> " ...can be dispersed into the atmosphere in any accident in which the conventional explosive in a nuclear weapon burns or explodes. If the explosive involved is 1HB, an explosion is highly unlikely, since 1HE is remarkably difficult to detonate. In case of a fire, plutonium will burn along with the 1HB. Warheads made with HE may also burn in a fire rather than explode, and in fact this happened six times at U. S. Air Force bases between 1958 and 1965 when nuclear warheads were involved in fires.
>
> "All in all, between 1950 and 1980 there were 32 serious nuclear weapon accidents ('Broken Arrows'), [BUT] None have occurred since 1980. .... there were two accidents that involved explosions with plutonium. These were airplane crashes at Palomares, Spain in 1966 and at Thule, Greenland in 1968. Luckily, these occurred in relatively unpopulated areas, and no public exposures resulted."

Fortunately these are now past history, from which we have learned,

The DARHT and the Los Alamos Neutron Science Center (LANSE) projects may not be aimed at improved safety. There is a claim that 1 mm. resolution in neutron radiography is "perhaps" enough to see cracks, etc. in pits, [that] seems optomistic. The study of such cracks on the implosion process need not be of great importance and of limited interest. If one wants reliable weapons of mass destruction, simply replace those cracked pits, or better, retire them. To deter one or two countries, one needs only a FEW weapons.

2/32.01 continued

To summarize, we need the continuing presence of safe, reliable weapons so as not to harm workers and/or the public. The testimony above does not indicate that defects in previous weapons or aging of the enduring stockpile weapons pose a great safety risk.

All the pit manufacture program and (similar new projects) seem to be directed at maintaining a large expert scientific and calculational presence. Do they solve all of the the problem of accidental plutonium dispersal?

"There has been 50 years of experience and more than 1000 nuclear tests, including perhaps 150 nuclear test of the modern weapon types, in the past 20 years." from the Jason Report cited above.

4/40.07

More significantly, efforts to improve the weapons carry with them, the concommitant need to test

4/40.07 continued

these improved weapons perhaps at a later time. These efforts are in direct opposition to the nation's commitment to Non-poliferation (NPL) and the zero yield Comprehensive Test Ban Treaty (CTBT).

5/40.05

Thus the Stockpile Stewardship and Management program is apparently "misdirected" towards improved safety when the less apparent real goal seems to be improved weapon design and implementation. These factors carry with them, increased risks both to the workers and the public in terms of hazardous materials and delayed environmental remediation.

James T. Waber

Date Comments were Received:	
Received by:	

Comments on the
Draft Programmatic Environmental Impact Statement
for Stockpile Stewardship and Management

May 7, 1996

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1/40.07

The draft Programmatic Environmental Impact Statement (PEIS) doesn't consider anything except what the Department of Energy (DOE) has already made its mind up to do. The preferred and no-action alternatives alike support the continued design, development, testing, and production of nuclear weapons into the future indefinitely.

2/40.85

DOE refuses to look at other programmatic possibilities for achieving any objectives of the United States. It rejects them without analysis. The PEIS thus fails to be a document that anyone can rely on to understand the real options before us, but instead becomes an advertisement and political apology for nuclear weapons and the institutional priorities of the weapons establishment. The character of the document is revealed even in DOE's choice of language. For example:

> For the Stockpile Stewardship and Management PEIS, speculation on the terms and conditions of a "zero level" U.S. stockpile with international verification, as some have suggested during the scoping meetings, goes beyond the bounds of a reasonably foreseeable future. For the same reason, DOE has not chosen to speculate on a return to the nuclear arms race requiring a stockpile larger than START-I size. [page S-10]

The use of the word "speculation" here (and on the part of DOE officials at the hearing held in Livermore) is meant to be pejorative and dismissive. To my knowledge, no one asked DOE to "speculate" and DOE has not pointed to any comments that used that word.

1/40.07 continued

Instead, scoping comments (including my own) asked DOE to "consider," "investigate," "study," "analyze," and "plan" for the sort of reduction in nuclear arms that the US government promised, and is legally bound to negotiate, in Article VI of the Non-Proliferation Treaty (NPT). I'm sure our NPT partners would be interested to learn that it is "speculation" and "beyond the bounds of a reasonably foreseeable future" to consider actually meeting the obligations that the United States undertook at the extension conference in April 1995.

A derisive comment cannot substitute for analysis and argumentation. As DOE well knows, many people—including many that DOE would consider knowledgeable and expert in these matters—are considering how, in concrete terms, the world might move toward the abolition of nuclear weapons worldwide. It is clearly not unreasonable for DOE to examine how the weapons complex might accommodate that movement while keeping the stockpile "safe" and "reliable" until it is dismantled

3/40.60

It should not be necessary to repeat scoping comments here. But I would refer you to those of the Western States Legal Foundation and also to those that I submitted. I urge DOE to look at them again and retract its pejorative dismissal of their content. It should withdraw this PEIS and redo it with a reasonable array of options, including one or more "zero level" options.

The other linguistic trick of the quoted paragraph above is to equate "speculation" about reducing nuclear arms with speculation about increasing them under a renewed arms race. It takes "a return to the nuclear arms race" as an exterior event in which DOE would respond, rather than as something it would participate in and could precipitate. It wrongly presupposes that the arms race has ended and that nothing proposed in the Stockpile Stewardship and Management Program (SS&M) would continue it.

1/40.07 continued

In fact, as will be discussed below, proposed SS&M facilities would contribute to increased weapons research and development—the driving force behind the arms race. The PEIS is silent on this important issue; it fails to address the relationship between the SS&M program and future advances in weapons technology.

Long-Term Effects

As discussed later in these comments, the facilities of the SS&M program will be used for nuclear weapon design and, inevitably, for the development of new weapons. This activity will have long-term effects—on the environment, on future problems that might confront the United States and available policy options, on the social arrangements we must make to contend with continued nuclear development and proliferation, on the future costs of indefinitely maintaining the nuclear weapons establishment on education, health care, and social services, on the possibility of successfully achieving a nonproliferation regime, and so on. The PEIS fails to address any of them.

Consider here just the issue of proliferation. A new generation of advanced design facilities is likely to yield, in time, a new generation of advanced weapons. Eventually these inventions and refinements of weapons technology will proliferate and come back to target our children and grandchildren.

There is dispute over exactly what refinements and inventions might come out of the SS&M program—whether, for example, NIF can provide a pathway to fusion-only weapons and other profound breakthroughs. But there should be no dispute that NIF and the other proposed facilities will open design possibilities that were previously closed.

One set of easily predicable outcomes is that weapons designs will:

- Become smaller,
- Become simpler to build, and
- Permit greater specialization.

These developments are almost inherent in technological practice, especially as new diagnostic tools come into the hands of the practitioners. Computer technology provides perhaps the most dramatic examples of these developments, but they're also evident in other technologies—internal combustion engines, radios, electric motors, telephones, and so on. One need look no farther than the history of nuclear weapons over the past 50 years.

The possibility of such refinements to weapons design should be especially troubling to those in DOE concerned about proliferation. Smaller weapons are easier to transport and harder to detect. Simplified weapons are easier to produce. Specialized weapons expand the potential, and lower the acceptable threshold, for their use.

4/40.32

Incredibly, however, the PEIS doesn't take proliferation seriously. It seems to take the stance that labeling something secret will keep it secret indefinitely. For example, it says:

> Much of this testing [to assess the safety and reliability of the remaining weapons in the stockpile] is classified and could not lead to proliferation without a breach of security. [page S-19]

But people don't have to steal your secrets to learn what you know. They can observe what you do, work backward from bits and pieces, follow parallel unclassified developments, and so on. All technologies eventually proliferate or become useless as they're superceded by other technologies. DOE would be hard pressed to name one weapons technology—gunpowder, cannons, repeating revolvers, submarines, long-range bombers, cruise missiles—that did not proliferate over time.

Elsewhere, DOE is less self-serving. Its December 19, 1995, report, *The National Ignition Facility and the Issue of Nonproliferation*, more correctly calls classification "a temporary stop-gap" [page 31] while still offering it as a way of managing the problem. That report is included by reference in the Project-Specific Analysis (PSA) on NIF, Appendix I, and its conclusions are repeated:

> (1) the technical proliferation concerns at NIF are manageable and therefore can be made acceptable, and (2) NIF can contribute positively to U.S. arms control and nonproliferation goals. [pages I-5 and I-6]

5/21.17

However, managing a concern about proliferation is not by any means the same as preventing it. And the only way that NIF contributes to U.S. nonproliferation goals is by making the test ban acceptable to the U.S. weapons establishment; it does nothing concrete to advance nonproliferation.

DOE's stubborn myopia and its lack of interest in the processes of proliferation are staggering, especially for an agency that's in the business of inventing the tools of mass destruction.

Enhanced Experimental Capability

6/40.36

The principal proposal of the SS&M program is to build a new generation of nuclear weapons facilities. These facilities provide "enhanced experimental capability" [page S-18], but what activities do they support? DOE would have us understand them in the context that the PEIS succinctly summarizes as follows:

> The United States has halted the development and production of new design nuclear weapons. The experimental testing program will be used to assess the safety and reliability of the nuclear weapons in the remaining stockpile. [page S-19]

Pronouncements like these have led many people to believe that the SS&M program is a change in the mission of the weapons establishment, that weapons design has ended and all future efforts are directed at keeping existing weapons reliably safe.

1/40.07 continued

However, an examination of the proposal leads to the opposite conclusion—that the stated focus on the "safety and reliability" of remaining weapons is misleading and that the design, development, and production of new weapons is very much on the agenda.

1/40.07 continued

A weapons-design program. First, it's important to look at what the new facilities are and to examine them in the overall context of the weapons complex. Stockpile stewardship centers on the Accelerated Strategic Computing Initiative (ASCI), which will provide the computing power for advanced nuclear weapons models, and on new experimental capabilities that will help refine and validate those models.

> Without nuclear testing, science-based stockpile stewardship will focus on obtaining the more accurate scientific and experimental data that will be needed for more accurate computer simulations of nuclear performance. [page S-16]

As others have pointed out, there has been a qualitative change in scientific practice over the past few years, aided by the advent of fast computers with ample storage capacity. The trend is away from full-scale experiments (like underground explosions) and toward information-based modeling supported by precise experimentation to test and supply data for critical parts of the model. Genetic modeling in biology is a well-known example, as are models in astronomy, climatology, and physical oceanography. In "weapons science," advanced models running on ASCI computers will provide the test beds for future weapons experimentation and development. As Vladimir Iakamets has said, "informational testing" will replace "underground testing."

The new generation of weapons facilities fits this paradigm perfectly. They're intended, at great cost, to produce the precise parameterized data that's needed to refine and test the models. As the PEIS says, they "provide experimental data that can be used to adjust (normalize) the computational models in conjunction with past nuclear test data" [page S-18].

For example, the new Dual-Axis Radiographic Hydrodynamic Test Facility (DARHT) at Los Alamos National Laboratory will "enable two radiographic images to be captured simultaneously or sequentially" and will thus permit weapons scientists "to perform three dimensional diagnostics of a simulated nuclear weapon primary" [page S-27]. Existing test facilities, used to design all weapons now in the stockpile, capture only one image of a surrogate primary during a test implosion, and therefore don't allow three-dimensional diagnostics.

The centerpiece of the SS&M program, the National Ignition Facility (NIF), will isolate thermonuclear explosions in the laboratory. Previously, the fusion physics of an H-bomb could be studied only by exploding a weapon underground. The fusion reaction would occur in an environment created by the high explosive that set the bomb off, the fission primary that triggers the fusion secondary, the boost to the fission explosion, the transport of x-ray radiation from the primary to the secondary, the imploding tamper that compresses the fusion fuel, and so on. In this environment, it's very difficult to isolate and focus on the fusion itself, especially when the explosion immediately destroys the instruments that are being used to gather the data.

With NIF, however, weapons researchers can isolate the fusion reaction and take it out of the noisy environment of a bomb blast. They can gather specific sorts of data unavailable from test explosions. Experiments can be focused and replicated, many more of them can be conducted in a shorter period of time. So, in many ways, NIF is an advance over underground tests.

It's somewhat disingenuous, therefore, for DOE to present this enhanced experimental capability as a poor substitute for nuclear testing. Although underground tests might still be useful, they belong to the old paradigm; the weapons designers can do without them.

It's also misleading for the PEIS to talk only of how these facilities will be used to "assess the safety and reliability of the nuclear weapon in the remaining stockpile." It's clear that what is taking place is a paradigm shift in the way "weapons science" is conducted. The ability to design new nuclear

1/40.07 continued

weapons is not being lost, but in many ways is being enhanced. It's impossible, therefore, not to conclude that stockpile stewardship is, in large part, the infrastructure for a weapons-design program.

Unchanged mission. Second, although current policy may prohibit "the development and production of new design nuclear weapons," it doesn't prohibit their design. Weapons researchers at the laboratories will continue their efforts to invent new nuclear devices. The new designs will be informed by and tested against the computer models, and the models will be validated and refined by the new experimental capabilities. Although a test ban treaty would prevent full-scale prototypes from being exploded underground, hardware components of the new designs may also be built and tested. All that current policy prevents is "development"—turning these designs into production models.

Thus, despite the new language that DOE employs, the mission of the nuclear weapons complex hasn't changed. It's the same mission as before with, at most, its tail cut off. The driving force of weapons development—weapons research—is not only in place, but strengthened under stockpile stewardship.

It's interesting to contemplate what the United States would do if some other country—India perhaps, or Sudan, or China—announced that it was investing billions in facilities for nuclear weapons design, but that it would not actually construct the new weapons. This country would not be reassured by the policy proclamation; it would view the planned facilities for what they inherently were, and would evaluate them as such. We—and the PEIS—should similarly evaluate the facilities of the SS&M program.

New design weapons. Third, there is reason to disbelieve the claim that "the development and production of new design nuclear weapons" has ended. The language of this claim is important: DOE says that it won't produce "new design weapons," not that it won't put any new weapon designs into production. In fact, much of the SS&M program rests on the twin justifications that safety and reliability concerns may force some redesign of weapons in the stockpile and that aging weapons can't be replaced with identical designs (due, for example, to the unavailability of original materials). If engineering changes to the stockpile were not contemplated, there would be no reason for most of the SS&M program.

What then, is the difference between a "new design weapon" and a new weapon design? The PEIS, is silent on this issue. Although it says, for example, that during the 1980s "the production of new design weapons" replaced "dismantled weapons nearly one for one" [page S-12], it doesn't say what distinguishes the new designs of the 1980s from the new weapons (but presumably not new designs) of the 1990s and beyond.

When asked to explain the difference in concrete terms focusing on weapons capabilities, Steve Guidice said that "we are not developing and producing new design weapons, meaning there are no mark numbers like the last weapon we put into the stockpile was the W-88, so there's no W-89 or W-90 planned to be developed or produced" [April 11, 1996, hearing, evening session, pages 25-6 of the transcript] and that "there are no new mark numbers, as happened, as been continuous for the last four decades, of new mark weapons -- new design weapons being generated to replace old ones. We're sticking with the same basic set." [page 27] In other words, when a new weapon replaced an old one, former practice was to assign it a new number. Current practice is to reuse the old numbers. This is a bookkeeping difference, not a real one.

The recent decision to introduce a redesigned B-61 weapon into the stockpile may be a case in point. The new B-61 will have an earth-penetrating capability that the old weapon lacked.

1/40.07
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The PEIS ought to be forthright on this point and spell out exactly—concretely in terms of weapons capabilities—what kinds of changes to the stockpile are permitted under the "no new design weapons" policy.

Changing the policy. Fourth, even if we take the DOE at its word and accept that the "United States has halted the development and production of new design nuclear weapons," and further accept that there is no intention to change this policy (despite continued weapons design), it still remains a matter of policy. Administrations change; conditions change; policies change. The ban on new design weapons is not a permanent part of the SS&M facilities. In the absence of international agreements and guarantees, only capabilities count.

Furthermore, the SS&M program will sow the seeds for a change of policy. It will generate the very conditions that will argue strongly for putting new design weapons in the stockpile, and it will do so on several fronts:

- For example, the very justification that's now used for NIF—that it's needed to attract and retain the best minds—will likely resurface later to argue for renewed development and production. At first, NIF may attract some people to weapons work, but over time, as "weapons science" advances and weapons inventions accumulate, weapons designers will want to see the results of their work come to fruition in the stockpile. Experience with high tech companies shows that the most talented people don't stick around if the product never goes out the door. As long as the product remains nuclear weapons, organizational pressures will build to carry the product cycle through to completion.

  In other words, the SS&M program will generate an *organizational imperative* for the development and production of new design weapons. This follows from the fact that DOE has not changed the mission of the nuclear weapons complex, but contemplates a curtailment at the production end only. If the mission were true stewardship (keeping weapons safe until they can be dismantled under international agreement), competent personnel could be found and retained for that mission.

- Moreover, new weapons designs will make current weapons "obsolete." The new designs may be more cost-efficient to produce and maintain, they may be better adapted to some supposed war scenario, or they may just be smaller and produce a more "reliable" explosion. As "weapons science" advances, so will weapons design.

  The existence of these new possibilities will generate arguments for their inclusion in the stockpile on technological grounds—as "better" weapons. Why should you drive a 20-year-old gas guzzler, when you can have efficient modern car—and in fact have already paid for most of it? Thus, the SS&M program will generate a *technical imperative* for a change in policy.

- Over time, the inventions and ideas of the SS&M weaponeers will surely proliferate. Moreover, proliferation is aided by DOE's promotion of internal confinement fusion abroad and as a dual-use technology—for both weapons and energy research.

  As the inventions of the weaponeers find their way into the hands of others, we will begin to hear arguments that the US must put the new designs in the stockpile before someone else beats us to it, or as a counter to the technological developments of some other country. So the SS&M program will generate a *competitive imperative* for a change in policy.

1/40.07
continued

- The amount of money that will be spent on the nuclear weapons complex will eventually argue for a better payoff on the investment. Why should we invest billions in state-of the-art facilities and settle for 25-year old designs? Thus, in order to justify itself, the SS&M program will generate a *political imperative* for a change in policy. This may be the first argument we hear, before the new facilities are finished.

Any long-term evaluation of the SS&M program must come to grips with the fact that it not only puts into place the infrastructure for a new round of weapons research and development, but that it also undermines any policies that would seek to prevent their addition to the stockpile.

7/21.01

Purpose and Need for the National Ignition Facility

The PEIS is charged with justifying the National Ignition Facility (NIF) as part of a stockpile stewardship program whose purpose is "to ensure the continued safety and reliability of the remaining nuclear weapons and to preserve the core intellectual and technical competencies of the United States in nuclear weapons in the absence of nuclear testing" [page I-S1]. It attempts to do so mainly in Appendix I. The argumentation is obscured in the draft, but seems to follows these steps:

1 The PEIS posits that because the policy of nuclear deterrence has not changed, DOE's responsibilities for "safety and reliability" haven't either:

> [N]uclear deterrence will continue to be an important element of the U.S. national security posture. Thus, DOE's responsibilities for ensuring the safety and reliability of the Nation's nuclear stockpile and for maintaining expertise in nuclear weapons generally will continue for the foreseeable future. [page I-5]

2 It derives the need for a new science-based stockpile stewardship program from the unavailability of full-scale nuclear tests:

> [T]he size of the Nation's nuclear stockpile is being considerably reduced, and the Nation has halted all nuclear weapons testing. Consequently, DOE has been directed . . . to establish a stockpile stewardship program to ensure the continued safety and reliability of the remaining nuclear weapons and to preserve the core intellectual and technical competencies of the United States in nuclear weapons in the absence of nuclear testing. [page I-S1]

3 It next bases the stockpile stewardship program on computer modeling supported by experimentation:

> Building on existing capabilities, the DOE science-based stockpile stewardship program includes an accelerated strategic computing initiative and several new experimental facilities that . . . provide the data needed to verify the models and help assess specific problems that arise. The stewardship program consists of three major components that are used to evaluate stockpile surveillance data: (1) experimental capabilities and facilities, (2) scientific evaluation by competent scientists of the information from the experimental capabilities and facilities, and (3) validation of the computer models using the accelerated strategic computing initiative. These

three components lead to the development of a corrective action to resolve the identified problem. [page I-6]

4 It then requires the models to cover all aspects of nuclear weapons performance, not just the effects of aging or specific safety and reliability concerns as weapons remain protected in a quiescent state:

> Because nuclear tests would not be available, more sophisticated and comprehensive computer models would be needed to conduct essential evaluations. For confidence to be established in these new models, experimental facilities must be able to provide data on all processes in the relevant physical regimes that occur in weapons. [page I-6]

5 Finally, it lists the ways that NIF experiments might help provide data concerning weapons performance (section 1.2.2.3).

7/21.01 continued

This chain has a number of weak links. Before examining them, it should be noted that the PEIS does not claim that NIF is needed to ensure the "safety" of weapons in the stockpile. Only "reliability" is mentioned. The claim is only that without NIF, "DOE would lack the ability to evaluate some significant reliability issues, which could adversely affect confidence in the Nation's nuclear deterrent" [page S-27].

First, at step 1, the PEIS presents no rationale for the link between deterrence and the particular standards of reliability that DOE employs. If deterrence is the threat of a retaliatory second strike, how closely a weapon in the stockpile adheres to a precise performance profile would probably not matter much. Even considerable deviation from the profile wouldn't affect its ability to deter a first strike. In other forums, DOE has admitted that the reliability concern with, say, a replacement material is not whether the weapon would perform at all, but with the precise calibration of yield and other performance factors. It's necessary to bring all arguments for NIF back to deterrence, not just to some arbitrary and unstated reliability standard.

6/40.36 continued

Second, the argument at step 2—that new facilities are needed to "to ensure the continued safety and reliability of the remaining nuclear weapons . . . in the absence of nuclear testing"—can only be substantiated by showing that there aren't other means available to do the job. This demonstration could begin by recounting how underground tests were formerly used to do it. (In fact, underground tests were used for design purposes, as the new facilities will be.)

Third, between steps 3 and 4 there's a leap from experimental facilities that "are used to evaluate stockpile surveillance data" to those that "must be able to provide data on all processes in the relevant physical regimes that occur in weapons" explosions. The PEIS should explain why experimentation should not be limited to the particular areas where "safety" and "reliability" concerns arise. On the other hand, it's clear why "all processes in the relevant physical regimes" must be covered by models used to design new weapon types.

7/21.01 continued

Fourth, the discussion of the kinds of information that NIF research would provide (step 5) fails to explore whether there are alternative routes to the same information. NIF can do it, but is it really needed for this purpose?

Fifth, with one exception, the examples given for NIF experiments are concerned with the basic processes of weapons performance, not with any discernible reliability issue. A later statement that these "processes are very important in assessing a weapon's reliability" [page I-8] is not an argument, but an unsubstantiated claim.

7/21.01 continued

Sixth, the one example that's presented to show that "NIF would also play a role in evaluating specific problems that arise in the stockpile" [page I-8] is seriously deficient. The example is of a material, a glue, that has changed composition with age. To determine whether the opacity of the glue has been affected "it may be necessary to put some of the changed material into a NIF target, raise its temperature and pressure to near those that would occur when the weapon is exploded, and measure its opacity" [page I-8]. Those measurements would be used to refine the model, and the model would then be used to re-evaluate the performance characteristics of the weapon.

It's unclear, first of all, how necessary the NIF experiment really is. Are there other ways to correct the problem—such as rebuilding the weapon with newer glue? It's also unclear how severe such problems might be. How does the indeterminacy that results from aging affect the deterrent posture that "reliability" is meant to support? In other words, could we live with the indeterminacy and still maintain deterrence?

The PEIS, thus, not only fails to convince, it demonstrates how irrelevant NIF is to the central stockpile stewardship concern of "safety" and how marginal it is even to "reliability."

8/21.15

At the same time, it shows that NIF would probably have a major role to play in continued weapons research and design. However, the PEIS doesn't analyze the impacts of this activity—either long-term or short-term. It must.

I was at the hearings April, 26,1996 about stockpile stewardship. If you want to know why the majority of the people I heard who gave speeches were irate, infuriated by Los Alamos, ready to keep writing letters, suing in legal battles, resisting by non violent protest, even risking their own lives for the future generations to protect themselves and their families from LANL's latest schemes, (30 year war plans/goals whether we have an enemy or not), it is because the scientists in Los Alamos are not making radio parts, they are not a quilting bee, (a guilting bee maybe), or a social organization to end world hunger or help the homeless, (those don't make mega-bucks), LANL is a major cog in the war making machine, a major recipient of the 75% of the U.S. dollar that benefit no one but go into war manufacturers pockets, a hiree of nuclear corporations. The LANL scientists have bought into this nuclear mania and LANL has made a lot of money making bombs. LANL in the cold war mania benefited greatly monetarily, they made astounding amounts of money, for the work they did in making bombs. These bombs effect us all personally! They can cause us to fear, to get sick, to watch our children die of emissions/plutonium pollution/wastes, they can cause us to die in nuclear war, nuclear winter, nuclear fallout and nuclear testing fallout, they can destroy the world 2 3 times over and Russia could destroy the world 2 times over... that's 5 times the amount of bombs we ever needed! That is why people feel the nuclear issue is entirely a problem, not a solution and has never been anything but a problem for mankind at this stage of evolution and the world's people often feel they can bear it no more. If DOE's and LANL's over protective wives and scientists, confused at the vehement reaction to their way of getting "bread and butter" (bombs and butter) and are wondering what all the fuss is about and how we could ever say such "not nice things" to such nice, nice scientists, that is why! These

1/40.72

2/40.50

two world views, whole different worlds it seems, are not on different planets! "Through the clash of differing opinions the spark of truth arises." (Baha'i paraphrase.) The point is if any one of us is not sincere, avoiding the truth, nursing big time cases of running denial, I would first see who it might possibly be, (I wonder, I wonder, who could possibly have a vested interest, DOE/LANL's well paid scientists or mothers and fathers, citizens and laymen protecting their children from nuclear catastrophes.)

LANL is asking New Mexicans to welcome with open arms the agonized and screaming with guilt broken and run out of town, infamous, catastrophic failures of all the riff raff dirty and outlawed, (the outlawed and the outlaws to boot), nuclear projects that absolutely NO STATE OR NO PERSON WANTS ANYMORE! No one in their right mind wants nuclear production, (which makes you wonder if LANL IS in their right mind), in their back yard! It's the end of nuclear production, the cold war is over, the nuclear waste has caused untold U.S. casualties and suffering, every knowledgeable citizen is at the emotional breaking point, people are getting hysterical, they can't and feel like they won't take this hideous affront to our lives anymore. The whole planet is at this point! The whole planet is sick of nuclear madness and will arise as one body to say no! Nuclear production is over, LANL just doesn't know it yet! Years ago the LANL was told by the government to change over to peace time occupations...they didn't listen. THE FIRE/NEAR MELTDOWN THAT RECENTLY THREATENED LANL WAS GOD'S/NATURE'S WAY OF SAYING YOU WILL BE DESTROYED BECAUSE YOU ARE NOT IN HARMONY WITH THE PLANET'S BLOOMING/UNFOLDING/PLAN. DID LANL HEED THIS WARNING OR WILL THEY SHRUG IT OFF? Heck! They have not heeded warnings that what they were doing could destroy civilization as we know it, annihilate the human race and all life on earth and still insist that they are saving us! (Balony!) In spite of the

1/40.72 continued

3/43.18

fact that it is not legally supposed to be impossible to sue DOE they have been sued and are in a myriad of lawsuits, they have been literally run out on the rail in disgrace everywhere they have operated. Rocky Flats won 35 million in damages for the outrage that DOE perpetuated on their town. Rocky Flats was shut down in disgrace and run out of town practically tar and feathered or worse. How dare LANL bring all that horror to us! The health costs to the children in Rocky Flats have no monetary price and you can not bring back dead children from the grave! DOE has no shame!

1/40.72 continued

After all New Mexicans have been through, even if I believed we needed more weapons, and I DO NOT, with nuclear problems and fall out and waste, with Sandia the stockholder for the most nuclear weapons, with WIPP slated for the first major joke of a convenient rug to hide waste under so they can weasel out of the numerous lawsuits and angry contaminees, with all the Indian pueblos on or near uranium mines and uranium run off (and not to mention all the Indian children getting groin cancer and living in uranium trailings, <u>and not one person in Washington or LANL has ever showed a shred of concern and not one person).</u> DOE or any nuclear corporation blinks an eye as they designate New Mexico as the convenient Nuclear center for all nuclear projects, the nuclear sacrifice zone, no one protests that a whole state is now to be sacrificed for "national Security", forget the money, they seem to be crying over the money and ignoring the screams of children in hospitals dying of cancer!)

2/40.50 continued

That we have to bear this hideous nuclear anomaly, like a horrible mutated hump on our back, a horrible malignant cancerous growth on our once enchanted and fair face is an outrage! I say NO to LANL stockpile stewardship just as all the other states now all say no! NO ONE WANTS THE NUCLEAR WASTE, NO ONE WANTS TO DEAL WITH IT FOR 240,000 YEARS, IT MAKES ALL THE SENSE IN THE WORLD TO STOP MAKING THE DARNED, DEMONIC (lack

4/40.15

of good purpose, ill intentioned), ANTI-HUMAN STUFF! With all the nuclear problems we have already, to be burdened with weapons production is adding <u>contamination on top of contamination</u>, never bothering to clean up the nuclear nightmare before piling more nuclear stockpiles on top of us. IT'S AN OUTRAGE!

4/40.15 continued

(Never bothering to comply with international treaties signed by the president himself and backed by all nations of goodwill.)

5/40.07

The fact that LANL fired and laid off the Tiger Team (who I heard speaking their outrage at the LANL stockpile stewardship hearings), rejecting their expert work to troubleshoot LANL problems of which they were at first hired for, found 700 problems and were therefore considered whistle blowers and fired! IT IS AN OUTRAGE TO MY SENSIBILITIES THAT THE TIGER TEAM AND THE CLEAN UP TEAM WAS FIRED, THAT THERE IS ALL THIS MONEY, THE MONEY THAT COULD HEAL OUR GAPING AND SUCKING NATIONAL DEFICIT, TO PRODUCE MORE BOMBS WHEN EVEN ONE IS AN OUTRAGE TO ALL THAT IS HOLY AND GOOD AND A DETRIMENT TO ALL LIFE, AND NO MONEY IS SLATED FOR CLEAN UP, SAFETY OR TROUBLESHOOTING. THIS TESTIMONY FROM THE OUSTED TOP EXPERT WORKERS <u>WHO ARE ACCOUNTABLE</u> IS HEARTBREAKING FOR NEW MEXICO.

1/40.72 continued

We have been completely betrayed! Never once can the 2,000 known leaking waste dumps be cleaned! NOW THE 2,000 DUMPSITES ARE NOT THERE SCIENTISTS AT LANL SAY! I GUESS IF THEY ARE LEFT IN PAPER BAGS FOR A FEW MONTHS THE PLUTONIUM MAGICALLY DISAPPEARS INTO THE GROUND! OUT OF SIGHT, OUT OF MIND IS DOE'S/LANL'S MOTTO! I GUESS PLUTONIUM CONTAMINATING OUR WATER SUPPLY ISN'T SUCH A BIG DEAL TO THEM! WHAT NONSENSE! WHAT A PERFECT CRIME! The horrible truth is evident to me: LANL and DOE know that plutonium, a substance that has no known way to dissolve, lasts 240,000 years before it starts to break down, has a charge/ray so powerfull that the human body runs on about 5 % of it's energy and it puts out rays hundreds of times more

4/40.15 continued

powerful than the amount it takes to run a human body, a ray that bombards passing cars with rays that knock out human genes, as the truck passes you get the equivalent of hundreds of x-rays while you sit at a stop light BY A NUCLEAR WASTEBEARING TRUCK, a substance that erodes 2 feet of concrete every 3 to 50 years, that erodes metal drums every few years and needs to be recontained, (that put into a hole at WIPP to let the containers erode into salt and get liquified by underground aquifers and swept into the Rio Grande and on to Mexio is a indicent, detrimental and ignorant as an idea can ever get), that mimics iodine and goes into the thyroid causing thyroid cancer, that mimics calcium and gets into the bones to cause leukemia, that mutates the genes of the young girls and pregnant mothers,our mothers and daughters, the carriers of the genetic content that makes the human body, the blue print to human beings, (they are holy and need protecting, they should be cherished, honored, beolved!), mutating the gene pool for generations to come, that effects children more than any adult because they are so young and vulnerable, that is invisable but gets into the invironment, comes down with the rain, becomes part of the natural cycles, becomes apart of every day life, never biodegrading and so causing disease for 240,000 years, messing up generation after generation! The native Americans say we should take care of 7 generations and not do anything that affects that far ahead. Who can see 240,000 years into the future? Who can monitor this waste for that long? How can we pass this nuclear burdon onto our children? Here, you have no life now. YOUR LIFE IS TO SIT ON THIS STUFF AND KEEP IT OUT OF THE HANDS OF TERRORISTS, TO RECONTAIN IT EVERY FEW YEARS, TO DIE OF ACCIDENTS AND DISASTERS AS IT GOES OUT OF CONTROL IN WILDFIRES AND GETS LOOSE IN EARTHQUAKES AND LOOSE LIVES DUE TO HUMAN ERROR. Some people say there has to evolve a brotherhood of nuclear guardian

angels, men and women are needed to devote their entire lives to guarding this stuff and tending to it. You and all your relatives need to sit and watch this nuclear waste for 240,000 years! The outrage comes in DOE's irresponsibility of caring for plutonium/nuclear fallout. Not only are they going to let this lethal dose upon mankind, it is being premeditated, lot's of people like me have expressed outrage and horror at what they are doing right now and if they put the waste in the ground or burn it off into the air you might as well kiss the United States Of America, the land of the free, good bye because we will have been poisoned from within! Slowely but surely we will all die! RADIATION HAS TO BE CONTAINED AND RECONTAINED DILIGENTLY AS LONG AS IT TAKES, ABOVE GROUND, EASILY ACCESSIBLE, NEAR THE SITES THAT CREATED IT, UNTIL A WAY IS FOUND TO REDUCE IT THAT DOES NOT PRODUCE EMMISSIONS EITHER,WHICH MAY BE NEVER! The point here is that we will accept nothing less than 100% accountability for nuclear waste containment and 100% non emmision policies! But the outrage comes from the tossing the HOT wastes to the 4 winds and into the nations water supplies, like an old toy! CLEANING NUCLEAR WASTE WILL WIN A FEW PORK BARRELS, A FEW BILLIONS, BUT IF THERE IS NO MORE BOMBS TO MAKE, REMAKE (Bombs=Mega bucks), PERFECT and perfect, make and remake, drain the nationl budget and go for broke remaking more perfect bombs after the old bombs are taken apart! IT IS ONLY THE PERFECT BOMBS THAT MAKE MONEY, IF IT IS OF HUMAN INTEREST, SAFETY OR NATIONAL SUCURITY IN HUMAN ARENAS, IF IT MAKES NO MONEY, THAN IT IS OF NO INTEREST. NUCLEAR CLEAN UP DOES NOT MAKE MEGA BUCKS, SO NUCLEAR CLEAN UP IS ABANDONED. I'VE HEARD OF IRRESPONSIBLE, CHILDISH IMMATURE, INFANTILE, MATURITY CHALLENGED, (THESE ARE THE NICE WORDS, WORDS LIKE SCOUNDRELS, PSYCHOPATHIC, INSANE, IMMORAL COME TO MIND), OUT OF TOUCH WITH REALITY PEOPLE, BUT THIS TAKES THE CAKE! RATHER THAN DEAL

4/40.15
continued

4/40.15 continued

WITH A SUBSTANCE THAT IS, UNLIKE ANY OTHER KIND OF POISON, HOT/EXTREMELY DANGEROUS FOR 240,000 YEARS, AND IS THE MOST DESTRUCTIVE ELEMENT TO THE HUMAN RACE OF ANY POISON, (IT BEING SAID A POUND OF PLUTONIUM COULD DESTROY THE HUMAN RACE), AND NOT SAID LIGHTLY, THE DOE TOOK NO RESPONSIBILITY FOR IT'S(plutonium's) EXISTENCE, WENT INTO DENIAL, WENT WEAK IN THE MORAL KNEES AND WAS SEDUCED INTO THE ARMS OF MULTI-MILLIONS, AND ZONED OUT ON STATISTICS, CHARTS AND MENTAL EQUATIONS, FOLLOWING THE ELUSIVE "PERFECT WEAPON" INTO LA LA LAND. SO THE SAYING FITS LOS ALAMOS NATIONAL LABS PERFECTLY/TRAGICALLY,"Deniel is not a river in Egypt."

It is totally unacceptable that New Mexicans be burdened with weapons production. It make me sick to think of the contamination we have suffered already. I can tell you right now that the workers in LANL are not the only people in total denial. Many people have bought the lie, hook line and sinker that LANL is pristine, sanctified, above question, clean, etc., etc....mostly the 1/3 of the population here who hold jobs in the LANL, but I can tell you these people are in the majority now. I have been to every nuclear hearing I could possibly get to for the last 20 years! I am a good, decent, citizen exercising my democratic rights, of course. I have trunks full of magazine clippings and testimonies I copied. I wish I could die of cancer in ignorant bliss blaming the 240 other contaminants. The difference is, if we are stupid enough to buy cancer causing cigarettes, nitrate laden meat, radiated food, etc. than only we pay the price of our poor consumer choices and die the lonely death of the stupid. If any person who lives next to factories of any kind dies of toxins and waste dumps that is a tragedy/blood on the hands of negligent factory owners who would rather get money than take responsibility for running non polluting factories, (the

pollution stopping devices are a loss of profits), the planet is getting an extra unbearable burden of toxins which is totally inexcusable but only those people next to the pollution die. The culmination of negligent humans, billions strong, polluting, wasting, killing and decimating nature for profit, collectively add up to planetary death too, but if we snap and stop, the pollution will clean, the rivers will heal (as has been seen in the great lakes, the animals return and repopulate, if not extinct), oh no.....but not radiation, ONCE MADE it has to be watched and contained for 240,000 years, once released into the environment it goes on for 240,000 years taking it's toll on life and mutating our genes! LOW LEVEL PLUTONIUM WILL NOT MAKE YOU DROP DEAD, YOU CAN GET IT ON YOUR ARM AND IT WILL NOT BURN YOU IF YOU WASH IT OFF RIGHT AWAY, IT IS MORE LIKE A POWERFUL RAY THAT CONTINUALLY KNOCKS OUR GENES OUT OF PLACE. WHAT A WEIRD AND TERRIFYING POISON! If it gets into your body, it will take 5-15 years to turn into cancer but like the first atomic explosion observers, the Hiroshima survivors, etc., etc., etc., etc...it inevitably comes. IT IS WELL DOCUMENTED WHAT HAPPENS TO HUMAN BEINGS WHO ARE CONTAMINATED BY NUCLEAR RADIATION. In the prime of your life you nevertheless will be cut down with an excruciating cancer that is as predictable as the sun rising, unless you get drastic cleansing like fasting and special food treatments, the plutonium could be flushed from your thyroid or organs deep inside your fat, (fat stores toxins), your tissues and your bones, even the cancers stopped and remised but the mutated genes will not be able to be repaired by genetic experts (or all the kings horses) who have no business meddling with the human gene pool either, making everything even worse! PLUTONIUM THEREFORE, IS SAID TO BE THE WORST POISON ON EARTH! WE HAVE NO BUSINESS MAKING IT, SELLING IT OR RELEASING IT INTO THE ATMOSPHERE.

Technology has no answers, humans cannot deal with plutonium and most people I know say NO to making more of this plutonium, no one yet on earth knows what to do with! I SAY NO TO THE MINDLESS PRODUCTION OF MORE PLUTONIUM, THROUGH NUCLEAR POWER PLANTS (CHERNOBLY, 3 MILE ISLAND) OR NUCLEAR WEAPONS PRODUCTION! NUCLEAR POWER PLANTS ARE UTTERLY AND TOTALLY CORRUPT AND EVIL TO THE CORE AS THEY USE THE INNOCENCE OF MAKING ELECTRICITY TO GENERATE PLUTONIUM THAT IS MADE FOR BOMBS! NUCLEAR POWER PLANTS SACRIFICE THE HEALTH OF THOSE CLOSEST TO THEM, MUTATE THE BABIES, ETC, AND CAUSE UNTOLD HUMAN HORROR! IS THAT THE WAY WE TREAT OUR FELLOW HUMAN BEINGS? DOE AND LANL NOT ONLY TAKE ADVANTAGE OF HUMAN NAIVETÉ, TRUST IN THE GOVERNMENT AND INNOCENCE/APATHY/OVERWHELMED BY SURVIVAL BUSINESS, BUT THEY SPEND MILLIONS OF DOLLARS ON BRAINWASHING, ADVERTISING AND PROPAGANDA TO PULL THE WOOL OVER THE PEOPLE'S EYES ABOUT THE HORRIFIC NATURE OF THE COMBINATION OF ANY FUSION PROCESS THAT ALWAYS RESULTS IN PLUTONIUM, THAT ALWAYS RESULTS IN ESCAPING NUCLEAR PARTICLES, THAT IS STORED IN ASTRONOMICAL AMOUNTS, STAGGERING AMOUNTS, THAT ARE RIGHT NOW IN DANGER OF SOME CARELESS HANDLING THAT WILL AUGMENT THE ALREADY MASSIVE CONTAMINATION PROBLEMS (AND STILL LANL HAS NO CONCERN FOR WHAT THEIR HANDS HAVE WROUGHT BUT CAN ONLY CHASE THEIR "PERFECT" BOMBS STRAIGHT INTO THE PITS OF HELL AND TAKE US ALL WITH THEM IF THEY COULD) Why can't LANL find a way to make a living that doesn't emit plutonium as it's by product! Is that too much to ask of human beings! Live and let live does not include plutonium! Say no to PLUTONIUM! I am not sorry AT ALL if LANL sell out's of humanity for money scientists loose their jobs. I could be sorrier for common crooks who loose their job's stealing and drug smuggling when they get put in jail! LANL knows the cold war is over! I HEARD ON PUBLIC RADIO THAT THE PRESIDENT O.K.'d a huge military

budget for the military, comparable to the cold/(hot) war budget even though the cold war is over, just to appease the military and prove that he wasn't too far left in the dove category. Our government approved dangerous and outdated practices and allotted enough money to cure our budget deficit FOR WEAPONS PRODUCTION just to make the military complex happy! THIS IS AN OUTRAGE TO ALL I HOLD SACRED! OUR COUNTRY NEEDS PROGRAMS FOR THE POOR, THE AT RISK, THE MINORITIES, THE REGULAR PEOPLE, THE ALIENATED, THE INNER CITIES, TO ELIMINATE RACISM BEFORE OUR STREETS RUN WITH BLOOD, THE BACK WOODS, LEFT OUT, THE HOMELESS, FOR ENVIRONMENTAL HEALING (OUR LAST UNTOUCHED FOREST , THE LAST 1% OF THE MIGHTY AMERICAN FORESTS IS BEING CUT, 98% OF THE NATURAL FORESTS ARE NOW GONE!), FOR EDUCATION REFORM, FOR HEALTH, FOR ORGANIC AGRICULTURE, FOR GOOD THINGS THAT REAL HUMANS CAN USE AND THE GOVERNMENT BUDGETS ALL THAT MUCH NEEDED MONEY TO THE MILITARY INDUSTRY COMPLEX TO LINE THEIR POCKETS AND GIVE US NOTHING FOR ALL THE HARD EARNED MONEY WE SWEAT AND SLAVE FOR EVERY DAY/THE TAX MONEY WE GENERATE, FOR MULTI BILLION DOLLAR BOMBS THAT ENDANGER NATIONAL PEACE AGREEMENTS. WHAT IS WRONG WITH THIS PICTURE?????

6/40.12

Already I am fairly sure, I and my family have had contact with plutonium/we are contaminated! My children put their hands into the pond, innocently, at Fuller Lodge to play with the ducks! I find out later that is LANL's first nuclear Dump! Couldn't they have put up a sign warning kids not to put their hands in the lake stating the truth that it has plutonium in it? Thier denial made them think the lake clean, their conscience became entrophied from misuse from these first omissions of emissions, that the poison, to them, didn't exist, because they didn't want it to, because the money was so good it some how made the poisons invisible/nonexistent! WHAT LANL DID TO THE CHILDREN IN HIROSHIMA THEY CAN'T SEEM TO HELP DO TO THEIR OWN

1/40.72 continued

CHILDREN WHO'S SUFFERING FROM FATAL CANCERS (THYROD, BONE, BRAIN TUMORS) ARE AMONG THE HIGHEST STATISTICS IN THE UNITED STATES! My children played in the Bandilier River now known to be toxic. Does Bandeliar Park warn children not to play in the rivers? I've drunk water at San Ildifonso Pueblo after a hot day at a sacred dance. San Ildefonso has contaminated water! How terrible! I swam in Bandaliar river and the Rio Grande as a teenager. Now I know these rivers also had radioactive contamination. LANL still insists they are not polluting! The Geiger counters must be broken! Now the river Rio Grande is endangered because of all the pollution! Can you imagine New Mexico without the Rio Grande? All the time I was growing up in New Mexico LANL was burning radiation into the air as a way to get rid of the plutonium! I'll tell you where it went! Right into my and other New Mexican's lungs. Unless we are lucky the wind didn't come near us...we got contaminated! LANL, don't tell me you don't have a nuclear waste problem when I have seen charts warning people worldwide that New Mexico's LANL is one of the worst contaminated sites. If there was no nuclear waste problem, why has LANL been trying to get permits to burn radiation in furnaces all these years! In 1977 the forest fire burned the labs and there may have been releases then. What happened in 1983 to get Geiger counters registering illegal emissions? WHY DID LANL HAVE TENS OF THOUSANDS OF TRUCKLOADS OF WASTE TO GO TO WIPP IF IT HAD NO CONTAMINATION? Why was it so anxious to fill WIPP up and LANL had enough plutonium to fill plenty of space at WIPP and it reserved plenty of room to make more waste! There was even talk of making WIPP just for all the waste LANL was generating! Now when we had the big fire,(1996), they said they took the explosives out as if it fit in a few boxes! What a sham this radiation truth is! I DON'T BUY LANL'S NEW STORY THAT THEY HAVE NO CLEAN UP PROBLEM. IN THESE

FIRES THE GROUND THAT HAS LONG AGO ERODED RADIATION CONTAINERS ALTHOUGH THEY MAY HAVE REMOVED THE EVIDENCE, (THE RUSTED OUT CONTAINERS), THE AREA STILL HOLDS RADIATION, YOU CAN'T MOVE WHOLE MOUNTAINS FULL OF DIRT AND WATER, BUT IT IS THERE AND IT GETS IN THE PLANTS AND IN A FIRE THE RADIATION STILL GETS OUT WHEN THE PLANTS BURN. LITTLE BITS OF RADIATION ARE ALL OVER THE PLACE. CLEAN UP IS JUST A HOPEFUL STATEMENT MEANT TO APPEASE THE PUBLIC. LANL AND DOE HAVE NO INTENTIONS OF SERIOUSLY EVEN TRYING TO CLEAN UP THE AREA AND THEY NOW SAY, AS IF WE CAN FORGET WHAT THEY SAID A YEAR AGO, THAT THEY HAVE NO PROBLEM! I HAVE A PROBLEM WITH LANL SAYING THEY DON'T HAVE A PROBLEM! What about the 2,000 uncleaned dumpsites, workers in the lab reported were in paper bags, cardboard boxes and eroded metal drums? Everyone hates the feeling of secrecy in LANL. WHAT'S REALLY GOING ON? WE WANT TO KNOW! They poison your land, water and air but they are not criminals but heroes defending U.S. from national foes. Yeah right! EVEN IF BOMBS ARE THE CURE ALL FOR ALL OUR INTERNATIONAL ILLS, (eliminating THE NEED FOR TREATIES AND INTERNATIONAL AGREEMENTS, PEACEFUL COEXISTENCE AND UNDERSTANDING THE REAL ISSUES AND PERCEPTIONS), BECAUSE WE CAN SIMPLY NUK THEM /ANYONE TO DEATH IF THEY SO MUCH AS DARE TO NOT BEHAVE), WE HAD TO LIVE KNOWING WE WERE BEING RADIATED! We had to live knowing our children could be radiated! All this time I had to grow up in these beautiful mountains, with all these good hearted and well intentioned Hispanic people, not knowing if the air is clean or foul beyond belief! When you can't even take a clean breath of air isn't there something wrong! No wonder some people go into deep denial, how can we be expected to sanely carry on our normal lives in this insane and abusive constant nuclear contamination? IF YOU NUK US WITH CONTAMINATION WE WON'T BE ABLE TO MAKE MONEY, WE WON'T PAY TAXES AND EVENTUALLY THE BOMB MONEY WILL RUN OUT!

7/40.69

This secrecy is undermining a lot of people's faith in their government. I think if people loose faith that their country is good and well intentioned and has their best interest at heart, personally, every single person no matter what their circumstances, race or economic background OR STATE the government will face an erosion from within that is anarchy at best and a condition that will take revolution/civil wars at worst to straighten. I'll tell you right now people don't take it lightly when they are poisoned, outright poisoned. Why should they? Do you like the thought that we could be facing anarchy as more and more people turn against their own country as it turns against them and their very right to breath a clean breath of air, for heavens sake, what do LANL and DOE expect when they are killing people? THAT LANL AND DOE DON'T ADMIT THAT THEY ARE KILLING PEOPLE DOESN'T MEAN THAT PEOPLE ARE NOT DROPPING LIKE FLIES BY WHAT LANL AND OTHER DOE SITES HAVE DONE TO PEOPLE! IT'S AN OUTRAGE! I wish that I was just being paranoid as some people accuse. I wish I could sleep at night without thinking about what terrible new plans LANL is coming up with now. NOW I KNOW THEIR STOCKPILE STEWARDSHIP PLAN, THEY ARE PROUD OF IT, AND I SAY NO WAY, I hate IT. I HATE THE STOCKPILE STEWARDSHIP PLAN! As if this isn't enough LANL has to come up with excess of 100 deadly and monstrous new nuclear projects! It's too much for my soul to bear! I can't bear being contaminated every day, incidents over and over again go unpunished. We get no relief. There is no end to this pollution. THIS RADIATION NIGHTMARE SEEMS TO GET MORE DEADLY AND SCARY EVERY DAY AS LANL TAKE ON EVER MORE HORRIFIC PROJECTS. LANL CLEARLY WANTS TO MAKE NEW MEXICO THE CENTER FOR ALL RADIATION, WEAPON AND PLUTONIUM RELATED PROJECTS. I FEEL LIKE A VICTIM THAT JUST HAD A DEADLY TAPE WORM SETTLE IN MY HEART. I FEEL LIKE ALL EVIL HAS COME TO SETTLE IN THIS VALLEY. I KNOW THERE IS EVIL ENOUGH IN THIS WORLD TO GO AROUND BUT I FEEL WE

HAVE TAKEN ON MOST OF THE MAJOR EVIL OF THE WORLD. IF WAR IS A SATANIC INSTITUTION (WAR CAN BE A HEALING IF IT IS TOTALLY NECESSARY AND WORLD SANCTIONED BUT AS AN INSTITUTION, A WAY OF LIFE, PERPETUATING WAR'S WHERE NO WARS EXIST, EVIL ON TOP OF EVIL) THEN I FEEL LIKE ALL THE DEVILS IN THE UNITED STATES HAVE DESCENDED ON OUR STATE. WHAT ONCE WAS A RURAL COMMUNITY NOW HAS BECOME A HIGH TECH NIGHTMARE. We now have not a moments peace! I can say I will devote my life to saying no to LANL and DOE's contaminated ideas but what a waste of my artistic and spiritual talents! I can say I will die saying no to weapons of mass destruction but my soul cries out at this prospect. I want to live! I don't want to die defending my air and a healthy environment and I don't want to see anyone die defending the rights and lives of people on this planet! HUMAN RIGHTS ARE GOD GIVEN RIGHTS! How can people pervert and twist the law, Thou Shalt Not Kill to include making weapons of masser destruction without batting an eye? How can they do that! MY WHOLE SOUL CRIES OUT AT THE WASTE OF ALL THIS IDEA OF DEATH! CAN'T WE ALL JUST KILL OUR EGO'S IN THERAPY AND REALIZE THE END OF THE WORLD IS THE END TO CONTROL, FORCE, VIOLENCE AND DISRESPECT FOR LIFE ON EARTH AND IS NOT THE END OF THE PHYSICAL WORLD! Stop trying so hard to make the end of the world prophesy come true. This whole concept is a total misunderstanding. It's just the death of a cycle! The prospect of a life of hearings, you cut off one head and ten spring up, you cut that head off an 100 spring up syndrome is draining! Everyone says DOE and the military problem is too big FOR THE PEOPLE OF THE UNITED STATES TO EFFECTIVELY TACKLE. The government is a practically a military government, not a democracy, if it gives up what is right to appease and pacify big out of control, tyrannical babies. WHO DOES RUN THIS GOVERNMENT, I WONDER, THE MILITARY OR THE PEOPLE, WHO AFTER ALL ARE SUPPOSED TO HAVE THE RIGHT TO LIFE

LIBERTY AND THE PURSUIT OF HAPPINESS. WHAT HAPPENED TO MY RIGHT TO LIVE WHEN I AM DESIGNATED INTO A HUMAN SACRIFICE (TO THE BOMB MAKING MACHINERY), ZONE! ARE YOU SAYING I HAVE NO RIGHTS! YES, I DO HAVE RIGHTS! NEW MEXICO CAN SAY NO TO DRUGS AND NEW MEXICO CAN SAY NO! TO BECOMING THE MILITARY NUCLEAR SACRIFICE ZONE AND NEW MEXICO CAN INSIST ON NOT ACCEPTING ANY HAREBRAINED PROJECT THAT DOESN'T COMPLY WITH EVERY SINGLE SOLITARY ENVIRONMENTAL SECURITY MEASURE THAT 100% GUARANTEES THE HEALTH AND SAFETY OF EVERY SINGLE NEW MEXICAN MAN, WOMEN, CHILD AND EVERY SINGLE SOLITARY FUTURE CHILD. UNTIL THEIR RIGHTS ARE SAFEGUARDED, NOW AND FOREVER, AS LONG AS THE EARTH SHALL EXIST, I WILL NOT BE HAPPY. I WILL NOT ACCEPT COMPROMISES FOR THE FUTURE OF THE BEAUTIFUL AND SPIRITUALLY GIFTED NEW MEXICAN CHILDREN! Whoever says that THEY CAN MAKE UNITED STATES SACRIFICE ZONES (AND WHAT LANL PREPOSSESS WITH THE STOCKPILE STEWARDSHIP PROGRAM DOES MAKE US INTO A SACRIFICE ZONE FOR WASTE AND EMISSIONS), has given up on a government of the people and for the people! That is a terrible and hopeless thing to say! Could the DOE AND LANL and other culprits, knowingly or unknowingly be conspiring in a way, by it's secret ways, that will defeat democracy, by not listening to the people about their outrage at being contaminated by the fallout from nuclear industries everywhere around them? DOE AND LANL would be the first to say we are defending our democracy. They are not listening to the people about not building bombs and nuclear power plants! They can not at the same time prepare for war and negotiate for peace and they cannot at the same time say they are our big brother's (where have I heard that name) protecting us and at the same time contaminate us with no mercy and no regret. Maybe they aren't protecting national interests or international interests or the American people's interests but their own financial interests! This is why

we need international laws to protect us from corporations or governments or militaries, from being contaminated/corrupted beyond hope AND GOING OFF HALF CAULKED, TAKING OVER INNOCENT COUNTRIES, POLLUTING AND ENDANGERING SPECIES, COMMITTING GENOCIDE, OPPRESSING AND ENSLAVING PEOPLE AND DEVELOPING NUCLEAR BOMBS. ANY NATION CAN GO BERSERK, LIKE OUR MILITARY IS RIGHT NOW, IN THE FUTURE ALL WORLD AFFECTING ENVIRONMENTAL AND WAR MAKING EFFORTS WILL BE SCRUTINIZED AND OUTLAWED IF DANGEROUS TO THE WORLD BY THE LAWS ENFORCED BY THE LEAGUE OF NATIONS. RIGHT NOW THE UNITED STATES OF AMERICA NEEDS WORLDWIDE INTERVENTION AND WE SHOULD BE CALLED TO ACCOUNT FOR WHAT LANL PREPOSSESS AND LANL SHOULD BE CONVICTED OF CRIMES AGAINST HUMANITY. I'm here to tell you from everything I see and know, LANL and DOE (with the exception of a few whistle blowers), as regards to upholding any kind of standards on clean and safe facilities, (regardless of any national security issues), is corrupted beyond hope of repair! LANL is like a criminal who cannot stop being a criminal until they realize what they have done is wrong. The prisons are full of prisoners who think they are innocent, it was everyone else's fault, who have no integrity, it was because the women dress was sexy that he killed her.! The labs say because terrorists might get their hands on atomic power or a bad country might make one atom bomb that we must make enough bombs to bomb the earth three times!!!!!! The labs are full of scientists who innocently make bombs of mass destruction who say they hurt no one, are benefiting mankind and have pure and crystalline manna as by products we should go out and catch like bread and honey to feed our babes from the sky and say thank you big brother, thank you! This is another case of hypocrisy! Just like building bombs while we signed treaties not to make bombs is hypocrisy. It is hypocrisy to tell other countries not to build bombs while we build them. "Do what I say, not what I do is the message." People say coal killed people too. I say, "coal killed 1 generation and did not last for 240,000 years! People are saying," stop killing us!" WHAT IS THE USE OF DEFENDING A COUNTRY DESTINED TO DIE FROM CANCERS FROM WITHIN? WHO EVEN WANTS TO TAKE OVER A COUNTRY FULL OF RADIATION FALLOUT THE DEAD AND DYING? WHO WOULD EVEN WANT A CONTAMINATED COUNTRY? What kind of idiots are we to fight over land: our grave? NO ONE WILL EVEN WANT OUR WRETCHED COUNTRY AFTER ALL THAT! WHY PRIDE OURSELVES LIKE AN OLD WITHERED SOCIAL BUTTERFLY/far from the prime of youth THINKS ALL THE MEN ARE AFTER HER? IN A FEW GENERATIONS THE PEOPLE WILL LOOK BACK AT US AND CURSE US. If they weren't so mad they'd laugh at us as pompous fools.

I had to become a women still under nuclear threat and I had to live with the knowledge that my little blooming love nest was being radiated! Every breath could mean death, mutation. This toxic stew was not the result of national security! Even if there was a sane need for more bombs, if we already didn't have enough to destroy the world 3 times sane scientists would have made every effort, every human effort possible to protect us from the fallout, the toxic emissions, the waste! HAZEL O'LEARY OUR GREAT DOE LEADER SEEMS TO HAVE PILFERED THE FILTHY DOE FUNDS, AS IF SHE DOESN'T MAKE ENOUGH MONEY ALREADY! The bald face disregard cannot be hidden under the cloak of national security! Does national security give you the right to kill your own country folk? When do statistics of: so many people are to die from security, turn into real people to love and cherish? When will statistics of so many people have to die to save the rest of the country stop after A WAR IS ENDED AND WE ARE PEACEFULLY NEGOTIATING WITH OUR FORMER ENEMY? The longest path is often from the head to the heart! LANL HAS THAT LONG JOURNEY TO GO AND THEY HAVE NOT STARTED

EVEN WITH THE FIRST BABY STEP! WHAT IS A HEART... THEY AREN'T EVEN ASKING YET!

Friends of mine were jailed stopping the opening of WIPP. Fine people with more love and compassion for humanity in their little fingers than LANL has among every scientist since it's start combined! Wipp and it's chaos had us all traumatized and horrified by visions of unreported spills, two radiation carrying trucks colliding and releasing the deadly airborne variety of plutonium we all dread, 2 OR MORE NUCLEAR ACCIDENTS A YEAR, unreported emissions, mixing high level and low level wastes and getting the foot in the door to store more and more deadly waste, getting the o.k. to make endless more waste because they felt they had a place to tuck it away from public view and away from criticism, 20,000 trucks on the road carrying waste 1 mile from my house. We were trying to build our own home in peace amidst all this! I spent all those child raising years and home building years in agony, despair, rage and horror at what DOE and LANL were trying to do to our state by making it the nuclear waste dump of the nation. Meanwhile the incriminating evidence of DOE's scandalous negligence mounted nationally along with the hairs on my neck. DOE contaminated every single solitary site they used (abused) they deceived the people, never once telling people of dangerous nuclear levels, spills, contamination or disasters. DOE had no regard for human safety and they took only the most nill precautions and only the most lackadaisical efforts were made to protect the people, inform them of the dangers, keep records of the accidents and health risks that did happen (most of the records they did keep were probably distorted, evidence in itself) or even make any effort to clean up the nuclear messes. NOW THEY ARE TRYING TO PRETEND THE NUCLEAR MESSES DON'T EXIST SO THE GOVERNMENT WON'T HAVE TO PAY THE BILLIONS AND BILLIONS TO EVEN ATTEMPT TO CLEAN THEM

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UP. IF THE GOVERNMENT HAS THE MONEY TO MAKE MORE BOMBS YOU CAN BET YOU LIFE THAT THEY HAVE THE FUNDS TO CLEAN UP THE NUCLEAR MESSES. THE TRUTH...THEY DON'T CARE...IF DOE CAN GET AWAY WITH IT THEY WON'T TRY TO GET THE FUNDS, THEY WILL FIRE THE CLEAN UP CREWS AND EVEN KILL THE MOST ADAMANT PROTESTERS THAT GET RIGHT IN THEIR FACE!

I'm ashamed and feel dishonored, as a state, by LANL. I am disappointed in LANL all along the treacherous nuclear path they took. A rotten evil foundation (war is a satanic institution) was formed when they dropped the bombs on Japanese cities. Why 2 weeks after they were invented? Why 2 cities? Two cities! Why cities empty of all soldiers, what an evil, evil thing! Now there is mounting evidence that Japan would have surrendered if we had just assured them that they could keep their leader! What an evil and pointless beginning LANL has. MANY OF THE FIRST SCIENTISTS, EVEN EINSTEIN ,PROTESTED BITTERLY, EVEN TOOK THEIR LIVES AS A PROTEST AND REFLECTION OF PERSONAL RESPONSIBILITY THEY COULDN'T LIVE WITH. The foundation concepts AT LANL are evil and the evil has continued to grow and gross us out with it's ever more erroneous and outlandish behavior. LANL continues to abhor us and this stockpile stewardship fe-pa abhors me infinitum! The only good thing I can say about all this is, thank God more nuclear bombs haven't gone off! We can all breath a sigh of relief and take apart the bombs, as Russia has and be glad it's over! But no, LANL wants to make the cold war go on FOREVER....it was so monetarily profitable! When will bombs making not be considered a business a corporation chooses because it generates more revenue? When will the people of the United States, all of us not be statistics/pawns to barter for more investment in bombs? Just enough weapons to defend the borders is a far cry from amassing masses and masses of weapons of mass destruction! The president of the

United States and the congress has to stop LANL before they get us all embroiled in more world anarchy and more nuclear proliferation by setting a bad example to the other upcoming nations and making treaties totally obsolete by loosing our credibility, this is serious. OUR NATION IS SETTING A BAD EXAMPLE TO EVERY BOY IN THIS NATION. EVERY BOY IS COPYING THE U.S. IN IT'S "VIOLENCE CURES EVERYTHING STAND." THE MESSAGE IS LOUD AND CLEAR TO SOLVE EVERY PROBLEM WITH VIOLENCE AND WE NOW HAVE BY FAR THE MOST INTERNALLY VIOLENT NATION IN THE WORLD. THE MILITARY PERPETUATES THE BRAINWASHING OF LITTLE BOYS AS SOLDIERS AND SO WE HAVE THE MENTALITY OF LOTS OF BOYS WILLING TO SOLVE PROBLEMS WITH VIOLENCE. WE HAVE THE PROBLEM OF THE MILITARY BEING A KIND OF JOB CORE TRAINING PROGRAM FOR POOR MEN AND SO A MAJORITY OF OUR MEN GET TRAINED IN HOW TO KILL. THEY KILL IN WARS AND COME BACK AND KILL U.S. CITIZENS BECAUSE THEY ARE TRAINED TO USE VIOLENCE FOLLOWING BLIND ORDERS AND VIOLENCE TO SOLVE PROBLEMS. THEY HAVE NO WORLD SKILLS! PRESIDENT CLINTON IS THE FIRST PRESIDENT TO SET A GOOD EXAMPLE BY HAVING THE ARMIES STOP WARS, DEFEND HELPLESS PEOPLE FOR NO PROFIT OF OUR OWN AND I FEEL PRESIDENT CLINTON AND PAST PRESIDENT CARTER ARE SOME OF THE MOST BRAVE PEOPLE ON THIS PLANET. I WOULD FOLLOW PRESIDENT CLINTON'S LEAD IN CUTTING MILITARY SPENDING! PRESIDENT CLINTON WAS RIGHT TO PROTEST THE VIET NAM WAR THAT IN THE END ONLY BROUGHT HUMILIATION TO OUR COUNTRY. Sure there may be terrorists and rouge nations but the allied nations must unite now into some semblance of agreement or all is nearly lost. The time is now!

It was the evil in man that won out that day the U.S. dropped the bomb on Hiroshima. All nations have committed genocide including the Native American Indians in wars against each other and Eskimo's, Mao killing a million of the rich and elite, Hitler defying every law of human decency perpetuating mass genocide, The first non Indian Americans killing the Native Americans in a genocide so horrendous it parallels Hitler in racism run rampant, Stalin's murdering masses of people, Spain and it's decimation of the Inca people and so it goes. The point is the U.S. is not totally innocent and we still hope not to be bombed. Japan might have been guilty but the children who were bombed were innocent. If we, in the U.S. were bombed for what we did to the Indians we would not say we deserved it, but we do, for what we did to other human beings to take their country, to conquer a people. However wretched we are for supporting Hitler before he turned Monstrous, Saddam Hussan and other military dictators who turned sour, the children and future generations deserve a chance. I am saying there is no excuse good enough for us to hold whole countries hostage with our bombs. If God asked me to bomb other nations to save our own I would say if humans have gotten to that stage of evil we don't deserve to exist and I would refuse to bomb Japan or any other nation. THE TRUTH, AS I SEE IT IS THIS: NOT GOD, NOT ANY FORCE OR INTELLIGENCE ON EARTH WOULD MAKE HUMAN SOUL'S BOMB WHOLE NATIONS TO STAY ALIVE. GOD WOULDN'T MAKE A MOTHER DECIDE BETWEEN HER TWO CHILDREN LIKE A MOTHER IN THE HOLOCAUST WHO HAD TO DECIDE WHICH CHILD A NAZI WOULD KEEP TO TRAIN AS A NAZI AND WHICH ONE WOULD BURN IN THE GAS CHAMBERS. GOD DOESN'T SET UP SUCH SINARIOS IN THE FIRST PLACE BY SAFEGUARDING PEACE AND GOOD RELATIONS AND WORLD WIDE HUMAN RIGHTS INSTITUTIONS. THERE IS NO ALTERNATIVE OR SUBSTITUTE FOR WORLD ORDER AND PEACE. GOD DOES NOT EXPECT US TO DO SUCH SOUL KILLING THINGS (EVEN TO KILL ONE HUMAN BEING CONDEMNS YOUR SOUL TO DEATH,) I KNOW GOD WOULD HAVE A BETTER PLAN. IF GOD PUT ME IN THAT SITUATION OF HAVING TO KILL A HUMAN BEING OR DIE MYSELF, I WOULD DIE. I WOULD PROTECT MY FAMILY BUT NOT IF I ALSO HAD TO KILL A WHOLE OTHER FAMILY FOR SOME REASON. I WOULD TRUST IN GOD'S

UNIVERSE AND DIE MYSELF AND LET MY FAMILY DIE RATHER THAT COMMIT A HEINOUS ACT. SCIENTISTS AT LANL HAVE TO WRESTLE WITH THEIR SOUL AND THEY ARE BREAKING PSYCHOLOGICALLY UNDER THE STRAIN. THEY ARE CRACKING UP. DON'T MAKE YOUNG SCIENTISTS CARRY THIS TERRIBLE FATE AND BE CONDEMNED TO THE DIVERSE FORMS OF INSANITY. DON'T SCIENTISTS HAVE THE RIGHT TO SANITY TOO? JUST AS THE WHOLE GERMAN COUNTRY, COLLUDED WITH HITLER TO LET WHAT HAPPEN HAPPEN, THE WHOLE U.S. IS WILLING TO BE PROTECTED BY DECIMATING WHOLE NATIONS, WE ARE WELL COLLUDED IN THIS MASS DESTRUCTION THING. JUST AS MALES COLLUDE IN NOT GIVING FEMALES RIGHTS AND SOCIETIES COLLUDE TO PERPETUATE RACISM SO MINORITIES ARE THE HAVE NOT'S, THE SLAVES. JUST AS A GROUP OF MEN ALL COLLUDE IN GANG RAPE BY NOT STOPPING IT AND SPOUSES COLLUDE IN ALLOWING INCEST BY NOT STOPPING IT, WE IN NEW MEXICO COLLUDE IN CREATING WEAPONS OF MASS DESTRUCTION BY NOT STOPPING LANL AND DOE. MANY PEOPLE SEE IT THAT WAY. THERE IS NO RAIN NOW MAYBE BECAUSE WE HAVE LOST IT SPIRITUALLY. Maybe New Mexico has been spiritually broken. We have sold our souls to the devil/war/death and we are now corrupted and so the really big guns can now be wheeled in. That is how I see it! GOD IS ALL POWERFUL AND LOVE IS TRULY THE STRONGEST FORCE ON EARTH. I KNOW THE PROPHET FOUNDER OF THE BAHA'I FAITH PROCLAIMED THAT <u>HE WAS THE PHYSICIAN</u> OF THE SPIRITUAL DISEASE THAT THREATENED THE LIFE OF THIS PLANET AND THE ONLY CURE IS TO ELIMINATE RACISM, UNITE HUMANITY AS ONE FAMILY AND UNIT THE NATIONS INTO STRONG LEAGUES OF NATIONS WHO UPHOLD HUMAN RIGHTS AND WORK AS A UNIT TO FURTHER THE RIGHTS OF LIFE ON EARTH. DO YOU THINK BOMBS ELIMINATE RACISM? NO! BOMBS PERPETUATE FEAR AND SUSPICION AND ARE THE EPITOME OF RACISM. <u>BOMBS, IT TURNS OUT, ARE NOT THE CURE BUT IN VERY FACT THE DISEASE INCARNATE!</u>

The people who speak out against nuclear proliferation have been working to educate themselves, like I have, for 40 years or more sometimes. The people who have really made it their business to be informed, nuclear proliferation comes out to be in their minds anti-life. If you analyze the comments you will hear many people defending life against the death that nuclear proliferation represents. LANL's stockpile stewardship is nuclear proliferation and that is why so many thoughtful people object adamantly to it. LANL is perpetuating racism by making bombs to kill "the others" the "enemy. LANL is motivated by fear....fear that another country will try to bomb us...it goes way beyond fear of having our country taken over. When I attended the TRINITY mediations between the LANL hawks and the Peace doves the scientists justified their position by saying making bombs was a deterrent to make other nations too afraid to bomb us. In the arms race this may have had some truth but now that the arms race is over the deterrent decoy is nonsense. If we needed an atom bomb for every terrorist atom bomb we could never generate the cold war again no matter how exaggerated and blown up we tried to make the threat! The cold war is over and to continue to proliferate arms is absurd! Times change and thank GOD! WHAT real enemy can we conjure up? USSR is a broken and torn country and it is, as we are, sorely contaminated and suffering greatly from Chernobyl and other contaminated facilities.

The U.S., like a young native of New Mexico so eloquently said, is not the bully or the policeman of the world. The anarchy of the world has lead us to take some dramatic and heroic stands but the energy gets drained if we don't take care of internal conflicts and problems. Like the work alcoholic husband who says he is working for the family but is abusive and cold to them personally, never giving priority to internal

affairs, coming home to find his bride absconded with another man, a country who neglects it's people and gives all the funds to the military, (children can't eat bombs), finds the loyalty to others. I feel democracy would have been winning converts on a social level if we had put all that money into helping feed and cloth other nations instead of bombs to make them scared of us.

We are only one nation, not the only important nation. Someday we will be only one of many nations, one vote, one voice. We are destined spiritually to lead the other nations but like any spiritual gift we can squander it and let it atrophy. Our strength is that we are multi national and that we have worked with the United Nations for so long. Our positive side is working for peace but our shadow side is scheming war. If we don't provide an impeccable example of non proliferation we could fall on our face and loose credibility and who will lead the world then? The world could truly go through anarchy and a time of terrible tests.,,eventually we will get back to the united nations idea because nations are not going away! Our making bombs arouses suspicions and perpetuates bomb making. As with inter community violence if there are people arming themselves, more people arm themselves and now in America there are reportedly three guns for every man women and child, 250 gun related deaths a week and rising fear/alarm of violence which makes more violence by the fearful killing more easily because they trust less. The fact that a lot of toxic dumps of all kinds are being put by minority neighborhoods underlines the racism and speaks loud and clear that we haven't defined who in the nation the bombs are defending. Could it be we are dehumanizing 'the others" in our nation as well as dehumanizing "the others" outside our nation and sometimes we get confused what nation we are defending. Could we be defending the same "White supremacy " nation Hitler espoused? If we look deep what do we see....racism or love for all nations and races? COULD IT BE THAT RACIST LEADERS ARE FIGHTING THEIR FEARS OF EACH OTHER WHILE PEOPLE LIKE BAHA'I AND OTHER OPEN HEARTED FOLK ARE MAKING FRIENDS WITH THE "ENEMIES" EVERYWHERE AND FINDING LOVE, FRIENDSHIP AND PEACE WITHOUT THE GOVERNMENTS?

That bomb making machinery is so expensive it drains off 35% of our tax dollars, leaves the congress bald facedly debating to take away children from unwed mothers and cutting off their welfare and food. The same people who protest abortion refuse to care for the poor unborn causing mass abortion to happen. When we are so stingy that we take away all the social programs, the art grants, the libraries, the educational system, the children's school lunches, the public broadcasting input, the forest services, parks, museums, social services, the social security, the health benefits for the poor, the help to illegal aliens who are in desperate of medical care, the very things that make life civilized, pleasant and beautiful. That make us able to help the really weak and helpless people, the old, the young, the retarded, the sick, the handicapped, the pregnant women, the unborn child, the educable youth, the jobless man, the struggling recovering substance abuse victim, the environmental concerns, the endangered animals....the list goes on and on and on. I sit incredulous as I hear of large bomber planes getting billions of dollars and the military blood suckers like LANL get billions and then I hear congress stingily taking away all the social services. Thank God President Clinton doesn't compromise all these important social programs. The schools need art so kids can be less physical and material and value the creative process. The jails need programs for rehabilitation that might work, the at risk kids need help integrating into society before they get criminally hardened....so it goes!

This nuclear tick is a time bomb that sucks our nations blood dry. The military sucks our blood like a vampire, our monetary lifeblood and leaves our nation weak and emaciated. Our rage grows as we get nothing much back from our taxes. I don't mind paying taxes if it goes for the nation's well being. LANL and DOE facilities are a tragedy when they make bombs with the money we make and pay in taxes instead of for causes benefiting mankind. I resent every penny that goes to defense.

I AM OUTRAGED THAT LANL SAYS THAT ALL THOSE BILLIONS OF DOLLARS TO MAKE BILLIONS AND BILLIONS AND BILLIONS AND BILLIONS AND BILLIONS OF DOLLARS WORTH OF BOMBS, BOMBS LIKE CRAZY THAT DRAINED OUR NATIONAL BUDGET DURING THE COLD WAR ARE NOT UP TO DATE! NOW THEY NEED THE MONEY EQUIVALENT TO THE WHOLE NATIONAL BUDGET TO MAKE NEWER UP TO DATE BOMBS!!!!!! I OBJECT! THE NUCLEAR BOMBS NOW (IT HAS BEEN WELL RESEARCHED), DO NOT GET DANGEROUS AND DETONATE BY THEMSELVES FOR ANY REASON INCLUDING AGE AND WE DO NOT NEED TO MAKE NEW BOMBS. THE HYDROGEN BOMBS ARE VASTLY DESTRUCTIVE COMPARED TO THE ONES THEY DROPPED ON HIROSHIMA AND THE OTHER HIDEOUS BOMBS, ONES THAT KILL ALL LIVING THINGS BUT LEAVE THE HOUSES ARE TOO DEMONIC TO IMAGINE THE MAKERS TWISTED AND MOLDING HEART. NO MORE BOMBS SHOULD BE MADE! THE BOMBS CAN BE LEFT UNTIL THEY ARE TAKEN APART AND THERE IS NO EMERGENCY TO MAKE MORE BOMBS. THERE IS NO EMERGENCY TO TAKE THEM APART RIGHT NOW EXCEPT INTERNATIONAL TREATIES...A GOOD ENOUGH REASON FOR ME.... BUT THERE IS AN EMERGENCY TO CLEAN UP AND STABILIZE OUR OWN LIVING ENVIRONMENT BY CONTAINING EVERY SCRAP/ATOM OF PLUTONIUM WE CAN AND RECONTAINING IT AS OFTEN AS NECESSARY TO PROTECT THE AMERICAN PUBLIC FROM AN INTERNAL CRISIS. WHEN WOULD DOE CARE ABOUT PLUTONIUM CAUSED CANCERS...WHEN ONE IN EVERY TWO PEOPLE DIE OF

CANCER.... INSTEAD OF THE ONE IN THREE ALREADY...WHEN CANCER BECOMES THE MAJOR KILLER OF CHILDREN(IT IS NEAR THAT).....WHEN THEIR OWN CHILDREN DIE......WHEN MUTATIONS ARE APPEARING REGULARLY IN THE VAST POPULATIONS? The horrible rational of DOE is that they are immune to suit because they are protecting us, exempt by law from litigation, plutonium is invisible and it doesn't hurt anyone as the atom goes into you it just sits quietly knocking off genes until, years later you die of cancer or have a mutated child and then DOE is not to blame...how can anyone prove that it was plutonium or DOE that did it? If it was plutonium that killed someone you can be sure it was Doe's poison that did it.

I can even, possibly understand dying for the world as a person or a state if it did save the world in some way. But how did destroying the world, in some way, end up as being able to be seen as saving it? I just don't get it! Even if I did believe it, how can I tell the young boy in the 7th grade I knew who won the Odyssey of the Mind contest statewide only to be shot down with crippling leukemia? How could I allow my own child to be the national sacrifice? How could I tell my son or daughter they had to die for us? How could the government pin awards of purple hearts on little 3 year olds and thank them for giving their lives for us?

THE WAY WE ARE BRAINWASHED TO THINK OUR GOVERNMENT CAN DO NO WRONG AND IS TAKING CARE OF US BENIFICANTLY/TOTALLY TO THE POINT WE DO NOT HAVE TO QUESTION OR THINK ABOUT IT, WHETHER IT MAKES SENSE OR NOT, WHILE IT ALL ALONG AMASS'S WEAPONS OF MASS DESTRUCTION TO PROTECT OUR NATION WHEN ANY ONE BOMB COULD DESTROY THE WORLD AS WE KNOW IT BY NUCLEAR WINTER OR RADIATION POISONING, AND CALL THIS NATIONAL SECURITY? IF YOU REALLY THINK OF IT, IT REALLY IS ABSURD. SINCE IT REALLY IS SO COMPLETELY AND UTTERLY LUDICROUS, ANY CHILD COULD SEE THE FALLACY. I BELIEVE IN MY HEART OF HEARTS THAT LANL

AND DOE AND OTHER NUCLEAR PROMOTING CORPORATIONS TRULY DO NOT MAKE BOMBS TO PROTECT US BUT TO MAKE MONEY. I WOULD DIE TO REALLY PROTECT THE EARTH, OUR NATION OR ANY CHILD ON EARTH. WHAT COULD BE WORSE THAN THE EARTH HAVING THE POTENTIAL OF DESTRUCTION, MASS DESTRUCTION AND ALL FOR GREED. I still insist that no human should ever, ever take money for making war machines or bombs. If it truly had to be done, as a mercy killing, to utterly destroy a government by any means to protect the world,(and we might be such a nation right now) all negotiations and means possible should provide alternatives first and all avenues explored and tried to the full extent humanly possible and no money should be taken. It would be like a mother taking money for pulling the plug on a vegetable/brain dead son or a father taking money for mercy killing a daughter's beloved but broken legged horse or a Nazi taking money for running the gas chambers, etc. Enough money to survive is respectable but to line your pockets fatly with other's misery and tragedy is inexcusable. Make all the bomb builders work as volunteers and give money to scientists who make cakes for their children's bake sales for school activities and see how many dedicated bomb building corporations stick around! Would we see the true colors of why scientists work? Would scientists work for free to make weapens of mass destruction or do we still see visions of world glory, pride, ego gratification, awards, money and lots of it as part of the picture.

OUR NATION'S DESTINY AND THE WORLD'S DESTINY SHOULDN'T BE DECIDED BY THE WAR PUSHING OBVIOUSLY IMMORAL AND INDECENT ENOUGH TO DENY THEIR PREDICAMENT AND INVOLVEMENT IN THE POSSIBLE DESTRUCTION OF THE WHOLE PLANET. I KNOW THAT THE PLANET IS GOD'S SPIRITUAL STEP STOOL AND WILL NOT BE DESTROYED, BUT IF THE SCIENTISTS MAKE BOMBS THAT CAN DESTROY THE world/ NOT TO DESTROY THE WORLD AND MAKE

WEAPONS OF MASS DESTRUCTION NOT TO DESTROY WHOLE CONTINENTS OF MEN WOMEN AND CHILDREN THAN WHY DO THEY CALL THEM WEAPONS OF MASS DESTRUCTION AND REALLY BUILD REAL BOMBS THAT REALLY COULD DESTROY THE WORLD? IF THEY WERE BOMBS MADE OF FELT AND FAKE PUPPETS TO THREATEN PEOPLE AND INTIMIDATE THEM I COULD SAY THEY ARE MAKING DETERRENTS. BUT NO, THEY ARE MAKING REAL BOMBS THAT KILL VERY REAL PEOPLE AND COULD KILL WHOLE NATIONS OF VERY REAL CITIZENS, INNOCENT CIVILIANS.

THE DECISION OF WHETHER OR NOT WE SHOULD HAVE WHICH BOMBS TO DEFEND OUR NATIONAL BORDERS SHOULD BE DECIDED BY WORLD FEDERATIONS NOT BY A ROOM FULL OF OUT OF A JOB SCIENTISTS AND CONFUSED DOE FACILITATORS WHO ARE JUST LAMELY FOLLOWING ORDERS. FOR A ROOM FULL OF OUTRAGED CITIZENS AND CONFUSED SCIENTISTS TO SIT AND DEBATE THE FATE OF THE WORLD, SCREAMING AT EACH OTHER PSYCHICALLY IS AN INCOMPARABLE SITUATION UNLIKE ANY OTHER HUMAN SITUATION I HAVE SEEN! THE HUMAN AGONY OF DECIDING THE FATE OF THE WORLD IS A JOKE UNLAUGHABLE. THIS KIND OF DECISION BELONGS NOT WITH THE PRESIDENT OR THE CONGRESS BUT IN THE UNITED NATIONS WHERE LANL AND IT'S ROLE SHOULD BE CAREFULLY CONSIDERED AND FULLY DEBATED IN A WOULD CONFERENCE LASTING MANY MONTHS. ANY STATE, PERSON, LABORATORY CAPABLE OF OR CONSIDERING MANUFACTURING BOMBS IS THE BUSINESS OF THE WORLD HUMAN RIGHTS DELIBERATORS, THE HUMAN RIGHTS PROTECTORS, THE WORLD FEDERATION OF NATIONS AND NO ONE ELSE. SINCE ALREADY WE HAVE A SUFFICIENT LEAGUE OF ALLIED NATIONS AGREEING TO NONPROLIFERATION WE MUST ABIDE BY THOSE DECISIONS ABOVE AND BEYOND CONGRESS. HERE IS ANOTHER DISCREPANCY. DOE OFFICIALS SAY THEY ARE JUST FOLLOWING ORDERS AND THAT NOT THEY BUT THE PRESIDENT AND CONGRESS DECIDES THE FATE OF BOMB MAKING AND THAT THEY DECIDED TO LET LANL MAKE BOMBS....I JUST DON'T UNDERSTAND WHY OUR PRESIDENT SIGNED THE

NONPROLIFERATION TREATIES IF WE DIDN'T MEAN IT! DO I LOOSE FAITH IN OUR GOVERNMENT'S WORD AS TRUE ON INTERNATIONAL TREATIES?

EVERY PERSON OF GOODWILL, LOVE AND ALL DEFENDERS OF THE INNOCENT CHILDREN ,(WHO DON'T MAKE BOMBS THAT COULD SIMULTANEOUSLY DECIMATE THEM IRONICALLY AT THE SAME TIME). THE VOICELESS CREATION WILL ARISE AS ONE BODY AND DEFEND THEIR LIVES BY STOPPING bomb PROLIFERATION... NUCLEAR PROLIFERATION, IN ITSELF, IS THE ONLY ACTIVITY HUMANS ARE DOING THAT COULD DESTROY THE WHOLE PLANET IN ONE FELL SWOOP! MILITARY DIRECTED, BOMB MAKING CORPORATIONS ARE MAN MADE INSTITUTIONS, HOWEVER SATANIC, HAVE BEEN MADE AND THEREFORE CAN BE UNMADE, TAKEN APART AND UNDONE. LUCKILY TAKING THE BOMBS APART IS WITHIN HUMAN CAPACITY AND ALTHOUGH ALMOST BEYOND HUMAN CAPACITY, CONTAINING AND RECONTAINING NUCLEAR WASTE CAN BE ACCOMPLISHED BY HUMAN BEINGS AND MUST BE ACCOMPLISHED BY HUMAN BEINGS IF WE ARE TO SURVIVE. RADIOACTIVE WASTE IS THREATENING OUR NATION AND OUR PEOPLE WAY MORE THAN NUCLEAR BOMBS FROM TERRORIST NATIONS ARE RIGHT NOW. IN THE FUTURE THAT IS POSSIBLE UNLESS WE UNITE AS NATIONS AND STRONGLY OUTLAW THE USE OF WEAPONS CAPABLE OF DESTROYING THE WORLD!!!!!

IT IS UNCONSCIONABLE TO LEAVE ALL THIS NUCLEAR WASTE FOR OUR CHILDREN TO RECLAIM AFTER IT HAS GOTTEN OUT OF CONTAINMENT AND INTO EVERY OCEAN, STREAM, LAKE AND CITY WATER SUPPLY? WHAT WILL OUR CHILDREN DO THEN? IF WE SUPPORT HITLER'S, SIDDAMS AND DOE'S AND THEY BECOME MONSTERS... SOMEONE HAS TO INTERVENE AND STOP THEM. AT THIS POINT THE CANCER WON'T CUT ITSELF OUT. THE CANCER HAS TO BE REMOVED. DOE WILL NEVER STOP REPLICATING THE CANCEROUS CELL BECAUSE IT IS AS UNHEALTHY AS IT'S COUNTERPOINT/MATERIAL SYMBOL THE BOMB AND CAN'T STOP, JUST LIKE HITLER COULDN'T STOP. MAYBE A WORLD BODY NEEDS TO COME AND POLICE THE UNITED STATES AND

FORCE US INTO ABIDING INTERNATIONAL LAW AND PROVIDING JUSTICE FOR IT'S OWN PEOPLE. THIS IS A LIKELY SITUATION UNLESS WE STRAIGHTEN UP AND FLY RIGHT! THAT WE, THE U.S. ARE PRIM AND PRISTINE, BLAMELESS AND PRAISEWORTHY IS NOT SO OBVIOUS TO THE REST OF THE WORLD AS IT IS TO THE POMPOUS NATION FANATICS WHO PROMOTE THAT IMAGE BUT WHO DON'T SEE THAT THEY HAVE NO CLOTHES AND EVERYONE NOW SEES THE TRUTH.....U.S. HAS A DARK SIDE...LIKE EVERYONE ELSE THAT MUST BE CONTROLLED AND REGULATED THE SAME AS ANY OTHER NATION. IS IT ANY WONDER THAT DOE IS CALLED DEPT. OF EVIL OR DEPT. OF ENTROPY AND HOW COULD WAR MAKING COMPANIES CALL THEMSELVES HONEYWELL AND OTHER SWEET SOUNDING NAMES? THESE SWEET SOUNDING NAMES ARE A COVER UP FOR SOME OF THE MOST HEINOUS CRIMES AGAINST HUMANITY EVER TO EXIST ON THE PLANET: HIROSHIMA BEING ONE AND PREMEDITATING THE PULVERIZING INTO DUST WHOLE NATIONS/CITIES/CONTINENTS IS ANOTHER . THAT IS WHY THESE NEXT 4 YEARS ARE THE MOST IMPORTANT YEARS OF THE LIFE ON THIS PLANET. IN EVERY WAY THE MASSIVE HEMORRHAGES OF SPECIES EXTINCTION, OZONE LAYER DESTRUCTION, GLOBAL WARMING, MASS FIRES AND EARTHQUAKES, GERMS/VIRUSES LIKE AIDS WHICH HALF OF AFRICA HAS ALREADY AND LOSS OF OUR GLOBAL AIR/MOISTURE MAKING AND TEMPERATURE REGULATING RAIN FORESTS ARE DECIMATED AND MOWED DOWN AND INTERNAL VIOLENCE, OUT OF CONTROL CONSUMERISM THAT IS USING 2/3 OF THE RESOURCES OF THE PLANET, DUMPING IN THE OCEAN THREATENING OUR WORLD'S FOOD SUPPLY, MEAT CONSUMPTION AND AGRICULTURAL PRACTICES THAT ARE CAUSING MASS EROSION AND PESTICIDE CONTAMINATION AND OTHER IMBALANCES THAT THREATEN LIFE ALSO. ALL THIS MUST STOP NOW!

THE FACT THAT NATIONS DON'T GET ALONG IS SOLVED BY TRYING TO GET ALONG WITH OTHER NATIONS, NOT BOMBS. DO YOU THINK I COULD BE FRIENDS WITH SOMEONE WHO IS PUTTING BOMBS IN MY FACE AND THREATENING TO BLOW

MY HEAD OFF AND ALL MY FAMILY IF WE DON'T WATCH OUT? HOW DOES THIS BEHAVIOR LOOK TO THE REST OF THE PLANET? In the next 4 years the Baha'i faith prophesies that the nations will SIMULTANEOUSLY lay down their arms in order that we not destroy the planet. THE POINT HERE IS THAT WHAT WE ARE DOING IS INDEED THREATENING THE TOTAL PLANET AND THE ONLY THING TO DO NOW IS TO AGREE NATIONWIDE TO NOT DESTROY THE PLANET! THIS IS CLEAR TO EVERYONE WHO THINKS ABOUT IT! This must happen! As we empower the U.N. by honoring it's agreements we become stronger, by our lead more nations join and become strong allies, the more nations that join the stronger the U.N. becomes and the stronger the U.N. becomes the more peace on planet earth is safeguarded against anarchy/anything goes, of out of control nations. Pretty soon we will not have many nations who are not benefited by this alliance and few that won't want to belong to this alliance with the rest of the world and any problem will be solved as a world. WHEN WE ARE AS CONCERNED ABOUT OUR BROTHER NATIONS AS WE ARE ABOUT OUR OWN NATION THEN WE WILL HAVE SOME ORDER. I CAN SEE LOTS OF SIGNS OF ALL THIS HAPPENING! ALL THE GOOD THINGS ARE HAPPENING. THE ONLY BAD I SEE IS WHAT AMERICA AND PEOPLE LIKE SADDAM HUSSAIN ARE DOING!

I don't buy that old excuse of DOE/LANL that they do what they are told by congress and the president. There are ample examples of men in Viet Nam, the Holocost, South Africa, Rhowanda, etc. of people who were tried in international war crimes courts and who are now imprisoned who said we were following orders. There are higher orders of truth on this planet than people's orders. If people don't see for themselves and hear for themselves do you think they can excuse their actions by saying someone else did it or I was following orders? Why don't the scientists just come out and admit that they are very proud of all these beautifully crafted bombs that are so hard to make and that they believe "might makes right" and they would push the button if the president said to and decimate nations because we have the right to show the world that no one can mess with us! We all have to follow our heart as to what is true. Deep in every scientist's heart don't you think they know they are doing something wrong? Of course they do! Their conscience bothers them daily but they probably shrug it off. Has the heart ever lied to us? I think not because the heart, a true heart where God sits on the throne and rules cannot go wrong. If every day we cleanse our heart and try to be true to our inner gifts and ultimate dreams I think all the nuclear scientists would feel compromised, used and misunderstood and misled. I am a servant to God's plan and I bend my will to God because I believe in His plan and I see myself a visitor to God's planet. I own none of this and I don't try to control what happens around me. I try to see everything as furthering God's plan and so I am one of the few who still have faith. As such I am a valuable asset to these times. I see the truth, I stand up for the truth, I identify myself with the truth and I refuse to be a bystander on the important issues and circumstances effecting my times. I refuse to be a by stander to crime, a coward who saves their wretched skin and has to answer to God for what they did or didn't do on ~~my~~ that stay on earth. Powerful social powers can be wrong, and not all brave men die for good causes. Lots of Hitler's army died to commit genocide on the human race. Absolute power corrupts absolutely and so the military complex has to be careful about acting on their own behalf inspite of the outraged cries of large populations, world treaties and the victim's wails. All evil deeds have doers because only humans can do evil.

Who asked the future generations, the youth, to whom the world belongs, (as us old foggies step out of their way or serve them as their generals), if this is the

future they want to care for? The youth I heard at the stockpile stewardship hearing said no, they didn't want that kind of a future for New Mexico and stop what we are doing now. All their friends are moving away. Why weren't they consulted? As we go lax and dump the nation's toxic bowels in an act of fear so crippling, mind clogging and soul numbing...we all seem to go into denial and go blank, the youth are young and fresh and still have visions that could help us out of these strangleholds. The new and upcoming scientists may be a new breed too and have been given by God the answers to our problems. We need to listen to the young and upcoming generations and let them lead us to a saner world. If the young scientists are as insane and heartless as the old scientists then they will need to be stopped too. Not just the scientists or the government rules the world. God is in charge here. All the youth need to be empowered by having a say in what will be their responsibility and what they feel about 240,000 years of watching over plutonium in New Mexico. Let the youth of New Mexico decide what they want for our state...quiet tourism and local culture/agriculture, artists, healing centers, autonomy, integrity, self sufficiency, educational facilities, parks and wildlife refugees or a military complex that spins it's deadly web throughout our state that slowly strangles out all the original life, leaves death, pollution and broken souls everywhere it touches and lose any say over our state because the whole thing is top secret, top priority and we are the nobody's who are the national sacrifice zone? Don't the young people deserve to say no to their future children getting cancer? Don't they have a right to a healthy life with no fear of being an enemy target? Don't we have the right to not be the waste dump for the nation's hot garbage? Is there any amount of money that makes up for high rates of cancer in small children just beginning their lives? Don't our youth have a right to jobs that don't tear their psyche apart by making them into military pawns, expendable, with no voice still, schizophrenic and unhappy? The old guard, the old foggies, the good old boys need to step down, lay our problems before the world, come clean and pay for our sins if we have sinned.

I say NO, we cannot let Doe, however arrogant, bloated heavily with our tax money, enough money to make bombs far into the world's future to their hearts content, fat with money, (the money rightfully that should go to heal the budget deficit....that much money!) and making more bombs, glutted with pork from pay off, dirty deals, slimy deals, fat, far too fat to move over or change. But order will prevail in the world and our lives depend on it. Our very spiritual lives, our soul's growth individually and collectively depend on the truth. LANL has not had to tell the truth for so long, has been able to justify lying as a policy of national security for so long, that they have forgotten how to tell the truth and are so double crossed and crosswired that LANL cannot grow in a healthy direction until they do tell the truth to themselves and to the world. THE TROUBLE WITH LANL AND OTHER DOE PROJECTS IS THAT THEY SPRUNG UP IN THE CLIMATE OF THE WORLD WARS AND THE COLD WAR AND WERE GIVEN CREDENCE. LANL IS TAKING ADVANTAGE OF THE TRUST WE PUT IN THEM TO RIPP OFF THE AMERICAN PUBLIC NOW WHEN WE DON'T NEED THESE BOMBS AT ALL...THERE IS NO POSSIBLE JUSTIFICATION. TO KEEP PERFECTING BOMBS, TO SAY WE NEED NEWER UPDATED BOMBS AFTER THEY SPENT ALL THAT MONEY, ENOUGH TO BREAK THE COUNTRY, AND MAKE MILLIONS OF MILLIONAIRES AND THOUSANDS OF BILLIONAIRES IS INCOMPETENCE, WASTING GOVERNMENT FUNDS AND NOW WHEN AMERICANS ARE DESPERATELY, FRANTICALLY WORKING 2-3 JOBS TO JUST GET BY, DEPRIVING THEIR CHILDREN OF LOVE AND ATTENTION, MOTHERS HAVING TO WORK TOO, ADDING TO THE PROBLEM OF VIOLENCE AND MORAL POVERTY, JUST TO MAKE BOMBS

WE DON'T NEED AND DON'T WANT, DON'T KNOW WHAT TO DO WITH THE ONES WE HAVE, MUST TAKE THE ONES WE HAVE APART AND MUST NEVER MAKE ANY MORE NOT TO THREATEN WORLD NONPROLIFERATION TREATIES, WASTING OUR COUNTRY WITH THE NUCLEAR WASTE AND CAUSING A DEEP AND ABIDING MISTRUST IN THE AMERICAN GOVERNMENT AND RAISING SERIOUS DOUBTS IF THIS COUNTRY IS A MILITARY GOVERNMENT, ON THE WAY TO BEING A DICTATORSHIP OR FASCIST REGIME....WASTING THE HARD WORKING AMERICAN'S TAX MONEY WILLFULLY WILLY NILLY, THROWING IT TO THE WINDS ON BOMBS THAT NEVER PUT A BLESSED THING BACK INTO THE ECONOMY FOR THE NON BOMB MAKERS, MAKING BOMBS THAT NO ONE CAN BENEFIT AND THAT HARM AND SCARE AND TERRIFY EVERYONE....MAKES ME SICK TO MY STOMACH!. Part of the truth may be that LANL scientists don't know what to do right now and that they need help. Even if they loose their jobs, like the whistle blowers before them, they can feel good about themselves again in some way. They need to say, "help! Help us! This whole thing is a mess! We are being pressured by the higher ups to take on more than we can handle here at LANL! How can one little lab take on 100 of the nation's hot and controversial projects on top of the serious clean up projects they haven't even started? The public is fit to be tied even over the first 2 we proposed, the scientists are flocking to psychiatrists chairs, we have all these angry whistle blowers who are telling it like it is, we can't keep secrets anymore, citizens groups are demanding to know the truth about what we are doing, skeptics are all over the place....." When I hear LANL come clean then I will know there is some heart at LANL and that it is o.k. to be a human being with feelings! I have seen the children of scientists who are angry and full of hate and who use force to solve problems. What people do in the work force comes home into the family life. If soldiers truly believe in what they are doing they won't go crazy in a war. If they don't truly believe in what they are doing they are in for serious trouble, psychologically, spiritually and morally. They will be insane. Rarely will insane people know they are insane and put themselves in mental institutes and rarely do criminals put themselves into jail. Rarely would a body reject a cancer, cut it out of itself, (healing from within comes only from deep and lasting changes in mental, spiritual and physical changes), someone has to stop the cancerous proliferation, put the criminals in jail and the over the edgers in the mental hospitals...it has come to that! Nuclear proliferation is in every way the equivalent of a cancer in the human body. The disease itself is racism and bombs instead of eliminating racism, perpetuate it. Bombs are the incarnation of hate. Bombs and weapons have only one purpose and only one purpose...to kill other human beings! The toxic waste dumps are the incarnate and toxic/deadly racism of fear of other people different than us and belonging to different nations we have no control over, but who need to be treated like equals. If any policing is to be done the responsibility needs to be shared by the federation of nations acting on joint/world collective decisions. There is nothing worse than this cancer for the body or soul of the earth. The body suffers but the soul is in greater agony because we are one race and one family on earth and as human beings we are the soul of this earth. If the soul is sick how can we expect the body to be well? All this focus on the physical is wasted energy. The spiritual work has to be done for the human world to be healed and the work is to love each other. This seems so simple as to be ridiculous. IF THE NATIONS ARE LIKE MEMBERS OF ONE FAMILY AND SHOULD TREAT EACH OTHER LIKE THIS AND THE PLANET IS SUFFERING FROM BEING A DYSFUNCTIONAL FAMILY, THEN OUR SOLUTION IS TO REALLY LISTEN TO OTHER NATIONS, THEIR PROBLEMS, HELP EACH OTHER, LEARN APPROPRIATE SKILLS FOR SOLVING PROBLEMS (NOT

KILLING EACH OTHER IN DOMESTIC VIOLENCE, TEMPER TANTRUMS AND SUICIDE) AND HELP EACH OTHER FEEL INCLUDED, HELP EQUALIZE AND SHARE THE RESOURCES SO AS NOT TO FIGHT OVER THEM, ETC. ETC. I AM ONE OF THE OLDER OF THE YOUNGER GENERATION AND THIS IS WHAT I HAVE TO SAY!

JUSTICE MUST PREVAIL! This intervention will happen because the consequences for the planet of this proliferation are too heinous for even the most numbed of us to bear. In one big collective yell the world will say NO and do anything in their power to stop the potential destruction of planet earth. If we have any soul in our bodies we have to defend the beautiful, sacred life on this earth. Every life on this planet is worth dying for! Justice must be upheld, in every aspect of our national lives, we must be accountable for our every action and it's consequences on the world population. Mass destruction bombs do not help the populations. The world being held as a hostage to bombs makes everyone nervous and makes a lot of the kids give up hope. Not having the world hostage to bombs of planetary destruction is not too big a concept for any of us to grasp. If LANL doesn't see their part in all this then they are really in denial that is so serious as to be incredulous. The world's populations know that they are held hostage and they don't like it! The world's people see all the way through this big lie osculating from, "we are providing national security by holding the world hostage, we are only doing what we are told, we don't want to loose our jobs, we need to make more perfect bombs, we are holding the world together because if we didn't threaten to bomb the whole world every minute some terrible dictator or terrorist MIGHT try to blow us up! All of these are lame excuses and they don't hold any water to thoughtful people! WEAPONS OF MASS DESTRUCTION DO NOT PROTECT US THEY THREATEN US WITH MASS DESTRUCTION!!!!!!!!WHEN CAN WE GET THAT THROUGH OUR THICK SKULLS????????

I live to tell people about Baha'ullah, the Prophet founder of the Baha'i faith, the Promised One of all ages, the culmination of all religions, civilizations, the Physician of the world, the Major Manifestation for this age and the bringer of the Universal Truth about our spiritual nature and true place in this Universe. I believe that these Prophets are the reason we exist. They exist to tell us that God is love and we are love exactly so we don't get into these kind of situations where we think bombs are keeping the world from destroying itself just as alcoholics feels that alcohol is the only thing that can feed their body. These addictions to bombs or alcohol are just that: addictions. In reality the addiction is killing the person/planet and needs to be stopped for the body to survive. We must love or die in spiritual evolution on this planet. I do not believe in the survival of the fittest because like the dinosaurs, if a being gets too big and unbalanced they topple over. LANL will be like the greedy dog dropping the real bone (green/helpful technologies) for the greedy image (more and more wars) that need more and more paranoid fears, that need more and more hideous weapons of mass destruction to appease people's fears in negative shame cycles that never seem to end. This is Heaven on Earth and not the devil's (lack of good/light or selflessness) playground! This peace of Heaven is all I know and all I have but because of it I have faith. I have faith that God is guiding us. No matter how helpless or hopeless the situation I have faith that God, (if we listen to him, and believe me He is speaking), will get us out of this. I reach deep into the heart of LANL every day and I pray with all my heart to end this nuclear nightmare/human drama/trauma! LANL has to say no to more nuclear projects! LANL should lead the world in being diplomats/Raisons in world conversations, plead access and funding to take the right path even if it means less money. Money isn't

everything and money is one of God's greatest tests for us. Did we sell our soul and the human race to the devil/war? LANL has to have a conscience! LANL needs to not fire the people of conscience/whistle blowers, but use them as spokes people for needed change in war entrenched, muck covered, prehistoric idea laden institutions and make them leaders into new times. WHISTLE BLOWERS ARE THE ONLY ONES WITH CONSCIENCE. THEY ARE THE ONES WHO PASSED GOD'S TEST. THEY RISKED PERSONAL COMFORT TO DO WHAT THEY FELT WAS RIGHT! LANL should say no to burdens that will in the end ironically end up destroying them physically in the waste or explosions that kill the rest of us or through evolution/spiritual evolution as mankind passes this treacherous stage and grows into maturity out of a very fool hardy and turbulent adolescence. IT IS A BAHA'I PROPHESY THAT THE WORLD WILL LAY DOWN THE WEAPONS CAPABLE OF DESTROYING THE WORLD BEFORE THE YEAR 2000. WHEN THEY DO LANL WILL BE OUT OF A JOB AND MANY OF THE GREEN FUNDS WOULD PROBABLY HAVE GONE ELSEWHERE. AS I SEE IT LANL AND DOE HAVE 3 YEARS TO CHANGE THEIR ACT OR EVERYONE INVOLVED WILL BE OUT OF A JOB. PEACE IS NOT THE ENEMY..PEACE IS HUMANITIES GOAL! WHEN PEACE IS HERE WAR MONGERS AND WEAPONS PRODUCTION ZEALOTS WILL BE OUT OF A JOB. SO PREPARE FOR PEACE! LANL is up to their ears in nasty nuclear projects so hot and hated and controversial, so loathed they put people into a rage even to think of them!

If LANL is sincere in doing the right thing for the world,(so as not to Rob Peter to pay Paul), they cannot sacrifice huge zones of U.S. states for military machinery/waste and production that causes most of the people around them to die slow but inevitable deaths from cancer to save the world by making more and more glitsy and "efficient" bombs that can destroy the world three times or nations once or whatever... GOD IS ONE. WE ARE ALL INTERCONNECTED. IF YOU BOMB ONE PART OF THE WORLD YOU HAVE BOMBED YOUR OWN FOOT

OR HAND. WE SHOULD WORK AS ONE SOUL IN MANY BODIES. WHAT IS HEALING FOR ONE PART OF THE EARTH IS HEALING FOR US ALL. WHAT IS HEALING FOR THE MAJOR ORGANS IS HEALING FOR THE WHOLE BODY OF MANKIND. WHAT IS GOOD FOR ONE PART OF CREATION IS GOOD FOR ANOTHER PART OF CREATION. IF SOMETHING IS BAD FOR ONE PERSON OR BEING IT IS BAD FOR ALL CREATION. ONLY IN VERY ADVANCED CASES WOULD A GOOD PHYSICIAN AMPUTATE AN ARM OR LEG/WAR. IN CASES THAT DIRE, ANY PHYSICIAN WOULD AGREE, THE WHOLE BODY IS IN EXTREME DANGER AND THAT DEATH FOR THAT PERSON IS VERY CLOSE. IF THE WHOLE OF CREATION DOES NOT GET BALANCED AND PEOPLE HAVE THE PHILOSOPHY, NEVER KILL A LIVING THING UNLESS YOUR LIFE DEPENDS ON IT AND NEVER KILL A HUMAN BEING UNLESS THEY ATTACK YOUR HOME OR NATIONAL BORDERS. HAVE STRONG LEAGUES OF ALLIED/GOOD NATIONS AND THIS ANARCHY WILL EVAPORATE. IF AN INDIVIDUAL MURDERS ANOTHER IT IS AN ACT OF MURDER AND YET WAR, EVEN UNDECLARED WAR IS GLORIFIED, PRAISED.

IN HUMAN TERMS ADAM AND EVE TAUGHT US THE LESSONS OF COUPLES; TO MAKE THE RIGHT CHOICES CONSCIOUSLY, BUDDHA-KRISHNA TAUGHT US OF INDIVIDUAL/INNER LIFE; MEDITATION, YOGA, ABRAHAM TAUGHT US OF FAMILY; LOYALTY TO GOD FIRST, MOSES TAUGHT US THE LESSON OF TRIBE; TEN COMMANDMENTS FOR SOCIAL BEHAVIOR, JESUS TAUGHT US TO LOVE OUR NEIGHBOR OR OTHER TRIBES, MOHAMMED TAUGHT US TO BUILD NATIONS AND COMPLETED THE NATION BUILDING CYCLE. MOHAMMED WAS THE LAST OF THIS CYCLE, NOT THE LAST, AS MISTAKEN MUSLIMS STATE. MOHAMMED WAS THE RETURN OF CHRIST CHRISTIANS WERE WAITING FOR BUT ONLY 75 CHRISTIANS TURNED INTO MUSLIMS. THE BAB AND BAHA'U'LLAH WERE DOUBLE/TWIN PROPHETS AND THEIR JOB WAS TO START THE NEW CYCLE THAT WILL LAST FOR MANY THOUSANDS OF YEARS, THEIR ROLE IS TO UNITE THE NATIONS. IN ANOTHER 1,000 YEARS ANOTHER PROPHET WILL APPEAR TO PERHAPS UNITE EARTH WITH OTHER PLANETS OR WHATEVER IS THE NEXT STEP!

EACH CELL IN THE BODY MUST BE NOURISHED, EACH LINK IN ECO CYCLES, EACH HUMAN AND EACH HUMAN ORGANIZATION (INDIVIDUAL, COUPLE, FAMILY, TRIBE, STATE OR CULTURAL GROUPING, EACH NATION.) EACH GROUPING HAS TO BE NOURISHED AND IT'S NEEDS ATTENDED TO MAKE A HUMAN BEING. YOU CANNOT, IN THIS AGE, REMAIN IN THE DARK AGES AND NOT ATTEND TO THE FACT THAT NATIONS EXIST AND NEED OUR FULL PARTICIPATION AND ATTENTION IN WORKING WITH OTHER NATIONS. EACH HUMAN GROUPING HAS TO BELONG TO THE WHOLE! YOU CANNOT LEAVE HUMANS ISOLATED, SEPARATE, APART, ABUSED, TORTURED, ISOLATED, NEGLECTED, OPPRESSED, INJUSTICE DELT TO THEM...THOSE PEOPLE BECOME OUTCASTS, ANTI-SOCIAL, DISSOCIATED. ~~OUTCASTS~~, FORM COUNTER-CULTURES SOME OF THEM EXTREMELY IMMORAL AND VIOLENT, BACKWARDS, OUT OF TOUCH (LIKE LANL IN A WAY IS OUT OF TOUCH AND SO BECOMES VIOLENT/IGNORANT OF SOCIAL NORMS AND TRENDS) AND BECOME A MENACE TO ALL CITIZENS OF FAIR MIND. THESE ANTI-SOCIAL, UNLAWFUL PEOPLE SET UP THEIR OWN RULES AND PLAY THEIR OWN GAMES AND SERVE THEIR OWN NEEDS (SOUNDS LIKE DOE TO ME) AND ARE THE TRUE DANGER TO THE WORLD. INDIVIDUALS WHO HATE, WHO DEMEAN OTHERS, PREJUDICE THAT DEGRADES OTHERS AND IRRESPONSIBLE PEOPLE WHO PROJECT THEIR TORTURED CONDITION ONTO OTHERS....THESE ARE THE ENEMIES OF CIVILIZATION. THIS TYPE OF HATER TYPE IS FOUND IN ALL ISOLATED PEOPLE OF EVERY ECONOMIC STRATA AND IN GOVERNMENTS WHO STRAY FROM HUMAN DECENCY IN EVEN THE SLIGHTEST WAY. IF YOU CAN SACRIFICE A CITY FULL OF JAPANESE CHILDREN, TOTALLY INNOCENT AND NEW TO THE WORLD, PRETTY SOON IT IS O.K. TO MAKE BOMBS TO BOMB OTHERS, PRETTY SOON IT IS O.K. TO SACRIFICE THE CHILDREN OF NEW MEXICO OR IDAHO OR COLORADO FOR MILITARY ENDS, PRETTY SOON WE ALL HAVE THE CREEPS!

If LANL doesn't care one wit about me and my family how can they expect me to support them and their projects, their dirty, filthy, contaminated, emission laden, outlawed and outmoded industries?

LANL IS A LOST CAUSE, A FAILING ORGANIZATION, A CORRUPT AND CORRUPTING INFLUENCE TO NEW MEXICO, A LIABILITY, A HOPELESS CASE. LANL is weak spirited, subject to arbitrary hierarchies, functions with unity only on the basest premises: we must make bombs, we must have jobs, function on control and manipulate tactics that are as faulty and questionable as their political stances in the world arenas the manufacture and promote expensive dodo's that serve no earthly purpose! I say NO to LANL stockpile stewardship. You can not be a steward of non living/lethal, evil intended bombs like Jeff Dauber stewarded his victim's bones in the wall! You steward the earth, the animals, the children of all races, the water so it is clean, the plants that grow in the mountains! What a choice of names! Dragons, children of alcoholics, obsessive and crazy people hoard bombs and only a very far gone organization would go crazy with glee at the prospect of hoarding, not stewarding, all those dangerous bombs! I feel the glee of madmen and I feel always that underneath the objectionable project they propose evil bomb pushers are really closing in for the kill so they can do something even more sinister and dangerous than they are even saying! I feel DOE would stop at nothing and would make New Mexico a den for the highest level waste, the most horrendous weapon production and the most evil and secret of plans to disrupt peace so they can keep making bombs! LANL is not making model t's to polish and fawn over! LANL couldn't be sentimentally making a scrap book of catastrophes they hope to gloat over and covet like a psychopath goes back and covets a bone or a token from their kill. They have Hiroshima in their scrap book and all the contaminated dumpsites...could LANL want all the cast off projects no one else wants? It would be karmic ally correct if LANL gathered all the children

of the children back into their fold...the bombs of all their bombs of the mentality they created. They could want to be a museum of horrors/atomic relics and show what they could do to people. These bombs, once dismantled, can only exist in museums and in madmen's grandiose schemes in loony bins. AS THE WORLD OF PEACE AND ORDER RISE THE WORLD OF CHAOS, WAR AND INJUSTICE DISINTEGRATE. SINCE THE LANL REJECTED THE CHILDREN'S PEACE STATUE I GET THE FEELING THAT LANL IS THE ENEMY OF PEACE. LANL FEEL THAT A PEACE STATUE IN THEIR CITY IS THREATENING THEIR BOMB MAKING GOALS! THAT CHILDREN'S LONGING FOR PEACE IS THE ENEMY TO BOMB PRODUCTION AND EVEN THE IDEA IS ABHORRENT/ALIEN TO THEM! WHEN PEACE IS YOUR ENEMY DOESN'T THAT SAY SOMETHING ABOUT YOUR STATE OF MIND? DOE MUST FORM A SANE PHILOSOPHICAL BASE IF IT WISHES TO HAVE ANY CREDIBILITY IN THE HUMAN WORLD!
WHAT DISTINGUISHES LANL FROM A DAVID KORRESH, MINUTE MEN, KKK, SADDAM HUSSSAIN, CORRUPT POLICE, PILFERING POLITICIANS OR LYNCHERS? States can become corrupt and want to detach from the united nations...but the nation building time is over. Nations can get corrupt governments, dictators who create wars, invade other nations, try to kill opposing voices, disobey world treaties, back other tyrants, steal the people's money by pilfering and squandering taxes, focus on nation fanaticism and discourage working with other nations, scoffing at inter affairs and concerns, starving and neglecting their own people, blaming real people for taking government funds from bomb making for legitimate human problems like health care, not becoming fully involved in international regulation and human rights laws and not help enforce them making the commitment lip service and not a heartfelt or acted upon commitment, making the U.N. weak, not supporting peace keeping and humanitarian groups, mocking and belittling gentle, sensitive, peaceful people for avoiding wars (like the

war mongers mocked Carter for stopping a war in Haiti instead of praising him, neglect the environment, back corporations- right to not put anti-pollution devices or comply with environmental clean air and water acts, bully, bribe, co-erce others to do what they want, squandering resources for future generations (maybe all this uranium could've gotten us off planet earth to a new planet as the sun runs out), squandering human health for CO-orporate benefit, acting spoiled, obnoxious and irresponsible in every way unaccountable, etc., etc., etc.,

LANL, in every way fits in with the corrupted who make money off of human misery (like people who sell arms to both sides and enemy countries, co-orporations who sell outlawed chemicals and pesticides like DDT to foreign countries who have no laws banning it, clothes companies who sold pajama's with cancer causing chemical outlawed in the U.S., drug lords, gangsters, Mophia) secrets to Russia, mischief makers who focus on the worst of human nature to justify extreme acts of cruelty and depravity. The Germans justified their cruelty and depravity by blaming the Jews for being good at business affairs and hard working and prosperous...as if being smart and industrious justified Jews being put into the gas chambers by the millions! LANL AND DOE HAVE TO BE CAREFUL ABOUT HOW THEY JUSTIFY WHAT THEY ARE DOING BECAUSE WE ARE LISTENING! There is viscous murderous evil in planning to murder people and LANL has to see how evil they have become in order to stop what they are doing. LANL justifies it's horrible job by stating how horrible the world is!

The world is hard and to stay alive is hard in and of itself, that is part of the struggle. No one gets out of life alive anyway. The point is our souls are eternal and we are not here to protect our bodies by doing anything or just about anything to survival (survival of the fittest.) If we do what is right by disregarding our

own discomfort, growing pains, public opinion, monetary reward or even torture and death then we are on the road to understanding the true purpose of this life is to let our souls be purified by the tests of life, not to avoid them at all costs or at the price of our very soul. Bad people can't say they are creating struggle and are growing because they have antrophied, stagnated and fight for materialistic gains and not human life. Bad people choose materialism instead of spiritual growth and rot in jails, hell and in their own rotten existence they can get no satisfaction because spiritual qualities like forgiveness, generosity, mercy, compassion and kindness are foreign. Building bombs won't get you a red carpet to God, the nation's heart, the mother's blessing. WAR IS DEATH PEACE IS LIFE. LANL IS DEATH PEACE TREATIES ARE LIFE.

What you do to the least of us you do to the rest of us. I can't understand how the scientists are lured to Los Alamos by the porked up Public School's good educational opportunities, and yet their children suffer the highest rates of skin cancer,(radioactive calcium goes into the bone and multiplies the bone), childhood cancer, leukemia/cancer of the bone and thyroid cancer (radioactive iodine goes right to the thyroid.), and other scary maladies. Don't these statistics scare you scientists and warn you that these types of cancer are high where radioactive contamination is taking place! How can scientists be in such a trance/state of denial not to see what living near plutonium does to their families? To some extent all of us around nuclear facilities are in denial about the statistics. Even if you cockily say we are contaminated already if your child got cancer you would be bitter as all get out. A lot of people I know right now are fighting cancers of all kinds. I know many, many people who have died of cancer already!

DURING THE FIRES THE WIND QUICKLY BLEW THE SMOKE AT 35MPH TO US AND WE HAD TO BREATH! I WAS UPSET THAT

LANL HAD NO EVACUATION OR WARNING PLAN IN CASE LANL CAUGHT FIRE! I FELT THEY WOULDN'T TELL US THE DANGERS AND THEY DIDN'T. DO THE HOSPITALS HAVE RADIATION ANTIDOTE (FOR WHAT LITTLE GOOD IT'S WORTH!) I WAS IN TERROR. THOSE OF US WHO ARE EDUCATED ABOUT THE TOXIC WASTE ACCUMULATIONS, THE NUCLEAR POWER PLANT THERE WERE SCARED TO DEATH. WE COULD'VE BEEN DYING LIKE FLIES N A MELT DOWN, PLUTONIUM LADEN SMOKE AND EXPLOSIONS. EVERYONE WAS PACIFIED THAT IT WAS SAFE AND THE ONLY BOXES OF BOMB MAKINGS WERE IN BOXES AND CARTED AWAY. I KNOW THERE ARE 2,000 TOXIC DUMP SITES AND YOU CAN'T CART THEM AWAY IN HUNDREDS OF TRUCKS! IF LANL WAS A WEAPONS COMPLEX THIS FIRE COULD'VE BEEN THE END FOR US IF IT HAD CAUGHT. FIRES ARE A COMMON OCCURRENCE IN LANL. THE TREACHEROUS MOUNTAIN ROADS AND THE FIRE HAZARDS MAKE LOS ALAMOS A TERRIBLE PLACE TO MAKE BOMBS. EVERYWHERE IS A TERRIBLE PLACE TO MAKE BOMBS FOR THE PEOPLE WHO LIVE THERE!

I know there are a few good projects going on in LANL but I haven't heard of a great deal of thought being given to alternative purposes for LANL. We poured out our heart after LANL asked for our input about LANL and I have heard of not a single idea we suggested as being contemplated. The evil and horror of bomb production make doing any good project impossible. The choice is still ours. LANL never apologizes to us for the contamination, suffering and psychic pain we endure and even envision an end to all this madness. <u>A scientist there said he could throw up on the statistics for stockpile stewardship they were so haphazard and random and the emission standards were so low they let way more toxic emissions out into the community than many facilities in the world allowed even! What kind of protection is this for us? I DEMAND A POLICY OF NO EMISSIONS FOR PLUTONIUM AND SINCE THAT CAN'T BE ACCOMPLISHED I SUGGEST YOU ABANDON THESE NUCLEAR PROJECTS ALTOGETHER!</u> More

than that, I demand no emission whatsoever as the standard for my family safety, compliance with all EPA standards and all RICRA standards.

We are all family here. All of New Mexico would like to see sanity and balance returned to LANL. The mental contortions needed to make bombs must be straightened out, loosened up and set straight. Set the poor twisted scientists to pasture. They must be exhausted from all the tension of the cold war and they need a rest...a long rest! They remind me of old mill horses who went around and around to grind the wheat. When they were retired they would go around and around a tree and make well worn paths deeper and deeper. That is what the horses did all their lives and they couldn't stop even if they were free to roam and buck and explore. The LANL scientists have helped to make bombs and make bombs and they want to continue to make bombs just as they always have even if they can now explore other ideas. Let these tortured souls free to lay on psychiatrists couches to try to straighten out their split from sanity and humanity. Let their trigger happy, caulked and ready, fight and flight reflex muscles relax in the many massage tables and bath their toxic cancers in the many health institutions available (if they aren't radioactive to touch) and give them lots of pain killers as they live out their operations and treatments for tumors. Let them write out their memoirs as the confusion mists and blurs and the try to make sense of their times and lives. As peace is established let them try to come to terms with their "role." They will complain to people, lament and wail, " They took apart all the bombs we worked so hard to make! We spent our whole lives to create them and it isn't fair!" "There, there", we'll say, "times change!"
As they wake up with nightmares in a cold sweat, " The Russians are coming! They are going to get us! Must make more bombs! Must make more and better

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COMMENT LETTER
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bombs!" we'll say, "don't worry love, the cold war is over. The USSR isn't a country anymore. The Russians took apart their bombs. Go back to bed dear."

I feel sorry for all these tortured minds who blew their main, most vital fuses trying to find a way, trying, trying to make bombs the way to solve the world's main problems of lack of order, stability or world peace. Trying to make bombs feed the hungry, put down tyrants, educate children, win wars and make make the U.S. the permanent world leader and top dog. To make bombs justify their existence is a very hard job for the psyche.

Let's unclench their fists from their bombs, lead them away from the bombs as they babble. "We understand," we'll say. It's been very stressful. Bomb making is a very stressful occupation. There! there! Lets forget the whole thing now! The leaders of the nations are uniting and the peace talks are well under way, peace treaties have been singed by everyone. Your work is done. No human being should live with the pressure you do. Many scientists would've committed suicide long ago, but you didn't, it's amazing, we'll have to think about this sometime! You're a survivor of the cold war, dear, but the cold war is over!"

I for one am glad the cold war is over. I am one of many who say no to upgrading the bombs we already have for the myriad reasons I can think of right now and the myriad of reasons myriads of brilliant and competent citizens think of to stop nuclear proliferation, under whatever disguise it takes,,,,modernizing the bomb industry or whatever...it is all unacceptable to me. Just stop making bombs! If LANL does not make some effort to use the billions of dollars they need for clean up... to clean up the toxic dumpgrounds in this country, I am going to be really disappointed once again at this total sloppy DOE way of doing things that endangers us all!

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COMMENT LETTER
PAGE 1 OF 13

May 7, 1996

Vernon J. Brechin
255 S. Rengstorff Ave. #49
Mountain View, CA 94040 1734
(415) 961-5123

Mr. Jay Rose
Office of Reconfiguration
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, DC 20585
Attention; SSM PEIS
(202) 586-5484

Dear Mr. Rose:

Following this cover letter are my comments on the "Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management-February 1996" DOE/EIS-0236 (SS&M DPEIS).

1/40.87

Although I was quite impressed with the quantity of information that was contained in this PEIS I found the layout and the content of the various alternatives to be quite troublesome.

The alternatives seem to comply with neither, the desires of the majority of the public, who commented on the Implementation Plan, or with the spirit and intent of NEPA.

I can not see how the present PEIS can be fixed without a major rewriting an resubmission of the document for public comments.

I was only able to comment on about 5% of the document that I had marked up. I hope you take my comments seriously.

Sincerely,

Vernon J. Brechin

Vernon J. Brechin

cc: Elizabeth Blaug-Council on Environmental Quality
Gary L. Bennethum-Office of Management and Budget (OMB)
Joan Glickman-Public Accountability-HQ-DOE
Frankie Sue Del Papa-Attorney General, State of Nevada
Christopher Paine-Natural Resources Defense Council (NRDC)
Arjun Makhijani-Institute for Energy and Environmental Research (IEER)
Stephen I. Schwartz-Nuclear Weapons Cost Study Group The Brookings Institution, Wash., DC
Senator Harry Reid-(Nevada)
Senator Richard H. Bryan (Nevada)
Senator John Glenn-(Ohio)
Representative John Ensign-(Nevada Dist.1)

Representative Barbara Vucanovich-(Nevada Dist. 2)
John B. Walker-State of Nevada Nuclear Waste Project Office
Earl Dixon-Harry Reid Center for Environmental Studies, LV
Dan W. Reicher-PDAS for Policy (HQ DOE)
Robert Alvarez-DAS for Natl Sec & Env Rest Pol (HQ DOE)
Sandi Carroll-US EPA Region IX

Comments on the 'Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management' - February 1996 (DOE/EIS-0236).

General comments:

The 'Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management' - February 1996 (DOE/EIS-0236), (SS&M DPEIS) performs a poor job of evaluating a multibillion dollar program which the DOE is claiming will maintain U.S. deterrence based upon a large nuclear weapons arsenal. As envisioned, by the DOE, this program would consume about as much public funds for the maintenance of nuclear weapons and for the readiness to test as was expended on the testing and maintenance program during the Cold War period.

2/40.13

The SS&M DPEIS fails to mention that, before the fall of the Berlin Wall when our nuclear arsenal was much larger and weapons development and production were the primary focus of DOE's Defense Program office, the annual expenditures, for nuclear weapons maintenance as well as for safety and reliability testing, were a small fraction of the latest program cost. Presently, the field maintenance of nuclear weapons usually involves the infrequent visit by a Special Weapons test technician who plugs a test box into the nuclear weapon to check whether it still meets the test specifications. If it does not, which is very rare, then the nuclear device is removed from service. The cost of this field test procedure is thousands of times less than the cost of the new SS&M program.

3/40.15

The SS&M DPEIS mentions that maintaining a state of readiness to resume underground testing is part of the new program. No mention is made about the history of a previous test readiness program. The Final PEIS should provide details of the embarrassing history of the Safeguard C atmospheric nuclear testing readiness capability program. This program involved the operation of facilities on Johnston Atoll to permit the swift resumption of atmospheric nuclear testing. The operation lasted for 29 years, from 1964 until 1993, when Congress was made aware of its continued existence. Despite the fact that during the last 25 years of the program's existence there was virtually a zero likelihood that atmospheric testing would resume, the Safeguard C program managed to consume about 1.6 billion tax dollars. The SS&M program could consume that amount in a year. How many tens of billions of tax dollars will be spent by the time Congress discovers that we were prepared to resume underground testing when that likelihood was essentially zero?

This SS&M DPEIS needs to do a much better job of comparing the past activities with the new activities in order to justify the need for a whole new set of, extremely expensive, nuclear weapons simulation and test machines. The lessons learned from the 1,054 nuclear tests conducted by the U.S. will not be forgotten. Hundreds of billions of dollars of damage has been acknowledged by the DOE and much of this will be passed on to future taxpayers. Lets not add to that squandering of our nation's precious resources by spending tens of billions on machines of questionable value.

"Summary" document
SUMMARY
S.2 Purpose OF AND NEED FOR THE STOCKPILE STEWARDSHIP AND MANAGEMENT ACTION
S.2.3 Purpose and Need
Stockpile Stewardship--The Laboratories and Nevada Test Site
p. S-16, 1st column, 3rd paragraph, 9th line from bottom
"Assessment and certification of nuclear performance is a nonstatistical, technical judgement by the weapons laboratories based on scientific theory, experimental data, and computational modeling. The scientific practice of 'peer review' has been fundamental to these judgements. Experts from the two nuclear design laboratories review each other's data and conclusions on important issues, thereby providing an independent check and balance."

4/40.08

001. Internal checks and balances can not substitute for external checks and balances. The high levels of secrecy associated with nuclear weapons related work tends to severely limit the "peer review" network to a small group of people at the weapons labs who depend on weapons work for their livelihood. Many scientist avoid going to work for the nuclear weapons labs precisely because they believe the lab's "peer review" processes are not in the best spirit of the scientific process. Associated with restrictive secrecy classification processes are the "need-to-know" requirements which are usually controlled by highly bureaucratic institutions. These need to know requirements further narrows the scope of the lab's peer review process by limiting the knowledge diversity of the reviewers. Such a process is not considered to be good science by many researchers who work outside our weapons labs.
It has also become common knowledge that our secrecy laws are sometimes used to hide scientific results that could prove embarrassing to the labs. In secret labs, troublesome projects can be quietly phased out without revealing the true nature of the problems. Politicians and bureaucrats can, and often do cut scientific studies short, thus preventing the publication of final reports on projects that may have been funded for many years. Many scientists have come to realize this kind of process has a lot more to do with politics than with real science.

Stockpile Management--The Industrial Base
Weapon Assembly/Disassembly (A/D)
p. S-17, left column, middle paragraph
"The Pantex Plant (Pantex) is the only DOE site currently authorized to assemble or dissemble stockpile weapons." "However, NTS(Nevada Test Site) has few of the support facilities required for volume assembly or dissembly of stockpile weapons. A major programmatic consideration is the cost of re-creating facilities that already exist at Pantex. Due to ongoing weapon dismantement requirements, the alternative to transfer this function to NTS

would be slow but achievable within a 10-year period."

5/30.02

002. Whenever mention is made, throughout the SS&M DPEIS, of the "Weapon Assembly/Disassembly" function, the names of the specific facilities seems to be avoided, especially in the case of the new and very costly "Device Assembly Facility" (DAP) at the NTS. The NTS contains the older Able and Baker A/D facilities in a remote section of Area 27 of the NTS. The, just completed, $100 million DAP complex was originally funded for the purpose of replacing and expanding the functions of the old Able and Baker sites. The construction of the DAP complex started about a decade ago when there were expectations of an expanded underground nuclear test program at the NTS. The facility was designed, funded and constructed primarily for the purpose of assemblying a maximum of a few dozen nuclear explosive test devices, for use at the NTS's underground test areas. Construction of the facility was completed about three years after the U.S.underground nuclear test moratorium went into effect. The final construction was halted and then restarted with the belief that this facility could eventually be used to supplement some of the nuclear weapons disassembly functions of the Pantex Plant in Texas. Since the DAP facility was not originally intended for this purpose, significant and very costly expansions to the facility will be needed to significantly increase the nuclear weapons disassembly work that the Pantex Plant is presently performing.
Although the quote above states that "A major programmatic consideration is the cost of re-creating facilities....," this SS&M PEIS fails to provide such cost analysis for this or for the dozens of other projects that are proposed or are already under construction. This SS&M PEIS mentioned that more detailed consideration of the DAP would be provided in the "Environmental Impact Statement for the Nevada Test Site and Off-site Locations in the State of Nevada" (DOE/EIS 0243) (NTS EIS). A through review of the draft version of this document indicates that there is little consideration given to the expansion of the DAP complex and no analysis of the cost of such an expansion.

2/40.13
continued

The Final SS&M PEIS should frequently refer to the official names of the various facilities so the analyst, at the executive Office of Management and Budget (OMB) and the Congressional Budget Office, can properly compare the facilities mentioned in this document with the facilities that are listed as "line items" in the proposed U.S. Budget.

S.3 ALTERNATIVES
S.3.1 Development of Stockpile Stewardship and Management Program Alternatives
Stockpile Management Assumptions
p. S-22, left column, first bullet
"The No Action alternative includes all existing site facilities plus all facilities for which Congressional budget 'line item' construction was started by the end of fiscal year 1995 (September 30, 1995)."
003. The No Action should not be based upon the ground breaking of new construction projects that were started by September 30, 1995. Many of these projects will require many more

Congressional appropriations and many more years of construction before they will be completed. The DOE's Defense Program funding level, on September 30, 1995, was not substantially less then the levels that existed before the end of the Cold War. The No Action alternative and the Downsize Existing Capability alternatives are not crafted in ways that will produce the so called "Peace Dividend" for the American tax payers.

5/30.02 continued

004. The Downsize alternative, is presented in this SS&M DPEIS, as part of a plan of "relocating" the functions of one facility to another facility. As this plan is presented, it could in some cases actually increase the cost of performing a function. For example, transferring the A/D functions of the Pantex Plant to the DAF complex at the NTS would require major expenditures for expanding the existing DAF complex. Even then, the transfer might take nearly a decade to complete. If the U.S. nuclear arsenal was limited to less than 100 nuclear weapons then upgrade, to the DAF complex would be unnecessary and the Pantex A. functions could be closed down.

1/40.87 continued

The Downsize alternative, as presented in this DPEIS, fails to address the concerns, expressed by a great many of the commentators, during the scoping and implementation phase of the present SS&M DPEIS. As a result, it does not comply with the spirit and intent of the National Environmental Policy Act (NEPA). Before a Final PEIS is issued, the draft study needs to be completely reworked so that it reflects the desires of the public rather than the wishes of the Defense Program division of the DOE. After this rework, the DOE should again submit the revised document for public comment.

S.3.4 No Action Alternative
p. S-24, left column, last paragraph
"From a programmatic perspective, the No Action alternative would not ensure DOE's ability to maintain core U.S. competencies in nuclear weapons while also maintaining a safe and reliable smaller, aging U.S. stockpile. Because this is not acceptable, the No Action alternative is not considered to be reasonable. However, in accordance with the CEQ regulations, the No Action alternative is presented and assessed in this PEIS."

6/41.18

005. The leading sentence expresses a very one-sided view point of Defense Program division of the DOE. The second sentence states that this is not acceptable and therefore it renders the No Action alternative to be unreasonable. Just because DOE's Defense Program office views this as "not acceptable," does not necessarily mean that it is unacceptable to the folks who pay their salaries. The last sentence indicates that the No Action alternative was only provided in this SS&M DPEIS in order to satisfy the President's Council on Environmental Quality (CEQ) regulations.
The last two quoted sentences demonstrate, more than any other passage in this nine pound set of documents, the extreme levels of self serving arrogance still present in some sectors of the DOE. Such expressions of human

6/41.18 continued

arrogance are not appropriate in a document that is supposed to put the environment and public's needs first. Government officials, who exercise some control over a massive nuclear arsenal that is capable of extinguishing human life on this planet, need to be held to a higher level of accountability than that which is evidenced in this set of SS&M PEIS documents.

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Volume I
Chapter 4: AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS
4.9 NEVADA TEST SITE
4.9.2 Affected Environment
4.9.2.1 Land Resources
p. 4-444, Figure 4.9-2.--Principal Facilities and Testing Areas 2535-NTS/SSM at Nevada Test Site.

7/01.02

006. This figure contains a map of the Nevada Test Site in which a specific area of the test site, once labled as "Area 51," has been deliberately removed from the map drawing. The test site boundary line, at the northeast corner of Area 15, is shown incorrectly as enclosing Area 15 rather than as extending around Area 51 before returning to Area 15.
In this SS&M DPEIS, all 17 of the figures, which contain maps of the Nevada Test Site, exhibit the same deletion. This is not totally surprising to me since the folks at the DOE's Nevada Operations Office (DOE/NV), which is located in Las Vegas and manages the NTS, has been allowed to supply these deceptive NTS maps for the last 38 years. These deliberately deceptive maps have been widely distributed to the general public, to the public's elected representitives, to State government officials, and to federal executive agencies which are supposed to exercise oversight functions. The deceptive maps have wound up at the Presidential Office of Management and Budget (OBB) and at the Inspector Generals Office. These deceptive maps can be found in libraries all across this country, whether they be public or highly specilized government document repositories. Presently the DOE is distributing dozens of tons of NEPA documentation that contain these defective maps. Rather than enhansing our democracy, such actions damage our democracy by eroding the public trust. It is about time that this lie be ended.

The figures that are in error are as follows:

Volume I
p. 3-30 Figure 3.4.1.3.--Weapons Assembly/Disassembly Site Map 2839/SSM for Nevada Test Site.
p. 4-443 Figure 4.9-1.--Nevada Test Site, Nevada, and Region. 2885/SSM
p. 4-444 Figure 4.9-2.--Principal Facilities and Testing Areas 2535-NTS/SSM at Nevada Test Site.
p. 4-445 Figure 4.9.2.1-1.--Generalized Land Use at Nevada Test 2651/SSM Site.
p. 4-446 Figure 4.9.2.1-2.--Primary Facilities, Assessembly/ 2652/SSM Disassembly Area, and Testing Areas at Nevada Test Site.

7/01.02 continued

p. 4-453 Figure 4.9.2.4-1.--Groundwater Hydrologic Units at 2643/SSM Nevada Test Site and Vicinity.
p. 4-456 Figure 4.9.2.5-1.--Major Fault Systems and Historic 2537/SSM Earthquakes in Nevada Test Site Region.
p. 4-458 Figure 4.9.2.6-1.--Distribution of Plant Communities at 2538/SSM Nevada Test Site.
p. 4-460 Figure 4.9.2.6-2.--Distribution of Desert Tortoise at 2886/SSM Nevada Test Site.
p. 4-526 Figure 4.12-2.--Locations of Underground Testing Areas 2879/SSM and Tests on the Nevada Test Site.

Compare this last map with the one found on p. 4-107 of the NTS DEIS (DOE/EIS 0243). You might want to alter the title.

Volume II
p. A-41 Figure A.1.8-1.--Nevada Test Site, Nevada, and Region. 2885/SSM/App
p. A-42 Figure A.1.8-2.--Principal Facilities and Testing Areas 2535-NTS/SSM/App at Nevada Test Site.
p. A-71 Figure A.3.1.2-1--Location of Facilities at Nevada Test 3058/SSM Site.
p D-52 Figure D.2.4-8.--Minority Population Distribution for 3119/SSM Nevada Test Site Surrounding Area.
p D-64 Figure D.2.4-16.--Low-Income Population Distribution by 3120/SSM Poverty Status for Nevada Test Site and Surrounding Area.
p. I-118 Figure I.4.3.1.1-1.--Generalized Land Use at Nevada 3157/SSM Test Site and Vicinity.
p. I-123 Figure I.4.3.1.4-1.--Distribution of the Desert Tortoise 3159/SSM at the Nevada Test Site.

A single map, that contains Area 51, can be found in the NTS DEIS (DOE/EIS 0243) on page 4-10. All the other dozens of maps, contained in this 8+ volume document, are intended to be deceptive.

==

8/40.41

007. The SS&M DPEIS "COVER SHEET" briefly mentions in the next to the last paragraph that, "A classified appendix has also been prepared to support the purpose of and need for the plutonium-242 to be stabilized at SRS for use in future weapons complex research and development activities." At the very least, this classified appendix should be listed in the "Table of Contents" of the Final SS&M PEIS. In addition, at the location where this appendix would appear, in the publicly released SS&M FPEIS, there should be an appendix that provides a full accounting of the reasons for the classification of this information . This accounting should include the level of classification and any special handling requirements. If this document is assigned an automatic declassification date, this too should be noted. All the rules and regulations under which the document was classified should be provided and an explanation of how the release of this information could jeopardize national security should also be provided. Finally the name and title of the person or persons who were responsible for

8/40.41 continued

classifying the document should be provided along with their phone number and other contact information such as Fax numbers and possible e-mail address.
Better yet, reform the secrecy laws in such a way that government officials will be just as likely to be prosecuted for withholding vital environmental information from the public, as they are now libel for revealing similar information that has undergone the classification process.

4.12 ENVIRONMENTAL IMPACTS OF UNDERGROUND NUCLEAR TESTING
Geology.
p. 4-525, right column, 4th paragraph
"Underground conventional HE, hydrodynamic, and hydronuclear experiments would produce some of the physical effects on geologic media and processes associated with underground tests of nuclear devices (e.g., compression and fracturing). These effects are anticipated to be significant and irrevocable although small in relation to the effects of detonation of nuclear devices."

9/05.04

008. Before the word "hydronuclear" add the phrase "zero yield subcritical." Either remove the word "processes" or define what geologic processes refers to in this context. In two places, replace the word "devices" with the word explosives. Replace the phrase "geologic media" with the phrase "underground soil, rock and groundwater." Explain the meaning of the term significant in this context. For example place a dollar amount on it. The term irrevocable at the NTS often refers to environmental damage which is so extreme that there is no practical economic remedy for it. A trillion dollars could be spent on cleanup at the site and it still would not be fixed. Explain, quantitatively what is meant by "small in relation to the effects of detonation of nuclear devices." What is considered to be small in relationship to a trillion dollars worth of existing damage?

10/40.02

Presently the Nevada Test Site is preparing to perform a set of six zero yield subcritical hydronuclear experiments that are estimated to cost $20 million each. The first experiment, "Rebound," is scheduled to take place on June 18, 1996. It will involve the explosive dispersal of substantial quantities of plutonium in an underground room. After each test, the plutonium contaminated room will be abandoned and another test will be conducted in a adjacent room. These tests are to be conducted at the Lyner Complex which lies 26 miles to the northeast of the Yucca Mountain nuclear waste study site. At Yucca Mountain, scientist have spent billions of dollars for about a decade to determine if they can safely contain plutonium, produced by nuclear power reactors. This waste plutonium is supposed to be surrounded by multiple engineered barriers that are expected to last for thousands of years. The containment standards, for the plutonium that may wind up in Yucca Mountain, are very strict and are derived from Environmental Protection Agency (EPA) and Nuclear Regulatory Commission (NRC) regulations. The underground nuclear experiments, that are conducted at the NTS, are not subject to the same set of rigorous

10/40.02 continued

standards. This is because the Defense Program office, of the DOE, is largely self regulating. The estimated cost of of cleaning and stabilizing some of the DOE's weapons production facilities is over $200 billion and much of that cost will be passed on to future tax payers. A lot of this cost can be attributed to the self-regulatory nature of the DOE's Defense Program.

Though, these subcritical experiments will present a major environmental hazard that will persists for around a quarter million years, the SS&M PEIS makes no mention of these specific tests. Part of the reason for this lack of candidness can be found in the NTS DEIS, where an obscure notice in the rear of the summary mentions that there is a classified appendix that deals with the environmental impacts at the Lyner Complex. The one aspect of the Lyner, subcritical experiments, that might need to be classified as secret, is the specific data that would be produced by these equation-of-state experiments. An environmental analysis, that describes the explosive dispersal of plutonium dust in an underground room, is not going to give away the family jewels concerning the equation-of-state data. It is much more likely that the DOE's Defense Program office has, misused its secrecy laws in order to protect itself from potential environmental liability problems that could come from its restarted reprocessing program at SRS and from the subcritical experiments at the NTS.

The DOE should explain, in the Final SS&M PEIS, why there was a mention of one classified appendix in the DPEIS but not another. It should also come clean with references to any other classified environmental impact analysis that will be applied to the SS&M PEIS "Record of Decision" (ROD). The suggestions, listed in comment 007, should also be applied in the case of the classified Lyner study. As long as the DOE attempts to hide behind its walls of secrecy, the public and Congress will be unlikely to continue their support.

11/01.04

4.9 NEVADA TEST SITE
p. 4-442, left column, first line
"NTS was established in 1950 and currently occupies approximately 351,000 ha (867,000 acres) located 105 km (65 mi) northwest of Las Vegas, NV."
009. Replace the area with the legal size of 792,650 acres. It may have been established in 1950 but it was not legally withdrawn until 1952.

4.9.2 Affected Environment
4.9.2.1 Land Resources
Land Use
p. 4-442, right column, second line
010. Refer to comment 009.

eight line from top
"All of the land within NTS is owned by the Federal Government and is administered, managed, and controlled by DOE."

11/01.04 continued

011. Area 51 is not managed by the DOE. The Final PEIS should also indicate all the other properties that the Nevada Operations Office is responsible for including the Remote Sensing Laboratory on the Nellis AFB.in North Las Vegas, Nevada, the Project Faultless underground nuclear explosion site at the Central Nevada Test Area, the Project Shoal underground nuclear explosion site near Fallon, Nevada, the Salmon underground nuclear explosion site in Mississippi, the Projects Long Shot, Milrow, and Cannikan underground nuclear explosion sites on Amchitka Island, Alaska, the Rulison and Rio Blanco underground nuclear explosion sites in Colorado, and the Gnome and Gasbuggy underground nuclear explosion sites in New Mexico.

12/04.07

4.9.2.4 Water Resources
Groundwater
Groundwater Quality
p. 4-454 right column, first line
"Groundwater at portions of NTS has been affected by nuclear testing activities conducted during the last 43 years."
012. Replace the word "affected" with the word "contaminated."

sixth line
"Because the watertable lies at considerable depth, most radionuclides are absorbed before they can reach the groundwater."
013. Remove or correct this statement since it does not make much sense. Tests that are conducted below the water table will be in direct contact with the groundwater and therefore some radionuclides will be in the surrounding groundwater.

13/11.37

4.9.2.9 Radiation and Hazardous Chemical Environment
Environment
Accident History
p. 4-472, left column,third paragraph, first line
"Since 1970, there have been 126 nuclear tests that released approximately 54,000 Ci (2,000 TBq) of radioactivity to the atmosphere. Of this amount, 11,500 Ci (430 TBq) were accidental due to containment failure (massive releases or seeps) and late-timeseeps."
014. Remove the word "radioactivity" and before the word "approximately" insert the phrase "radioactive activity level." Replace the phrase "were accidental" with the phrase "was an accidental release."
The leading paragraph under the heading "Accident History" is not needed since it does not relate to accidents. It simply serves as neutral filler.
The end of this section provides an interesting example which is a good example of how NTS "scientist" play with data. The date chosen, in this accident history section, was done quite deliberately so that the Baneberry venting accident, in 1970, wouldn't inflate the radiation release figures. The Baneberry accident released 6,700,000 Ci. Before 1971 there was more than 25,300,000 Ci released from underground tests.
The NTS atmospheric tests released 12,000,000,000 Ci into atmosphere. It should be remembered, that many NTS scientis:

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COMMENT LETTER

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argued that atmospheric testing was performed safely and were opposed to underground testing.

4.12 ENVIRONMENTAL IMPACTS OF UNDERGROUND TESTING
p. 4-522, left column, first paragraph, fourth line
"More detailed information on the environmental impacts of underground nuclear testing is contained in the 'Environmental Impact Statement for the Nevada Test Site and Offsite Locations in the State of Nevada (DOE/EIS 0243) January 1996.'"

14/04.09

015. The entire section from the Draft NTS EIS that covers "RADIOLOGIC SOURCES IN GROUNDWATER" should be transfered to the SS&M PEIS. This extends from p. 4-159, line 8 to p. 4-163, line 24. This should include: "Table 4-27. Remaining isotope inventory under or within 100 m (330 ft) of the water table." The type of units needs to be labled in the table and another set of columns should provide the quantity of each isotope in terms of their mass in grams. The text should also mention the total quantity of plutonium-239 that has been deposited i , or near the water table. According to the data in the table, this comes to somthing like 0.76 metric tons. If these tests constitute only about 20% of the total number of underground tests then then that suggest that over three metric tons of plutonium-239 lie buried under the testing grounds of the NTS.

15/10.23

p. 4-522, right column, first and second paragraphs
016. Based upon the materials that remain from a typical underground explosion it appears that large volumes of mixed transuranic waste may be the product of these explosions. The text should provide an estimate of the volume of this waste and the volume of the potentially affected rock, soil and groundwater. This should be expressed in terms of cubic kilometers. The text should also indicate whether or not this mixed waste material might come under the terms of the Federal Facilities Compliance Act and if it does, will it require treatment.

16/01.05

Land
p. 4-523, right column, second paragraph
017. After the description of the area of land that is ruined after each test and the description that these are unavoidable impacts, provide a infrared satellite image of the surface of yucca flat.

9/05.04 continued

Geology
p. 4-527, left column, second paragraph, last three lines
"The effects of subsidence and the confined radioactivity on the environment will persist for many years."
018. Place the word 'partially' before the word "confined." Replace the word "many" with the phrase " at least a quarter million."

12/04.07 continued

Water Resources
p. 4-527, left column, last paragraph
"Because underground nuclear testing does not utilize any significant amount of groundwater, it is unlikely that there

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12/04.07 continued

would be any potential impact to groundwater availability.
019. Groundwater that may be potentially contaminated is water that people are likely to avoid. The subsistence farmer, in the distant future, may not have his well water checked on a regular basis.

p. 4-527, right column, first paragraph, first line
"However, as an unavoidable consequence of underground nuclear testing, the quality of the groundwater under some portions of NTS has been affected. If any underground tests were to be detonated under or near the water table, additional impacts to water quality could be expected.
020. In two places, replace the word "quality" with the word "purity." Replace the word "some" with the word extensive." Replace the word "impacts" with the word "damage." Replace the phrase "could be expected" with the phrase "would take place."
I'm sure the environment appreciates such highly creative bureaucratic styles of writing. Future generations, who have to pay for the cleanup cost, will appreciate the style as well.

17/42.08

p. 4-527, right column, third paragraph
"The exact quantity of substances that are released during a given test is unknown, but can be approximated based upon the similarity in materials used and in the overall testing procedures.
021. After most test were conducted, a drill back operation was performed which retrieved a sample of the melt pool. The analysis of this sample provides data on what has been deposited by the nuclear explosion. Unfortunately, this data is classified and as a result, many other extremely expensive procedures are employed, including the drilling of monitoring wells. Because the monitoring contractors are prevented, by the DOE, from drilling into the immediate vicinity of a test cavity they often only obtain water samples which are little more than control samples. It is time the DOE came clean with all the data that would allow site characterization researchers to fully characterize and evaluate the underground contamination situation at the Nevada Test Site and all the offsite nuclear test areas.

This ends my comments on the SS&M DPEIS.

Vernon J. Brechin
April 7, 1996

Rocky Flats Cleanup Commission, Inc.
James S. Stone, P.E., Technical Advisor
2510 Miller St., Lakewood, CO. 80215-1323, V/Fax (303) 237-8058, SSMDPEIS.DOE; 5/7/96

U.S. Department of Energy, Office of Reconfiguration
P.O Box 3417, Alexandria, VA 22302

Re: Public comment on DOE/DEIS-0236, Stockpile Stewardship and Management.

1/42.18

- RFCC agrees the Rocky Flats Environmental Technology Site is not suitable for the stewardship and management of nuclear weapon components and special nuclear materials and that RFETS must have these materials removed at the earliest date. There are multiple reasons beyond the scope of this report, but suffice to say "about 2 million people are in eminent danger" by nuclear materials. RFETS is in a total decontamination and decommissioning program. In addition to nuclear weapon components and SNM, there are large quantities of Plutonium waste to be removed before D&D can begin. Also, the existing buildings are not suitable for this storage according to the DNFSB. The cost of a temporary D&D program to strengthen the storage buildings and the mortgage of about $2 million/day would deplete the budget. The RFCC urgently requests an immediate decision on the disposition and schedule of this liability or permission to provide interim storage at a dedicated off-site facility.
- A recent conceptual design type Proposal has been submitted by my firm - Stone Environmental Engineering Services, Inc. See attached Prospectus. It describes a Site for 3 options: Open drum/crate storage; Stabilization/cementation monofill disposal; and a Sub-terrainian building for open storage, monofill disposal; storage vaults; and research facilities. The preliminary evaluation by RFETS is "An advantage this alternative has over other offsite disposal alternatives is the reduced transportation costs and risks".
- The Site provides for near term compliance with requirements of the "Settlement Agreement and Compliance Order on Consent No.93-04-23-01", which compels DOE and its contractors to implement the Mixed Residue Reduction Program in a timely and adequate manner.
- Site graded 87 to 95% in Geotechnical, Hydrological, Environmental, and Economical rating matrix in the DOE Technical Approach Document (050425 Rev.1, 4/88).
- The SS&M Program provides DOE an opportunity to check my hypothesis that some Beryllium pits fabricated at Rocky Flats between 1975 and 1990 by Rockwell International, may have a fatal flaw. These pits were machine finished on a lathe dry (without the benefit of cutting/cooling media.) I believe that some pits may have gotten case hardened (brittle) areas and none were heat treated after machining. This may cause a non-symmetrical implosion, leakage of tritium gas and a malfunction of the thermal-nuclear device. DOE could test this hypothesis on a few dismantled Be pits for a structural failure of this configuration. I reported this to Rockwell in about 1982 and to the FBI in about 1992. There was no response.

Sincerely,

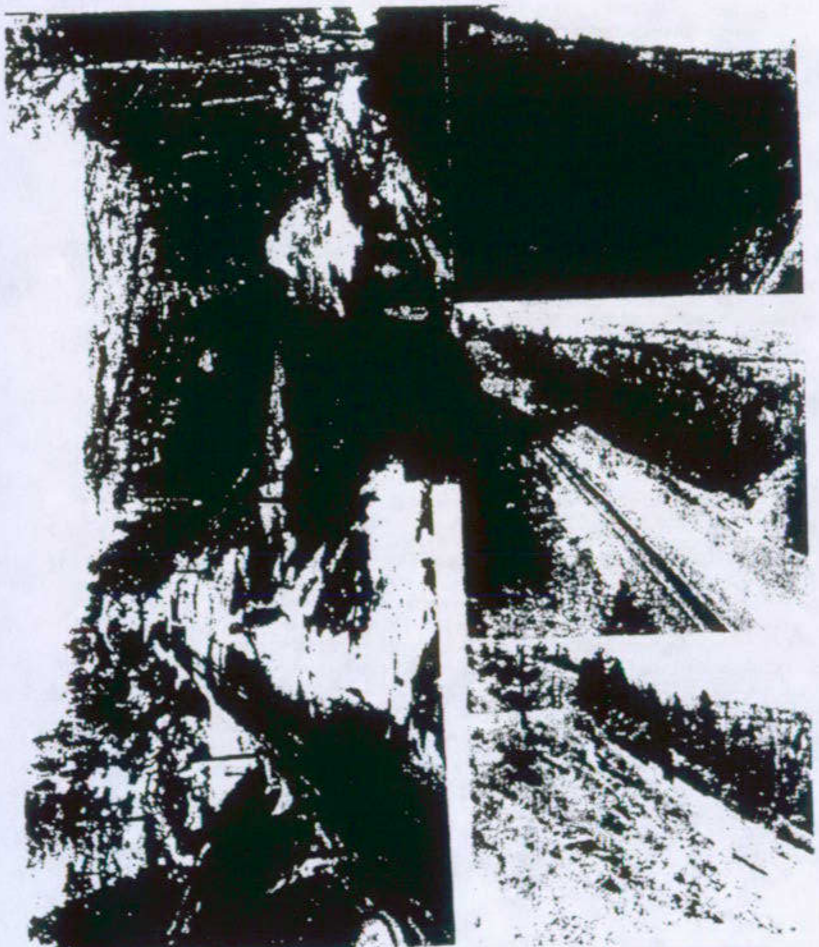
James S. Stone

Stone Environmental Engineering Services, Inc.
James S. Stone, P.E., Vice President Engineering
2510 Miller St., Lakewood, Colorado 80215-1323; Ph./Fax 303-2378058; RADWAS06.RFP; 12/4/95

ACCELERATED SITE ACTION PROJECT

Rocky Flats Environmental Technology Site, Denver, Colorado

PROPOSED NEAR OFF-SITE DISPOSAL/STORAGE FACILITY FOR ASAP II SCENARIO 1 WITH MONITORED AND RETRIEVABLE DISPOSAL SITE FOR ALL RADIOACTIVE WASTE, SAFE REPOSITORY FOR ALL SPECIAL NUCLEAR MATERIALS, AND A RESEARCH FACILITY.



PHOTOS OF THE UNDEVELOPED SITE LOOKING NORTHWEST - GROSS VOLUME - 3 MILLION CU. YDS.

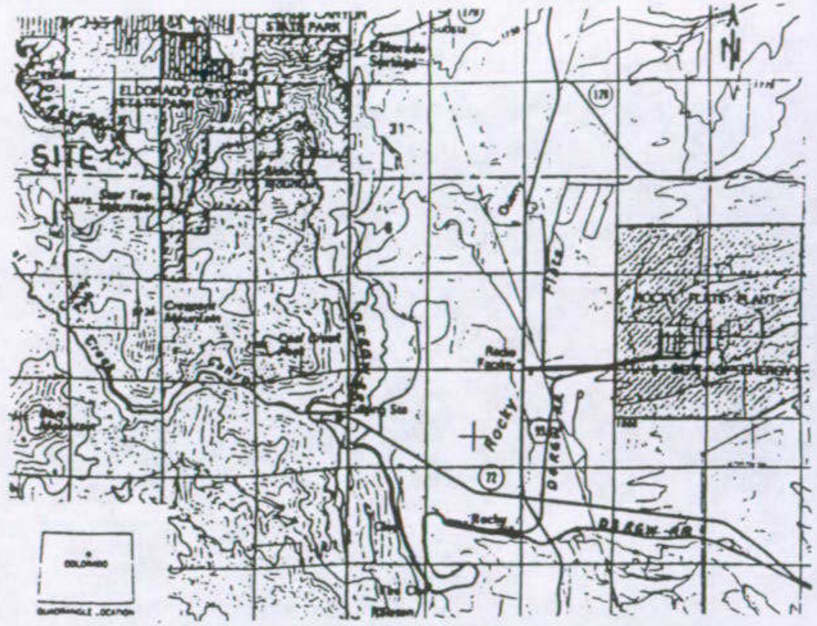
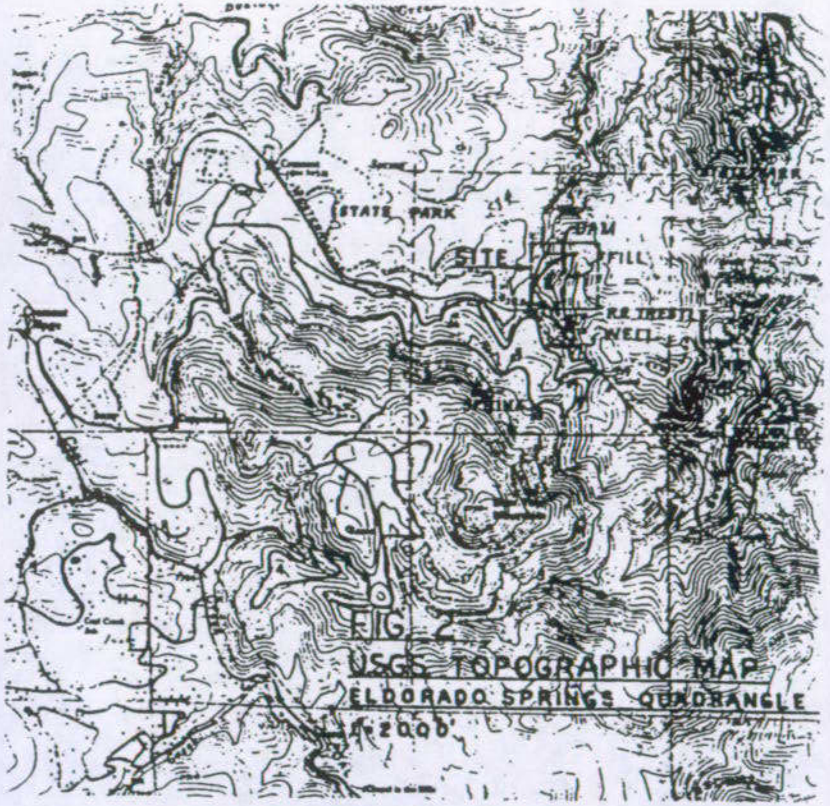


FIG. 1 SURFACE MANAGEMENT STATUS 1986

B.L.M., DENVER WEST, COLORADO QUADRANGLE, 1" = 1 mile

I: **SURFACE MANAGEMENT STATUS:** Stone Environmental Engineering Services, Inc. owns a 38 acre, remote, dry, stable., granite ravine located in the foothills ~ 6 miles W-NW in a straight line from the Rocky Flats Environmental Technology Site. SEES offers the site and 3 conceptual designs that complement Kaiser-Hill's Accelerated Site Action Project. Our version of Scenario No. 1 (Greenfield) provides for off-site monitored and retrievable disposal of Low Level & Low Level Mixed Waste, with the option for different price ranges, and the safe monitored storage of Transuranic Waste and Special Nuclear Material and a Research Facility. The site is ~ 20 miles by railroad from RFETS and ~ 3 miles East from Crescent Village, Boulder County, Colorado. The site is bordered on the West by the Eldorado Canyon State Park; on the South by the Denver & Rio Grande Western Railroad; and on the North and East by private property. In 1963, D&RGW RR designed the railroad spur track and trestle for ash disposal at this site from our proposed municipal waste incinerator in Denver. In 1965, the County of Boulder administration approved the site for ash disposal, but the City Council of Denver opted to develop the Lowry Landfill. In 1986, U.S. Environmental Protection Agency considered the site for disposal of Radium from Denver, but opted to move the Radium into storage sheds in Denver. In 1992, U.S. Department of Energy considered SEES' proposal for Interim Storage of TRUW at the site, but opted for completion of the Waste Isolation Pilot Plant in New Mexico. The site is surrounded by abandoned Uranium mines and is naturally radioactive, which has curtailed local residential development. This design provides adequate protection from all other foreseeable hazards. See the USDOE "TECHNICAL APPROACH DOCUMENT - Table 5.3 Geotechnical, hydrological, environmental, and economic rating matrix" shown. Rating = 87%. Residences and the Research Center (Opt. 3.3 only) would be located on the east access road overlooking the planned monofill, Gore Mountain Range, and Gross Reservoir or located in Crescent Village/RR Jct. Recreation includes hiking, horseback riding, fishing, rock climbing, and serenity. We hope you will approve this plan. We would be pleased to answer questions at your convenience. Please call Jim Stone, P.E. (303) 237 8058). Thanks for your consideration.



2. TOPOGRAPHY: The site was formed by flow foliation of Precambrian granitic bedrock. There is no recorded seismic activity in the last 10,000 years, within 10 miles of the site. The floor of the ravine appears to be dry, unfractured, and drains into Johnson Gulch at the NW property corner. The ravine has a plan area of ~ 15 acres; is ~ 1800 ft. long; ~ 1100 ft. wide; ~ 250 ft. deep at the maximum fill elevation of 7280 ft.; and gross volume of ~ 2.5 million cu. yds. The storm water shed on the north slope of Scar Top Mountain is ~ 124 acres and would produce ~ 61 cu. ft./sec. runoff from a 100 year storm. The railroad track berm has always diverted the runoff into Johnson Gulch. A perennial spring is located ~ 3600 ft. NW from the NW property corner. Well # 10, near the north end of Tunnel # 17, is rated at ~ 10 gals/min. The population density is ~ 4 residences per adjacent square mile and the closest residence is ~ 3/4 mile from the site. The primary route to the site is by D&RGW RR. The secondary roads, built by the defunct developer are obsolete, but are passable with a four-wheel vehicle. It is proposed that the original right-of-way road to the site, just inside the south fence line, would be improved from Crescent RR Junction to extend across the dam and double back on an improved abandoned road. Potentials for transporting LL/LLM waste to the site are to use an aerial cable-bucket line or a buried belt-conveyor corridor. A secured railroad car would be used to transport TRUW/SNM. Additional land (~ 100 acres) will be required for a buffer zone.

OPTIONS FOR A "NEAR OFF-SITE" WASTE FACILITY

3. CONSTRUCTION OPTIONS FOR KAISER-HILL's ASAP for RFETS: The background for the project is described in Fig's 1 & 2. This general preconstruction work applies to all Options and includes: Purchase of ~ 100 acres for a secured buffer zone; Improve ~ 9,000 ft. access road; Clear-cut trees & rock clearance on ~ 25 acres; Use 2 security guards, full time ~ 2 yrs.; Construct ~ 2,000 ft. RR spur, ~ 600 ft. long x 30 ft. high trestle, & RR on-off loading dock; Install ~ 6,000 ft. security fence, with 1 dock gate and 2 road gates; Install site facilities and utilities to suit the respective Option. Comply with all applicable USDOE design and constructions standards for the respective type facility.

Opt. 3.1 This option specifies an open ravine, that is safe, dry, stable, granite, accessible by D&RGW RR, to provide for the off-site/safe/retrievable storage of ~ 1,500,000 net cu. yds. of LL/LLMW/DDW, in bulk, 55 gal. drums, & large crates from RFETS.
The work required includes: Seal floor and walls of ravine; Construct a concrete mix plant in the track area; Construct a concrete, roller-compacted, monolithic, gravity dam/shield, with granitic face surfaces, in 12" lifts; Maintain a 4 ft. min. freeboard height above the anticipated waste supply level; Install structural steel racks & aisles (~ 6,850,000 gross sq. ft. floor total area on 24 - 10 ft. levels) for receiving/retrieving waste in concert with the characteristics & volume of the waste supply; Install vent/drain piping for each container; Install an automatic sump/pump/holding tank system (s), to monitor surface runoff and drainage from containers; Install a site security facility including: A 2,000 sq. ft. building for living/office/service with: Facilities & utilities; Service vehicles; Site & building fire protection systems; Remote waste monitoring, communications by phone/radio; Propane tank, 30,000 gal.; Water well, with 30 gpm pump/hydrostatic system/10,000 gal. storage tank.

*Opt. 3.2 This option specifies a ravine per Opt. 3.1, filled with a 3,200,000 gross cu. yds. of stabilized waste/solidified cement monofill, to provide for the off-site/ disposal of ~ 2,500,000 net cu. yds. LL/LLMW/ DDW, from RFETS.
The required work includes: Construct a concrete mix/cement/waste mix plant in the track area; Construct a concrete, roller-compacted face shield, with a granitic face surface, monolithic with the cement/waste solidified monofill, in 12" lifts. Install all applicable facilities, utilities, similar features and requirements, as described in Opt.3.1. Install road and a planted soil cover on the roof.

Opt. 3.3 This option provides for off-site/monitored/retrievable/storage of ~ 1,200,000 net cu. yds. LL/LLMW/DDW, safe/monitored/retrievable/storage of ~ 10,000 net cu. yds. TRUW/SNM, from RFETS, and a Waste Management Research Facility, together in a secured/modern/subterranean building.
The required work includes: Seal floor and walls of ravine; Construct a fire/earthquake resistant, reinforced concrete, subterranean building in the ravine, with an occupancy partition between the Repository/Office section & the Retrievable Storage section. Backfill the void outside the walls with sand/gravel. The R/O is ~ 30 ft. wide x ~ 1100 ft. long x ~ 250 ft. (24 floors) high, with ~ 350,000 sq. ft. gross floor space for Offices, Laboratory, Equipment/Maintenance rooms, and Vaults for TRUW/SNM. The R/O has the main access road on top, Secured access sites & guard towers; Freight site with elevator. The RS has 24 matching floors in height and ~ 6,500,000 sq. ft. open floor space for retrievable storage of LL/LLMW. Install a network of access holes in each floor and the roof, connecting to road network on the roof. Install all applicable facilities, utilities, similar features and requirements, as described in Opt.3.1. Install a planted soil cover on roof.

4. ATTRIBUTES:
4.1 The concept of an off-site Repository in Colorado to care for our own radioactive waste is unique and laudable.
4.2 This proposal offers an off-site facility with three design options, as follows:
4.2.1 Safe/monitored/retrievable/storage of 1,500,000 net cu. yds. of LL/LLMW/DDW in an open facility.
4.2.2 Safe/monitored/disposal of 2,500,000 net cu. yds. of LL/LLMW/DDW in a 3,200,000 gross cu. yds. stabilized waste/solidified cement monofill.
4.2.3 Safe/monitored/retrievable/storage of 1,200,000 net cu. yds. of LL/LLMW/DDW, and safe/monitored/retrievable/storage of 10,000 net cu. yds. of TRUW/SNM, and a secured, modern Waste Management Research Facility.
4.3 The evaluation of this site was 87% in USDOE's "Technical Approach Document on geotechnical, hydrological, environmental and economic rating matrix.
4.4 We believe this site is more acceptable to the Stakeholders &
4.4.1 This proposal allows Kaiser-Hill's ASAP *GREENFIELD* scenario to be better evaluated.
4.4.2 This proposal allows a 20 mi. safe railroad haul, eliminates a lot of truck traffic/air pollution, and promotes research the control of radioactivity.

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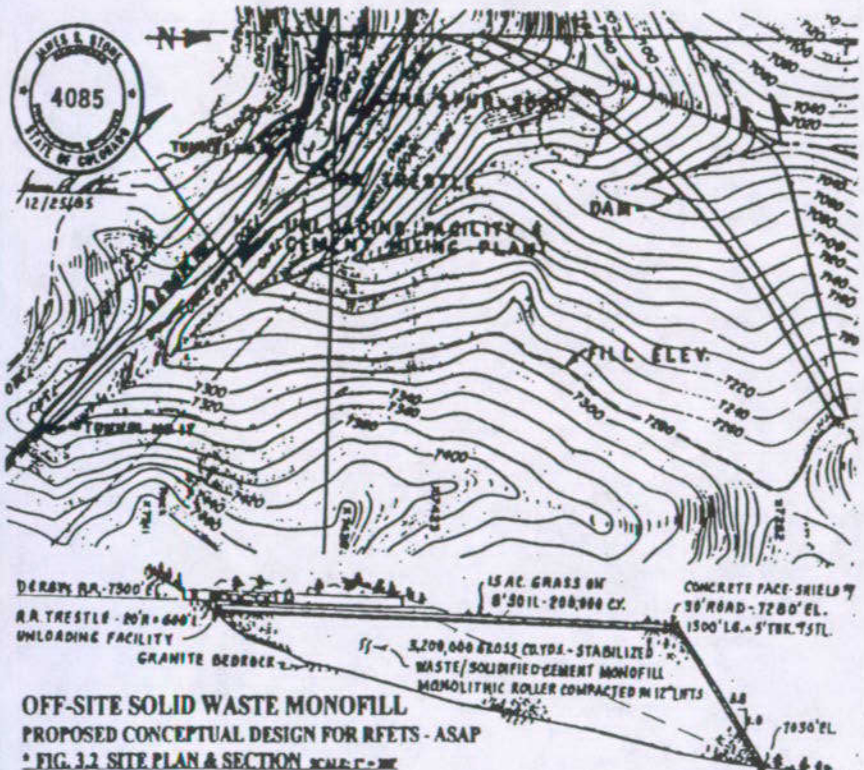

OFF-SITE SOLID WASTE MONOFILL
PROPOSED CONCEPTUAL DESIGN FOR RFETS - ASAP
* FIG. 3.2 SITE PLAN & SECTION

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COMMENT LETTER PAGE 8 OF 8

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COMMENT LETTER

PAGE 1 OF 4

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM Sheet 1

Please print clearly

First Name: CHRIS M.I.: B Last Name: MECHELS

Street Address: RT 4, BOX 2-B

Street Address 2:

City: SANTA FE State: NM Zip Code: 87501-

Organization:

Telephone: (505) - 982 - 2744 Fax: - -

Comments:

The chemical usage and emissions data do not make sense. In fact I believe the numbers have been fabricated by the contractor. If this is true the whole PEIS is suspect and needs to be redone! Examples follow!

1/34.16

High Explosive Operations:	? Alt	? Alt	? Alt
	LANL	LLNL	Pantex
Ethyl Acetate usage	• 454 KG	136 KG	1360 KG
High Explosive usage	• 45360 KG	• 72,567 KG	47400 KG
Acetone usage	• 2722 KG	227 KG	—
Acetonitrile usage	• 1814 KG	91 KG	—
Carbon Monoxide Emissions	• 4540 KG	1315 KG	413 KG
Nitrogen Oxides "	• 22700 KG	349 KG	1560 KG
Volatile Organics "	• 4540 KG	45 KG	122 KG

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

Sheet 1

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Comments (cont'd):

The other disturbing pattern of the LANL emission estimates is the occurrence of number sequences. (4,540, 22700, 4540, 227, 454, 4.5, 454, 22.7, 22.7) Comparing these numbers to Pantex, where there is a history of High Explosives Production, Pantex shows no such patterns. I believe the numbers were fabricated! My friend, a PhD in Chemistry agrees with my conclusion. As estimates of ES&H impacts are driven by emissions, these estimates are all, essentially, suspect.

2/03.05

Pit Fabrication	? Alt LANL	Alt Savannah River
Hydrofluoric Acid Usage	• 340 KG	10 KG
Nitric Acid Usage	• 32,886 KG	3420 KG
Liquid Nitrogen Usage	57 KG	• 4000 KG
Sodium Hydroxide Usage	96 KG	• 4,983 KG
Nitrogen Gas	• 1,360,800 KG	2,710 KG

Continued on Sheet 2

C Mechels
Rt 4, Box 2-B
Santa Fe, NM
87501

U.S. Department of Energy
PO Box 3417
Alexandria, VA 22302

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM Sheet 2

Please print clearly

First Name: CHRIS M.I.: J Last Name: MEICHEKS
Street Address: RT 14, BOX 24-B
Street Address 2:
City: SANTA FE State: NM Zip Code: 87501-
Organization:
Telephone: 505-982-7144 Fax: - -

Comments: Continuing the examples from sheet 1.

3/33.09

Secondary and Core Fabrication Mission

	Pt ANY LANL	Pt AIII LLNL	Pt A4, Y-12
NITRIC ACID usage	•20,000 kG	300 kG	1000 kG
Sulfuric Acid usage	•20,000 kG	—	—
ARGON GAS usage	1,000,000 kG	467,300 kG	•14,000,000 kG
Nitrogen GAS usage	500,000 kG	1,452,000 kG	•5,000,000 kG
Calcium hydroxide usage	30,000 kG	•8,730 kG	30,000 kG
Ferric Sulfate usage	7,500 kG	•2,200 kG	7,500 kG
Sodium Nitrate usage	1,500 kG	•440 kG	1,500 kG
Graphite usage	2,000 kG	•590 kG	2,000 kG
Yttria usage	300 kG	•45 kG	150 kG
PVC Plastic bag	1,500 kG	450 kG	1500 kG

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

[redacted]

Reviewer's Initials: ______

Sheet 2

Comments (cont'd):

The pattern here is: LANL & Y-12 show the same numbers with a few very odd exceptions (Nitric & Sulphuric Acids) and LLNL has estimates which range from 1/3 to 1/4 the other sites. Very odd indeed as they are doing the same mission.

4/02.01

The utility requirements are quite bizarre:

	LANL	LLNL	Y12
Electricity	36,000 MWh	15,000 MWh	•118,000 MWh
Diesel	100,000 liters	85,200 Liters	•250,000 Liters
Water	55,000,000 liters	36,000,000 liters	•1,510,000,000 L

5/33.05

Staff	•523	760	•870

These numbers show little basis in fact.

Summary: This PEIS presents a unique chance to identify the requirements for the same mission at different sites. The data reveal disparities which can't be explained. The PEIS in this aspect, on the chemical usage & emissions data, are the core of evaluating ES&H concerns.

U.S. Department of Energy
PO Box 3417
Alexandria, VA 22302

SSM-M-111
COMMENT LETTER

PAGE 1 OF 1

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: MADELEINE M.I.: Last Name: NELLS

Street Address: 3691 CAJON DE LA VACA

Street Address 2:

City: SANTA FE State: NM Zip Code: 97505 -

Organization:

Telephone: - - Fax: - -

Comments:

1/41.03 The environmental impact of this country's nuclear program, at LANL and elsewhere, will be greatly influenced by the nature and extent of the nuclear program. The foregoing statement would be a truism and not worth anyone's time to read if it were not the case that citizens are being invited to comment on the environmental impact of a nuclear program and the program itself was decided upon almost behind closed doors. The nature and extent of this country's nuclear program is too important a question to be passed over quickly as a few items in a very long budget. Let us determine in an open national debate what kind of nuclear program the country needs, and then making the nuclear program environmentally acceptable might be much less difficult.

Thank you,
Madeleine Nells

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

Reviewer's Initials:

SSM-M-112
COMMENT LETTER

PAGE 1 OF 3

East Bay
Peace Action
for a saner world

P. O. Box 6574
Albany, CA 94706
Phone (510) 233-0915

May 7, 1996

D O E, Office of Reconfiguration
P O Box 3417,
Alexandria, VA 22302

SUBJECT: Comments on draft PEIS for the SS&M Program:

1/40.54 East Bay Peace Action feels that the draft PEIS on the Stockpile Stewardship & Management program is FATALLY FLAWED.

We feel that it is so lacking in dealing with the real problem of how to rid the world of the threats of Nuclear war that it is useless to make any comments on the details.

2/40.07 Instead we will just emphasis our position that the only reasonable alternative is diligent working toward the complete abolition of all weapons of mass destruction. We believe that the SS&M program is absolutely going in the wrong direction. It certainly does not in any way comply with article IV of the NPT.

Sincerely

Elizabeth Brown

Elizabeth Brown, Chair

Enclosed: 2 page Comment - "Abolition Is The Only Reasonable Alternate PLAN FOR ZERO!"

ABOLITION IS THE *ONLY REASONABLE* ALTERNATIVE;
PLAN FOR ZERO!

Comment on the Department of Energy (DOE) Draft Stockpile Stewardship and Management Programmatic Environmental Impact Statement (SS&M PEIS)

Contrary to global expectations that a Comprehensive Test Ban Treaty (CTBT) will halt nuclear weapons development and lead inexorably to disarmament, as we await the signing of the treaty this year it appears that nuclear weapons research, development and testing by the United States will continue unabated. The National Ignition Facility (NIF), planned for the Lawrence Livermore National Laboratory, is intended to produce miniature thermonuclear explosions to provide data for the "advance" of nuclear weapons science. Slated to go on line in 2002, *ten years after the end of the Cold War*, the NIF represents the single largest military program ever planned for the Livermore Lab. The NIF, which will cost more than $1 billion to build, with a projected lifetime cost of over $4.5 billion, is the most expensive element of a vast laboratory-based infrastructure to preserve the capacity to maintain, test, modify, design and produce nuclear weapons well into the 21st century — *with or without underground testing*. The Department of Energy's (DOE) multi-billion dollar "Stockpile Stewardship and Management" (SS&M) Program includes an elaborate system of high-tech laboratory facilities consisting of explosives testing installations as large as sports stadiums, extensive new manufacturing capabilities, and the world's fastest supercomputers.

When President Clinton announced his support for a "zero-yield" CTBT last August, he strongly endorsed the SS&M Program as a necessary means of maintaining the U.S. "nuclear deterrent" without underground testing. This coupling is strikingly reminiscent of the deal struck during negotiation of the 1963 Partial Test Ban Treaty (PTBT) which banned nuclear tests in the atmosphere, in space, and under water. At that time, the nuclear weapons establishment and its allies in Congress and the Administration insisted as a condition for ratification that the U.S. pursue an extensive underground nuclear weapons testing program while maintaining the nuclear weapons laboratories and the capacity to speedily resume atmospheric testing. In the years immediately following conclusion of the PTBT U.S. nuclear testing increased and the weapons labs grew stronger. Thirty-three years later, the U.S. nuclear arsenal far exceeds that of 1963 in sophistication. *The SS&M Program anticipates maintenance of thousands of these weapons of unspeakable mass destruction for the foreseeable future.* (DOE's "base case" planning scenario assumes maintenance of at least 3,500 "strategic" nuclear weapons plus an estimated 5,000 non-strategic and reserve weapons.)

By allowing for the preservation, indeed, expansion of U.S. nuclear weapons capabilities through underground testing, the 1963 PTBT represented a lost opportunity to pursue nuclear disarmament. This suggests that the substitution of a laboratory-based infrastructure for underground testing proposed by the SS&M Program will recapitulate the profound failure of the PTBT to end the nuclear arms race. Replacing underground nuclear

2/40.07 continued | testing with an expanded laboratory infrastructure exemplifies a continued U.S. commitment to nuclear weapons as core instruments of national policy. The Nuclear Non-Proliferation Treaty (NPT) -- signed in 1970 and reaffirmed by the U.S. and 177 other countries in 1995 -- forbids non-weapons states from acquiring nuclear weapons, in exchange for which nuclear

2/40.07 continued | powers pledge eventually to disarm. Article VI of the NPT states: "*Each of the Parties to the Treaty undertakes to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament . . .*" The SS&M Program poses a threat to international security by perpetuating the legitimacy of nuclear weapons. This, in turn, may encourage other countries to abandon their NPT obligations.

The U.S. has squandered more than $4 trillion on nuclear weapons over the last 50 years, *an amount roughly equivalent to the national debt.* Including new or upgraded tritium facilities and production, SS&M Program operating costs are likely to exceed $40 billion within a decade. Moreover, the fifty year U.S. embrace of the atom as an instrument of military technology and an energy panacea has created an enormous environmental burden in

3/10.11 | the form of contaminated air, land, and water, and vast quantities of radioactive wastes. As a byproduct of the SS&M Program, DOE projects staggering rates of more nuclear waste generation for at least the next two decades.

2/40.07 continued | If the U.S. is serious about stemming the spread of nuclear weapons, it must take leadership in ending the international nuclear double standard and make disablement, dismantlement, and eventual abolition of nuclear weapons a top priority. *Nonproliferation requires unconditional, irreversible disarmament.* The SS&M Program is antithetical to this approach.

4/41.17 | The National Environmental Policy Act, the statute under which the SS&M Programmatic Environmental Impact Statement (PEIS) is being prepared, requires a comparative analysis of *all* reasonable alternatives. Yet, despite the NPT obligation to disarmament and international expectations for a CTBT, the draft PEIS rejects consideration of *any* alternative based on indefinite maintenance of a hypothetical stockpile of less than 1000 nuclear weapons, or *any* alternative scenario based on "passive" maintenance of the existing stockpile through inspection and identical remanufacture of parts (as opposed to building and operating a massive array of sophisticated experimental facilities that can be used for continuing nuclear weapons design). It also dismisses any "denuclearization" option out of hand, despite an avalanche of public comments, since 1991, demanding inclusion of a "plan for zero" stockpile option. ***In fact, denuclearization is the only reasonable alternative.***

5/40.12 | **The undersigned organizations agree that as a nation we cannot afford the economic, environmental and national security costs of the SS&M Program described in the draft PEIS.** Continued nuclear weapons research, testing and production cannot be justified. The SS&M Program is a budgetary black hole; it endangers public health and the environment and drains resources badly needed for more constructive purposes such as environmental restoration, education, health care and affordable housing. By providing a means for nuclear weapons

2/40.07 continued | designers to continue their deadly pursuits and supporting the maintenance of a huge nuclear arsenal well into the 21st century, the SS&M Program undermines the stated U.S. goal of encouraging nonproliferation by sending a hypocritical message to other nations: "Do as we say, not as we do." We call on the DOE to listen to what thousands of U.S. citizens have been telling them for years. nuclear weapons make us *less* secure -- let's get rid of them! The draft SS&M PEIS is wholly inadequate. **DOE, go back to the drawing board and plan for the elimination of nuclear weapons. It's the *only reasonable* alternative.**

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: SUSAN M.I.: L Last Name: CURTIS

Street Address: 8 CONCHAS PLACE

Street Address 2:

City: SANTA FE State: NM Zip Code: 87505-

Organization: USA CITIZEN

Telephone: - - Fax:

Comments:

1/41.05 Reducing Stockpile good – eleminating better Should be voted on nationally.

2/40.72 LANL work harmful to public heath With huge global issues, global warming, disease epidemics these 'educated persons' (same personnel) would better serve my tax dollars by studying these issues and quit trying to improve weapons construction

Rocky Flats closed due to health concerns FBI had to force way in. Rocky Flats lied & covered up.

What will LANL do?
I breathe same air – not fence can keep out

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us

Receiver's Initials: ______

Comments (cont'd):

2/40.72 continued I drink same water

With US radical groups (ie OK bombing) basics I feel very vulnerable about security and weapons with this ability on our freeways

With NM Drunk Driving records, it is very irresponsible to allow weapons on freeway!

1/41.05 continued Allowing public input good. Acting on public input better.

2/40.72 continued US facing major economic crisis. Money could better serve citizens if channelled elsewhere.

Having bombs does not make me feel safer – on the contrary – they make me feel at a much greater risk!

1/41.05 continued Why not let public dictate policy – isn't that what democracy is?

U.S. Department of Energy
PO Box 3417
Alexandria, VA 22302

SSM-M-116
COMMENT LETTER

PAGE 1 OF 1

David C. Losey
1628 Citation Drive
Aiken, South Carolina 29803-5224

May 7, 1996

Mr. Jay Rose, SSM PEIS
Office of Reconfiguration
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, DC 20585

Dear Mr. Rose:

I'd like to offer these comments on the EIS for *StockpileStewardship and Management*.

1/40.35 Throughout the EIS there are assertions about our ability to maintain a safe and reliable nuclear weapons stockpile based on factors such as technical competency and resources. While I agree that a strong technical program is necessary to safeguard these weapons, questions of nuclear weapons safety go far beyond those of technical competency. Assertions that a science-based program can "maintain a safe... nuclear weapons stockpile" may overstate the program's value. Should the risks and benefits of the nuclear weapons programs be stated more carefully?

2/40.32 The summary document section S.2.5 on Nonproliferation concludes that "Much of the (experimental weapons) testing is classified and could not lead to proliferation without a breach of security". This statement implies that adequate security classification of this component of the nuclear weapons program will somehow preclude proliferation. Is it possible that the postulated relation between adequate classification and weapons proliferation is not so simple?

Thank you for the opportunity to comment on this program.

Sincerely,

David C. Losey

David Losey

SSM-M-117
COMMENT LETTER

PAGE 1 OF 1

Raima Isabel Davis
Rt. 1 Box 213-Z2
Canyon, TX 79015
(806) 499-3509

Jay Rose
Office of Reconfiguration
1000 Independence Avenue, S. W.
Washington, D.C. 20585

Dear Mr. Rose,

I am concerned about the disposal and storage of nuclear wastes at a site within 30 miles of my home and directly over my water supply. We live in a area which is not served by a water supply provided by a municipality. We have our own well which is tapped directly into the Ogallala Aquifer. It is frightening to think that in a few years I may be drinking contaminated water without even knowing it.

1/04.05 Even if the possibility of contamination did not exist, the accelerated draining of the aquifer necessitated by the processing of nuclear wastes is a threat not only to agriculture, but to the quality of life in the Texas Panhandle. The aquifer is being drained at an alarming rate by irrigation of crops. We must find a way to use less water, not more.

Surely there is a site available which is not over an aquifer that supplies water to 8 food producing states. The Chamber of Commerce of Amarillo and the Department of Energy are using faulty logic to protect current jobs at the expense of our very survival in the future

Please do not store surplus plutonium at Pantex. Please do not process plutonium at Pantex, and please do not store hazardous wastes at Pantex.

Sincerely,

Isabel Davis

Isabel Davis
A Citizen of Randall County, Texas

SSM-M-118
Comment Letter
PAGE 1 OF 1

May 7, 1996

Mr. Jay Rose
Office of Reconfiguration
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585
(Attn: SSM PEIS)

Upon reviewing the Draft DOE PEIS, for Stockpile Stewardship and Management, DOE/EIS 0326, 1996, I wish to offer the following comments.

1/21.14

APPENDIX I: (1) Suggest that the proposed areas considered for "laydown" or temporary staging of equipment, materials, and supplies at LLNL, to be used in construction of the National Ignition Facility (NIF), be designated in the project-specific assessment at Appendix I.

APPENDIX I: (2) Suggest that the potential impacts of the staging of NIF construction equipment and supplies at LLNL, as well as the impacts of construction of the proposed NIF, also be addressed in Appendix I, as well as in the PEIS text, as appropriate.

Sincerely,

Kenneth C. Zahn, PhD.
4102 Rocky Point Court
Tracy, CA. 95376
Ph: (209) 832-4324

cc: EEG File

SSM-M-119
Comment Letter
PAGE 1 OF 1

May 4, 1996

Jay Rose
Office of Reconfiguration
1000 Independence Avenue, S. W.
Washington, D. C.

Dear Mr. Rose:

1/40.07

I am opposed to continuing nuclear weapons design improvement and increased production capability for several reasons:

Risk of destroying trust among others in the Non-Proliferation Treaty,

Damage to the environment of producing new wastes which we don't know what to do with,

The lack of need, since we are light years ahead of anyone else in nuclear capability;

The expense for something not needed when there are so many desperate needs in our country.

Sincerely,

Donna Singleton
6614 Roxton
Amarillo, Texas 79109

SSM-M-120
COMMENT LETTER

PAGE 1 OF 1

Anna Marie Wink
17201 FM 245
Amarillo, Texas 79107

Jay Rose
Office of Reconfiguration
1000 Independence Avenue S.W.
Washington, D.C. 20585

Dear Sir:

I am sure you receive all sorts of pleas from Pantex employees and Amarillo business people to expand Pantex activities in any manner. And why not? These employees could not earn comparable wages at any other place, and this does bring revenue to the business community.

1/40.15 Great minds produced Atomic energy, of which they had no knowledge of its long term affects on human life or the environment. Thus every area of nuclear production is contaminated — some uninhabitable sacrificial zones of waste lands.

2/04.05 My point is enough of this United States has been sacrificed to the Nuclear Process. Use plants and resources already in use. Make do with what you have. Do not mess up or use up more land or water resources. Pantex Plant site over the Ogallala Aquifer, the only source of water to many people and agribusinesses in a semi state area of great agricultural production. Nothing should be done to risk contamination to the water or environment of so great an area of God's Good Earth.

Thank you for your time.
Anna Marie Wink, a 92 year resident of Carson and Potter Counties

SSM-M-121
COMMENT LETTER

PAGE 1 OF 1

May 1, 1996

U.S. Department of Energy
Office of Reconfiguration
Post Office Box 3417
Alexandria, VA 22302

To whom it may concern:

1/42.15 As a person who lives in New Mexico near Los Alamos National Laboratory, I would like to register a strong vote against DARHT as well as any increased weapons production.

2/43.18 The recent forest fire brought into the headlines something of which those of us who live here are constantly aware -- we are very vulnerable to nuclear contamination. That fire got to within 3/4 mile of LANL, if it had continued in the direction in which it was headed my family and I would be contaminated with radiation.

You may not think that New Mexico is very heavily populated or has much political clout. But those of us who live here value our lives and our future and we have already put up with enough contamination and lies from LANL. Please don't endanger us any more.

Thank you.

Sincerely.

Robbie Miller

SSM-M-122
COMMENT LETTER
PAGE 1 OF 1

U.S. Dept. of Energy
P.O. Box 3417
Alexandria, VA 22302

May 7, 1996

To Whom It May Concern:

1/40.50 I am writing to register my objection to the proposed Stockpile Stewardship Program at Los Alamos National Laboratory, for the following reasons:
1) The proposed cost of almost 4 billion is too much
2) The program is not needed.
3) Treaties require us to disarm not escalate
4)The waste will endanger this area.

Please note my objections accordingly.

Sincerely,
Andrew Lovato
1001 Santa Clara Dr.
Santa Fe, NM 87501

SSM-M-123
COMMENT LETTER
PAGE 1 OF 7

State of New Mexico
ENVIRONMENT DEPARTMENT
Harold Runnels Building
1190 St. Francis Drive, P.O. Box 26110
Santa Fe, New Mexico 87502
(505) 827-2850

GARY E. JOHNSON
GOVERNOR

MARK E. WEIDLER
SECRETARY

EDGAR T. THORNTON, III
DEPUTY SECRETARY

May 6, 1996

James Rose
Acting Director
Office of Reconfiguration
U.S. Department of Energy
P.O. Box 3417
Alexandria, VA 22302

Dear Mr. Rose:

RE: DRAFT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT FOR STOCKPILE STEWARDSHIP AND MANAGEMENT (DOE/EIS-0236); UNITED STATES DEPARTMENT OF ENERGY; FEBRUARY 1996

The following provides New Mexico Environment Department (NMED) staff comments concerning the above-referenced Draft Programmatic Environmental Impact Statement (DPEIS).

A. HAZARDOUS AND RADIOACTIVE MATERIALS ISSUES

1. A number of items in the DPEIS appear to be in conflict with NMED laws and regulations

a) Volume I, page 4-237, 4.6 LANL, 4.6.2.3 Air Quality, Ambient Air Quality, "As shown in the table [Table 4.6.2.3-1. Comparisons of Baseline Ambient Air Concentrations with Most Stringent Applicable Regulations and Guidelines at LANL, 1990 and 1992] baseline concentrations are in compliance with applicable guidelines and regulations with the exception of the 1-hour photochemical oxidants."

1/03.04 (1) Photochemical oxidants were out of compliance with New Mexico Ambient Air Concentrations standards for these years.
(2) Are the years 1990 and 1992 representative years for air emissions? Are they a conservative/ non-conservative example? Why not use more recent years, such as 1994 or 1995? Are other years in compliance with air standards?
(3) On page 4-264, under 4.6.3.3 Air Quality, No Action, "No action air quality utilizes estimated air emissions data from operations at LANL in 2005 assuming continuation of current site missions to calculate pollutant concentrations at or beyond LANL site boundary."

James Rose
May 6, 1996
Page 2

1/03.04 continued

The photochemical oxidant concentration was not addressed. The estimated concentration of this pollutant was not in the table presented; why was this pollutant not included?

2/03.06

b) Volume I, Page 4-285, 4.6 LANL, 4.6.3.3 Air Quality, Management Alternatives, Sensitivity Analysis, "The concentrations of pollutants for the high case pit fabrication, HE, and non-nuclear fabrication missions are expected to be within applicable Federal and state regulations and guidelines. The 24-hour concentrations of nitrogen dioxide for the high case secondary and case fabrication mission may be above applicable standards and guidelines." (Table 4.6.3.3-1. Estimated Concentrations of Pollutants from No Action and Stockpile Stewardship and Management Alternatives at LANL is identified in neighboring sections for reference of the estimated emissions mentioned above.)

(1) For the case of nitrogen dioxide, the estimated concentrations of the combined program impacts is estimated to be 276.69 micrograms/cubic meters and the most stringent guidelines are 188 micrograms/cubic meters (24 hour average). In Volume II, Appendix B, Air Quality, Table B.1.3.1-1. Ambient Air Quality Standards Applicable to the Candidate Sites, the New Mexico guideline listed for nitrogen dioxide is 117 micrograms/cubic meter (24 hour average); this air quality value was also exceeded. This value is more stringent than the 188 micrograms/cubic meter value, mentioned previously. Values should be rechecked or text should be modified.

2 There were some deficiencies in the information provided which prevent an adequate environmental assessment of the project.

a) Some of the comments for the issues above (1) apply.

3/11.38

b) Volume I, Page 4-12, 4.1.9.2 Facility Accidents, Accident Analysis for Postulated Accident Scenarios, "Accident risk to collocated workers was calculated for a hypothetical worker at 1000 m from the facility, or at the site boundary, whichever is closer."

(1) Usually in EISs, EAs, and SARs, the collocated workers are located at a much closer distance, such as 100 m and then at increments to 1000 m. The closer distances provide a more conservative (and more realistic) risk analysis for accidents.

4/11.39

c) Volume I, Page 4-300, 4.6 LANL, 4.6.3.9 Radiation and Hazardous Chemical Environment, Management Alternatives, Pit Fabrication, "...the presented noninvolved worker impacts were not modeled due to the unavailability of certain site-specific information. There may also be small risks to construction workers who are involved with tasks that are in close proximity to potentially contaminated areas."

(1) Noninvolved workers were not modeled.
(2) If risks to construction workers were not modeled, how can they be quantified as "small". If the source term of contaminated soil that they may be exposed to is a low activity, or limited to a small area, it should be indicated in text.

James Rose
May 6, 1996
Page 3

5/11.40

d) Volume I, Page 4-304, 4.6 LANL, 4.6.3.9 Radiation and Hazardous Chemical Environment, Stewardship Alternatives, Combined Program Impacts, Facility Accidents, "...there are potential impacts to involved workers who would be located in the facilities. Quantitative statements of these impacts cannot be made until design details are developed further, at which time the number and location of facility workers can be estimated to support accident impact analyses. However, depending on the type of accident, facility workers in close proximity to the point of the accident could receive high levels of exposure to radiation, with potentially fatal impacts."

(1) Impacts to workers were not modeled for accident analysis, however, fatalities may occur, but the number of deaths is not estimated nor projected

6/11.07

e) Volume 1, page 4-300, 4.6 LANL, 4.6.3.9 Radiation and Hazardous Chemical Environment, Management Alternatives, Pit Fabrication, Radiological Impacts, "The average annual dose to involved workers for this alternative would be 380 mrem. The dose to the entire facility workforce would be 55.8 person-rem. As stated in the methodology section 4.1.9, all worker doses were referenced either from alternative-specific working group data reports or from the radiation exposures for DOE and DOE contractor employees 1992 database which reports doses for similar types of operations...."

(1) Is the 1992 database representative for the projected years? Do working group data contain situation-specific source terms and shielding considerations?

f) Volume I, page 4-300, 4.6 LANL, 4.6.3.9 Radiation and Hazardous Chemical Environment, Management Alternatives, Secondary and Case Fabrication, Radiological Impacts.

(1) same as e) above.

7/11.42

g) Volume II, Appendix E, Human Health, page E-9, E.2.2 Methodology for Estimating Radiological Impacts of Normal Operation, E.2.2.2 Data and Assumptions, Meteorological Data, "For use in design basis accidents, the 50 percentile option was used."

(1) The 50 percentile option depicts conditions that are "average". Usually in EISs, EAs and routine site analyses for risk from accidents, risks are analyzed under "worst-case" conditions, which are also known as 95 percentile conditions (when using certain codes). Accident risks were not analyzed under worst-case conditions in this DPEIS and an underestimation for accidents under extreme conditions could result

8/11.43

h) Volume II, Appendix F, Accidents.

(1) Solid uranium criticalities were modeled, and plutonium liquid criticalities were modeled, however, no plutonium metal criticalities (solid) were analyzed This accident analysis may

James Rose
May 6, 1996
Page 4

8/11.43 continued

not have been performed in the past, however, the accident scenario should be considered due to the projected increases in the number of pits under the "pit fabrication alternative"

(2) The methodology section should mention how the source terms for the criticalities are determined, and source terms should be listed by radionuclide and activity, not only as the number of fissions. From the information presented in the dPEIS, it is not possible to determine whether the criticality analyses are valid.

4/11.39 continued

i) Volume I, page 4-435, 4.8 Sandia National Laboratories, 4.8.3.9 Radiological and Hazardous Chemical Environment, Stewardship Alternatives, Proposed National Ignition Facility, Radiological Impacts, "The presented total dose to noninvolved workers was not modeled due to the unavailability of certain site-specific information."

(1) Radiological impacts to noninvolved worker were not performed.

B. AIR QUALITY ISSUES

9/40.51

1. It appears that the "stewardship" portion of the plan, or the science-based program to maintain the reliability of the nuclear weapon stockpile in the absence of nuclear testing, requiring studies of materials in extreme conditions similar to nuclear detonation conditions, would release small to minimal amounts of air pollutants. The research aspect of the stewardship fits in very well with the activities for which Los Alamos National Laboratory (LANL) is already known. Siting these activities at LANL would have a positive impact on the Stockpile Stewardship program as well as on LANL itself.

10/03.08

The "management" part of the plan is of greater environmental concern, as it involves additional emissions. In this part of the plan, a significant portion of nuclear weapon maintenance and pit handling and nonnuclear component manufacturing would be shifted to LANL. The management aspect of the plan actually refers to manufacturing and involves activities previously handled at weapons manufacturing plants such as Rocky Flats and Pantex. "Management" of the nuclear stockpile would result in emission of both radioactive and nonradioactive pollutants, some modeled at levels higher than applicable standards. Carrying out Stockpile Management at LANL would have a detrimental effect both on the lab and the surrounding community, and we do not recommend LANL to be considered as a site for this portion of the program.

11/03.07

2. The DPEIS contains no plans to monitor directly the emissions from these projects or to conduct ambient monitoring in the community if the projects are implemented. As of October 1994, with the termination of a 5-year contract between NMED and the National Park Service, non-radioactive ambient monitoring for criteria pollutants was discontinued at the Bandelier site on the southern boundary of LANL adjacent to the Bandelier National Monument. We are not aware of any other ambient monitoring for criteria pollutants being conducted at LANL or in the Los Alamos community. The radioactive ambient monitoring being conducted by LANL focuses mostly on LAMPF, which is currently the largest source of radioactive emissions. Monitoring of actual conditions around the proposed projects is of prime importance to verify the modeled emissions presented in the DPEIS.

James Rose
May 6, 1996
Page 5

12/40.15

In addition to monitoring, there should also be remediation plans in place in the event of actual emissions being measured higher than modeled ones

2/03.06 continued

3. In terms of nonradioactive air pollution, on page 4-265, col 1, and in table 4.6.3.3-1, the environmental impact resulting from secondary and case fabrication shows that modeled estimates for 24-hour average concentrations of nitrogen dioxide would be 231 micrograms per cubic meter (ug/m3) and 277 ug/m3 from the combined programs, thereby greatly exceeding the applicable state standard and worsening the air quality of the area. There are two points to be made about this. First, the State of New Mexico cannot permit such large exceedances of its standard. Second, the exceedance of the standard is even greater than that shown in tables 4.6.3.3-1 and 4.13.1.5-2. These tables show the most stringent regulation or guideline for nitrogen dioxide to be the state standard, which is listed as 188 ug/m3. However, this figure does not reflect a correction for the altitude of Los Alamos, which is approximately 7200 feet above sea level. Correcting for altitude, the state standard of 0.10 ppm is calculated to be 146 ug/m3[1]. It is our view that LANL should be

---

[1] The equation used for adjusting the concentration of nitrogen dioxide for altitude is:

$$C = \frac{Mw \times ppm}{4.553 \times 10^{-5} \times T \times 10^{Z \times 1.598 \times 10}}$$

where

C = concentration of the gas in micrograms per cubic meter

Mw = molecular weight of the gas

ppm = concentration of the gas in parts per million by volume

T = average summer morning temperature in Rankin at site (typically 530 deg.)

Z = site elevation in feet

(This equation is taken from New Mexico Air Pollution Control Bureau Dispersion Modeling Guidelines , p.25)

James Rose
May 6, 1996
Page 6

2/03.06 continued

omitted as a possible site for secondary and case fabrication because of the high concentration of nitrogen dioxide that would be emitted.

4. In table 4.6.2.3-1 and in other tables containing most stringent regulations or guidelines for gaseous criteria pollutants, these concentrations have not been adjusted to Los Alamos altitude which is 7200 feet above sea level.

13/11.44

5. On page E-64, cols 1-2, the discussion revolves around an investigation undertaken to assess melanoma risk at LANL because of worker exposure to low-level ionizing radiation. The study was the result of "a reported threefold excess of melanoma among laboratory workers" at Lawrence Livermore National Laboratory (LLNL) in California. The study was applied to LANL because of the similarity of the work done at both labs. At the end of the first paragraph in col 2, it is stated that "the only significant association with diagnosis of melanoma for males was being a college graduate...or having a graduate degree ..." To us it follows obviously that the vast majority of workers at both LLNL and LANL are males who are college graduates or who have graduate degrees and that the workers at LANL are significantly at risk for melanoma resulting from exposure to low-level ionizing radiation. Will workers be informed of the risk? Is this an acceptable risk, and can anything be done to diminish it?

14/11.45

6. NMED is sometimes referred to by its previous name, Environmental Improvement Division or by the incorrect form, NM Health and Environmental Department. Examples of incorrect naming can be found in the following:

page K-17, col 1, paragraph 2

pages 5-15 and 5-16, table 5.3-4

These should all be changed to New Mexico Environment Department.

15/03.10

7. There is a factual error on page 4-542, col 2, paragraph titled "Air Quality." The last sentence stating that LANL is in a nonattainment area for ozone is incorrect. Attainment is determined by comparison with the federal standard, which for ozone is 0.12 ppm for an hourly average. The rule for determining a nonattainment area is explained in this same document on page 4-236, col 2, paragraph 3. At the ambient air monitoring site operated by NMED at southern boundary of LANL, adjacent to Bandelier National Monument, the highest value measured for ozone between 1989 and 1994 was 0.090 ppm for a one-hour average. Please note also that there is no state standard for ozone and, as of December, 1995, neither is there a state standard for photochemical oxidants.

16/03.11

8. The New Mexico regulations alluded to on page K-17, col 1, paragraph 2 are obsolete or contain errors. First, the reference to "total suspended particulates" as "PM10" is incorrect. Although both names refer to particulates, they are measured by different monitors and have different standards. Second, the reference to New Mexico standards for beryllium, asbestos, heavy metals,

James Rose
May 6, 1996
Page 7

16/03.11 continued

photochemical oxidants, and nonmethane hydrocarbons is now obsolete. In 1995, these pollutants were eliminated from the New Mexico regulations. Federal regulations remain in existence for some of these pollutants. The pollutants eliminated from state standards are also mentioned in tables in section 4 and in Appendix B.

9. The document contains some usage or typographical errors which should be corrected, including the following:

page E-63, col 2, last paragraph: repetition of the sentence "Population exposures are confounded by occupational exposures."

17/11.46

page E-64, col 1, towards the end of the large paragraph where the Wilkinson study is being explained, the word "countries" should be "counties"

page F-13, col 2, in the last paragraph, jumbled spelling of the word "National"

18/11.47

page F-17, col 2, scenario 1, the sentence "The fire releases the plutonium contamination from the inner surfaces of the gloves" should read "... the inner surfaces of the glovebox"

We appreciate the opportunity to comment on this document. Please let us know if you have any questions on the above.

Sincerely,

Gedi Cibas, Ph.D.
Environmental Impact Review Coordinator

NMED File No. 977ER

STOCKPILE STEWARDSHIP AND MANAGEMENT
Draft Programmatic Environmental Impact Statement

COMMENT FORM

Please print clearly

First Name: C A [illegible] E M.I.: [illegible] Last Name: [illegible]

Street Address: [illegible]

Street Address 2:

City: [illegible] State: N M Zip Code: [illegible]

Organization:

Telephone: [illegible] Fax:

Comments:

Please continue on the other side if you wish to use additional space. THANK YOU—your comments are important to us.

I have two points to make in connection with the Stockpile Stewardship and Management Program and its possible role at Los Alamos National Laboratory.

1/40.21 My first point concerns the present management at LANL. My opinion as a citizen observer of LANL since 1967 is that this management has lost the trust of many of its employees and much of the public familiar with its record. If either the U of C or DOE were doing effective oversight of this Lab management, management would be looking for work elsewhere. If Stockpile Stewardship and Management work came to LANL, employees with jobs related to health and safety would be hindered from truth-telling for fear of management pressure or job loss. LANL is a very dangerous place to speak your mind. Current management implements and blesses a subjective and undemocratic system of employee evaluation and control. Many LANL employees lack clear, measurable work goals and objective performance appraisals. This is how they are disempowered and demoralized and made subject to the personal favor or disfavor of managers. There is intimidation and fear of job loss for whistle blowers. Could current management survive a truthful accounting of health and environmental problems occurring on the Parajito Plateau during its watch? I have almost no confidence in Lab health and safety pronouncements. These are LANL cultural reasons why I feel SS and M work must not come here. We the wider citizenry of the state cannot be safe if those responsible for our safety are afraid to speak openly.

2/40.72 My second point concerns the Stockpile Stewardship and Management Program itself, SSand M. I have a second acronym for it: FBFW -- feather-bed for weaponeers...who continue the arguments that have successfully emptied 4 trillion dollars from the American taxpayers' wallets directly into their intestines for the last 50 years. Since the end of the cold war 5 years ago, billions have been spent at LANL but I am unable to name a single product or useful technology benefiting the taxpayer and resulting from this expenditure. The public is endlessly susceptible to fear mongering... weaponeers and their business supporters always characterize the world as full of dragons and dragon-want-a-bes. They sell the public the idea that only by spending billions of tax dollars on nuclear technologies for a future of geological proportions can we hope to be safe from the likes of North Korea and other third world countries. One supporter of the nuclear agenda recently answered the question of -who was the enemy likely to be in the future -with the response that we might face the French someday.

SSM-M-124
COMMENT LETTER **PAGE 3 OF 3**

3/40.69 I note a point made to me not long ago: how do I, a U S taxpayer, measure success in programs like SS and M......how do I know the weaponeers won't just acquire their wish list of computer capacity and instrumentation they now want and then in 5 years announce that they just really can't do a first rate job after all without testing. I have no confidence in their scenarios or their word.

4/40.07 My personal preference is a custodial program for nuclear stockpiles based on minimal production of replacement parts funded at a small fraction of proposed SS and M amounts. Such a program will tell the rest of the world that we are capable of honoring our Non Proliferation Treaty obligations, my government will appear sensible at last to the immorality of weapons of genocidal scope ...and I will look forward to paying my taxes on April 15th each year. I don't want LANL or Livermore, or Sandia doing SS and M

5/40.27 work, I want them all to "get a life" in the real world. I want labs where the future is seen as more than recreating the past.

SSM-M-125
COMMENT LETTER **PAGE 1 OF 6**

April 23, 1996

124 Hampshire Court
Oak Ridge, TN 37830

US Department of Energy
Office of Reconfiguration
PO Box 3417
Alexandria, VA 22302

Sir:

I am forwarding my comments on the Draft Programmatic Environmental Impact Statement on the DOE Stockpile Stewardship and Management Program. I have divided these comments into comments on major issues. remanufacturing, protection of response capability, protection of skills, data included in the document, and a tabulation of specific comments.

1/40.11 Many of the comments reflect the fact that the SSMP fails to meet it original objectives, protection of the stockpile and protection of the ability f the nation to respond to changing national security challenges. The DOE Weapons Program continues to be a high cost

2/40.13 program, but the bulk of the cost is tied up in large experimental facilities which will make a minimal contribution to weapons science, other than to maintain and challenge a core physics group. Meanwhile, the management of the production technology development

3/40.24 program is being turned over to the weapons laboratories, with dollars being moved into facilities and personnel to bring them up to a par with the development staffs at the production plants which they are being asked to manage.

I recognize that the preparation of the draft PEIS represents a major effort and that the production organizations have contributed to the documents. However, until a revised plan geared to true national security needs has been generated, a revision to the draft PEIS will be a futile effort.

Sincerely,

Robert B. Burditt
retired Program Manager for Weapons Manufacturing Development, Y-12

STOCKPILE MANAGEMENT QUESTIONS/COMMENTS

A. REMANUFACTURING

4/40.33

Was there an overt attempt to prejudice the whole perspective of the assessment of alternative by selecting the term 'science based" for the laboratory management generated DOE plan, with the automatic categorization of all the alternatives as 'non-scientific'? Why do we consider remanufacturing to be 'non-scientific' and unacceptable (3.1.2.4) when our standard method of doing business has been to run a single or a few tests of a device tailored to fit the constraints of test limitations and then manufacture production weapons against a set of specifications which is written to control the product to within an acceptable range of the design. In some cases production cycles have lasted for ten and more years after the original test.

Why is remanufacturing not considered feasible on page S23 of the Summary SS&M draft PEIS, but is considered to provide a great advantage to the Soviet Union in the testimony of C. Paul Robinson before the Strategic Forces Subcommittee of the Senate Armed Forces Committee?

The term reliability is used extensively through the document to justify laboratory investment and has been used in the past to justify nuclear testing. Reliability has been used in terms of the match of a device to the projected design yield, using a precision measure that was based on potential tactical applications. In the absence of a tactical weapons stockpile, a revised definition of reliability would appear to be necessary. In a similar vein, yield select capability no longer seems appropriate and adds to complexity.

B. PROTECTION OF RESPONSE CAPABILITY

If, as claimed by C. Paul Robinson in his congressional hearing testimony, the Russians are planning to maintain their stockpile by replacing 1000 units per year, a change in their attitude would permit them to double a START II level in three years, whereas the capacity we are planning to provide would give us the same doubling in somewhere between 10 and 30 years and our capability for adding new facilities appears to be 10 years or more Is this an accurate assessment and is it acceptable?

Unless we protect a standby capability for production and provide for a true plutonium pit production capability, we will leave ourselves vulnerable to both a restoration of the cold war and to an effort by a significant industrial nation to create a nuclear force, which could be competitive in five years.

C. PROTECTION OF SKILLS

5/40.23

Nuclear components are manufactured in house so that materials and processes can be replicated. The materials which are most subject to subtle changes are plastics and electronics, which can be tested to a establish a statistical confidence that they are acceptable and which do not perform any nuclear function which must be verified in a nuclear test. Is the continued production of weapons to specification at a low rate not a more reliable method of providing confidence by maintaining skills, materials and processes than shutting down the complex and then hoping that because of NIF and ATLAS we can somehow assure that a new process will produce an acceptable weapon? Can you identify a single past safety or reliability issue that NIF would provide the ability to evaluate?

Relative to paragraph 3.1.2 4 is there not a contradiction between the concern expressed in this paragraph about subtle changes in materials and processes and the push for new processes which shows up later, particularly in the area of casting to shape?

D. PEIS NUMBERS

6/08.10

The numbers included in the PEIS contain innumerable inconsistencies in logic and inconsistencies in mathematics. For example, in 3.4 why is surge operation used for generating the operations analysis numbers, rather than the base case, which would presumably be the actual staffing level and would be a more realistic identification of the manpower and socioeconomic impact? In the analysis in 3.7.1.1, why are the impact numbers calculated based on the three shift surge operation, when single shift operation is the base case (3 1.1 1-1), other than that this reduces the socioeconomic impact?

7/08.09

Was any type of referee review of the input numbers used by DOE in preparing this report, since idiosyncrasies such as order of magnitude differences in utilities, and peculiarities such as the concept that LANL would impact no indirect people for the 523 workers and 321 incremental workers associated with the secondary/case mission (3.4.4.3-2), need to be resolved? The LANL no indirect numbers make no sense, some of the utility requirements make no sense and some of the discharge numbers make no sense. The numbers used in Table 3.7.1-5 imply that people required for D&D would provide an immediate amelioration of the socioeconomic impact of change in staffing, but what fiscal year budget does the reduction come in and what fiscal year is the D&D work budgets in? The D&D on building 9201-4 has been on the long range schedule on and off for fifteen years and still has not risen to a level which would rate priority and considering the priority problems associated with D&D of plutonium facilities, does it not seem probable that this work might be scheduled thirty years from now? Would this work be done by Lockheed-Martin people or by contract workers, and how soon would it have to be scheduled in order for L-M workers to be kept on the

8/11.09

payroll to do it? Table 4.2.3.9-2 shows 0 involved workers for the phaseout alternative, but a flat 14,200 workers for the non-involved category. Where are the D&D workers? Why do the non-involved workers have a higher exposure level than involved workers? If

8/11.09 continued	it is a characteristic of the estimating process (because of the absence of site specific information), then what is the quality of our estimates for the general public?
9/08.01	How many of the new ER jobs at Y-12 which supposedly ameliorate the socio-economic impact in Oak Ridge are truly new jobs and how many of them are merely a relocation from K-25? The document postulates that 95% of the jobs which would be eliminated in the event of the transfer of Y-12 missions would be replaced by D&D jobs. Will these jobs not inherently be temporary, low paying jobs? Is there any likelihood that the funding, in excess of 100 million per year, will actually be available, particularly since priority must be given to the Rocky Flats site?
	E. INDIVIDUAL COMMENTS
10/40.68	1. Surely, contrary to the statement in paragraph 1.1, there must be some stockpile size (10, 100) at which the size of the stewardship facilities facilities could be smaller? Are not other countries which have smaller nuclear stockpiles operating with smaller laboratories and science bases?
1/40.11 continued	2. (1 1) Why have we chosen to use START II as a base case when there are uncertainties about START II? Has this not us in on tritium facilities?
11/42.11	Relative to paragraph 1.6.1, what would the need date be for a new tritium facility if we had used START I as a planning base?
12/40.82	3. (3 2 2) Relative to this paragraph, what ORR DP assignments are not performed at Y-12?
13/40.63	4 (3.3.4.2) What prohibitively expensive alternative to the HEPPF is referred to here as being
14/40.36	5. Has any consideration been given to the truly long term, 100s of years and more? Ideally, there should be no more need for a stockpile, but we still need to have a strategic option
15/40.64	6 (3.5) After all the concern expressed about subtle changes in materials and processes, emerging technologies proposes continuing work in areas which represent significant changes in processes and materials. Is the intent to protect technical capability, to have technologies available in case of a resumption of testing or a breakthrough in experimental technology, or is there an expectation that we can just go ahead and use them regardless of our previous protestations?
16/40.65	2.3.4 What are the different materials referred to in this paragraph whose aging characteristics are not well understood and could they not be replaced without compromising the military objectives of the stockpile? 3.5.1 Rocky Flats spent on the order of ten years and tens of millions of dollars on near-net-shape casting without success due to the complex metallurgical phase structure of the plutonium system; why do we think that better computer modeling will change the problem?

17/40.80	7. In paragraph 3.7 I did not see any reference to E-U for primaries, would it go with the secondary mission or what?
18/08.28	8 Is the statement in paragraph 4.2.2.8 that all jurisdictions have positive fund balances not misleading, since state law requires positive fund balances and jurisdictions deal with this by generating capital obligations, which are not included in fund balance calculations?
19/08.23	4.2.3.8/Public Finance Who projected that total expenditures for the public area would increase an average of less than 1% per year from the year 2000 to 2030?
20/08.12	In Figure 4.2.3.8-4 why does the text under public finance only discuss ROI impacts when the Oak Ridge impacts are 5 1/2 and 7 1/2%? Since these numbers are for 2005 and the staffing levels show a level for 2030 only half of 2005, what do we project the impact will be then?
21/04.03	9. (4.2.3.4 Para 2) What are the increased operating requirements of existing secondary and case fabrication facilities in the no action case? (No action does not imply resumed production and this projection is not made with regard to other sites.)
22/11.02	10. Why do we use the year 2030 staff levels for rad doses (P4-60 and 4-61) and use 2005 for economic impacts?
23/11.29	11. (P4-61) Is it really true that hazardous impacts would be reduced to zero as a result of secondary and case fabrication phaseout, unless we completely greenfield the site, including recovery of material from burial grounds?
24/11.30	12. (Table 4.2.3.9-4) How were accident numbers generated, e.g. it is not clear why the probability of a significant BeO release is so high?
25/10.02	13. In paragraph 4.2.3 10, how do we project zero waste associated with the move of HEU to another location unless containers can be removed and shipped in existing trucks with no repackaging?
26/33.06	14. (4.6.3) Does someone really believe that only minimal modification to existing facilities at LANL would be required for the secondary and case fabrication mission? No facilities exist for large LiH fabrication and processing exist and only minimal uranium and assembly facilities exist and facilities must be adequate to deal with potential surge requirements? This type of equipment costs tens of millions of dollars
27/40.40	15. As a follow-up to my concerns about the capacity/capability of the complex to respond to unanticipated needs, page -2 of the Analysis of Stockpile Management Alternatives, build rates above 100 per year would adversely impact the ability of LANL to perform their surveillance, research and development missions Does this mean that there is no way that we could truly support a surge capacity need.
	16 What, if any consideration has been given to safeguards/inspection provisions in these studies?

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COMMENT LETTER
PAGE 6 OF 6

28/08.11 | 17. In the discussion on page S36, why are only direct employment impacts considered in socioeconomics? If there are negative factors, such as land use, waste management, hazardous operations, transportation problems, would these not have negative socioeconomic impacts.

3/40.24 continued | 18. How are the production plants to maintain high quality technical staffs if all technical decisions are made by the Laboratories? (This was always a problem at Pinellas, which interacted with Sandia in the manner proposed for the future of all the Plants?) The previous mode of operation already led to problems in retaining some staff members because of problems in publishing by plant members and constraints on their activities

29/33.08 | The analysis with regard to this study discusses the preproduction of a supply of enriched uranium and lithium hydride sufficient to provide for (base line?) needs for up to 100 years. Does not past experience indicate that this will guarantee the loss of the associated technology.

30/33.07 | 19. Who, by name, are the supposed experts at the Laboratories in uranium and lithium hydride? What are their qualifications?

31/32.16 | 20. If laboratory facilities are so capable, why are we investing in new facilities at LANL and why are we postulating that it will be another five years before LANL can make a production pit?

32/32.13 | 21. How long can pits remain in the stockpile before buildup of decay products becomes a design concern or a handling concern?

SSM-M-126
COMMENT LETTER
PAGE 1 OF 32

CCNS
Concerned Citizens for Nuclear Safety

May 16, 1996

Mr. Steve Guidice
USDOE
Albuquerque Operations Office
P.O. Box 5400
Albuquerque, NM 87185

Dear Mr. Guidice,

Please accept my apologies for my tardiness in submitting CCNS's comments on the Draft Stockpile Stewardship and Management PEIS. As I told you in our phone conversation, my mother-in-law (who lived at my residence) recently died. The events preceding and following her death made it impossible for me to prepare adequate comments on a subject as complex and important as the Stockpile Stewardship and Management Program. I hope that DOE will understand my extraordinary circumstances during this period of time and still consider my comments.

I have expressed a copy to Mr. Jay Rose at the DOE Office of Reconfiguration as well.

Thank you for your understanding.

Sincerely,

Jay Coghlan,
CCNS

Concerned Citizens for Nuclear Safety • 107 Cienega St., Santa Fe 87501; 505/986-1973 • April 25, 1996

107 Cienega Santa Fe • New Mexico • 87501 • USA (505) 986-1973

Comments on the

Draft Stockpile Stewardship and Management Programmatic Environmental Impact Statement

Submitted by

Jay Coghlan, Program Director
Concerned Citizens for Nuclear Safety

Submitted to

Mr. Jay Rose, Director
Office of Reconfiguration
U.S. Department of Energy
PO Box 3417
Alexandria, VA 22302

Concerned Citizens for Nuclear Safety (CCNS) submits the following comments on the Draft Stockpile Stewardship and Management Programmatic Environmental Impact Statement (hereafter DPEIS). CCNS is a public education organization focusing on nuclear weapons policies and issues impacting the State of New Mexico. We have been actively involved in DOE nuclear weapons complex reconfiguration issues, particularly those affecting Los Alamos National Laboratory, since 1990.

These comments are organized as follows:

I. The Stockpile Stewardship and Management Program and Nonproliferation Issues

The July, 1995, Notice of Intent to prepare a Stockpile Stewardship and Management (SSM) Programmatic Environmental Impact Statement (PEIS) stated that three particular SSM Program challenges must be met:

- Full support at all times of the nation's nuclear deterrent with safe and reliable nuclear weapons while downsizing the nuclear weapons complex;
- Preservation of the core intellectual and technical competencies of the weapons laboratories; and
- Assurance that the activities needed to maintain the nation's nuclear deterrent are consistent with the nation's arms control and nonproliferation efforts.

1/40.60 In the DPEIS, DOE quotes Article VI of the Nonproliferation Treaty which obligates the nuclear powers "to pursue negotiations in good faith on effective measures relating to the cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control." (Article VI, NPT, 1970) DOE then notes that the NPT does not provide any time period for achieving this goal. "However, in keeping with these NPT goals, the NPR [Nuclear Weapons Posture Review] strategy does express the U.S. intent to pursue further reductions in nuclear forces beyond START II. Therefore, the implications of further reductions below the START II-sized stockpile are discussed in the Stockpile Stewardship and Management PEIS where they are relevant." (DPEIS p. S-10) However, throughout the document, DOE does little more than to posit an hypothetical low case of a 1,000 weapons in some theoretical START III" scenario, while at the same time asserting that the size and quality of SSM Program activities are independent of future stockpile sizes.

2/40.07 Despite accelerated rates of dismantlement since the end of the Cold War, there are still more nuclear weapons in global stockpiles than when the NPT was first signed in 1970. The SSM Program, as proposed, will likely be an obstacle to a stringent nonproliferation regime under a renewed NPT. The SSM Program constitutes a mere reduction-in-place of the past nuclear weapons complex, rather than the fundamental change mandated by the NPT. This opposition to the NPT is further compounded by the program's aggressive pursuit of improved computational abilities, simulated testing facilities and agile manufacturing techniques. Future SSM facilities will certainly improve capabilities for new design and production, and will thereby arguably discourage strict observance of the NPT by other countries. Since the SSM Program allows for continuing improvements and seeks to indefinitely preserve the stockpile, it is fundamentally at odds with the international commitment to disarm.

The NPT disarmament goal should be progressively implemented through deliberate and carefully phased multilateral arms reductions, in time involving all declared and undeclared nuclear weapons states. Important initial and intermediate steps towards disarmament are the achievement of a CTBT, proportional reduction of all stockpiles into the hundreds and below, a global ban

2/40.07 continued

on the development of new nuclear weapons systems,[1] and a corresponding global ban on the reprocessing of fissile materials.

The aim of this comment section is to point out the inherent contradiction in the program challenges stated above. The SSM Program, as constituted, gives predominant weight to the Nuclear Weapons Posture Review, specifically its directives to maintain design and production capabilities. At least equal weight needs to be given in program planning to the NPT which, as a treaty, is enshrined as national law and which precedes the Posture Review. The SSM PEIS, within the limits of its planning window, should provide interim steps towards final resolution of the contradiction inherent in the three program challenges. The SSM PEIS should recognize the primacy of the NPT which requires corresponding recognition that the ultimate baseline for the future stockpile is already in the terms of the NPT and which is zero.

1/40.60 continued

Given that it is folly to unilaterally disarm, interim stockpile sizes should be recognized and planned for, but with emphasis placed on their continuing diminishing interim status as we seek to honor our NPT commitment. The SSM PEIS should help provide a road map towards eventual disarmament, rather than creating obstacles to it.

2/40.07 continued

The JASONs have touched upon the danger that the SSM Program can present.

> One worrisome aspect of the Stewardship program is that it may be perceived by other nations as part of an attempt by the U.S. to continue the development of ever more sophisticated nuclear weapons. This perception is particularly likely to be held by countries which are not very advanced technologically since they are less able to appreciate the limits on advanced weapons design that a lack of testing enforces. The stewardship program, unless managed with restraint and openness, including international collaboration and cooperation where appropriate, might end up as an obstacle to the Nonproliferation Treaty.
>
> The United States, as the world's preeminent conventional military power, has the strongest security motivation to prevent nuclear proliferation, with its "equalizing" aspects.[2]

This quote is relevant today to the ongoing CTBT negotiations. The aim of the CTBT is, of course, to deny nations weapons design capability. To the extent that other nations perceive, rightly or wrongly, that the U.S. has circumvented that prohibition through the creation of a sophisticated AGEX program, they may be encouraged to pursue their own weapons programs. DOE must avoid this possible encouragement by, as the JASONs suggest, implementing the SSM program with restraint and openness. However, restraint is hardly the operative word for the

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1 Here, a ban of new nuclear weapons systems is emphasized so that future mating of existing physics packages to new delivery systems is also included (for example, see discussion of the B-61 modification). In addition, the SSM PEIS needs to explicitly acknowledge that the number of remaining weapons systems in the post-START II arsenal is limited to the seven commonly referred to.

2 Draft Stockpile Stewardship Report, JASONs, August 1994 (writing before 1995 NPT renewal), pp. 16 and 15.

3/41.19

SSM Program as it stands now, given the $2.7 billion in proposals for facility construction/upgrades and $2.1 billion for the Accelerated Strategic Computing Initiative (see attached table).

2/40.07 continued

Adverse international perception was undoubtedly heightened by last month's threats to destroy Libya's reported deeply-buried chemical weapons factory. Asst. DoD Secretary Harold Smith is quoted as saying that "[i]f we wanted to destroy (the chemical weapons factory), [the] B-61 is the nuclear weapon of choice."[3] This is germane to SSM Program discussion for at least two reasons. First, the specific type of the B-61 that Smith referred to is a modification currently being worked on by LANL and SNL under the SSM Program. DOE plans to "[d]eliver first production unit kit for B61-11 in FY 1997."[4] It also demonstrates that the CTBT will not halt weapons development by the U.S. Secondly, this threat was made two weeks after the U.S. signed protocols declaring an African Nuclear Weapons free zone which forbade the use or the threat of use of nuclear weapons in Africa. This whole incident serves to illustrate the schizophrenia, even hypocrisy, of both the SSM Program and national nonproliferation strategies.

DOE and the Administration have stated as a matter of policy that new warheads will not be produced. But under the Nuclear Weapons Posture Review and the SSM Program there is no prohibition on weapons design *per se*, meaning that work at the conceptual design and feasibility stage are acceptable. Additionally, there is no clear definition of "new" warhead versus "modified" warhead. In answer to an explicit question, DOE essentially said that it could change the nonnuclear components, the primary, the secondary, the yield, the military characteristics, and still call it a modification of an existing design.[5] Internationally, it is difficult for the U.S. to argue that the SSM Program's sole aim is to maintain stockpile safety and reliability when not only have existing facilities been used for design but are also being greatly augmented by new facilities. Continuing conceptual development of next generation facilities, such as the Advanced Hydrotest Facility, further aggravate the situation.

The B-61 modification program is not the only current area of continuing design work. Submarine Launched Ballistic Missiles are also listed as a major area of study.[6] Asst. Secretary Reis has testified that planned near-term stockpile modifications include W76 re-certification, W88 pit rebuild, and the B61 Mod 11.[7] LANL states that "[f]uture initiatives may include the application of robust design concepts from a current DOE/Department of Defense (DoD) to assess proposed strategies for replacing weapons in the stockpile in the absence of nuclear tests and an extensive production complex."[8] Moreover, DOE states that it will "[c]onduct other weapons studies as requested by the Department of Defense."[9]

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3 Associated Press, April 23, 1996.
4 FY 1997 DOE Congressional Budget Request, Atomic Energy Defense Activities, p.61.
5 ISIS roundtable with DOE officials, March, 1996
6 FY 1997 DOE Congressional Budget Request, Atomic Energy Defense Activities, p.61.
7 Hearing of the Subcommittee on Military Procurement, Committee on National Security, March 12, 1996, Reis, p.15.
8 FY 1996 LANL Institutional Plan, p. 16.
9 FY 1997 DOE Congressional Budget Request, Atomic Energy Defense Activities, p.61.

2/40.07 continued

In the future, the intervening time between design and production will be greatly compressed. For example, "Sandia has demonstrated feasibility of very tight coupling of design and production processes....Weapons systems designers will be able to determine if their designs-are manufacturable with the available production systems."[10] "They will permit more rapid prototyping by simulating and validating process options on computers, rather than on the factory floor."[11] "Advanced rapid manufacturing is the logical successor to rapid prototyping."[12] Thus, in the near future, it appears that the U.S. nuclear weapons complex will be capable of holding designs "on the shelf" for rapid small-lot production when it is deemed necessary.

1/40.60 continued

In addition to possible future design and production, the planned longevity of U.S. nuclear weapons programs contradicts NPT Article VI. It is mere lip service for the DPEIS Summary to state that "the NPR strategy does express the U.S. intent to pursue further arms reductions in nuclear forces beyond START II." The fact is that the SSM Program, asproposed, explicitly builds in direct opposition to our NPT obligations. Throughout the DPEIS, three stockpile size cases are assumed in order to arrive at production capacity assumptions. They are 1) a base case of 3,500 "accountable" warheads (START II level), 2) a high case of 6,000 accountable warheads (START I level), and a low case of 1,000 accountable warheads (<START I level).[13] In all preferred Stockpile Management alternatives, activity costs are projected out to the year 2020. To postulate the existence of even a 1,000 warheads (not to mention continuing R&D) to the year 2020 is not acceptable. It is not enough to state that the NPR strategy expresses intent to pursue reductions beyond the START II level. If SM activities are projected until the year 20020, then DOE must include in the SSM PEIS a stockpile in the few hundreds as demonstration of a national commitment to the NPT. DOE's two previous attempts to complete the Reconfiguration PEIS were doomed by failures to consider smaller stockpile sizes. This mistake should not be repeated.

4/32.12

As it is, not only is an appropriately low stockpile size not considered, but under all considered stockpile sizes, costs for SM activities continue to rise every year until the year 2020. Under DOE's preferred alternative to perform pit fabrication, requalification and reuse at LANL, program costs are described as consisting of 1) capital investment, 2) steady-state operations, and 3) cost of the ongoing pit evaluation and R&D program.[14] First of all, CCNS does not believe that further capital investment above maintenance is required. Secondly, there is not meant to be any "steady-state" costs. As per a genuine commitment to NPT Article VI, stockpile sizes and infrastructure are to continually decline until the disarmament goal is finally honored.

5/32.01

Thirdly, proposed plutonium R&D programs are in large part for the express purpose of re-establishing the capability for larger-scale pit production.[15 16 17] Asst. Secretary Reis states that "[m]aintaining the stockpile has

10 *FY 1995 SNL Institutional Plan*, chapter 5-p. 3.
11 *FY 1995 SNL Institutional Plan*, chapter 5-p. 5.
12 *FY 1995 SNL Institutional Plan*, chapter 5-p. 9.
13 From *Draft Stockpile Management Preferred Alternatives Report*, DOE, February 1996.
14 Ibid.
15 DOE states that it "will perform development and demonstration work at its operating plutonium facilities over the next five years to study alternative facility concepts which could be utilized in the future in the construction of a larger fabrication capacity." *Draft Stockpile Management Preferred Alternatives Report*, DOE, February 1996, p 13.
16 LANL Director Hecker testifies that "[w]e are also teaming with colleagues at Lawrence Livermore, Savannah River, and Pantex to develop contigencies for larger-scale pit production requirements. We expect to learn much from the W88 pit rebuild program and the 50-pit manufacturing module at TA-55 that would allow the team to design a modular, large-scale production capability that could be deployed rapidly should requirements change." Hearing of the Subcommittee on Military Procurement, Committee on National Security, March 12, 1996, Dr. Hecker, p. 12.
17 LANL states that the "long-term Los Alamos National Laboratory mission needs for such capabilities [*which an upgraded Chemical and Metallurgical Research Building would provide in support of LANL's plutonium processing at TA-55*] are currently programmed for at least another 20 to 30 years." *FY 1997 LANL Capital Assets Management Plan*, CMR Activit y Data Sheet, p. A-17.
18 Hearing of the Subcommittee on Military Procurement, Committee on National Security, March 12, 1996, Asst. Sec. Reis, p. 5.
19 Hearing of the Subcommittee on Military Procurement, Committee on National Security, March 12, 1996, Dr. Tarter, pp. 7 and 11.

2/40.07 continued

become a program which will provide for indefinite life extension."[18] LLNL Director Tarter states that "the laboratories and plants are developing comprehensive life-extension plans for each weapon system slated for the enduring stockpile" and "[t]he objective is to enhance the structural integrity of the W87 so that it may remain part of the enduring stockpile beyond the year 2025...."[19] All of this is backwards and contrary to the NPT.

6/40.02

DOE planned subcritical experiments at NTS are poorly rationalized and certainly poorly timed. That these tests are slated to be performed underground, even as negotiations for the CTBT are expected to be their concluding phase, raises serious verification problems that could help stymie achievement of the CTBT. While the first two tests will reportedly not involve weapons configurations, DOE has not stated that future tests will have this prohibition. If weapons configurations are used, this could result in fission yields that, while small, would nevertheless contradict the express goal of achieving a "zero-yield" CTBT. Subcritical tests are not required to maintain NTS readiness. Nor is there reported evidence that suggests that plutonium aging affects weapons performance, which is the touted area of study for these tests. The subcritical tests are ill advised and should be canceled. They should under no circumstances be performed underground. If DOE is rash enough to proceed with these tests, they should be conducted above ground in containment vessels under international monitoring.

2/40.07 continued

In sum, the SSM Program, proclaimed as the safeguarding mechanism for U.S. participation in a Comprehensive Test Ban Treaty, can have the end effect of seriously undermining universal observance of the NPT and may help hinder completion of the CTBT. Keeping the Nevada Test Site open, planning the subcritical tests, maintaining stockpile sizes beyond what is required for minimal deterrence, all the while making massive investments in future nuclear weapons facilities, will be widely viewed as violating NPT Article VI.

7/40.22

II. SSM Program Rationale, the *Stockpile Life Study* and *Stockpile Surveillance: Past and Future*

The underlying rationale for the SSM Program is that the loss of full-scale underground testing will lead to decreasing confidence in the safety and reliability of the aging nuclear weapons stockpile. Absent this rationale, it would be difficult for DOE to justify operating current facilities, much less build new ones, since official policy now proclaims that no new nuclear weapons will be produced. In December, 1993, SNL completed its *Stockpile Life Study* (hereafter "Study" or SLS), which largely undercuts the SSM Program's rationale. The Study reviewed the entire history of the modern nuclear weapons stockpile, analyzing data from the testing and evaluation of 13,500 weapons out of a total of 70,000 stockpile weapons. Historically, 2,330 "defects", including multiple occurrences, were discovered. Out of these, 257 "actionable" defect types were identified, of which 32% led to "product change proposals" (PCPs) involving retrofits and major design changes. About half of all PCPs were due to new weapons requirements rather than defects.

The Study found that with surveillance and repair, U.S. nuclear weapons retain high safety and reliability: "[A]lthough nuclear weapons age, they do not wear out; they last as long as the nuclear weapons community (DoD and DOE) desires. In fact, we can find no example of a nuclear weapon where age was ever a major factor in the retirement decision." In the viewgraph "Factors Affecting Weapons Retirements" states that "missions, policy, standards, delivery systems, and state-of-technology change; however, nuclear weapons do not wear out." "Mk Number Lifetime" demonstrates extensive experience with "old" weapons, some with stockpile lives of 35 years or more. "Average 'Actionable' Defect Types...." demonstrates (with archival data of 28 years) that nearly half of all defect types are discovered in the weapon's first three years and 80% in the weapon's first fifteen years. Defects caused by aging are rare and have not increased over time since a weapon's first production unit. Additionally, the stockpile is not now reaching an advanced age due to scheduled retirements under arms reduction agreements. Weapon systems designated to remain in the post-START II stockpile currently range between seven and seventeen years of age.

Only a very small fraction of the *few* defects discovered have significantly affected reliability: "Failures, defects, and aging problems have been discovered, but these have been rare." Of these already rare defects, 57% were found to have no effect on reliability. Ninety-six per cent of those defect types considered significant enough to be "actionable" were subsequently judged to affect reliability less than 10%. A total of 10 defect types were found that resulted in a reliability decrement of 10% or more.

Very few defect types have been discovered in nuclear weapons primaries or secondaries. "257 'Actionable' Defect Types...." shows that only 5% of defect types have involved primaries. Conspicuous in their absence are any defects in weapons secondaries.

Underground nuclear tests (UGTs) have not uncovered defects and have not been used to design fixes: "The Stockpile Evaluation Process" depicts a robust existing stockpile surveillance program. "The Stockpile Evaluation Program does not

7/40.22 continued

include underground testing." "Nuclear Weapons Defects, Where....Discovered" states that "actionable" defects were never first discovered in stockpile confidence underground testing. Underground tests have been used to confirm the reliability of only four changes to stockpile weapons since 1970.

Past defects have been fixed and few are anticipated in the future: Nuclear weapons "are not allowed to degrade." The Study does not identify any defect that could not be understood or any component that could not be replaced in the last thirty years. "Future Workload Issues" anticipates that an average of "1 [one] 'actionable' defect will be discovered each year."

The Study adds weight to previous studies and expert opinion showing that the safety and reliability of the U.S. nuclear weapons stockpile can be maintained under a comprehensive nuclear testing ban. The key implications of the SLS – that the U.S. arsenal is highly "reliable;" that underground testing has rarely been used to confirm the reliability of stockpiled weapons; and that future defects can be fixed with existing surveillance programs and facilities – are highly relevant to the proposed SSM Program.

The Study was prepared by SNL's New Materials and Stockpile Evaluation Program. SNL designs the nonnuclear components of nuclear weapons, while LANL and LLNL design the nuclear components. SNL conducts the stockpile evaluation process. Although written by SNL, the Study incorporates all defects that were significant enough to merit "product change proposals," including the few defects found in the nuclear components.

In fall, 1994, LANL and LLNL weapons scientists were unable to provide the Galvin Commission with any examples of defects in the enduring stockpile that were not already counted in the Study. All 26 PCPs in the enduring stockpile were individually reviewed. The findings of the Stockpile Life Study raise questions not only about any supposed need for additional nuclear testing, but also about the purpose and justification for the SSM Program. Under the guise of carefully and conservatively managing an aging stockpile's safety and reliability without underground testing, the weapons laboratories have pushed for a set of new facilities that have little to do with stockpile management. None of DOE's proposed SSM program facilities, nor its Advanced Strategic Computing Initiative, have been needed to maintain the arsenal up to now. Underground testing has played only a very limited role in stockpile evaluation and maintenance for the last 25 years. Despite the rarity of defects involving primaries, and none involving secondaries, nearly all of the proposed SSM Program investment is directed at the nuclear portion of weapons. Certainty about the performance of the exhaustively-tested weapons in the so-called "enduring stockpile" has never been higher. The SLS undercuts the rationale that the loss of underground testing creates the urgent need for future facilities to ensure stockpile safety and reliability.

Subsequent to disclosure of the Study, DOE has criticized the SLS as having been the work of one weapon laboratory, and a primarily nonnuclear laboratory at that. In response, DOE prepared a new study *Stockpile Surveillance: Past and Future*, signed off on by all three weapons laboratories. This study has in turn been incorporated

7/40.22 continued

by reference into the DARHT FEIS, and excerpted at length in the DPEIS. As the DPEIS Summary puts it, "The past role of nuclear testing is emphasized [in the new study] because such testing can no longer be relied on to provide unambiguous high confidence in the future safety and reliability of an aging stockpile." By inference, this provides the justification for the many proposed Stockpile Stewardship facilities.

As the DPEIS Summary readily agrees with the SLS, three-quarters of weapons defects have been detected by the existing Stockpile Surveillance Program. However, the Summary goes on to say that "[n]uclear tests have identified certain classes of stockpile problems not observable in the surveillance program." First of all, as a baseline, all current weapons are certified to be safe and reliable. From here, analysis of past problems and anticipation of future problems must be separated into safety and reliability issues. The two paragraph discussion of stockpile data in the DPEIS (p. 2-6) is wholly inadequate for this purpose. Future iterations of the SSM PEIS must explicitly separate the two issues.

Historically, safety problems have been addressed through operational changes and the scheduled retirement of weapons that do no not meet modern safety standards. Dr. Ray Kidder, former LLNL senior physicist, has stated that aging affects reliability rather than safety.[20] As to the need for testing for reliability, Richard Garwin has stated "[t]hat's a red herring. Historically, nuclear test explosions have not been the mechanism used to determine the reliability of the stockpile. Further, reliability cannot be verified in that way" and "because 'reliability' is a statistical construction, it is clear - or it should be clear - that not enough weapons can be fired to insure statistical reliability."[21]

J. Carson Mark, ex-director of LANL's Theoretical Division, has argued that "the reliability, effectiveness, safety and security of our nuclear arsenal can be maintained without nuclear tests" long in advance of the proposed SSM Program. He said:

> For a more meaningful perspective [on historical defects] one needs to know something of the actual course of events. It is true that checking on or solving problems with some 14 weapon models out of a (then) total of 41 has involved some post-deployment nuclear tests. Nine of these involved weapons which were deployed, or scheduled for deployment, during the 1958 - 1961 testing moratorium, and simply had not been adequately tested in their final configuration before being placed in the stockpile....They convey a very clear message: A weapon should not be deployed before all of the tests necessary to certify it for deployment have been made and provided acceptable results....This lesson has been learned. It has nothing to do with

20 "Metals corrode, and organic matererials such as plastics, adhesives, and HE that are present in a nuclear warhead will deteriorate with age. Such aging effects degrade a warhead's reliability rather than its safety...A severe case of aging was the deterioation of the HE in the W68 Poseidon warhead....The reliability, but not the safety, of the warhead was affected." Report to Congress: *Assessment of the Safety of U.S. Nuclear Weapons and Related Nuclear Test Requirements*, R.E. Kidder, July 26, 1991, p.6.
21 "Atoms Do Not Age," *Bulletin of Atomic Scientists*, October 1993.

> the need for continued testing to maintain the reliability of the existing U.S. stockpile...If the surveillance program reveals a major problem with an important weapon - such as explosive deterioration or fissile material corrosion - the weapon can then be manufactured to exactly its original specifications, without further testing...Most important, no changes or improvements in matters which could affect the behavior of the nuclear system in an existing, certified weapon design would be acceptable."[22]

7/40.22 continued

Earlier, in 1987, Dr. Kidder expressed a similar view:

> The test record indicates that the nuclear weapons in the existing U.S. stockpile are sufficiently robust to allow for future replication....the test record does not support the thesis that reliable manufacture cannot be accomplished...Assuming, therefore, that vendor-supplied materials and components are still available at the time desired for remanufacture (and this will not necessarily be the case), the remanufacture of existing, well-tested warheads is possible...It seems clear that if appropriate action were taken in advance, the future validity of these components and materials could be assured.[23]

8/40.33

The DPEIS is deeply flawed through its categorical rejections of the *Remanufacturing* and *Maintenance Alternatives*. DOE's bottom line is that "emphasis on nuclear components which can no longer be functionally evaluated by nuclear tests" precludes adoption of the *Remanufacturing Alternative*. CCNS believes that 1) if the political will were present in the weapons community to provide in advance for remanufacturing of all components, the validity of remanufacturing would be assured; and 2) that (as Kidder and Mark indicate) the history of testing does not support exclusion of nuclear components in an overall remanufacturing approach. Similarly, we believe that DOE's rejection of the *Maintenance Alternative* is baseless, given the evidence of the Stockpile Life Study and other citations included in these comments.

7/40.22 continued

DOE's new report *Stockpile Surveillance: Past and Future* is disingenuous in a number of ways. First, for reasons discussed in the preceding section, it puts undue emphasis on the role of underground testing in the discovery of historic defects. The Tri-Lab study also performs a sleight of hand by adding three weapons for a total of ten in the "planned" stockpile (year 2000), as opposed to the SLS's seven weapons in the "enduring" stockpile (post-START II and -year 2004). The SLS also has explicit categories for "explosive components" and "nuclear parts (pits)." The newer study combines the two into the category "primary," thereby inflating the overall number of defects in this crucial category. By claiming over 200 findings for the planned stockpile, in comparison to the 26 major "product change proposals" (PCPs) reported in the SLS, it would indeed appear that problems with an aging stockpile would be more severe than originally thought. However, when the 29

22 "Do We Need Nuclear Testing?" J.Carson Mark, *Arms Control Today*, November 1990.
23 *Maintaining the U.S. Stockpile of Nuclear Weapons During a Low-Threshold or Comprehensive Test Ban*, R.E. Kidder, October 1987, pp. 6 & 7.

7/40.22 continued

"actionable" findings for the extra three weapons in the "planned" stockpile[24] are subtracted from the 110 "investigated-corrective action" findings in the Tri-Lab study,[25] 81 actions remain. Employing the stated ratio of 31%[26] implemented retrofits or major design changes to total actionable findings, 25 retrofits or major design changes are found to have been implemented for weapons remaining in the enduring stockpile. The SLS had reported 26 retrofits or design changes for those same weapons.[27]

Both studies reach the same bottom line for future necessary changes as well. The SLS states under "Future Workload Issues" that "For the enduring stockpile (comprised of 7 systems), historical data suggest that : 1 'actionable defect' will be discovered each year. About 2 PCPs will approved each year - 1 of these will constitute a major change." The Tri-Lab study states "based on the age of the planned stockpile over the next ten years, historical data would project an average of one to two change proposals per year, with one of these resulting in a major change."[28] The Tri-Lab study, however, immediately spins that "these projections are most likely minimum numbers," arguing that the stockpile these projections were derived from was on average younger than the "planned" stockpile in future years. As already discussed, the SLS clearly shows that defects decrease with age. Moreover, the stockpile is not now advancing into an overly "old" age because of the already scheduled retirement of older weapons.

In private conversation, senior DOE officials have presented the imagery of the "bathtub curve," where after a weapon's first production unit the number of defects sharply decline, then remain fairly stable, to finally rise in time with age. These officials acknowledge that the data doesn't yet exist to support this hypothetical rise in defects. The salient fact, with respect to SSM Program rationale, is that existing programs and existing facilities have successfully dealt with historic defects rates that exceed those that are now anticipated for the future. DOE and the DPEIS provide insufficient justification for the expensive and internationally provocative SSM Program. Because the rationale is so baseless, CCNS is forced to conclude that the SSM Program is political cover for maintaining the design and production capabilities mandated by the Nuclear Weapons Posture Review.

With respect to possible expansion of weapons effects R&D capabilities through the construction of future facilities (such Jupiter) under the SSM Program, CCNS sees no underlying rationale whatsoever.

9/40.39

Finally, DOE has acknowledged that weapons scientists had the foresight some time ago to set aside carefully measured quantities of special nuclear material (perhaps in actual weapons configurations) for the express purpose of studying future aging

24 *Stockpile Surveillance: Past and Future*, September, 1995, graph, p.38.
25 Ibid, graph, p.31
26 Ibid, graph, p.26.
27 CCNS does not claim that these numbers are definitive. The bar charts in both studies are crude in their precision, and exact numbers of findings per defect category could vary by plus or minus one in some cases. The overall point stands: *Stockpile Surveillance: Past and Future*, once corrected for the "enduring stockpile," validates the findings of the *Stockpile Life Study*.
28 *Stockpile Surveillance: Past and Future*, September, 1995, p.13.

9/40.39 continued

effects. The results of these studies could be central to the debate over age-induced defects. DOE should release relevant data on this subject in the SSM PEIS.

III. DOE's NEPA Hierarchy

DOE's programmatic reviews have been compelled by litigation by citizens groups, originally in 1989, which led to an agreement by DOE to perform the Reconfiguration PEIS (R-PEIS) and the Environmental Restoration and Waste Management PEIS. Subsequent litigation in 1994 led to a resumption of the R-PEIS, which was then renamed the SSM PEIS. DOE has improved its NEPA compliance, and there is now a proliferation of PEISs. The aim of this section is to point out the gaps or inconsistencies between these PEISs and other DOE NEPA processes.

10/42.12

Consideration of environmental impacts caused by environmental restoration activities has been completely dropped in the current Waste Management PEIS (WM PEIS). Overall, there is no adequate discussion of potential wastes from disposition activities, "reasonable" alternatives for reprocessing found in various EISs, and wastes from proposed MOX-fuel reactors. Under the WM PEIS, large volumes of future wastes to be explicitly generated by the SSM Program[29] are being preliminarily evaluated.[30] There is no link between the WM PEIS and the SSM PEIS in discussion and consideration of the environmental effects and costs of future wastes generated by the SSM Program. The SSM PEIS, with a scheduled completion date of August 1996, will no doubt precede completion of the WM PEIS (which, at this time, has no announced completion date). Hence, DOE will be implementing its SSM Program before the effects and costs of program wastes have been fully evaluated against the matrix of all other DOE waste issues.

11/42.05

No NEPA process programmatically covers the increasingly important issue of reprocessing. Reprocessing is partially covered in different aspects by a pyroprocessing EA for INEL, the Disposition PEIS (which covers only "surplus" materials and hence is not relevant to the SSM Program), the Foreign Research Reactor Spent Nuclear Fuel EIS (not relevant to the SSM Program), and two SRS EISs (see Section V below). There is a need for an integrated document that evaluates reprocessing as a whole across the residual complex, in contrast to the incoherent formulation of reprocessing policy through disparate documents. An overall document is needed to evaluate possible proliferation impacts, environmental impacts and program costs, instead of a piece-meal drift back into reprocessing.

12/42.10

For obvious reasons, the DPEIS is linked to the Tritium Supply and Recycling PEIS. As a matter of process, the old R-PEIS was bifurcated into the two individual PEISs

29 "As modified, the WM PEIS focuses on waste management facilities (those required to treat, store, or dispose of existing wastes and wastes that will be generated in the future as a result of DOE nuclear weapons stockpile and stewardship and research programs". Draft WM PEIS Summary, USDOE, August 1995, p. 13.
30 For example, "Low-level waste. Approximately 114,000 cubic meters of LLW are stored, and an estimated 1,378,000 cubic meters are expected to generated over the next 20 years....Volumes do not include environmental restoration wastes." Ibid, p.11.

12/42.10 continued

only in October 1994. Since the DPEIS rejects consideration of stockpile sizes below a thousand warheads (despite the DPEIS's inherent conflict between considering SM activities until the year 2020 and NPT Article VI), the DPEIS builds in a bias towards the necessity for future tritium production. Furthermore, as discussed in the section below, the DPEIS's assumption of the START II base case for planned stockpile size may well inexorably lead to higher stockpile sizes. This in turn will boost the need for tritium production. The point is that better integration between the two PEISs is required.

13/42.01

Plutonium pit storage is considered in at least three different documents: strategic pit storage in the DPEIS, interim surplus pit storage in the Pantex Site-Wide EIS (SWEIS), and long-term surplus pit storage in the Disposition PEIS. DoD sites are not considered for long-term pit storage, although the Manzano Weapons Storage Area near Albuquerque is the largest existing facility for such storage and is listed as a reasonable alternative for interim storage in the Pantex SWEIS. Again, better program integration is required.

At the site level, present NEPA documentation is not adequate for sites potentially impacted by SSM Program alternatives and/or reprocessing options. SNL has never had a SWEIS. LANL's last SWEIS is hopelessly outdated (a new one is now in process, but it appears questionable that all likely SSM Program projects will be addressed). The in-process Pantex SWEIS covers pit storage, but not adequate analysis of low-level waste, mixed waste, and other SSM Program or Disposition PEIS activities at the site. For INEL, pyroprocessing impacts and management of all existing LLW, Tru, and HLW is not integrated into one single site document. Similarly, for SRS the impacts of tritium production, future MOX fuel reactor operations, reprocessing, and waste management activities are not integrated into one site document.

14/40.90

At the site level, it appears at times that a deliberate policy of inappropriate NEPA segmentation is being pursued. A good case in point are the proposed upgrades for LANL's Chemical and Metallurgical Research Building. The three planned upgrade phases have historically lacked clear demarcation between them. All phases have been combined into a single budget line item. The Defense Nuclear Facilities Safety Board has commented on how technical inconsistencies exist between what is described in program documents and what is actually being implemented in the Phase 1 Upgrade. In addition to a draft EA for the Phase 2 Upgrade, separate EAs were done for the Fire Resistant Pit Program and the Radioactive Resource Recovery Program, despite the fact that all of these activities are occurring in the same building and closely in time. Finally, interim storage of 46 spent fuel rods in the CMR Building is "presumably only valid for a short time"[31] and no reported decision has been made on their long-term storage. All of this takes place against the backdrop of a laboratory with repeated NEPA violations and no currently valid SWEIS from which to tier project-specific reviews.

15/41.16

CCNS believes that a policy document is needed as the "mother" of all of these NEPA processes. Such a document would provide the bridge between the PEISs

31 *Spent Fuel Working Group Report*, USDOE, November, 1993.

15/41.16 continued

(and other NEPA processes as needed) and consider their inter-relatedness. We believe that such an effort, fully integrated between DOE DP and EM, would greatly enhance the Department's decision-making capabilities and result in better decisions.

IV. SSM PEIS Stockpile Sizes and SSM Capabilities

1/40.60 continued

In the DPEIS, "DOE assumes that facilities would be sized and operated to support a base case stockpile size consistent with the START II protocol. This PEIS also discusses impacts that would be expected for supporting a larger stockpile based on START I Treaty Levels, and a hypothetical stockpile smaller than the START II protocol." (DPEIS p. S-3) This assumption is somewhat glib in that the DPEIS totally ignores the relationship between Russian Duma ratification of the START II protocol and further arms control negotiations. Sentiment is strong in the Duma that the U.S. is essentially outsmarting Russia, leaving it at a strategic disadvantage. This is, in large part, due to Russian suspicions over tighter strategic encirclement by the West through the eastern expansion of NATO and current American proposals for an anti-ballistic missile defense (which theoretically could enhance U.S. first-strike capabilities). More germane to the DPEIS is that START II is widely perceived in the Duma has being inherently unfair. Under the protocol, land-based ballistic missiles would be prohibited from deploying more than one nuclear warhead. This is a distinct disadvantage to Russia, which predominantly relies on its land-based arsenal. It favors the U.S. with its fleet of submarine-launched missiles, which face no similar restriction. These fears on the part of the Duma may keep it from ratifying START II.

As Jack Mendelsohn of the Arms Control Association put it, "An awful lot is riding on the continued reduction of these missile systems. If you reverse this process, you begin to slip back into action-reaction, move-countermove, and the potentially confrontational and distrustful atmosphere that existed before the collapse of the Soviet Union."[32] From this perspective, the DPEIS baseline is not the passive base case it may appear to be. Due to "move-countermove," the planned composition of the U.S. stockpile under the START II protocol may in and of itself initiate the need to "hedge" backs towards the higher START I level. Therefore, an inherent prejudice is built into the DPEIS. Rather than treating a sub-START II stockpile as hypothetical, the DPEIS needs to aggressively plan for further arms cuts in order to help assure START II ratification by the Duma. The alternative may inevitably be stockpile sizes greater than the START II level.

16/40.36

DOE claims that "National security policies in the post-Cold War era require that all the historical capabilities of the weapons laboratories, industrial plants, and NTS be maintained. Capability is the practical ability to perform a basic function or activity. Stockpile stewardship and management capabilities are independent of foreseeable future stockpile sizes." (DPEIS p. S-3) As previously discussed, existing surveillance programs and facilities appear to be more than adequate to fulfill the proclaimed

32 "Russian, U.S. Politics May Rekindle N-Tensions," Peter Slevin, Knight-Ridder Newspapers, May 12, 1996.

16/40.36 continued

SSM Program mission of ensuring the safety and reliability of the enduring stockpile. However, beyond merely maintaining historic capabilities of stockpile stewardship facilities, DOE is instead seeking to aggressively expand their capabilities through proposed facilities. This is rejection of stockpile curatorship. Curatorship, underpinned by existing surveillance programs and facilities and remanufacturing as needed, would maintain a credible deterrence. The DPEIS is deficient through its failure to examine and justify what is genuinely needed for deterrence.

17/40.56

The DPEIS inappropriately constricts the window of time that is considered in the document. As already mentioned, the R-PEIS was in process for six years without coming to completion. During that time, the second alternative of the revised R-PEIS (the modify- and upgrade-in-place alternative) was being incrementally implemented without the benefit of a ROD. Now the DPEIS designates the No Action Alternative to include "all existing facilities for which Congressional budget 'line item' construction was started by the end of fiscal year 1995 (September 30, 1995)." (DPEIS p. S-22) For the out years, DOE claims that future major facilities are

18/41.17

not to be included in the DPEIS "because they have not reached the stage of development and definition that is necessary for evaluation and decision making." [See discussion of the Advanced Hydrotest Facility below.] Yet the DPEIS plans for Stockpile Management activities until the year 2020. The SSM PEIS can't have it both ways.

1/40.60 continued

CCNS rejects DOE's assertion that needed Stockpile Management capabilities are independent of future stockpile sizes. As previously explained, assumption of the START II stockpile size may in turn lead towards higher stockpile sizes. This, in turn, can lead to implementation of the plans now being developed for larger scale pit production. On the other side, a drive for continually decreasing stockpile sizes could concomitantly lower the need for long-range maintenance of SM capabilities, at the same time better coinciding with national and international nonproliferation efforts.[33]

6/40.02 continued

The NTS budget should be cut to a skeletal budget in order to demonstrate a genuine commitment to the CTBT. The proposed subcritical tests at NTS should be permanently canceled. Under no circumstances should they be held underground because of the accompanying transparency problems.

19/40.41

V. DARHT, Plutonium-242 Reprocessing and the SSM Program

The abstract to the SSM PEIS contains the following sentence: "A classified supplement has also been prepared to support the purpose of and need for the plutonium-242 to be stabilized at SRS for use in future weapons complex research and development activities." In other recent NEPA analysis, DOE had designated

33 DOE personnel have made the argument that the existing suite of SM facilities needs to be maintained so that dismantlement activities can continue. This obviously applies to some facilities, such as Pantex, but does not explain, for example, $300 million in upgrades TA-55 and $240 million in CMR Building upgrades at LANL.

19/40.41 continued

Pu-242 in solution at the Savannah River Site as "Programmatic" material, had stated that it is not in a form that can presently be used, and that future DOE decisions will decide on its use.[34]

Pu-242 is not fissile like Pu-239 that is used in weapons, hence it is ideal for future use in hydrotesting at DARHT. That rate of use is likely to be above the historic rate of use at PHERMEX.[35]

The DPEIS recognizes that the Interim Management ROD "left programmatic decisions for the plutonium-242 to DP." Subsequently, "DP has determined that the plutonium from-242 from SRS would be useful for future R&D activities." DOE then constricts discussion by stating that "the issue for this PEIS concerns where to store the plutonium for such use. This section provides an analysis of the alternatives for storing SRS plutonium material for future R&D use. Further information regarding shipping, storage and use of this material is contained in a classified appendix to this PEIS." (DPEIS p. 4-571 & 472, *"Use of Plutonium-242 for Research and Development"*)

In the DPEIS, alternatives being evaluated for Pu-242 storage are to leave the material in place at SRS (the No Action Alternative), or to transport the material to LANL or LLNL for use in R&D. The DPEIS notes that LLNL is currently reducing its plutonium inventory. For LANL, the expected storage site is TA-55, presumably at the Nuclear Materials Storage Facility which is linked via tunnel to PF-4, the only currently operating plutonium fabrication facility in the country. The DARHT FEIS notes that the "plutonium processing capability at TA-55 is extensive and adequate for the required operations: chemical separation, alloy preparation, foundry capability, casting and machining."[36] PF-4 also has a dedicated Pu-242 scrap recovery area.[37]

34 "DOE categorized certain nuclear materials as Programmatic ....These consultations identified plutonium-242....as potentially required ...." "At present, DOE uses plutonium-242 for research...." (p.1-22) Under table 1-1, DOE has 13,000 liters of Pu-242 solution stored in H canyon. "Plutonium-242, which DOE could use in the nuclear weapons stockpile stewardship program..." and "All the programmatic material already exists at the Savannah River Site. However, none of the material is in a form that DOE could use at present." (p.2-5) "Future DOE decisions will determine if these materials will actually be used." (p.2-6) *Interim Management of Nuclear Materials FEIS*, DOE SRS, August 1995.

35 This can only be inferred by comparison to past rates of uranium use since information on plutonium is classified. On DARHT FEIS page 3-24, DOE states that in 1988 EPA NESHAPs approval was obtained for the DARHT baseline alternative. This approval limited the annual expenditure of uranium to 220 kg. "This limit was based on the amount of depleted uranium used at PHERMEX during the mid-1980s. However, since that time, underground nuclear testing has ceased, programmatic objectives have changed, and a limit of 1,540 lb (700 kg) would be required to meet all objectives under this alternative."

36 DARHT FEIS, USDOE, August 1995, p.3-6.

37 "The north half of Building 4 houses plutonium source production facilities, plutonium metal equation of state and chemistry research, and PU-242 scrap recovery areas in the 200 area compartment." Point Summary for TA55-4, November 23, 1992.

20/41.18

In the DPEIS, DOE repeats its assertion that "DOE has determined that implementing the DARHT ROD will not prejudice any ultimate decisions in the Stockpile Stewardship and Management Program." (Volume 1, page 1-9, emphasis added) In the course of DARHT litigation, DOE had claimed that "proceeding with DARHT now will not prejudice any decisions to be made pursuant to the Stockpile Stewardship and Management Programmatic EIS or the Los Alamos National Laboratory Site-Wide EIS."[38] DOE does, however, admit to DARHT's relevance to both the PEIS and LANL SWEIS.[39]

19/40.41 continued

The Department states that "DOE addressed production/processing of plutonium within the LANL infrastructure, relevant to all isotopes, in the [DARHT] FEIS."[40] While that discussion in the DARHT FEIS is only cursory, at least DOE concedes to the necessity of discussing production/processing relevant to all isotopes. What the DARHT FEIS failed to raise were impacts on plutonium infrastructure outside of LANL related to the DARHT decision.

In sum, extensive future use of Pu-242 at DARHT is possible; that use may help prompt resumption of processing of Pu-242 at SRS; therefore, implementing the DARHT ROD can arguably prejudice decisions to be made in the SSM Program. These DOE decisions related to the reprocessing and use of Pu-242 need consideration in the SSM PEIS. Furthermore, any resumption of reprocessing needs programmatic analysis of possible proliferation and environmental impacts.

VI. The SSM PEIS and DARHT's Second Axis

20/41.18 continued

DOE successfully argued in federal court that DARHT is an independently justifiable interim action, one that could proceed in advance of completion of the SSM PEIS and a new LANL SWEIS. Therefore, the injunction against construction and operation of the facility was dissolved.[41] In his opinion, the judge noted that LANL "currently has a single-axis radiographic hydrotest facility called PHERMEX which was constructed in the 1960's, however its penetration and the resolution of its images are markedly inferior to that expected from DARHT. Moreover, the addition of a second axis at DARHT creates the capability to obtain time-sequenced images and three-dimensional data. DOE has therefore decided to replace PHERMEX with DARHT and dismantle PHERMEX entirely."[42] It remains to be seen if LANL will dismantle PHERMEX, given current upgrades to that facility.

21/41.20

DARHT's second axis is, however, a separate and distinct budget line item. It was intentionally programmed that way because it was judged that the technology of the accelerator for the first axis needed to be demonstrated before

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38 Defendant's Reply Memorandum, November 20, 1995, p. 3.
39 Ibid, p. 23.
40 Ibid, pp. 21-22.
41 Memorandum Opinion and Order, Senior Judge E.L. Mechem, U.S. District Court for the District of New Mexico, April 16, 1996.
42 Ibid, p. 3.

21/41.20 continued

installation of the second axis.[43] Moreover, there is not consensus on the fundamental issue of the need and benefits of dual-axis technology at DARHT.[44] As mentioned, DOE admits to the relevance of DARHT to both the SSM PEIS and the LANL SWEIS. DARHT's Second Axis construction start date is 1997; it's costs are at $37.4 million. The Atlas Facility has a start date of 1996; its costs are $43.3 million.[45] Hence, the two projects are roughly comparable in costs and start dates. Whereas the Atlas Facility is included in the DPEIS, it is unacceptable that the DARHT Second Axis is not. The SSM PEIS should include consideration of DARHT's second axis.

VII. The Advanced Hydrotest Facility

18/41.17 continued

CCNS offered extensive comment on DARHT and the SSM Program in August 1995 SSM PEIS scoping comments. Those comments addressed DARHT's future relationship to possible nuclear weapons design and remanufacturing and NEPA issues concerning the DARHT EIS. As mentioned above, DOE has continually maintained that DARHT is an independenty justifiable project. One step under NEPA in determining whether a project is independently justified is a finding that a project will not lead to subsequent developments. CCNS argued that DARHT does lead to subsequent development. First and obvious is DARHT's proposed second axis, which is a separate budget line item. Yet more significant is the proposed $422 million Advanced Hydrotest Facility (AHF). LANL states that "[t]he Advanced Hydrotest Facility (AHF) will consist of a large radiographic accelerator system that builds on current flash x-ray (FXR) machine technology and that is planned for DARHT."[46] The JASONs describe the AHF as "the next major step in improving hydrotest capabilities" after DARHT. They also state that "[f]urther simulations and analysis, and experience with DARHT, are needed before one can judge the cost/benefit of further improvements in hydrotest capabilities, such as envisioned for a future Advanced Hydrotest Facility...."[47]

In the course of the DARHT litigation, Asst. Secretary Reis declared the following:

> "The SS&M PEIS will not consider any other new facility to provide the necessary enhanced radiographic hydrotest capability. Early in the planning

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43 "Prior to the construction of the second leg of the facility, I would suggest a comprehensive review of the experience of others with dual-axis experiments." Dave Hall.
"The second DARHT leg will be useful, but not nearly so important as attaining or exceeding the accelerator performance goals for the first leg." Ray Pollock.
"However, these uses and possibilities [of dual-axis experiments] seem to be niceties rather than significant capabilities, and they hardly justify the cost (and relative inflexibility) of a second LIA axis, with a fixed focal point and severe constraints on containment sphere design." Seymour Sack, *Hydrotest Program Assessment*, HPAIC, October, 1992.
44 "There was no consensus position presented to this panel on the needs and benefits of two beam radiography." Juan Ramirez, DARHT Feasibility Assessment Independent Consultants *Final Report*, March 1995, p. 36.
45 Costs and construction start dates from the *FY 1996 LANL Institutional Plan*, p.82.
46 FY 1996 LANL CAMP AHF Activity Data Sheet.
47 Draft Stockpile Stewardship Report, JASON, August 1994, pp. 29 and 4

stages for the PEIS, DOE proposed that an Advanced Hydrotest facility (AHF), representing the next generation of hydrotest capability beyond DARHT, be included within the scope of the PEIS. Conceptually, the AHF would improve on the capabilities of DARHT by applying the data and information gained through the operation of DARHT. The AHF thus could never be an alternative to DARHT, because DARHT is an essential precursor to the AHF. The AHF was proposed initially for inclusion in the scope of the PEIS in order to make that document as forward looking as possible with regard to the future of science-based stewardship. Upon further reflection, however, DOE has decided to not address the AHF in the PEIS, because the AHF's parameters are so minimally defined at this point that a meaningful analysis of its environmental impacts would be impossible to perform. The potential role of the AHF in science-based stockpile stewardship, and the nature of its environmental impacts, must await the development of better information.[48]

18/41.17 continued

The AHF is not so "minimally defined," as the following DOE quotes demonstrate:
- In FY 1994, "The major components for an Advanced Hydrotest Facility accelerator were constructed and successfully tested. An interLaboratory Physics Requirements Committee was established to provide the requirements for an Advanced Hydrotest Facility."[49]
- In FY 1995, "Tested technology for an Advanced Hydrotest facility, including the development of a full inductive adder power modulator."
- In FY 1996, "Continue[d] Advanced Hydrotest Facility development activities."
- For FY 1997, "Continue Advanced Hydrotest Facility development activities including development of physics design requirements and research of potential pulse power machine technologies."[50]

The AHF is expensive and, if built, will obviously be central to future stockpile stewardship activities. The AHF should be put back into the scope of the PEIS. Stockpile management activities are being considered in the PEIS until the year 2020. There is no reason why the AHF, with a construction start date of 2001,[51] should be excluded. Dropping the AHF from consideration in the SSM PEIS smacks of evasion of the NEPA issue concerning determination of DARHT as an independently justified project. A decision to build the AHF, irrespective of the question of inclusion in the PEIS, would also inevitably conflict with NPT Article VI.

VIII. The Tail Wags the Dog

14/40.90 continued

In 1989, DOE prepared an environmental assessment for the Special Nuclear Materials Research and Development (SNMR&D) Laboratory. This laboratory was

48 Declaration of Victor H. Reis, November 17, 1994.
49 FY 1996 DOE Congressional Budget Request, Atomic Energy Defense Activities, p .77.
50 Last three quotes from FY 1997 DOE Congressional Budget Request, Atomic Energy Defense Activities, p. 76.
51 Construction start date from the *FY 1996 LANL Institutional Plan*, p. 83.

the largest capital project ever proposed for LANL, with one estimate above $400 million in construction. The SNMR&D lab was to be one of a triad of facilities which would create a "special nuclear materials park" at Technical Area-55. TA-55 already sites PF-4, the only currently operating plutonium processing facility in the country, and the NMSF, an underground storage vault for weapons-grade materials (currently undergoing renovation for fundamental design deficiencies). Congress declined to fund the SNMR&D lab, the fundamental reason being the lack of clear programmatic need for the facility given the recent end of the Cold War.

The SNMR&D lab proposal, far from being dead, is still alive in the form of the various proposed upgrades to LANL's CMR Building (which the defunct SNMR&D lab proposal was suppose to replace). The relationship between PF-4, the plutonium processing facility at TA-55, and the CMR Building is made clear in the following quote:

14/40.90 continued

> The CMR Building and TA-55 are the largest mission-related facilities in the Los Alamos National Laboratory installation. Specific analytical chemistry support for plutonium processing at TA-55 includes SNM accountability, waste characterization, and certification of materials. The CMR Building is now 40 years old; however, the systems and space to support chemical and metallurgical laboratories can be made acceptable for meeting the needs of current and projected activities by providing for the upgrades identified in this project. *The long-term Los Alamos National Laboratory mission needs for such capability are currently programmed for at least another 20 to 30 years.*[52] (emphasis added)

CCNS submits that the italicized portion of the quote above is a stunning admission by LANL which lays bare a central problem in the SSM PEIS. The fact is that the SSM PEIS, with respect to future activities at LANL, is merely rubber stamping what the lab has been pursuing for a number of years. LANL management is already anticipating the probability that production activities will spill over from PF-4 to the CMR Building.

> The prospect of additional limited manufacturing roles for the Laboratory, especially those involving nuclear materials, places a premium on viable space.....Are there options for PF-4 activities to relocate in wings 3, 5, or 7 of CMR?....Wings 2 and 4 are being mentioned as a location for CSA [canned subassemblies, i.e., highly enriched uranium components for weapons secondaries] work.[53]

It is likely that DOE and LANL are already reserving space in the CMR Building for these future operations. That this process has been ongoing for some years now is supported by the quotation below.

> A meeting was held at Germantown Headquarters (HQ) on September 1, 1992, to review the status of new programs being planned for the Chemistry

52 FY 1997 LANL CAMP, CMR Activity Data Sheet, p. A-17.
53 "Manufacturing Assignments and the PEIS," LANL Memo, February 6, 1995.

14/40.90 continued

and Metallurgical Research (CMR) Building. The meeting was attended by members of my staff (the Office of RD&T Facilities and the Office of Engineering and Operations Support), Program Secretarial Officers (PSO) program sponsors, program management from your office, and personnel from the Los Alamos National Laboratory (LANL) representing CMR programs. The meeting objective was to reconcile the schedules for the preparation, review, and approval of the safety analysis documentation with the programmatic schedules.[54]

The Defense Nuclear Facilities Safety Board, while commenting on the Fire Resistant Pit program at the CMR Building, noted: "Technical inconsistencies exist between what is actually being done in the CMR building upgrade design and what is described in program documents, and also between key program documents themselves."[55]

DOE has prudently decided to defer from formulating details in a proposed Phase III CMR Upgrade until the completion of both the SSM PEIS and the LANL SWEIS. This position is possibly disingenuous as the old and dead R-PEIS listed three alternatives for the reconfiguration of the complex: 1) the construction and operation of new facilities; 2) the modification/upgrading of existing facilities; and 3) no action (continued operation of existing facilities). On February 14, 1995, DP Asst. Secretary Victor Reis was quoted in The Albuquerque Journal as stating to a Los Alamos audience, "The laboratories have to take on a manufacturing role." He acknowledged that using the laboratories as production sites is the primary option under study for the reconfiguration of the complex.

In CCNS' view, the modify and upgrade alternative was not merely under study, but was being incrementally implemented at this time. LANL is the principal site for implementation of the modify/upgrade alternative for reconfiguring processing operations involving strategic plutonium. LANL management is clear on the subject:

> A consolidation strategy is being followed to effect cost reduction and streamlining of operations. Outdated and less-used facilities are being closed and others are being modified and upgraded to accommodate consolidation of activities. For example, the Chemistry and Metallurgical Research (CMR) facility upgrade allows the consolidation of currently dispersed nuclear materials capabilities together with the attainment of new capabilities at a substantial cost savings over a completely new facility.[56]

This is consistent with the July 1993 R-PEIS Revised NOI's proposal for co-locating RD&T functions with nuclear materials storage, processing and component manufacturing operations involving the same material. Together, the CMR

54 "Guidance on Startup Authority and Safety Analysis Documentation," Memo from DOE HQ to manager DOE AL, Sept. 1992.
55 "Review of Chemistry and Metallurgical Research (CMR) Facility Hot Cell Upgrades and the Fire Resistant Pit Program," DNSFB Memo, November, 1994.
56 The 1993 LANL Strategic Plan, "Nuclear Weapons Sector Overview," p.10.

14/40.90 continued

upgrades and existing capabilities at TA-55 give LANL the ability to provide plutonium processing operations for a reconfigured nuclear weapons complex with the capability of fabricating 100 to 200 warheads per year.[57] These programmatic decisions have been predetermined and the CMR upgrades are central to the process.

LANL management has already effectively preselected the Expanded Operations Alternative listed in the LANL SWEIS's May 1995 Notice of Intent. The 1993 LANL Strategic Plan is explicit in stating that the Lab's "unique reason-to-be" will remain nuclear weapons technologies, and makes clear that LANL's goal is to become "the prime...steward for the nation's stockpile." In its vision of prime stewardship, LANL management called for the establishment by FY 96 at the Lab of "complete pit fabrication and inspection capability" and "a complete capability..... to prototype war reserve pits." According to the Plan, the future expanded LANL role will involve all of these manufacturing capabilities and activities:

--fabrication of plutonium triggers,
--manufacture of uranium components,
--manufacture of lithium components,
--fire-testing of new plutonium pits at full scale,
--expanded plutonium and SNM storage,
--loading of tritium into nuclear weapons,
--further development of plutonium and uranium processing technologies,
--development of tritium manufacturing techniques,
--manufacture of detonators for weapons, and
--fabrication of beryllium components.

Acquiring or enhancing these capabilities or activities would then give the Lab the ability to manufacture complete nuclear weapons prototypes. In addition, the Strategic Plan called for the consolidation of LLNL plutonium R&D activities at LANL.

The infrastructure to support LANL strategic planning is being implemented through proposals for future facility construction or upgrades in the FY 1996 LANL CAMP. Through the year 2015, $4.85 billion in proposals for construction or upgrading of facilities at LANL breaks down as:
• $2.936 billion for nuclear weapons research, development and testing facilities;
• $629 million for plutonium, enriched uranium, tritium, etc. processing and fabrication facilities sufficient for producing complete nuclear weapons;
• $364 million for waste management facilities in support of nuclear weapons programs; and

57 "The capability to fabricate a modest number of new warheads or remanufacture those in the enduring stockpile will be optimally located at the chosen nuclear-materials storage and processing site. (One way of assessing the needed capacity for fabrication is to compare the number of weapons in the long-term stockpile with a typical weapon lifetime. From this basis we can estimate a need for about 100 to 200 units per year.)...

In ther future, the traditional distinction between responsibilities of the production complex and the design laboratories will become somewhat more diffuse."

John D. Immele (then-LANL Assoc. Director for Nuclear Weapons Technologies) and Phillip D. Goldstone (then-Chief scientist for LANL ICF Programs), "Redefining the U.S. Nuclear Weapons Program and the DOE Nuclear Weapons Complex," 1993 Los Alamos Science, p.47.

14/40.90 continued

• $783 million for redirecting the Lab's primary energy research facility into a center for nuclear weapons surveillance and experimental tritium production.

[On an up-to-date note, LANL Director Hecker has recently testified before Congress that the lab has "completed the transfer of necessary Rocky Flats hardware and gauging equipment" for pit rebuild activities.[58] This is strikingly in advance of a ROD for the SSM PEIS.]

In all, over 95% of all future LANL facilities are for nuclear weapons programs or are in support of those programs. CCNS presents all of the above to demonstrate that with respect to SSM Program alternatives at LANL, the entire SSM PEIS process is a mere rubber stamping of what the lab has been pursuing all along.

IX. LANL Issues

Laboratory Contract Mangement

22/40.78

Nowhere in the DPEIS are management contracts discussed for the sites affected by the proposed SSM Program. This is of special concern for LANL because of what is widely perceived as serious mismanagement by UC over 53 years. Under UC management, LANL has been allowed to operate under continuing noncompliance with environmental law.[59] Numerous instances of NEPA violations, such as the initial construction of the DARHT facility without an EIS and the lack of a currently valid SWEIS, have been found. The lack of economic spin off to the region is a common complaint. The UC Regents have refused to meet with prominent members of the New Mexico State Legislature. The laboratory has recently conducted a divisive series of employee reductions-in-force (RIFs) which has aroused much regional bitterness and is now being contested in court. These RIFs have had a disproportional affect on minorities and ES&H personnel. Work related accidents are currently on the rise. The lab environmental program is widely perceived as ineffective, slow, and a waste of taxpayers' money. The integrity of LANL's scientific programs themselves is under question due to a dispute over the selection of alternative ICF programs at LANL. There is a serious discrepancy in accountable plutonium inventories at the lab. Under the current contract, UC remains indemnified from financial responsibility in the event of litigation. There is no evidence that the performance-based review is anything more than a rubber stamp. Nevertheless, this is the style of management under which DOE intends to reconstitute plutonium fabrication capability. This flies in the face of good ownership by DOE.

58 Hearing of the Subcommittee on Military Procurement, Committee on National Security, March 12, 1996, Hecker, p. 11.
59 See Memorandum Opinion and Order in CCNS vs. DOE, Senior Judge R.L. Mechem, U.S. District Court for the District of New Mexico, April 2, 1996.

Fire

The Dome Fire of this month illustrates the grave potential impacts that major forest fires in the Jemez Mountains could inflict a result of LANL operations. During the fire, CCNS logged 100+ telephone calls from citizens concerned with possible fire-induced radioactive releases. Fortunately, the fire remained 2 - 3 miles south of the LANL boundary. However, due to present drought conditions in New Mexico, the risk of fire remains very high. It is possible that New Mexico is entering into a drought cycle that will last some years.

23/43.18

DOE needs to carefully evaluate fire suppression techniques in and adjacent to LANL property. Of particular concern is the yet-to-be-decided alternative to move HE fabrication operations to LANL's TA-16. TA-16, already inflicted with much residual tritium and HE contamination, is particularly vulnerable to a fire, especially should another crown fire develop in taller timber (as was the case in the Dome Fire). The entire southern segment of LANL, which has been the location for many open-air dynamic experiments, should be rigorously cleaned up.

DOE needs to carefully consider all aspects of the LANL SSM Program from the perspective of a potentially catastrophic fire. In order to allay future public concerns, DOE should redouble efforts to make the LANL ambient air monitoring system (AIRNET) credible and continue to fund on-line public access to AIRNET data (NEWNET). Unconfirmed reports that some AIRNET stations went offline during the fire, along with possible funding cuts to NEWNET, are disconcerting.

The DPEIS's *Affected Environment and Environmental Impacts at LANL*

24/03.04

The DPEIS uses 1990 and 1992 data for comparision of baseline ambient air concentrations with the most stringent applicable regulations (DPEIS 4-237 & 4-238). It is inexcusable that more recent data is not employed. It is also inexcusable that many of the listed pollutants are not monitored and that baseline concentrations for these pollutants are just assumed to be less than applicable standards.

25/04.16

The NMED OB has pointed out numerous inadequacies or factual errors in Section 4.6.2.4, Water Resources at LANL (pp. 4-237 to 4-245). Throughout this section, the data in the tables are from 1992. More recent data (e.g. the 1993 LANL Environmental Surveillance Report[60]) is available and should have been used. "In Parajito Canyon, Homestead Spring feeds a perennial stream only a few hundred yards long." The stream is instead 2 -3 miles long, and is fed by other springs in addition to Homestead Spring. "Only during periods of heavy paricipation or snowmelt would waters form Pueblo, Los Alamos, or Sandia Canyons extend beyond LANL boundaries and reach the Rio Grande." This needs to be backed up with good volumetric data. The gauging stations are reportedly in place in those canyons to provide years of data. "In Mortandad Canyon, no surface runoff to

60 The 1993 LANL Environmental Surveillance Report was received by this office only some four months ago. At this time in the year 1996, it should be expected that 1995 data would be available. LANL has had a continuing problem in getting out environmental data in a timely fashion. This should be corrected by DOE. In general, one of the fundamental deficiencies in the DPEIS is the lack of up-to-date environmental information for all affected sites.

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25/04.16 continued — LANL's boundary has occurred since studies were initiated in 1960." Is this information based on physical data such as gauging data or is this an assumption?

26/04.17 — "Groundwater in the LANL area exists in three modes - in shallow alluvium in canyons, intermediate perched groundwater and in the main aquifer." There is a forth mode - shallow perched water in the Bandelier tuff. Under *Groundwater Availibility and Use*, downgradient users besides the communities of Los Alamos and White Rock are not mentioned. What about San Ildefonso and Santa Clara Pueblos?

27/04.18 — With respect to groundwater monitoring wells, there is little consistency in the placement of wells. As a system, the existing wells are inadequate. They are also old (the most recent was drilled in 1963), in many cases not throughly grouted and may be leaking. They also generally have lenghtly intervals between sampling screens (some greater than a 100 feet, e.g. DT-9 is screened from 1040' to 1500') and hence are likely to miss the contaminants that they are suppose to detect. Finally, the LANL surface water discussion is entirely devoid of any discussion on how the contaminants are inflicting ecological damage through adverse effects on biota.

28/06.02 — There is no discussion in Section 4.6.2.6 *Biotic Resources* on the effects that any of LANL's contaminants may have on wildlife.

29/11.06 — The DPEIS states that "the estimated probability of this person [the maximally exposed member of the public] dying of cancer at some point in the future from radiation exposure associated with one year of LANL operations is about 4 chances in 1 million." (DPEIS 4-256) Then, under *Health Effects Studies*, are the following paraphrased entries:

> "[M]odest elevations in brain and nervous system cancer incidence during the mid- to late-1980s[61]....The 1986 to 1990 thyroid cancer incidence rate was nearly four-fold higher than for the reference population,[62] and county breast cancer rates were consistently higher[63]...Ovarian incidence[64] and melanoma incidence in the county during this time period was approximately two-fold greater..." (DPEIS 4-258)

These past incidences are, of course, not from present lab operations. They do, however, engender deep skepticism over the claim that a 4 in 1 million chance of a cancer fatality annually will occur due to one year of LANL operations. Concerns over cancer rates in Los Alamos County merit credible epidemeological study.

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61 DPEIS Appendix E.4.6 states "Incidence in the county during this time period was 70- to 80-percent greater than that observed in a New Mexico state and national reference population."
62 Ibid, "Los Alamos County experienced a sudden and marked increase in thyroid cancer incidence in the mid-1980s."
63 Ibid, "County breast cancer incidence rates consistently were 10- to 65-percent higher than state and national reference rates."
64 Ibid, "For the 1986 through 1990 period, ovarian cancer incidence was roughly two-fold higher than that observed in a New Mexico state population. The majority of the excess ovarian cancer incidence was confined to the census tract corresponding to two neighborhoods and was four to six-fold higher than that observed in the remaining census tracts."

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30/40.21 — Under *Accident History*, the SSM PEIS needs to note the recent forklift accident and the fatality due to an electrocution. Root causes need to be identified. Analysis needs to be made of the effect that the recent reduction-in-force has had on occupational safety. Reportedly a number of qualified safety personnel were let go.

31/40.57 — Under *Emergency Preparedness*, what evacuations plans have developed in the event of a nuclear accident or catastophic fire? Because of the limited egress in and out of the Los Alamos region, the lack of well thought out and publicized evacuation plans can have grave consequences.

Under *Waste Management*, LANL and DOE need to note that compliance with environmental law is <u>compliance</u> with environmental law, <u>not</u> compliance with compromises negotiated behind closed doors with EPA.

32/43.19 — The DPEIS states that because "there is no spent nuclear fuel or HLW associated with any of the proposed activities at LANL, there is no discussion in this PEIS of spent nuclear fuel or HLW generation and management at LANL." NEPA segmentation concerning the CMR Building has already been discussed. The CMR Building is central to future SSM programmatic activities at LANL. Apparently, 46 fuel rods from the Omega West Reactor are being stored in the CMR Building's basement, with no decision in sight for long-term storage. In addition, the CMR Building is not currently considered to be seismically safe. DOE needs to reach a decision on long-term storage of these fuel rods.

33/10.34 — Under *Transuranic Wastes* and *Low-Level Wastes*: Both sections note the treatment of liquid wastes at the Radioactive Liquid Waste Treatment Facility (RLWTF). The DPEIS states that liquid LLW from pit fabrication and reuse "would be processed, with radioactive constituents removed, in accordance with the treatment permit issued by the State of New Mexico, and discharged through permitted NPDES outfalls." (DPEIS p. A-120) While the RLWTF does discharge liquid effluent through NPDES-permitted outfalls, there is no such treatment permit issued by the State of New Mexico. According to the NMED OB, nitrate and nitrite levels on the Mortandad Canyon floor as a result of RLWTF effluent greatly exceeds state water quality levels. In addition, the RLWTF outfall #051 is suspected to be the source of serious beta and alpha contamination in the canyon. The lack of adequate groundwater monitoring has already been noted.

Atlas Facility Project-Specific Analysis

34/22.03 — For the general reasons discussed in sections I and II of these comments, CCNS believes that the Altas Facility is not needed. Defects in secondaries (the reported primary area for research by Atlas) are quite rare. It has been commonly stated by various weapons experts that the physics of secondaries is already well understood.

35/11.45 — A minor point: In the Appendix K acronym list, NMEID is listed for the New Mexico Environmental Improvement Division. Please note that the division was elevated to state cabinet status some years ago. It is now the New Mexico Environment Department.

34/22.03 continued

It is stated that the Pegasus II facility is used for up to 24 experiments annually. Atlas, on the other hand, will perform up to 100 experiments. What is the need for the dramatic rise in experiments?

36/40.55

Referencing the 1992 LANL Environmental Surveillance Report as "LANL 1994b" is deceptive, giving the impression the data is more recent than it really is. The outdatedness of all LANL environmental data is one of the fundamental flaws in the DPEIS.

37/03.12

The DPEIS states that the "irregular terrain at Los Alamos affects wind motion and spreading. Localized wind gusts may not be in the same direction as average wind patterns." (DPEIS K-17) This illustrates the need for LANL to correlate ambient air monitoring to LANL's complex topography.

XI. Summarized Points and Conclusion

I. The SSM PEIS and Nonproliferation Issues

- The DPEIS's brief nonproliferation analysis is wholly inadequate.
- The three stated program challenges in the proposed SSM Program are inherently contradictory. In program planning, at least equal weight needs to be given to NPT Article VI instead of predominant reliance on the Nuclear Weapons Posture Review. The SSM Program should help provide a road map towards eventual disarmament, rather than creating obstacles to it.
- There will inevitably be strong international concern over the proposed SSM Program. These misgivings may well encourage the further proliferation of weapons of mass destruction by undermining the NPT and discouraging international ratification of the CTBT.
- DOE needs to provide strict definition between warhead "modification" and "new" designs.
- The DPEIS projects stockpile management activities until the year 2020, with costs for those activities continuing to rise year after year. Life extension programs are currently being developed to ensure the viability of individual weapons systems to the year 2025 and beyond. Yet the DPEIS is incapable of projecting stockpile sizes below 1,000 weapons as a means of demonstrating commitment to NPT Article VI.
- DOE makes no adequate assessment of what constitutes minimally required deterrence in order to better reconcile contradictory program challenges.

II. SSM Program Rationale

- The stated rationale that the proposed SSM Program is needed to maintain stockpile safety and reliability does not square with available data. Once corrected for additional weapons systems, the 1995 *Stockpile Surveillance: Past and Future* report essentially validates the 1993 *Stockpile Life Study*.
- The emphasis on testing in the later report is not really relevant to the "enduring" START II stockpile. The issues of safety and reliability need to separated

in analysis. Aging affects reliability rather than safety. Because reliability is a statistical construction, reliability cannot be established through individual tests.
- The stockpile is currently certified to be both safe and reliable. There is no publicly available body of data that suggests that aging effects are expected to dramatically rise. Existing programs and facilities have successfully detected and fixed defects at rates that exceed what is now estimated for the future. The stated rationale for the SSM Program is political cover for maintaining design and production capabilities.
- The DPEIS's categorical rejection of the *Remanufacturing* and *Maintenance Alternatives* is not adequately supported and is not justified.
- There is no justifiable rationale for more weapons effects R&D facilities.
- DOE should release data on quantities of special nuclear material set aside decades ago for the purpose of measuring aging effects.

III. DOE's NEPA Hierarchy

- The WM PEIS and the SSM PEIS need to be linked. Environmental restoration activities need programmatic analysis.
- DOE needs to undertake programmatic review of all potential reprocessing activities for their proliferation and environmental impacts. All forms of pit storage need integration at the policy level.
- Sites affected by the SSM Program need up-to-date site-wide analysis. NEPA segmentation needs to be avoided.
- An overall Departmental policy document is required to link the PEISs and other relevant NEPA processes together in a cohesive manner.

IV. SSM PEIS Stockpile Sizes and SSM Capabilities

- Assumption of START II stockpile size as a base case may inherently prejudice the SSM Program towards higher stockpile sizes. In order to help assure Russian Duma START II ratification, the SSM Program should aggressively drive towards further arms cuts and plan accordingly.
- The DPEIS inappropriately constricts its planning horizon in the present and the future. *The No Action Alternative* inherently prejudices the outcome of the SSM PEIS.
- The DOE assertion that SSM Program capabilities are independent of stockpile size is not justified.
- The NTS budget should be cut to a skeletal budget.

V. DARHT, Plutonium-242 Reprocessing and the SSM Program

- The DOE assertion that the DARHT decision will not prejudice any decisions to be made in the SSM PEIS needs support. The relationship of DOE decisions relating to the use of plutonium-242 at DARHT to the resumption of reprocessing at SRS need analysis.

VI. The SSM PEIS and DARHT'S Second Axis

- DOE's omission of analysis of DARHT's second axis in the SSM PEIS is not supportable, especially given that the Atlas Facility is included for analysis in the DPEIS.

VII. The Advanced Hydrotest Facility

- DOE's decision to drop the AHF from consideration in the SSM PEIS is not supportable. This facility should be included in further DPEIS analysis.

VIII. The Tail Wags the Dog

- The SSM PEIS process merely sanctions what LANL has already strategically planned for. Many decisions appear to have been predetermined and some actions already illegally implemented in advance of a SSM PEIS ROD.

IX. LANL Issues

- DOE needs to seriously consider whether continued UC LANL mangement is in the best interests of the lab, the region and the nation.
- The potential impacts of a catastrophic fire at LANL needs analysis. The adequateness of the ambient air monitoring system at LANL and public access to its data needs to be assured.
- The lack of more up-to-date environmental data renders LANL environmental analysis inadequate. Some of the stated environmental facts are incorrect. The lack of comprehensive and/or complying monitoring systems renders all data suspect.
- In light of recorded cancer rate incidences in Los Alamos County, the DPEIS's projected cancer fatality rate due to one year of LANL operations is suspect.
- The DPEIS needs to evaluate the recent rise in occupational accidents at LANL.

X. Atlas Facility Project-Specific Analysis

- The SSM Program rationale as a whole provides insufficient justification for the Atlas Facility.

In conclusion, for all of the reasons mentioned above, the DPEIS is flawed and should be withdrawn. CCNS encourages DOE to re-issue the DPEIS.

Acronyms Used

AGEX	Above Ground Experiments
AHF	Advanced Hyrotesting Facility
CAMP:	Capital Assets Management Plan
CCNS:	Concerned Citizens for Nuclear Safety
CTBT:	Comprehensive Test Ban Treaty
CMR	Chemical and Metallurgical
DOE:	Department of Energy
EIS:	Environmental Impact Statement
DARHT:	Dual Axis Radiographic Hydrotest facility
DPEIS:	Draft Stockpile Stewardship and Mangement Programmatic EIS
DP:	Defense Programs
EM	DOE's Environmental Management Programs
FEIS:	Final EIS
HE:	High Explosive
HPAIC:	Hydrotest Program Assessment Independent Consultants
HLW	High-Level Waste
ICBM:	Intercontinental Ballistic Missile
ICF:	Inertial Confinement Fusion
INEL	Idaho National Engineering Laboratory
JASON	A DOE consultant group of prominent nuclear weapons scientists
LANL:	Los Alamos National Laboratory
LLNL:	Lawrence Livermore National Laboratory
LIA:	Linear Induction Accelerator
LLW	Low-Level Waste
MOX	Mixed oxide reactor fuels
NMED	New Mexico Environment Department
NMED OB	NMED DOE Oversight Bureau
NEPA:	National Environmental Policy Act
NMSF	LANL's Nuclear Materials Storage Facility
NPT:	Nonproliferation Treaty
PHERMEX:	Pulsed High Energy Radiographic Machine Emitting X rays,
Pu	Plutonium
R&D	Research and Development
RLWTF	Radioactive Liquid Waste Treatment Facility
ROD	Record of Decision
SLS	1993 Sandia Stockpile Life Study
SM	Stockpile Mangement
SNL	Sandia National Laboratories
SNM:	Special Nuclear Materials (plutonium and highly enriched uranium)
SRP:	Savannah River Plant
SSM :	Stockpile Stewardship and Management
SS	Stockpile Stewardship
SSM PEIS	The future or final Stockpile Stewardship and Management PEIS
START	Strategic Arms Reduction Talks (Treaties I and II)
SWEIS	Site-Wide EIS
TA	LANL Technical Area
Tru	Transuranic Waste
UC	University of California
UGT:	Underground Testing

DOE Stockpile Stewardship Facilities Costs

Facility	Location	Purpose	Construction Cost
Advanced Hydrotest Facility	NTS or LANL	6 - 8 simultaneous views of imploding simulated primaries; will use DARHT technologies	$422 million
Atlas Facility	LANL	capacitor bank for simulated weapons environments; for study of secondaries	$48.4 million
Chemical and Metallurgical Research (CMR) Building	LANL	3 phases of upgrades to LANL's largest building; analytical chemistry of plutonium and highly enriched uranium; first phase currently under way	$223.6 million
Contained Firing Facility	LLNL	contained hydrodynamic testing; for study of nuclear weapons primaries	$48.5 million
Dual Axis Radiographic Hydrotest Facility (DARHT)	LANL	open-air hydrodynamic testing; for study of nuclear weapons primaries; under construction, currently enjoined by court order	$148 million
Explosives Components Facility	SNL	contained high explosives testing; under construction	$27.8 million
Jupiter Facility	SNL	x-ray weapons effects facility; jointly funded by DOE and Defense Nuclear Agency	$240 million
National Ignition Facility	LLNL	192 beam laser system for fusion ignition and study of secondaries	$1.0736 billion
Facilities Revitalization, Phase II	3 labs & NTS	9 subprojects for new or upgraded facilities *	$248.3 million
Phase III	SNL & NTS	infrastructure	$111.6 million
Phase V	SNL	infrastructure	$34.6 million
Phase VI	LANL	infrastructure	$34.7 million

Total cost for proposed facilities construction and revitalization: $2,661,100,000

Accelerated Strategic Computing Initiative (ASCI); complex-wide; future interlinked secure computer network with massively enhanced computational abilities; slated for implementation through the year 2010; cost extrapolated through 2010 at currently projected levels: $2,104,300,000

Combined costs (facilities + revitalization phases + ASCI) = $4,765,400,000

LANL=Los Alamos, LLNL=Lawrence Livermore, and SNL=Sandia National Laboratories; NTS=Nevada Test Site. Sources: DOE FY96 Congressional Budget Request, Project Data Sheets; Draft ASCI Program Plan, DOE, June 1995; FY96 LANL and SNL Capital Assets Management Plans. * In DOE budget requests, DARHT is one of the nine subprojects in Phase II. In this table, DARHT costs are separated.

March 1996

United States Department of Energy

NAME: (Optional) RODNEY C. WILCOX
ADDRESS: 40 CADENCE CT., AIKEN, SC 29803-7710
TELEPHONE: (803) 648-1456

1/40.76

SRS SHOULD RECEIVE A MAJOR PORTION/ROLE IN EACH OF THE RESULTING DECIDED PROGRAMS AS DETERMINED IN THE RECORD OF DECISION. SRS HAS THE PEOPLE, FACILITIES, INFRASTRUCTURE, AND EXPERIENCE THAT IS NEEDED FOR SAFE, SECURE, COST EFFECTIVE AND INSPECTABLE OPERATIONS, MANAGEMENT, AND SATISFACTORY DISPOSITION OF WEAPONS-USABLE FISSILE MATERIALS. IN GENERAL THE SUPPORT FROM ADJACENT COMMUNITIES IS VERY FAVORABLE AND THIS NEEDED SUPPORT WILL GREATLY ASSIST DOE IN ACCOMPLISHING THE DESIRED MISSIONS.

FOR BETTER REASONS, THE EXCESS WEAPONS GRADE PLUTONIUM SHOULD BE UTILIZED TO MAKE MOX FUEL. SMALL REASONS SHOULD BE ELIMINATED AND RESOLVED TO ALLOW SUCCESSFUL USE OF MOX FUEL.

SSM-M-128
COMMENT LETTER

PAGE 1 OF 7

State of South Carolina

Office of the Governor

May 7, 1996

Mr. Stephen M. Sohinki
Director
Office of Reconfiguration
U. S. Department of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585

Project Name: Implementation Plan, Programmatic Environmental Impact Statement for the Stockpile Stewardship and Management Program DOE/EIS-0236IP

Project Number: EIS-960105-005

Dear Mr. Sohinki,

The Grant Services Unit, Office of the Governor, has conducted an intergovernmental review on the above referenced activity as provided by Presidential Executive Order 12372. All comments received as a result of the review are enclosed for your use.

The State Application Identifier number indicated above should be used in any future correspondence with this office. If you have any questions call me at (803) 734-0485.

Sincerely,

Rodney P. Grizzle
Grants Services Supervisor

SSM-M-128
COMMENT LETTER

PAGE 2 OF 7

Office of the Governor • Grant Services

South Carolina Project Notification and Review
1205 Pendleton Street
Room 477
Columbia, SC 29201

State Application Identifier EIS-960105-005
Suspense Date 3/3/96

Beth McClure
S.C. Department of Parks, Recreation and Tourism

1e Grant Services Unit, Office of the Governor is authorized to operate the South 1rolina Project Notification and Review System (SCPNRS). Through the system .e appropriate state and local officials are given the opportunity to review, mment, and be involved in efforts to obtain and use federal assistance, and to sess the relationship of proposals to their plans and programs.

ease review the attached information, mindful of the impact it may have on your ency's goals and objectives. Document the results of your review in the space ovided. Return your response to us by the suspense date indicated above. Your mments will be reviewed and utilized in making the official state recommendation ncerning the project. The recommendation will be forwarded to the cognizant deral agency.

RECEIVED
2 1996
GRANT SERVICES

ould you have no comment, please return the form signed and dated.

you have any questions, call me at (803) 734-0495.

Rodney Grizzle

- [x] Project is consistent with our goals and objectives.
- [ ] Request a conference to discuss comments.
- [ ] Please discontinue sending projects with this CFDA# to our office for review.
- [ ] Comments on proposed Application is as follows:

Signature: _____ Date: _____

Title: _____ Phone: _____

SSM-M-128
COMMENT LETTER — **PAGE 3 OF 7**

Office of the Governor • Grant Services
South Carolina Project Notification and Review
1205 Pendleton Street
Room 477
Columbia, SC 29201

State Application Identifier
EIS-960105-005
Suspense Date 3/3/96

Olney England
Office Of Community Grant Program

FEB 13 1996

ıe Grant Services Unit, Office of the Governor is authorized to operate the South ırolina Project Notification and Review System (SCPNRS). Through the system e appropriate state and local officials are given the opportunity to review, mment, and be involved in efforts to obtain and use federal assistance, and to sess the relationship of proposals to their plans and programs.

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Rodney Grizzle

you have any questions, call me at (803) 734-0495.

RECEIVED 1996 GRANT SERVICES

- ☐ Project is consistent with our goals and objectives.
- ☐ Request a conference to discuss comments.
- ☐ Please discontinue sending projects with this CFDA# to our office for review.
- ☐ Comments on proposed Application is as follows:

Signature: [signature] Date: 3/26/96
Title: ______ Phone: ______

SSM-M-128
COMMENT LETTER — **PAGE 4 OF 7**

Office of the Governor • Grant Services
South Carolina Project Notification and Review
1205 Pendleton Street
Room 477
Columbia, SC 29201

State Application Identifier
EIS-960105-005
Suspense Date 3/3/96

FEB 13 1996

James Hugh Ryan
S. C. Forestry Commission

ıe Grant Services Unit, Office of the Governor is authorized to operate the South ırolina Project Notification and Review System (SCPNRS). Through the system e appropriate state and local officials are given the opportunity to review, mment, and be involved in efforts to obtain and use federal assistance, and to sess the relationship of proposals to their plans and programs.

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ıould you have no comment, please return the form signed and dated.
Rodney Grizzle

you have any questions, call me at (803) 734-0495.

RECEIVED 21 1996 GRANT SERVICES

- ☐ Project is consistent with our goals and objectives.
- ☐ Request a conference to discuss comments.
- ☐ Please discontinue sending projects with this CFDA# to our office for review.
- ☐ Comments on proposed Application is as follows:

No Comment

Signature: Joe M. [signature] Date: 2-16-96
Title: DIVISION DIRECTOR, ADMINISTRATION Phone: 896-89..

SSM-M-128
COMMENT LETTER

PAGE 5 OF 7

Office of the Governor•Grant Services
South Carolina Project Notification and Review
1205 Pendleton Street
Room 477
Columbia, SC 29201

State Application Identifier EIS-960105-005
Suspense Date 3/3/96

Earl F. Brown, Jr.
South Carolina Human Affairs Commission

ıe Grant Services Unit, Office of the Governor is authorized to operate the South ırolina Project Notification and Review System (SCPNRS). Through the system e appropriate state and local officials are given the opportunity to review, mment, and be involved in efforts to obtain and use federal assistance, and to sess the relationship of proposals to their plans and programs.

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ıould you have no comment, please return the form signed and dated.

you have any questions, call me at (803) 734-0495. Rodney Grizzle

- [x] Project is consistent with our goals and objectives.
- [ ] Request a conference to discuss comments.
- [ ] Please discontinue sending projects with this CFDA# to our office for review.
- [ ] Comments on proposed Application is as follows:

Signature: Earl F. Brown, Jr. Date: 2/12/96
Title: Executive Assistant to Commission Phone: (803) 253-6322

SSM-M-128
COMMENT LETTER

PAGE 6 OF 7

Office of the Governor•Grant Services
South Carolina Project Notification and Review
1205 Pendleton Street
Room 477
Columbia, SC 29201

State Application Identifier EIS-960105-005
Suspense Date 3/3/96

Dr. James A. Timmerman, Jr.
South Carolina Wildlife and Marine Resources Department

ıe Grant Services Unit, Office of the Governor is authorized to operate the South ırolina Project Notification and Review System (SCPNRS). Through the system e appropriate state and local officials are given the opportunity to review, mment, and be involved in efforts to obtain and use federal assistance, and to sess the relationship of proposals to their plans and programs.

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ıould you have no comment, please return the form signed and dated.

you have any questions, call me at (803) 734-0495. Rodney Grizzle GRANT SERVICES

- [ ] Project is consistent with our goals and objectives.
- [ ] Request a conference to discuss comments.
- [ ] Please discontinue sending projects with this CFDA# to our office for review.
- [ ] Comments on proposed Application is as follows:

Signature: Date:
Title: Phone:

SSM-M-128
COMMENT LETTER

PAGE 7 OF 7

Office of the Governor • Grant Services
South Carolina Project Notification and Review

1205 Pendleton Street
Room 477
Columbia, SC 29201

State Application Identifier
EIS-960106-005
Suspense Date 3/3/96

Larry Setzler
South Carolina State Ports Authority

1e Grant Services Unit, Office of the Governor is authorized to operate the South
urolina Project Notification and Review System (SCPNRS). Through the system
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deral agency.

RECD 1996
Rodney Grizzle

ould you have no comment, please return the form signed and dated.

you have any questions, call me at (803) 734-0495.

- [ ] Project is consistent with our goals and objectives.
- [ ] Request a conference to discuss comments.
- [ ] Please discontinue sending projects with this CFDA# to our office for review.
- [ ] Comments on proposed Application is as follows:

Signature: Larry W. Setzler Date: 2-12-96

Title: ENGINEERING PROJECT MANAGER Phone: 803-856-7051

SSM-M-129
COMMENT LETTER

PAGE 1 OF 2

April 22, 1996

Jay Rose
Office of Reconfiguration
1000 Independence Avenue, S.W
Washington, D.C. 20585

Dear Mr. Rose,

It is widely acknowledged, even by highly respected military officers, that the proliferation of nuclear weapons is now among the greatest threats to national security of the United States. Our government has recently engaged in an extension of the Non-Proliferation Treaty, and is currently negotiating for a zero threshold for a Comprehensive Test Ban. The success of these activities to prevent nuclear weapons proliferation is entirely dependent on the ability of our government to inspire genuine confidence in other nuclear weapon states and those who have or who are approaching nuclear weapons capability that we are indeed serious about our treaty agreements.

1/40.05 What the Department of Energy has produced is an aggressive plan to continue nuclear weapons design and production capability. It is far more likely to provoke proliferation than lower the risks.

2/40.12 The SSM-PEIS document is also economically irresponsible. Although it presents itself as a plan for scaling down the nuclear weapons complex, the SSM-PEIS outlines at least $2.6 billion in capital costs for new and upgraded facilities. It also proposes more than $2 billion for accelerated computer capabilities. When plans for new tritium production are included, SSM program operating costs are likely to exceed $30 billion within a decade. At a time when federal spending programs are being slashed right and left, and many Americans, especially children, left in desperate need, this is unconscionable.

3/40.15 The proposed activities also project staggering rates of nuclear waste generation for at least 20 years. These wastes will produce additional waste management and cleanup costs far into the future, and put valuable environmental resources at risk.

Safety and reliability of the existing arsenal, the "rationale" presented for this proposal, do not require these expensive facilities. The DOE should think carefully about producing new wastes, given its inability to develop solutions for existing nuclear waste.

4/40.36 I urge the Department of Energy to implement a passive stewardship program, called a curatorship by many, to replace this aggressive and provocative SSM proposal.

Sincerely,

Doris Smith #50619

5/34.14 I am a member of the Pantex Plant Citizens Advisory Board and as such I have grave concerns about HE fabrication continuing at Pantex because of the severe problems the site presently has from HE waste. The ditches & playas are contaminated with chemicals, solvents, metals, HE and radionuclides. The perched aquifer beneath Pantex is contaminated and HE has been detected in wells on site & offsite.

SSM-M-129
COMMENT LETTER — **PAGE 2 OF 2**

5/34.14 continued

With downsizing and tight budget constraints we feel the DOE should consider these issues in determining the preferred option for HE work and related environmental issues. We have grave misgivings about using the Burning Grounds to dispose of HE and HE contaminated materials. We urge the DOE to discontinue this practice in our agricultural area. The threat of contaminating the meat products and cereal grains from this practice is all too real.

SSM-M-130
COMMENT LETTER — **PAGE 1 OF 1**

- ☑ ***NO!*** **To plutonium processing in the Texas Panhandle.**
- 1/42.06 ☑ ***NO!*** **To bringing plutonium to Pantex from other sites.**
- ☑ ***NO!*** **To long-term storage of plutonium over the Ogallala Aquifer.**
- 2/40.36 ☑ ***NO!*** **To facilities that handle nuclear waste or to processes that generate it.**
- ☑ YES! To a curatorship program.

I support jobs and development in the Panhandle that don't endanger workers, my family, our natural resources, or the reputation of Texas agricultural products.

Lee Loe
Houston, TX

SSM-M-131
COMMENT LETTER

YANKE FARMS
Clarence or Marilyn Yanke
HCR 3 BOX 27
SUNRAY, TX 79086
(806) 948-5696

JAY ROSE, OFFICE OF RECONFIGURATION
U.S. DEPARTMENT OF ENERGY
1000 INDEPENDENCE AVENUE, S.W.
WASHINGTON, D.C. 20585
ATTENTION: SSM PEIS

1/40.26 NO! TO PLUTONIUM PROCESSING IN THE TEXAS PANHANDLE.

NO! TO BRINGING PLUTONIUM TO PANTEX FROM OTHER SITES.

NO! TO LONG-TERM STORAGE OF PLUTONIUM OVER THE OGALLALA AQUIFER.

NO! TO FACILITIES THAT HANDLE NUCLEAR WASTE OR TO PROCESSES THAT GENERATE IT.

I SUPPORT JOBS AND DEVELOPMENT IN THE PANHANDLE THAT DON'T ENDANGER WORKERS, MY FAMILY, OUR NATURAL RESOURCES, OR THE REPUTATION OF TEXAS AGRICULTURAL PRODUCTS.

SIGNED [signature]

2/04.05 Please quit contaminating the Ogallala aquifer — There are already positive contamination results in 2 wells near Pantex — STOP NOW!

SSM-M-132
COMMENT LETTER

Natural Resources Defense Council — NRDC 25 years

1350 New York Ave., NW
Washington, DC 20005
202 783-7800
Fax 202 783-5917

May 31, 1996

The Honorable Hazel O'Leary
Secretary of Energy
1000 Independence Ave. SW
Washington, DC 20585

Dear Secretary O'Leary:

Please find enclosed a letter from a large number of organizations, including the Natural Resources Defense Council, expressing serious concerns regarding the Department of Energy's Draft Stockpile Stewardship and Management PEIS.

To arrange a meeting to discuss these concerns, please have your staff call me at (703)-356-6674 or (202) 783-7800. NRDC is moving its offices to 1200 New York Avenue, NW, Washington, DC 20005. Beginning June 17, NRDC's new number will be (202) 289-6868.

Sincerely,

[signature]
Barbara Finamore
Attorney

Enclosure

40 West 20th Street, New York, New York 10011, 212 727-2700, Fax 212 727-1773
71 Stevenson Street, San Francisco, CA 94105, [illegible], Fax 415 495-[illegible]
6310 San Vicente Blvd., Suite 250, Los Angeles, CA 90048, 213 934-6900, Fax 213 934-1210

May 31, 1996

The Honorable Hazel O'Leary
Secretary of Energy
1000 Independence Ave. SW
Washington, DC 20585

RE: Draft Stockpile Stewardship and Management Programmatic Environmental Impact Statement

Dear Secretary O'Leary:

1/40.85

We are writing to express our profound disappointment and concern about your Department's draft Stockpile Stewardship and Management Programmatic Environmental Impact Statement (SS&M PEIS or PEIS). We were, frankly, surprised by the depth and breadth of its noncompliance with the requirements of the National Environmental Policy Act (NEPA), all the more so because under your leadership, many of us have come to expect a higher level of performance from the Department in this area.

Regrettably, despite the considerable effort expended on it, the Department's draft SS&M PEIS precludes meaningful analysis of the SS&M program by failing to analyze the lion's share of the projects that constitute the program and by failing to discuss the full spectrum of reasonable alternatives. The PEIS is so fundamentally flawed that even a substantially revised version of the present draft will not satisfy NEPA requirements. Instead, the Department must begin by withdrawing the current draft PEIS. The revised scope of a new draft PEIS should and we believe could be swiftly established by taking into account the multitude of comments already received (and largely ignored) during the previous scoping process, and by incorporating the comments received on the present draft. The Department would then issue a new draft for public comment.

In conjunction with the Department's withdrawal of the draft SS&M PEIS, it will be necessary for the Department to place a number of SS&M projects on hold pending completion of an adequate PEIS and subsequent site-specific analyses.

The reasons for these conclusions are many and have been detailed in comments numerous organizations have already provided. Without attempting to recap here the full range of issues raised in all of our comments, perhaps the most important and central of them are these:

- The Department has inappropriately excluded its current stockpile stewardship program, including facilities now under construction, from programmatic

The Honorable Hazel O'Leary
May 31, 1996
Page 2

1/40.85 continued

analysis by including them in a mis-named, and ever-growing, "no action" alternative;

2/41.17

- Virtually all the planned stockpile stewardship facilities are excluded from analysis because they are said to be too far in the future, when in fact they are not—indeed, the Department is already investing considerable sums in designing, and developing the technology for, such facilities;

3/41.18

- The only three stockpile stewardship facilities actually analyzed in the PEIS are presented without meaningful alternatives and without supporting programmatic analysis, let alone any prior programmatic record of decision; and

4/40.60

- Overall, there are no programmatic alternatives analyzed for stockpile stewardship, and only siting alternatives are analyzed for stockpile management. The result is that there is no meaningful programmatic analysis of alternatives for stockpile stewardship and management. A short list of omitted reasonable alternatives would include: options implementing gradual but complete denuclearization (a reasonable alternative by virtue of U.S. obligations under the Nuclear Nonproliferation Treaty); options involving maintenance of a minimal stockpile of one to ten warheads, and a stockpile in the range of 100-500 warheads, the present size of the arsenals of the declared nuclear weapon states except Russia; options involving simple maintenance and remanufacturing of the arsenal; options involving fewer nuclear weapon laboratories; options involving Nevada Test Site closure; as well as options involving removing redundant technologies from each of the Department's SS&M subprograms, which would enable DOE to meet its stated objectives with fewer facilities, much lower costs, and greatly lessened environmental impacts.

3/41.18 continued

It is by no means just the SS&M PEIS as a document which concerns us, but the ongoing real projects in the stockpile stewardship and management program that are now proceeding prior to programmatic NEPA analysis. In this regard, it is important to note that DOE initiated the environmental review for rebuilding its nuclear weapons complex almost five years ago. In the interim, DOE has initiated or completed hundreds of millions of dollars worth of new facilities and facilities upgrades throughout the nuclear weapons complex, implementing substantial portions of the program which the subject PEIS and its predecessors were supposed to review. Many of these projects have as a result reached a stage of investment or commitment to completion likely to determine subsequent development or restrict later alternatives, in violation of NEPA.

The Honorable Hazel O'Leary
May 31, 1996
Page 3

While we greatly appreciate your intention to increase the Department's environmental compliance, we note that in several instances this compliance has still been achieved only pursuant to litigation, or the threat of litigation, by public interest groups. In view of DOE's manifest and willful noncompliance with both the letter and spirit of NEPA and its implementing regulations in preparing the current draft PEIS, we respectfully ask you to withdraw it, and to meet with our designated representatives regarding the PEIS and the projects now proceeding without adequate programmatic analysis, in violation of NEPA.

While we regret the additional burden on the Department that may be occasioned by our request, we note that this burden is entirely of the Department's own making. Had DOE taken its NEPA programmatic review obligations--and previously submitted public comments--seriously; the current situation would in all likelihood not have arisen. While we are prepared to negotiate in good faith, we cannot stand idly by while the Department's hasty, ill- considered, and on-going actions in pursuit of its nuclear weapons SS&M program effectively render NEPA a dead letter. That we will not do. The starting point for negotiations must be the Department's full compliance with its NEPA obligations.

Sincerely,

Christopher E. Paine
Senior Research Associate, NRDC

Maureen Eldredge
Military Production Network

greg mello
Greg Mello
Los Alamos Study Group

Jay Coghlan
Concerned Citizens for Nuclear Safety

Marylia Kelley
Tri-Valley CARES

John Burroughs
Western States Legal Foundation

The Honorable Hazel O'Leary
May 31, 1996
Page 4

Laura Kriv
20/20 Vision, National

Dale Nesbitt
20/20 Vision, 7th, 9th, 10th, and 13th Congressional Districts

Dan Eichelberger
Abalone Alliance

Garland Harris
All Peoples Coalition, including:
New Mexico Union of Hospital and Health Care Employees (AFSCME, AFL-CIO); Albuquerque Center for Peace and Justice; American Federation of State, County and Municipal Employees (AFSCME) Local 2260; Business People Concerned About WIPP; Laguna Acoma Coalition for a Safe Environment; National Association of Social Workers; Uranium Radiation Victims Committee, Shiprock, NM; Valencia County Concerned Citizens Association

Tom Rauch
American Friends Service Committee (Denver)

Wilson Riles, Jr.
AFSC, Pacific Mountain Region

Claire Greensfelder
Assoc. of University of California Alumni for Social & Ecological Ethics

Pamela Meidell
Atomic Mirror

Peter Drekmeir
Bay Area Action

Phil Klasky
Bay Area Nuclear Waste Coalition

Alan Senauke
Buddhist Peace Fellowship

Stormy Williams
California Communities Against Toxics

Michael Closson
Center For Economic Conversion

Seth Tuler
Childhood Cancer Research Institute

Rick Nielsen
Citizen Alert

Garland Harris
Citizens for Alternatives to Radioactive Dumping

Jami Caseber
Citizens Opposing a Polluted Environment

Ron Lamb
Coalition for Health Concern

Frances Chiappa
Coalition For a Test Ban

Gene Bernardi
Committee to Minimize Toxic Waste

Jane M. Williams
Desert Citizens Against Pollution

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Alice Slater
Economists Allied for Arms Reductions

Diane Thomas
Ecumenical Peace Institute/
Clergy & Laity Concerned

Frances Close
Energy Research Foundation

Margaret Morgan-Hubbard
Environmental Action Foundation

Chuck Broscious
Environmental Defense Institute

Sam Hitt
Forest Guardians

Curt Gandy
Fort Ord Toxics Project

David Cortright
Fourth Freedom Forum

Joe Volk
Friends Committee on National Legislation

Tom Carpenter
Government Accountability Project

Barbara Wiedner
Grandmothers for Peace International

Corine Thornton
Grandmothers for Peace International
California Chapter

Jan Provost
Grandmothers for Peace International
Northwest Chapter

Lorraine Krofchok
Grandmothers for Peace International
Southeast Chapter

Bruce Hall
Greenpeace USA

Peter Hendley
Hayward Area Peace & Justice Fellowship

Hisham Zerriffi
Institute for Energy and Environmental Research

Tom Zamora-Collins
Institute for Science and International Security

Claire Greensfelder
International Women's Network

Rick Gold
Lane County American Peace Test

Sherry Larsen-Beville
Livermore Conversion Project

Earl Johnson
Lutheran Peace Fellowship

Daniel McNassar
Magdalene House/Catholic Worker

Sharon Cowdrey
Miamisburg Residents for Environmental Safety & Health

Carol Wagner
Mount Diablo Peace Center

George Crocker
National American Water Office

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May 31, 1996
Page 6

Fred Allingham
National Association of Radiation Survivors

Brother David Buer
Nevada Desert Experience

David Krieger
Nuclear Age Peace Foundation

Paul Leventhal
Nuclear Control Institute

Mary Beth Brangan
Nuclear Democracy Network

Frances Harwood, Wendy Oser
Nuclear Guardianship Project

Michael Mariotte
Nuclear Information & Resource Service

Ralph Hutchison
Oak Ridge Environmental Peace Alliance

Doris Smith
Panhandle Area Neighbors & Landowners

Nancy Small
Pax Christi, U.S.A.

Daniel McNassar
Pax Christi, Bay Area Chapter

Judy Lowe
Peace Action, International

Gordon S. Clark
Peace Action, National

Erica Harrold
Peace Action, California State-Wide Office

Betty Brown
Peace Action, East Bay Chapter

Frances Chiappa
Peace Action, Greater Cleveland Chapter

Janice Tilton
Peace Action, Nashville Chapter

JoAnn Fuller
Peace Action, Sacramento/
Yolo Chapter

Alice Cox
Peace Action, San Jose Chapter

Karina Wood
Peace Education Action Fund,
Washington, DC

Mavis Belisle
Peace Farm

Bill Russell
People for a New Nuclear Policy

Daryl Kimball
Physicians for Social Responsibility

Carol Garman
Physicians for Social Responsibility,
NYC Chapter

Janna Rolland
Physicians for Social Responsibility,
NM Chapter

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COMMENT LETTER **PAGE 8 OF 8**

The Honorable Hazel O'Leary
May 31, 1996
Page 7

Margaret Mossman
Physicians for Social Responsibility,
Bay Area Chapter

David Culp
Plutonium Challenge

Kaz Tanahashi
Plutonium Free Future

Bruce Drew
Prairie Island Coalition

W. Thomas
Proposition One Committee

Ann Anderson
Psychologists for Social Responsibility,
Washington DC (national)

Mark Pilisuk
Psychologists for Social Responsibility,
CA Chapter

Andrew J. Thurlow
Rocky Mountain Peace & Justice Center

Aaron Belansky
San Jose Peace Center

Rosemary Brodie
Seattle Women Act For Peace

Matteo Ferreira
Shundahi Network

Dave Nesmith
Sierra Club, San Francisco Bay Area
Chapter

Ted Smith
Silicon Valley Toxics Coalition

Beatrice Brailsford
Snake River Alliance

Don Hancock
Southwest Research & Information Center

Bevery Gattis
STAND of Amarillo, Inc.

Father Bill O'Donnell
St. Joseph the Worker Church

Natalie Russel
St. Stephen's Catholic Church

Jackie Cabasso
Western States Legal Foundation

Deb Sawyer
Women Concerned - Utahans United

Lillian Nurnela
Women For Peace, East Bay

Edith Villastrigo
Women Strike For Peace

Jean Gore
Women's International League for
Peace & Freedom

Susan Baker
Writing to Reduce Weapons

SSM-C-001
COMMENT LETTER **PAGE 1 OF 2**

TEXAS TECH UNIVERSITY HEALTH SCIENCES CENTER at AMARILLO
School of Pharmacy
Office of the Dean

1400 Wallace Boulevard
Amarillo, Texas 79106
(806) 354-5463
FAX (806) 354-5549

April 10, 1996

U.S. Department of Energy
Office of Reconfiguration
P.O. Box 3417
Alexandria, Virginia 22302

U.S. Department of Energy
Office of Fissile Materials
P.O. Box 23786
Washington, DC 20026

RE: Comment on Stockpile Stewardship and Management (SSM) and Storage and Disposition (S&D) of Weapons-Usable Fissile materials Draft Programmatic Environmental Impact Statements (PEISs)

Thank you for this opportunity to comment on the U.S. Department of Energy's (DOE) Programmatic Environmental Impact Statements (PEISs) on Stockpile Stewardship and Management (SSM) and Storage and Disposition (S&D) of Weapons-Usable Fissile Materials. These comments are also directed toward the Pantex Site-Wide Draft Environmental Impact Statement, as most issues addressed in both these documents are identical.

1/40.52 Texas Tech University Health Sciences Center School of Pharmacy fully supports the retention and expansion of the Pantex facility as a storage, processing and component fabrication complex with capabilities for non-nuclear manufacturing and also research, development and testing. Pantex has been an integral part of this community for more than forty years, and has done so as a safe and environmental "clean" complex. There is every reason to believe that the facility would continue operating in such a manner. Pantex has been a pivotal force in expanding the economic base of the Panhandle from agrarian to industrial. As part of the community of Amarillo, we at Texas Tech University Health Sciences Center at Amarillo, depend on the socio/economic impact Pantex provides our area.

2/30.01 I am pleased that the DOE selected Pantex as the preferred alternative for assembly/disassembly. It is hopeful that Pantex will also be recognized as the preferred candidate site for new and/or consolidated stockpile management facilities. Pantex is the best site for maintaining the integrity of the U.S. nuclear stockpile because of maximum efficiencies and cost savings.

Labor cost, utility rates and water and land availability at Pantex make it the best site and perhaps the most cost-effective alternative for any new construction of SSM facilities. As an alternative site for all future defense-related facilities, Pantex would complement activities at the national

An EEO / Affirmative Action Institution

labs (such as the planned Atlas Facility and plutonium pit fabrication site at Los Alamos National Laboratory). Additional defense-related activities at Pantex would ensure that core technical capabilities are preserved at a location that can secure them at the most efficient cost.
3/40.13 The DOE should insist that, in its deliberations, budgetary comparisons between Pantex and the other sites are accurate and include capital, transportation, training, remediation and other costs.

4/34.01 The high explosives (HE) functions should also remain at Pantex in conjunction with the assembly/disassembly functions. HE capabilities must be retained to process the inventories on site from dismantling. This is also the least expensive alternative. Transfer of HE functions away from Pantex would cost between $40 and $50 million. Should future need arise for new weapon production it would be critical to have the HE facility at the weapons production/assembly site.

Pantex currently safely stores more than 8,000 surplus pits and plans are being made to ship additional pits from Rocky Flats to Pantex. I does not make sense to re-create storage facilities at another site and transport large amounts of plutonium across the country.Pantex should be designated the preferred site for any disposition options and related functions. Pantex could continue to store plutonium which is already on site and upgrade facilities for any and all storage options by DOE with minimal cost. It makes budgetary and policy sense to site disposition where storage already exists. Pantex already has the necessary safety , security and surveillance capabilities to accommodate an expanded role and is the production site closest to Los Alamos, the planned pit fabrication site.

1/40.52 continued I respectfully request DOE to designate Pantex as the preferred alternative site for all existing and new stockpile management and stewardship functions as well as consolidation of all plutonium storage and disposition and any related functions.

Thank you for the opportunity to comment on these documents.

Sincerely,

Arthur A. Nelson, R.Ph., Ph.D., Dean vk# 51187

To Whom This May Concern:

1/40.06 There is no problem greater that nuclear weapons and power solve than the problems they create. In fact, denuclearization is the only reasonable alternative. I demand that we act in this way immediately to make a more hospitable environment in which we can raise our children and future generations.

Sincerely,
Michael Caldemeyer

SSM-C-003
COMMENT LETTER **PAGE 1 OF 1**

Dear D.O.E.

1/40.06 In the Stockpile Stewardship PEIS, it is my comment that "Abolition is the ONLY REASONABLE ALTERNATIVE". Do not disregard abolition as an alternative - rethink your conclusions in the Draft SS+M PEIS.

Peggy Prince
20 [illegible] Rd.
Santa Fe, NM 87501

SSM-C-004
COMMENT LETTER **PAGE 1 OF 1**

U.S. Department of Energy
Office of Reconfiguration
P O Box 3417
Alexandria, VA 22302

U.S. Department of Energy
Office of Fissile Materials
P O Box 23786
Washington, DC 20026

1/30.01 **Comments on Stockpile Stewardship and Management (SSM) PEIS:** I support the selection of Pantex for weapons assembly and disassembly functions. I strongly favor the continuation of high explosives functions at Pantex, and oppose any plan to move these functions to the national labs. Since Pantex is the most cost-effective DOE facility and enjoys the strongest local support, I also support the addition of other environmentally sound stewardship and management functions at Pantex.

Comments on Fissile Materials Storage and Disposition (MD) PEIS: I believe that Pantex should be chosen as the location for fissile materials storage and disposition functions. Pantex already stores surplus plutonium, and has the needed safety and security capabilities to cost-effectively accommodate an expanded role. Fair budgetary comparisons, strong local support, and national security concerns, should lead DOE to choose Pantex for new fissile material storage and disposition functions that are conducted in a safe and environmentally sound fashion.

Name: Keith A. Jones Address 6505 Hurst Amarillo, Tx 79109-6937

SSM-C-005
COMMENT LETTER

PAGE 1 OF 1

1/42.06

✔ **NO!** To plutonium processing in the Texas Panhandle.

✔ **NO!** To bringing plutonium to Pantex from other sites.

✔ **NO!** To long-term storage of plutonium over the Ogallala Aquifer.

✔ **NO!** To facilities that handle nuclear waste or to processes that generate it.

I support jobs and development in the Panhandle that don't endanger workers, my family, our natural resources, or the reputation of Texas agricultural products.

SSM-C-006
COMMENT LETTER

PAGE 1 OF 2

9616 Deeble St Apt A
South Gate CA 90280
May 5, 1996

Jay Rose
Office of Reconfiguration
1000 Independence Ave SW
Washington DC 20585

Dear Mr. Rose:

It is widely recognized that the proliferation of nuclear weapons is among the greatest threats to national security. Our government has recently engaged in an extension of the Nuclear Non-Proliferation Treaty and is currently negotiating for a zero threshold for a Comprehensive Test Ban. The success of these activities to prevent nuclear weapons proliferation is entirely dependent on the ability of our government to inspire genuine confidence in other nuclear weapon states and those who have or who are approaching nuclear weapons capability that we are serious about our treaty agreements.

1/40.05 Unfortunately, the Department of Energy has produced an aggressive plan to continue nuclear weapons design and production capability. It is far more likely to provoke proliferation than lower the risks.

2/40.12 In addition, the SSM-PEIS document is economically irresponsible. Although it presents itself as a plan for scaling down the nuclear weapons complex, the SSM-PEIS outlines at least $2.6 billion in capital costs for new and upgraded facilities. It also proposes more than $2 billion for accelerated computer capabilities. When plans for new tritium production are included, SSM program operating costs are likely to exceed $30 billion within a decade. At a time when federal spending programs are being slashed right and left, and many Americans, especially children, are left in desperate need, this is unconscionable.

3/40.15 The proposed activities also project staggering rates of nuclear waste generation for at least 20 years. These wastes will produce additional waste management and cleanup costs far into the future, and put valuable environmental resources at risk.

Safety and reliability of the existing arsenal, the "rationale" presented for this proposal, do not require these expensive facilities. The DOE should think carefully about producing new wastes, given its inability to develop solutions for existing nuclear waste.

4/40.36 I urge the Department of Energy to implement a passive

4/40.36 continued | stewardship program, called a curatorship by many, to replace this aggressive and provocative SSM proposal.

Sincerely,

Patrick Bonner

April 29, 1996

Jay Rose
Office of Reconfiguration
1000 Independence Ave. S.W.
Washington, D.C. 20585

Dear Mr Rose,

1/40.07 | Nuclear weapons is among the greatest threats to national security of the United States. Our government has recently engaged in a Non-Proliferation Treaty and is negotiating for a zero threshold for a Comprehensive Test Ban. It is imperative that our government inspire confidence in other nuclear weapons states and other nations who may soon have nuclear capabilities that we are serious about our treaty agreements.

Aggressive plans to continue nuclear weapons design and production capability by the Department of Energy is very likely to provoke proliferation by other nations

2/40.12 | The SSM-PEIS document outlines plans for upgraded and new facilities, accelerated computer capabilities, and tritium production. It is very possible that the SSM program operating costs will exceed $30 billion in the next ten years. This is economically irresponsible. To put so much of our national budget into an SSM program when so many Americans, especially children, are living in poverty and need is unconscionable

3/10.11 | Staggering rates of nuclear waste will be generated by these proposed activities creating a need for more waste management and future clean up costs. Why put more of our environment at risk? The DOE should think carefully about producing new wastes, given its inability to develop solutions for existing nuclear waste

4/40.36 | This SSM proposal is aggressive, provocative, and unnecessary. I urge the DOE to implement a passive and less costly program

Sincerely,

Sherri Lebow
5117 Westgate Dr
Amarillo, TX 79106

SSM-C-008
COMMENT LETTER

PAGE 1 OF 2

WESTERN NC PHYSICIANS FOR SOCIAL RESPONSIBILITY
99 EASTMOOR DRIVE
ASHEVILLE, NC 28805-9211
April 10, 1996

U. S. Department of Energy
P.O.Box 3417
Alexandria, VA 22302

Subject: Draft PEIS: Stockpile Stewardship and Management

Greetings,

This letter is in response to the above subject dealing with the long-term storage alternatives for plutonium and highly enriched uranium. We concerned citizens raise the following objections to the proposal:

1/40.36 — 1. Rather than constructing new facilities at added expense, a passive stewardship and management plan could consist of weapons surveillance, pending future arms reductions. With such a strategy weapons defects could be resolved by replacing weapons components. Existing facilities could be used to test and certify remanufactured warheads, so that a high degree of confidence in our nuclear arsenal's safety and reliability would be continued.

2/40.12 — 2. In consideration of a diminishing nuclear stockpile, the proposed new facilities at an estimated cost of $2.6 billion would be wasteful and represent less an effort to provide for national security, than an effort to create jobs, in an era when we pay lip service to balancing the national budget.

3/40.07 — 3. One of our greatest objections is that new weapons experiment facilities are irreconcilable with our stated non-proliferation goals. Here we go again proposing to spend billions of dollars on nuclear weapons, including the designing of new ones, when we have recently agreed to a new Nuclear Non-Proliferation Treaty and are actively negotiating for a world-wide Comprehensive Test Ban Treaty.

Furthermore, we advocate the eventual establishment of a nuclear weapons free world. We encourage our leadership to move relentlessly in that direction. This message is also being conveyed to the President & our Congressional representatives.

Sincerely yours,

SSM-C-008
COMMENT LETTER

PAGE 2 OF 2

WESTERN NC PHYSICIANS FOR SOCIAL RESPONSIBILITY
99 EASTMOOR DRIVE
ASHEVILLE, NC 28805-9211
April 10, 1996

U. S. Department of Energy
P.O.Box 3417
Alexandria, VA 22302

Subject: Draft PEIS: Stockpile Stewardship and Management

Greetings,

This letter is in response to the above subject dealing with the long-term storage alternatives for plutonium and highly enriched uranium. We concerned citizens raise the following objections to the proposal:

1/40.36 continued — 1. Rather than constructing new facilities at added expense, a passive stewardship and management plan could consist of weapons surveillance, pending future arms reductions. With such a strategy weapons defects could be resolved by replacing weapons components. Existing facilities could be used to test and certify remanufactured warheads, so that a high degree of confidence in our nuclear arsenal's safety and reliability would be continued.

2/40.12 continued — 2. In consideration of a diminishing nuclear stockpile, the proposed new facilities at an estimated cost of $2.6 billion would be wasteful and represent less an effort to provide for national security, than an effort to create jobs, in an era when we pay lip service to balancing the national budget.

3/40.07 continued — 3. One of our greatest objections is that new weapons experiment facilities are irreconcilable with our stated non-proliferation goals. Here we go again proposing to spend billions of dollars on nuclear weapons, including the designing of new ones, when we have recently agreed to a new Nuclear Non-Proliferation Treaty and are actively negotiating for a world-wide Comprehensive Test Ban Treaty.

Furthermore, we advocate the eventual establishment of a nuclear weapons free world. We encourage our leadership to move relentlessly in that direction. This message is also being conveyed to the President & our Congressional representatives.

Sincerely yours,

SSM-C-009
Comment Letter

PAGE 1 OF 1

May 3, 1996

U.S. Department of Energy
Office of Reconfiguration
P.O. Box 3417
Alexandria, VA 22302

Dear Sirs:

Please consider this letter as comment on the Programmatic Environmental Impact Statement (PEIS), the Stock Pile Stewardship and Management (SSM) and the Storage and Disposition of Weapons Usable Fissile Material (S & D).

The safety of our environment and community are of primary importance when it comes to any change or expansion at Pantex. To date, I think that Mason & Hanger has proven their ability to run a safe and responsible operation. I trust that they would do so in the future.

1/40.52 I believe Pantex to be the best site for the SSM, the S & D Missions, as well as the High Explosives functions for several reasons.

1. The operating costs would lower Utilities, labor, cost of living and land costs are lower than at any other facility
2. The people at Pantex have the knowledge and ability to handle high explosives, fissile materials, and stock pile materials. They have been doing it safely for years and there is no reason to expect them to change.
3. The costs to move these functions to other sites would be very expensive.
4. The community has traditionally supported the work done at Pantex.
5. If the DOE chooses to down-size and locates vital assembly, manufacturing and storage missions in smaller facilities, what happens if we have an immediate need to produce larger quantities? If we cannot respond quickly to a major national crisis, our nuclear deterrent capabilities will be compromised.
6. It seems that most of the possible solutions of moving functions will require more transportation of dangerous materials exposing the population to risk.

Thank you for the opportunity to make these comments. I urge the DOE to designate Pantex as the preferred alternative for all existing and new stockpile management and stewardship functions as well as consolidation of all plutonium storage and disposition.

Sincerely,

Karen Riley
1600 Ina
Amarillo, Tx 79107

SSM-C-010
Comment Letter

PAGE 1 OF 1

1/40.52

- ☑ YES ! To plutonium processing in the Texas Panhandle.
- ☑ YES ! To bringing plutonium to Pantex from other sites.
- ☑ YES ! To long-term storage of plutonium over the Ogallala Aquifer.
- ☑ YES ! To facilities that handle nuclear waste or to processes that generate it.

I support jobs and development in the Panhandle that don't endanger workers, my family, our natural resources, or the reputation of Texas agricultural products.

Signed: Mark Smith
Box 792
Panhandle, Tx. 79068

CALL-IN COMMENTS ON DOE'S PEIS
ON TRITIUM SUPPLY AND RECYCLING AND
STOCKPILE STEWARDSHIP AND MANAGEMENT

• • •

MR. KOBASA: Stephen Kobasa, 46 Hobart Street, 06511-4033.

Yes. I would, I am at the moment on the list.

Again, I am on the mailing list.

Bits of all the amazing technical data that have been included in the draft programmatic environmental impact statement. I think it's important for us to think of what the term stewardship means.

1/40.06 And it should be included, I think, in your report, that real stewardship involving nuclear weapons would mean the complete abolition of all such devices and the careful and systematic treatment of all nuclear pollution which has resulted from the manufacture and production of nuclear weapons in the United States.

It's really time that we think in terms of abolition rather than renewal of programs. This is a special opportunity for us. It would be real stewardship, and not the technical variation and adaptions that are being considered right now.

Thank you very much.

CALL-IN COMMENTS ON DOE'S PEIS
ON TRITIUM SUPPLY AND RECYCLING AND
STOCKPILE STEWARDSHIP AND MANAGEMENT

• • •

MR. SCHRADER: My first name is Don, middle initial D., Schrader.

I'm speaking for myself as a human being, and for the rest of humanity.

18, that's 1-8-1-0, 1810, I should say, Silver. That was 1810 Silver SE, Apartment B, B as in Boy, Albuquerque, New Mexico, 87106.

No, I do not want to be on the mailing list. But my address gain, 1810 Silver SE, Apartment B --

Through an article in the Albuquerque Tribune

I want to make sure that you have my address correct, please. It's 1810, that's 1-8-1-0 Silver SE, Apartment B, B as in boy, Albuquerque, New Mexico, 87106.

1/40.27 And I absolutely oppose the expansion of nuclear weapons work at Los Alamos Laboratories in New Mexico. I despise and I damn all such work anywhere. But I especially oppose any expansion of it at Los Alamos. And I want to see all nuclear weapons production closed down worldwide, and especially here at Los Alamos and at Sandia.

I have protested nuclear weapons over 300 times at the gates of Kirkland Air Force Base and Sandia Weapons Lab. I have received thousands of insults and put-downs and fingers in my protests. I have received thousands of thumbs up and smiles and waves.

I have refused to pay any Federal income tax for 17 years because I refuse to pay for the United States to rob, torture, terrorize, brutalize, cripple, murder people all over the world, so the U.S. can hog the world's wealth. It's a crime against humanity that the United States has 5 percent of the world's population, consumes 30 to 40 percent of the world's resources, and supports all, dozens of dictators worldwide, who repress, oppress, persecute, rob, murder, their own people.

And so my stand is not something just cerebral or spouting off at the mouth. As I say, for 17 years, I have refused to pay any Federal income tax. Because how can I speak for peace if I pay for war?

I host a weekly television program here in Albuquerque every Friday live at midnight on Channel 27, Channel 27, public access cable.

[Recorded today at 1:40 p.m.]

SSM-P-003
COMMENT LETTER

PAGE 1 OF 2

CALL-IN COMMENTS ON DOE'S PEIS
ON TRITIUM SUPPLY AND RECYCLING AND
STOCKPILE STEWARDSHIP AND MANAGEMENT

* * *

MR. ROZSNYA: My name Balogh Rozsnya. It's a very difficult name, R-O-Z-S-N-Y-A.

I am not speaking for any organization.

1104 Avenida de las Palmas, Livermore, California 94550.

The stockpile stewardship management list.

I am a retired physicist from the Lawrence Livermore Laboratory, so I don't think that I have any conflict of interest.

1/40.24 I am very much concerned about the steady decrease of nuclear weapons research, both at Livermore and Los Alamos Laboratories. I am convinced that a country like the United States should have first-hand knowledge about the physics of weapons research, irrespective of any kind of political situation, which are always changing.

I think that under the present conditions, where Cold War tensions are reduced, the conditions are very good to carry out much-needed research, physics research, involving weapons research. And I urge your community to facilitate this by submitting proposals to maintain a minimum degree of research activities at the Los Alamos and Lawrence

SSM-P-003
COMMENT LETTER

PAGE 2 OF 2

1/40.24 continued Livermore Laboratories.

I would like to learn more about the [inaudible], if that is something which would decrease or not decrease with activities I am concerned about, so it would be very nice if you would let me a mailing list or an E-mail at my telephone number, (510) 447-6579. I would like to learn more about your committee so that I could [inaudible] it, and thank you very much for your attention.

[Recorded today at 11:52 a.m.]

* * *

[End of recorded tape.]

SSM-P-004
COMMENT LETTER

CALL-IN COMMENTS ON DOE'S PEIS ON STOCKPILE STEWAEDSHIP AND MANAGEMENT

MR. DUNCAN: H. Duncan, 6302 Cornell, 79109.
Both.

1/40.52
From an Amarillo meeting.
I am in favor of the plutonium storage at Pantex.
The site is already clean enough, and they have the facilities and personnel to handle the job adequately.
Thank you.

SSM-P-005
COMMENT LETTER

CALL-IN COMMENTS ON DOE'S PEIS ON STOCKPILE STEWAEDSHIP AND MANAGEMENT

MR. PUAREZ: Felipe Puarez, 14 North Wilson, Amarillo, Texas 79107.

1/40.52
The pamphlet floating around.
I think the Pantex plant should be kept open. They have a qualified group of employees out here. It would be of benefit to everyone.
Thank you.

SSM-P-006
COMMENT LETTER

PAGE 1 OF 1

CALL-IN COMMENTS ON DOE'S PEIS ON
STOCKPILE STEWAEDSHIP AND MANAGEMENT

MR. MALONE: Robert R. Malone.
Pantex.
Yes, I would.
From a notice on the Pantex --
1/40.52 I'm a security inspector at Pantex, and I just want you to know that I am 100 percent in favor of Pantex all the way around. Our safety record speaks for itself. We are the safest of all the DOE complexes; I think that gives us a leg up on about anybody.
Thank you.

SSM-P-007
COMMENT LETTER

PAGE 1 OF 1

CALL-IN COMMENTS ON DOE'S PEIS
ON STOCKPILE STEWARDSHIP AND MANAGEMENT

MR. DOWNEY: Nate Downey, PO Box 580, Velarde, New Mexico 87582.
Neither. None of it should exist.
At the hearing in Santa Fe on Sunday.
1/10.16 I feel you are totally wrong if you are going to start WIPP. I really wish you all would just stop.

SSM-P-008
COMMENT LETTER
PAGE 1 OF 1

**CALL-IN COMMENTS ON DOE'S PEIS
ON STOCKPILE STEWARDSHIP AND MANAGEMENT**

MR. DOWNEY: My name is Nate Downey, and I'm very mad. Why? So that you can blow us up more easily? The codes are a farce.

Just let me leave my comment.

I already did.

I was just trying to leave a comment and I got cut

1/40.06 off. This is, you know, typical of you people. You're just not listening. I mean, why should I even try? You people are just crazy. You are really powerful, really disgusting people who should just put the gun to their heads and just blow -- everybody -- whoever is listening to this, and I doubt that anybody is, quit your jobs. Plant food. Grow food. You know? I mean, we've got to do a lot more important things than try to create more poison if we want the human race to continue. It's pathetic.

[Recorded six days ago at 12:28 a.m.]

SSM-P-009
COMMENT LETTER
PAGE 1 OF 1

**CALL-IN COMMENTS ON DOE'S PEIS
ON STOCKPILE STEWARDSHIP AND MANAGEMENT**

MR. O'BUCHANAN: My name is Pat O'Buchanan. My address is 30847 Prestwick Avenue, Hayward, California.

I want to say that I think the NIS would create radioactive waste [inaudible] network.

I think that we do not need NIS. I think that the NIS poses serious nuclear nonproliferation threats. I think we should go on with our work with nonproliferation --

244-7505. This is a very disturbing message line.

I don't want to be on a mailing list.

I learned about this number from going to a hearing in Livermore.

1/21.12 I think that the NIS would create terrible radioactive waste. I think it sends a critical message to

2/40.07 other countries. I think we really have to work on the goal of nonproliferation, and eventually to do away with nuclear weapons.

That is my position.

[Recorded yesterday at 10:50 a.m.]

[End of tape.]

United States Senate
COMMITTEE ON ARMED SERVICES
WASHINGTON, DC 20510-6050

May 3, 1996

Honorable Hazel R. O'Leary
Secretary of Energy
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585

Dear Madam Secretary:

This letter constitutes the collective formal comments of the undersigned members of the United States Senate on the Department of Energy's (DOE's) Draft Environmental Impact Statement (PEIS) for Stockpile Stewardship and Management (DOE/EIS-0236).

1/40.62

The fundamental deficiencies in the analysis and conclusions of the DOE Draft PEIS for Stockpile Stewardship and Management are related to the incomplete nature of the National Security Policy Considerations upon which the analysis, conclusion, and preferred alternatives are based.

The most egregious deficiency is the total failure to include current Congressional legislation (National Defense Authorization Act for Fiscal Year 1996, Title XXXI, particularly sections 3137 and 3153) and associated national security policy guidance in the PEIS assumptions, analyses, and conclusions. This is totally unacceptable. This PEIS needs to be redone based on the full range of national security policies, both Presidential and Congressional. The conclusions of the just completed House and Senate markups for Fiscal Year 1997 must also be taken into consideration in the Final PEIS.

2/40.18

The draft PEIS recommended alternative results from the Department's almost exclusive planning focus on preserving the capabilities and core competencies of the national nuclear weapons laboratories. We recognize that preserving the weapons capabilities of these laboratories reflects essential national requirements. But very little attention has been paid to preserving the critical capacity and unique assets that exist at the Department's production plants, in spite of two years of Senate Armed Services Committee hearings which continue to point toward this deficiency in Departmental planning and strategy. The Final PEIS must take this into account.

3/40.17

Nowhere does the PEIS reference the significant body of Congressional hearings and testimony on the Stockpile Stewardship and Management Programs, particularly those before the Strategic Forces Subcommittee of the Senate Armed Services Committee. In particular, the PEIS ignores several critical facts brought out in testimony. For example, the PEIS does not note DOE testimony that science-based stewardship is not guaranteed to work, or that if it works it will not be ready for at least another ten years.

2/40.18 continued

The PEIS does not deal adequately with the need to maintain the stockpile and adequate production capacity over the next ten or more years. During this period, it is the Stockpile Management Program at the four production plants which is essential to replace weapons components, rebuild weapons, and maintain the capability and expertise to reconstitute the nuclear weapons stockpile should world events require it. In fact, the entire PEIS analysis about the size of the stockpile and associated manufacturing capacity is based on optimistic assumptions about future arms control agreements. The conclusion of the draft PEIS appears to reflect these initial assumptions rather than insights gained in analysis. In particular, the PEIS (p. S-11, line 12, Summary) states that the PEIS forecast for a smaller production complex results from unspecified "technical judgement" rather than technical analysis. This must be corrected in the Final PEIS analysis and preferred alternative.

The preservation of the nuclear production plant capabilities and capacities must receive full and fair consideration in the Final Stockpile Stewardship and Management PEIS. We are concerned that the planned reductions at the four production plants, as portrayed in the PEIS, are so severe that they will seriously impact the plants' ability to properly support the near-term and long-term safety and reliability of the Nation's nuclear weapons stockpile. This is an unacceptable situation which we look forward to seeing corrected in the Final PEIS.

We look forward to your assurance that the Department will thoroughly and fairly reevaluate ways to enhance and maintain the capabilities and production capacities at the Department's nuclear weapons production sites.

Strom Thurmond   Dirk Kempthorne
Fred Thompson   Bill Frist

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COMMENT LETTER — **PAGE 3 OF 3**

SSM-EF-002
COMMENT LETTER — **PAGE 1 OF 1**

Charlie Norwood
10th District, Georgia

Congress of the United States
House of Representatives

1707 Longworth Building
Washington, DC 20515
(202) 225-4101

May 7, 1996

Dr. Victor H. Reis, Assistant Secretary for Defense Programs
U.S. Department of Energy
Office of Reconfiguration
P.O. Box 3417
Alexandria, VA 22302

Dear Dr. Reis:

These comments are submitted in response to the Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management, DOE/EIS-0236, February 1996. Thank you for the opportunity to comment on maintaining the safety and reliability of the enduring weapons stockpile.

1/40.76

In the area of stockpile management, the Savannah River Site could provide full plutonium production scale capability, as opposed to extending the research and development capability of a national laboratory into a production arena.

The Savannah River Site, the nation's only functional, large-scale plutonium operation, offers the potential to achieve cost savings through common use of the site's existing facilities and infrastructure among all of the Department's nuclear material missions in the areas of defense, stabilization, and disposition. The Department should evaluate these programs from a holistic view, not in a piecemeal manner. This could save the taxpayers' millions of dollars

Sincerely,

Charlie Norwood
Member of Congress

SSM-EF-003
COMMENT LETTER

PAGE 1 OF 25

STATE OF TEXAS
OFFICE OF THE GOVERNOR

GEORGE W. BUSH
GOVERNOR

May 6, 1996

The Honorable Hazel O'Leary
The Secretary of Energy
U.S. Department of Energy
Washington, D.C. 20585

Re: Comments on Stockpile Stewardship and Management and Storage and Disposition of Weapons-Usable Fissile Materials Draft Programmatic Environmental Impact Statements.

Dear Madam Secretary:

The Pantex Nuclear Weapons Plant has been a key component in our nation's ability to achieve and maintain a strong national defense. The success at Pantex is a result of several factors, including good managers and dedicated, skilled, hard-working, efficient, and safety-conscious employees.

1/40.52

This nation continues to face an uncertain future with many risks. An effective strategy for diminishing those risks is to retain our core of expertise at the Pantex Plant. The Programmatic Environmental Impact Statements now being reviewed demonstrate that such a strategy is the best option for our nation's taxpayers.

The Pantex Plant enjoys broad community support because it has successfully demonstrated it can safely carry out its mission of assembling and disassembling nuclear weapons. That history of safety, success, and efficiency is the foundation for the future of the Pantex Plant.

The State of Texas is prepared to continue to assist Pantex with the significant role it plays in keeping the United States the defender of the free world.

Sincerely,

GEORGE W. BUSH

Post Office Box 12428 Austin, Texas 78711 (512) 463-2000 (Voice)/(512) 475-3165 (TDD)

SSM-EF-003
COMMENT LETTER

PAGE 2 OF 25

STATE OF TEXAS
OFFICE OF THE GOVERNOR

GEORGE W. BUSH
GOVERNOR

May 6, 1996

The Honorable Hazel O'Leary
Secretary of Energy
U.S. Department of Energy
Washington, D.C.

Dear Madam Secretary:

Enclosed are the comments from those individuals tasked by the State of Texas under the Agreement in Principle to evaluate the Draft Programmatic Environmental Impact Statements regarding Stockpile Stewardship and Management, and Storage and Disposition of Weapons-Usable Fissile Materials.

2/41.14

Pending before you is a request, from the Pantex Plant Citizens' Advisory Board and the Governor's Office, to extend the commenting period on the two documents to July 12, 1996. As was noted in that request, there is simply too much material to adequately review in such a short period of time

Should the May 7, 1996 deadline be extended, the enclosed comments will be amended to include a more detailed and thorough analysis.

Sincerely,

ROGER MULDER
Director, Pantex

Post Office Box 12428 Austin, Texas 78711 (512) 463-2000 (Voice)/(512) 475-3165 (TDD)

STATE OF TEXAS
OFFICE OF THE GOVERNOR

May 6, 1996

U.S. Department of Energy
Office of Reconfiguration
P.O. Box 3417
Alexandria, Virginia 22302

U.S. Department of Energy
Office of Fissile Materials
P.O. Box 23786
Washington, D.C. 20026

Re: Comments on Stockpile Stewardship and Management (SSM) and Storage and Disposition (S&D) of Weapons-Usable Fissile Materials Draft Programmatic Environmental Impact Statements (PEISs).

On behalf of the State of Texas, the Office of the Governor would like to thank you for the opportunity to comment on the U.S. Department of Energy's PEISs on Stockpile Stewardship and Management, and Storage and Disposition of Weapons-Usable Fissile Materials. Because those issues are so closely intertwined with the Pantex Site-Wide EIS, some of my comments may address that document as well.

1/40.52 continued

First and foremost, the State of Texas would like to re-emphasize our insistence that all current and future missions at Pantex be conducted in a safe and environmentally sound manner. Pantex has a long history of being a good neighbor, and one of the primary reasons is because it believes in protecting human health and safety, and the environment.

Based upon a review of all of the PEIS volumes, and statements made during the public hearings in Amarillo by DOE officials on April 22 and 23, 1996, our conclusions were confirmed that all actions considered for Pantex will have no significant impact on the health of workers nor any significant adverse impacts on the environment in the Amarillo area.

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DOE PEIS Comments
May 6, 1996
Page Two

However, as stated numerous times in the public hearings, there is concern that this statement of no significant impact is not clear in the summary document of the Storage and Disposition PEIS.

Instead, what is stated numerous times is: "Adverse impacts to water resources at Pantex would result from the continued local draw down of the Ogallala Aquifer, but Pantex's contribution to this draw down is expected to continue to decrease due to a decrease in other DOE activities at Pantex. Neither surface or ground water resources at other DOE sites would be affected."

The State of Texas believes this statement inaccurately and incorrectly singles out Pantex as an unacceptable site for its existing mission, as well as for any future missions. We ask that this be corrected immediately.

In reference to the statements regarding adverse impacts, the Amarillo community was told by DOE officials during the public hearings that there were no significant impacts on the environment, safety, or health from current or future missions proposed at Pantex. Therefore, the inaccurate perception of adverse affects, noted in the summary S&D document, should be corrected in the final document.

Toward that end, the State of Texas requests that in the S&D PEIS summary document, a clear statement should be added that no significant environmental impact would result from any considered alternatives at Pantex. In addition, the ranking of sites based upon these insignificant impacts (found in the sections Long-Term Storage Alternatives (page S-46), Disposition Alternatives (page S-46), and Comparison of Sites Within Alternatives (page S-48)) should be removed from the final report.

If the DOE insists upon using the word *adverse* in the final document to denote any deviation from the "natural state" of the environment, it should be applied equitably among all sites and quantified with the level of significance, since any action that disturbs nature could be considered adverse and every site considered would have adverse impacts for all alternatives.

3/30.01

The State of Texas is pleased that DOE selected Pantex as the preferred alternative for assembly/disassembly, thereby abandoning earlier plans to transfer those functions to the Nevada Test Site.

DOE PEIS Comments
May 6, 1996
Page Three

4/34.01 The same factors that lead DOE to make the correct decision in assembly/disassembly activities, should be applied to the issue of moving the High Explosives production operations from Pantex. DOE's own estimate that such a move would cost at least $40-$50 million should make Pantex the only choice for those activities.

Another factor is the risk involved in transporting the material from Pantex. And finally, there is a significant technology risk, should the High Explosives production program leave Pantex, while the highly skilled, experienced workers choose to remain in the Amarillo area.

If the statement is made that there simply is not enough work to keep workers busy in both the New Mexico labs and Pantex, the obvious choice is to keep the work at Pantex and allow the lab personnel the opportunity to maintain their proficiency by visiting Pantex.

Since that work is done at Pantex today, how are the lab personnel currently maintaining the desired level of proficiency?

STORAGE OPTIONS

5/40.20 Pantex has a proven history of safely storing nuclear weapons over the past 40 years.

Pantex could continue to store plutonium which is already at the site and upgrade facilities for the storage options being considered by DOE with minimal cost and difficulty. Pantex currently safely houses more than 8,000 surplus pits. It makes little sense to re-create storage facilities at another site and then unnecessarily transport large amounts of plutonium across the country from Pantex.

Pantex has the necessary safety, security, and surveillance capabilities to accommodate an expanded role with minimal costs and it is the production site closest to Los Alamos, the planned pit fabrication site.

DOE PEIS Comments
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Page Four

We believe any future missions at Pantex related to plutonium can be successfully carried out, provided the following three criteria are met:

1. Continued Local Support
2. Proven Technology
3. Independent Oversight

OFF-LINE ISSUES

During the public hearings in Amarillo, a number of comments were made from the audience requiring clarification from the DOE presenters.

Unfortunately, on more than one occasion, the response from the DOE official was that he and the questioner should "discuss that issue off-line."

Because the State of Texas believes that to be a totally inappropriate and unacceptable response to make, especially at a public hearing called for the sole purpose of discussing the issues contained in the PEISs, I attempted to capture as many of those questions in writing as possible.

STORAGE AND DISPOSITION OF WEAPONS-USABLE FISSILE MATERIALS PEIS ISSUES

Comment:

Section 1502.1 of 40 CFR Parts 1500-1508, the regulations implementing the National Environmental Policy Act, states:

DOE PEIS Comments
May 6, 1996
Page Five

"The primary purpose of an environmental impact statement is to serve as an action-forcing device to ensure that the policies and goals defined in the Act are infused into the ongoing programs and actions of the Federal Government. It should provide full and fair discussion of significant environmental impacts and shall inform decision-makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment. Agencies shall focus on significant environmental issues. . . Statements shall be concise, clear and to the point, and shall be supported by evidence that the agency has made the necessary environmental analyses." (Emphasis added)

Question

In light of these very clear and concise instructions based in law, how does DOE rationalize that Pantex is identified as having:

"the greatest potential to experience adverse cumulative impacts, particularly because of its relatively small, compact area. Water resources and biological resources would be vulnerable, and land resources . . . could be susceptible to adverse cumulative impacts" (p. S-46) (Emphasis added)

Comment

The Summary discusses three plutonium disposition categories (deep borehole, immobilization and reactor) consisting of nine alternatives, and ultimate high-level waste disposition.

Questions:

a If the immobilization alternatives and reactor alternatives (except CANDU) result in the same ultimate disposition, i.e. a high-level waste repository, what is the cost/benefit of the reactor alternatives?

b Are the references to a high-level waste repository referring to DOE's Yucca Mountain project in Nevada?

c What would constitute ultimate disposition in the case of the CANDU reactor alternative? Would the Canadians be allowed to send the resultant high-level nuclear waste back to the U.S.?

DOE PEIS Comments
May 6, 1996
Page Six

Comment

The oft-repeated phrase appears in the Summary:

"Potential adverse intersite transportation impacts related to all DOE sites could occur because of the increased risk of traffic accident fatalities."

Question:

Does any other site, except Pantex, have the capability to avoid the problem of having to ship the 21.8 metric tons of plutonium declared surplus by the President, since the material is already at Pantex?

Is there no risk to human health associated with intersite transportation of radioactive materials? Has a dose risk assessment been made?

Comment

In the Storage and Disposition Summary it is stated (page S-20) that "Potential adverse impacts to waste management would occur at Pantex, ORR (all three options), and SRS, because the construction of sanitary, utility, and process waste water treatment systems to treat non hazardous liquid wastes may be required."

Question

- How can the construction of facilities and systems to treat waste have the potential to adversely impact the *management* of waste? Is this a significant environmental impact as intended by Section 1502.1 of the NEPA regulations?

DOE PEIS Comments
May 6, 1996
Page Seven

Comment

In Volume III of the Storage and Disposition PEIS (pp. M-131 through M-155), the chemicals used are as follows:

Hanford reports 3 chemicals, none with slope factors
NTS reports NO chemicals
INEL reports 28 chemicals, 12 with slope factors
Pantex reports 25 chemicals, 6 with slope factors
ORR reports 10 chemicals, none with slope factors
SRS reports 15 chemicals, 5 with slope factors
Rocky Flats reports 10 chemicals, 3 with slope factors.

These reported chemical usages present an erroneous comparison, as all sites under consideration will use similar chemicals. For example, benzene is a combustion product of both diesel fuel and gasoline, and would be common to all sites.

Question:

Was the manner by which the information was requested not specific enough to ensure accurate reporting or are the records at some sites incomplete? Please correct.

Comment

In the Summary (p. S-46), it is stated that "When the other DOE programs previously identified in this section are considered, the rank order of DOE sites in terms of their descending potential for cumulative impacts changes to SRS, INEL, Pantex, NTS, Hanford and ORR." A similar statement appears on p. S-47.

Question

What does this statement mean? It is obscure and demands an explanation that is concise, clear, and supported by evidence.

DOE PEIS Comments
May 6, 1996
Page Eight

STOCKPILE STEWARDSHIP AND MANAGEMENT PEIS ISSUES

Comment

Separation of the explosive fabrication and assembly/disassembly missions would require that explosives be transported over long distances in order to be mated with the physics packages. In the case of LLNL, the extensive winter fogs of the San Joaquin Valley that create near zero visibility, sometimes for weeks-on-end, should be considered in any safety analysis.

Question:

6/09.06

a. Has an analysis been made of the additional hazards of transportation of HE from either of the national laboratories to where it would be used?

b. What would be the increased costs of intersite transportation?

Comment:

7/04.15

NTS workers and their families associated with the 2,253 new jobs (SSM Summary p. S-32) would likely reside in Las Vegas, NV, which is one of the fastest growing areas in the country.

Question:

Has an analysis been made of the impact of these additional residents on the Las Vegas municipal water supply?

Comment:

The preferred alternative for the location of explosives development has not yet been determined. Moving HE production from Pantex to one of the laboratories is under consideration. Note that there have been attempts to develop the land right next to LLNL's Site 300 fence for new housing.

DOE PEIS Comments
May 6, 1996
Page Nine

Question:

8/01.03
a. If the operation is moved to either LLNL or LANL, where would the building be placed and the testing be done?

b. What is the current and projected land use around LANL and LLNL (particularly, Site 300)?

A number of questions were also raised during the April 22-23 hearings in Amarillo that were addressed specifically to the Pantex Site-Wide EIS. Those questions will be included when the State issues its comments on that document.

If you have any questions or need additional information, please write or call me at 512/463-2198.

Sincerely,

Roger Mulder

ROGER MULDER
Director, Pantex

Support Material

The major impact areas covered by the S&D PEIS focus on water, air, and land resources. Pantex was named 3 times with air impacts, 4 times with land impacts, 6 times with waste impacts, and at least 11 times with ADVERSE water resource impacts. The statements about air and land impacts may be reasonable because at least one other site was mentioned with similar impacts (i.e. Pantex was not singled out to a large extreme. However a more accurate picture would result if DOE stated that these impacts are not significant). The most inaccurate representation in the summary is the discussion of adverse water resource impact, for which Pantex was incorrectly singled out at least 11 times above the other sites. Details are provided below.

Water Resources

- Water Availability:

All comparisons on water resources were made relative to the NO ACTION ALTERNATIVE for each site, with no absolute basis among sites, and always expressed as a percentage of the NO ACTION ALTERNATIVE. Without an absolute basis among sites to ascertain the "true impact on the environment", no rank ordering of sites or preferred alternatives based upon environmental impact can be justified. However, contrary to logic, this was done in the sections titled *Long-Term Storage Alternatives* (page S-40), *Disposition Alternatives* (page S-46), and *Comparison of Sites Within Alternatives* (page S-48).

To make this point clear, for a site that has worked to conserve water in the past, and which has a small water demand, the percentage increase due to any increase in construction or operation activity are disproportionately large relative to a site which has not applied water conservation techniques and which has a large water usage at the NO ACTION ALTERNATIVE (see item #1 below). On the percentage basis used relative only to the NO ACTION ALTERNATIVE, sites which apply conservation techniques are unfairly singled out.

Second, relating everything to the NO ACTION ALTERNATIVE without an absolute basis, implies that the current water demand significantly impacts the available supply or is a significant part of the demand of the local community such that a large percentage increase in water demand detrimentally affects the amount of water available for the local community (i.e. farmers and ranchers). Contrary to that implication in the summary, the impact of any of these activities on the Amarillo area water consumption would be less than 1% (see item #2 below).

To put this issue in perspective, the baseline (NO ACTION ALTERNATIVE) water consumptions are summarized below taken from the Summary S&D PEIS in million liters per year (MLY) focused only on the ground water component:

NO ACTION ALTERNATIVE (MLY)

Hanford	NTS	INEL	Pantex	Oak Ridge	SRS	RFETS
13,511	2,400	7,570	249*	14,760	13,247	439

* note the water use at Pantex for 1994 was 836 MLY and is "expected" to decrease to 249 MLY by 2005 due to drawdown (a small baseline made smaller). Ref. Vol II, p 4-167.

Item #1: The PEIS quotes increases in ground water usage for Pantex for the various alternatives from 2.8% to 44.2% above the NO ACTION ALTERNATIVE (this percentage increase is based upon the projected baseline of 249 MLY for the year 2005, a decrease from the current use rate of 836 MLY). Taken out of context, these numbers seem extreme. Indeed, these percentages were incorrectly brought forward in the word summary using this statement repeatedly: *"Adverse impacts to water resources at Pantex would result from the continued local drawdown of the Ogallala Aquifer, but Pantex's contribution to this drawdown is expected to continue to decrease due to a decrease in other DOE activities at Pantex. Neither surface or ground water resources at other DOE sites would be affected."* This causes the inaccurate perception that the large projected percentage increase in water use would be detrimental to the welfare of the local community. This might have been true if indeed the absolute demand placed on the available resources was significant. But, the maximum estimated increase is less than 1% of the water use in the area and a 44% increase of 1% is only 0.4% absolute increase (and this was based upon the 2005 projection, relative to current operations it would be a 67% decrease in water usage).

Item #2 (Ref: Vol 1, p 3-159 to 3-162):

- A: In 1994 while Pantex was drawing 836 MLY (836×10^6 L), the city of Amarillo pumped 23.9 BLY (23.9×10^9 L), from the Carson County well field. Using the PEIS number of 249 MLY in 2005, this equates to about 1% of the Town's water use. If water pumped directly by agriculture (which does not go through the Amarillo's water plant) were included this figure the relative demand by Pantex on the water drawn from the Ogallala Aquifer would be well below 1%.
- B: The recoverable water volume in storage and available for use in the Ogallala Aquifer in the High Plains Aquifer system is estimated at 5.15×10^{14} L. At this rate, if Pantex were operated for 1000 years using the highest water demand of all alternatives (Collocation - 379 MLY), Pantex would use less than 7/100% of the available water.

In summary, the repeated statements of adverse impacts on groundwater resources for any and all alternatives is based upon an inaccurate reference point and the actual impact brought out in the draft summary has no basis. To satisfy the requirement to make comparisons of water usage against the no action alternative, we suggest that the no action alternative be place on a percentage basis of actual area water usage to allow for an equitable and objective comparison between sites. For any sites where this percentage increase is insignificant, the PEIS and its Summary should state that fact clearly.

Texas Department of Health

David R. Smith, M.D.
Commissioner

1100 West 49th Street
Austin, Texas 78756-3199
(512) 458-7111

Radiation Control
(512) 834-6688

Carol S. Daniels
Deputy Commissioner for Programs

Roy L. Hogan
Deputy Commissioner for Administration

May 6, 1996

Mr. Jay Rose
Department of Energy
Office of Reconfiguration
1,000 Independence Avenue, S.W.
Washington, D.C. 20585

Dear Mr. Rose:

Enclosed are comments on the Draft Programmatic Environmental Impact Statement (PEIS) for Stockpile Stewardship and Management. We appreciate having been provided the opportunity to participate in this process and sincerely hope that our efforts contribute to overall success in resolving the difficult issues now before you.

9/40.51 | The Stockpile Management Preferred Alternatives, briefed at the April 22 and 23 1996 Amarillo Public Meetings, consisting of downsizing most Weapons Complex operations in place augmented by re-establishment of pit component manufacturing capability at Los Alamos National Laboratory, would have the least negative radiological impact on the affected regions of interest.

4/34.01 continued | The noted inclination to duplicate high explosives operations at Los Alamos National Laboratory, Lawrence Livermore National Laboratory, or both raises many more serious safety issues, however, than are presented in the PEIS, or are adequately addressed in the Stockpile Management Preferred Alternatives Report.

Efforts now underway and programmed to begin in the near future to update assessments and refine estimates of radiological and other health impacts from Pantex Plant operations on the worker and general populations must be maintained on schedule to increase public confidence in and acceptance of the continued mission at Pantex. We will continue to follow this important issue, and provide appropriate insight and assistance.

If we can be of any further assistance, please do not hesitate to contact us.

Sincerely,

Joseph A. Martillotti
Pantex Special Project Coordinator
Division of Compliance and Inspection
Bureau of Radiation Control

Enclosure

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Stockpile Stewardship and Management
DRAFT PEIS Comments

4/34.01 continued
6/09.06 continued
Summary, Page S-17 - High Explosive Components - The DRAFT PEIS documents do not provide sufficient information to support the claims that "...either laboratory has sufficient capacity to meet..." high explosives needs, or that "Costs for this function are relatively low...". In addition, safety issues related to shipment of shaped charges were not assessed in detail, either in terms of increased volume of shipments of shaped components over raw high explosives, or in terms of the technical vulnerabilities of the components.

10/34.11
Summary, Page S-31 - Relocate To Los Alamos - The statements that LANL research and development facilities currently possess sufficient (operational) capacity with little or no building construction/modification was apparently not based totally in fact, as evidenced by the failure to adequately address concerns expressed in the April 22 and 23, 1996 Amarillo public meetings. Further review of the Stockpile Management Alternatives Report and Analysis of Stockpile Management Alternatives Report verified that the DOE requirements for certification of those buildings to current standards was apparently ignored.

11/34.12
Volume I, Table 3.4.5.3-1, Page 3-76 contains insufficient information for analysis. The baseline numerical information contained in Table 3.4.5.2-1 cannot be compared reasonably with "minimal" resource requirements. It would appear, based upon a simple comparison between Table 3.4.5.2-2 and Table 3.4.5.3-2 that the missing "baseline" data should have been readily available for insertion in the table.

Texas Department of Health

David R. Smith, M.D.
Commissioner

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Carol S. Daniels
Deputy Commissioner for Programs

Roy L. Hogan
Deputy Commissioner for Administration

May 6, 1996

Mr. J. David Nulton
Department of Energy
Office of Fissile Materials Disposition
P. O. Box 23786
Washington, D.C. 20026-3786

Dear Mr. Nulton:

Enclosed are comments on the Storage and Disposition of Weapons-Usable Fissile Materials Draft Programmatic Environmental Impact Statement. Under the Atomic Energy Act, the Department of Energy is not subject to external regulation of use and handling of Special Nuclear Materials. The Secretary of Energy has committed to determining the feasibility of external regulation by the Nuclear Regulatory Commission (NRC), the Defense Nuclear Facilities Safety Board and/or NRC Agreement States. We believe that some form of external oversight of DOE activities in the Long-Term Storage phase of this project is in the best interest of the Department and stakeholders, and encourage the Department to move ahead with this initiative without delay.

Any change in the mission or operations at Pantex resulting from this PEIS must be undertaken with maximum consideration given to full compliance with published standards for protection of the public and environment against the effects of radiation. Future management of Pantex is crucial to the future of the Texas Panhandle, not only in near term socioeconomic terms, but also in fulfilling responsible stewardship of the environment for our successors. Decisions made in this process should be made giving full consideration to the needs of local citizens as well as the nation.

We appreciate having been given the opportunity to participate in this process and sincerely hope that our efforts contribute to overall success in resolving the difficult issues.

Sincerely,

Joseph A. Martillotti
Pantex Special Project Coordinator
Division of Compliance and Inspection
Bureau of Radiation Control

Enclosure

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Storage and Disposition
DRAFT PEIS Comments

Summary, Page S-46 - Long-Term Storage Alternatives - The statements concerning land use appear to conflict with Volume II, Pages 4-175 and 4-191 text.

Summary, Page S-48 - Comparison of Sites Within Alternatives - The statements concerning environmental impacts do not appear to be supported by the text and appear to be in conflict with Volume II, Pages 4-175 and 4-191 text.

Summary, Page S-67 - Facility Accidents - The statements do not provide any information or discussion upon which decisions might be based. A discussion of accident assessments previously documented would provide clarification. Volume I, Chapter 1.1.1, Page 1-2 "Materials Covered in This PEIS" describes the base condition and storage configuration from which decisions will be made. Discussion of the Plutonium Working Group findings, Defense Nuclear Facility Safety Board recommendations and the DOE standard for long-term storage of the fissile materials appears to be absent from the text. Provision of a general summary of the identified vulnerabilities or upgrades to storage conditions would be a useful addition to this table.

Summary, Page S-78 - Upgrade Existing Facility for Continued Storage - The "estimated impacts from a set of accidents that propagate radioactive releases" data appear to be a replica of Table 2.5.1, Volume I, Page 2-180. This is identical to "Beyond design basis earthquake" data contained in Table 4.2.3.9-4, Volume II, Page 4-160. Table M.5.2.3.2-1, Volume III, Page M-269, presents "Upgrade of Pantex Interim Storage" "Evaluation of a Composite Set of Accidents" impacts which are similar (within order of magnitude) but not totally consistent with the above information.

Summary, Page S-96 - Consolidate all Pu Material at One Site - The "impacts from a set of accidents that propagate radioactive releases" data appear to be a replica of Table 4.2.4.9-6, Volume II, Page 4-218, "Beyond design basis earthquake" scenario. The Table on Page S-96 replicates Table 2.5.1, Volume I, Page 2-199. However, Table 5.2.1.2-4, Volume III, Page M-242 contains a summary entitled "Evaluation of Composite Set of Accidents" which presents conflicting information.

Summary, Page S-117 - Collocation of Pu with HEU Storage Upgrade and/or New Facility - The headers of data columns indicate that the projections reflect a "set of accidents that propagate radioactive releases." The data presented, with the exception of MEI statistics, match exactly with Table 4.2.4.9-7, Volume II, Page 4-222. The table on S-117 replicates Table 2.5-1, Volume I, Page 2-219. Table 5.2.2.2-4, Volume III, Page M-251 "Collocation Alternative" contains a summary entitled "Evaluation of Composite Set of Accidents" which presents conflicting information.

Summary, Pages 149 and 150 appear to be out of order.

COMMENTS
BY
DAVID BOYLE
TEXAS A&M UNIVERSITY

4/34.01 continued

1. High Explosives (HE) Manufacturing.
The PEIS's assessment of key factors for this issue is generally inadequate and, in some cases, blatantly biased. The draft PEIS inaccurately "stacks the deck" in favor of moving HE manufacturing from Pantex to the labs. Draft findings on costs, core technical competency, and safety and environmental impact of the alternatives all need an improved, more objective analysis.

(A) Costs. The PEIS frequently dismisses as unimportant the cost differential between right-sizing HE manufacturing at Pantex and establishing it as a new mission at LANL and/or LLNL. The cost analyses are opaque and do not properly consider:

1) the higher cost of manufacturing man-hours at the labs versus Pantex.
2) the extra cost of transporting HE pieces manufactured at the labs to Pantex for warhead assembly.
3) the wasted sunk costs for the extensive high-tech HE manufacturing equipment recently installed as part of a Pantex upgrade.

The PEIS and various DOE spokespersons frequently claim "savings to the taxpayer" as a critical factor for the right-sizing decisions that hurt the economies of specific communities. When objectively determined costs for moving HE manufacturing to the labs are integrated over the long term (50 years or more), taxpayer savings is significant. Why does DOE dismiss cost savings as unimportant in this one case?

(B) Core Technical Competency.

1) The SSM PEIS ignores or seriously undervalues the significant technical risk to the enduring stockpile of moving HE manufacturing out of Pantex. All three lab directors have testified under oath to Congress about the serious risks involved with changing warhead manufacturing processes in the absence of nuclear testing. According to the PEIS, each of the warhead designs in the enduring stockpile have undergone at least one stockpile confidence test (SCT). The SCT provides our best and only real-world certification that the manufactured warheads are truly reliable (this reliability is the critical element of deterrence—the whole reason for having the weapons in the first place). These confidence-tested weapons were Pantex-built, including HE manufacturing. We know they work. We know the Pantex HE

4/34.01 continued

manufacturing procedures and people perform the HE manufacturing function properly. Starting up this critical production process as a new mission at the labs and adding the subtle, unstable effect of long distance transport between HE manufacturing site and weapon assembly certainly adds serious technical risks that the PEIS does not adequately recognize.

2) The PEIS unfairly and incorrectly undermines the Pantex alternative for HE manufacturing by its egregiously unbalanced description of the alternative sites' technical qualities. An informal content analysis of the site descriptions illustrates the significant degree of bias in favor of moving HE manufacturing to the labs. For example, the description of LANL as a potential alternative contains such glowing phrases as:

—LANL has continued to upgrade and modernize..
—State-of-the-art processing equipment .
—Full range of HE-processing equipment
—Proven quality assurance processes
—Stringent disposal requirements
—Continuous process improvements drive an effective best practices program
—Important safety considerations are incorporated
—Etc. (the list could be much longer).

The above short list describing LANL's qualities applies equally well to Pantex. Yet, the analogous PEIS segment on Pantex is a matter-of-fact, spare- the-superlatives description of Pantex HE manufacturing capability which explicitly understates the same qualities that the authors found so advantageous at LANL.

(C) Safety and Environment.

6/09.06 continued

1) The PEIS does not adequately evaluate the the safety impact of transporting hundreds of HE hemispheres from the labs to Pantex each year should HE manufacturing be moved to the labs.

4/34.01 continued

2) The safety and environmental impacts on the labs and their local communities of conducting this potential new mission at the labs are glossed over as "insignificant" without a serious analysis.

12/34.15

3) Providing the labs the economic benefit of taking over the Pantex HE manufacturing mission seems particularly unfair in light of the fact that Pantex, and the citizens of Amarillo, will retain the environmentally problematic mission of disposing of the replaced HE components, while suffering the economic insult of losing the environmentally cleaner manufacturing mission.

13/11.01

2. Aircraft Accident Analysis. The aircraft crash frequency determination and supporting consequence analysis appears inconsistent with that in the Pantex Site-Wide PEIS. In general, a corrected analysis should explicitly take into account such factors as:

--Actions taken or planned to reduce overflight frequencies.
--Future facility and storage consolidation that can reduce the footprint for aircraft/warhead interaction.
--The expected widespread use of insensitive high explosives in most, if not all, enduring warheads; also the introduction of fire resistant pits.
--Aircraft size and mass, building structures, and other factors that affect the consequence calculations.

BUREAU OF ECONOMIC GEOLOGY
THE UNIVERSITY OF TEXAS AT AUSTIN
University Station, Box X · Austin, Texas 78713-8924 · (512) 471-1534 or 471-7721 · FAX 471-0140
10100 Burnet Road, Bldg. 130 · Austin, Texas 78758-4497

May 3, 1996

U.S. Department of Energy
Office of Reconfiguration
P.O. Box 3417
Alexandria VA 22302

Dear Sir or Madam:

The following are review comments on the "Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management" from staff at the Bureau of Economic Geology of The University of Texas at Austin.

General Comment:

14/05.02
15/04.14 | Sections 4.5.2.4 and 4.5.2.5, which describe water resources and geology and soils, do not provide adequate information for the reader to determine if environmental impacts could result from proposed alternative actions at Pantex.

Specific Comments:

16/01.02 | Figures 4.5-2, 4.5.2.1-1, and 4.5.2.4-1. Playas are incorrectly labeled as dry lakes on these maps. Playas should be described as ephemeral lakes, as they are in the text. Most playas, including playas 2, 3, 4, 5, and Pantex Lake, hold water for 1 to 3 months per year. Playa 1 holds water throughout the year because it receives discharge from the Pantex waste water treatment plant.
Figure 4.5.2.1-1. Scale is incorrect. Compare with that of figure 4.5-2, which is correct.

4.5.2.4 Water Resources
Ground water

17/04.05 | Page. 4-179, para. 1-3. There is no significant discussion of recharge to the Ogallala aquifer. It should be described that most recharge is derived from runoff that collects in playa lakes. Recharge is focused through playas, moves through the vadose zone, collects in the perched aquifer, flows slowly through the fine-grained zone beneath the perched aquifer, and eventually flows through the unsaturated zone between the perched aquifer and the Ogallala aquifer to finally collect in the Ogallala aquifer. No mention is made of the velocity of water moving through the vadose zone to the perched aquifer. For example, "bomb" tritium has been detected in the perched aquifer, which means that precipitation that fell after 1950 has already reached the aquifer. There is no discussion of ground-water flow in either the perched or Ogallala aquifers. There is no discussion of the fact that contaminants in the perched aquifer have already moved off the Pantex Plant to the east.

4.5.2.5 Geology and Soils

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Page 2

16/01.02 continued | Page. 4-182, para. 2. All playas shown in figures 4.5-2, 4.5.2.1-1, and 4.5.2.4-1 except playa 3 are approximately 900 to 1000 m in diameter.

18/05.03 | Page. 4-182, para. 3. The lithology of the Ogallala Formation is not described. The description should include a brief discussion of the complex heterogeneity of the Ogallala because the variation in sediment types controls ground-water flow in the formation. The significance of the fine-grained zone as well as gravels in buried channels beneath the plant should be explained.

14/05.02 continued | Page. 4-182, para. 3 or 4. No attempt is made to describe the role of salt dissolution and subsidence in the formation of playa basins. High solute loads in streams draining the region indicate that these processes are active regionally. No mention is made of the potential effects, if any, of dissolution-induced subsidence at the plant.

19/05.05 | Page. 4-182, para. 5. No attempt is made to point out that Randall clay soils are Vertisols and that deep desiccation cracks and root tubules, which are potential pathways for recharge, are characteristic of these soils. Furthermore, these soils have a ustic moisture regime, which means that water moves down through the soil at some time in most years. That is, recharge occurs through even these clay soils.

14/05.02 continued | 4.5.3.5 Geology and Soils
Page. 4-206, para. 2. Because the description of geology and soils in section 4.5.2.5 is inadequate, the reader cannot determine that "hazards posed by geological conditions are negligible at Pantex."

If you have any questions concerning these comments please call me at (512) 471-0232.

Sincerely yours,

Thomas C. Gustavson
Senior Research Scientist

TCG:dc

cc: R. Mulder, Governor's Office
T. Grimshaw, BEG
J. Raney, BEG
D. Ratcliff, BEG

BUREAU OF ECONOMIC GEOLOGY
THE UNIVERSITY OF TEXAS AT AUSTIN

University Station, Box X · Austin, Texas 78713-8924 · (512) 471-1534 or 471-7721 · FAX 471-0140
10100 Burnet Road, Bldg. 130 · Austin, Texas 78758-4497

April 29, 1996

U.S. Department of Energy
Office of Fissile Materials
P.O. Box 23786
Washington, DC 20026

Dear Sir or Madam:

The following are review comments on the "Storage and Disposition of Weapons-Usable Fissile Materials Draft Programmatic Environmental Impact Statement" from staff at the Bureau of Economic Geology of The University of Texas at Austin.

General Comment:

Sections 3.5.4. and 3.5.5., which describe water resources and geology and soils, do not provide adequate information for the reader to determine if environmental impacts could result from proposed alternative actions at Pantex.

Specific Comments:

Page 846, para. 3. Potential impacts of the long-term storage alternative at Pantex depend greatly on waste disposal practices in addition to the natural characteristics of the site. Although the Ogallala is a valuable and critically important ground-water resource, the presence of the resource does not necessarily make it vulnerable to impacts of waste storage. Detailed studies by the Bureau of Economic Geology and other entities have shown that recharge to the perched and Ogallala aquifers is focused through playas or artificially ponded areas such as ditches and that recharge in upland or interplaya areas is negligible. Recharge occurs where surface water accumulates and develops sufficient hydraulic head over sufficient time to drive waters below the zone of evapotranspiration. Recharge of water or contaminants may also occur beneath manmade excavations such as ditches and landfill sites where runoff can accumulate (these are roughly analogous to playas) or as the result of leaking underground storage tanks. Appropriate engineering practices to prevent releases from storage sites and placement of storage facilities in upland (interplaya) areas at the Pantex Plant should limit the potential for adverse impacts to water resources at Pantex. As long as no wastes are introduced into the playas, buried on site, or placed in an area where water can flow through the wastes or pond in contact with the wastes, contaminants should not be transported into the subsurface and the Ogallala should not be impacted by Pantex activities. Proper engineering and adequate monitoring and maintenance would, however, minimize impacts of long-term storage on the Ogallala at the Pantex Plant.

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Page 2

Figures 3.5.4-1 and 3.5.4-2. Playas are incorrectly labeled as dry lakes on these maps. Playas should be described as ephemeral lakes, as they are in Figure 3.5.1.-1. Most playas, including playas 2, 3, 4, 5, and Pantex Lake, hold water for 1 to 3 months per year. Playa 1 holds water throughout the year because it receives discharge from the Pantex waste water treatment plant.

Figures 3.5.4-1 and 3.5.4-2. These maps indicate that the southern boundary of the Pantex site includes the rights-of-way for both U.S. Highway 60 and the Burlington Northern and Santa Fe Railroad. Compare with figure 3.5.1-1 where the southern boundary is shown correctly.

Page 3-164, para. 2. Data from seismic surveys and playa basin cores acquired by the Bureau of Economic Geology suggest that playas 3 and 5 and Pantex lake are surface expressions of local subsidence related to dissolution of underlying Permian salt beds.

P. 3-164, para. 1. All playas shown in figures 3.5.1-1, 3.5.4-1, and 3.5.4-2 except playa 3 are approximately 900 to 1000 m in diameter.

P. 3-164, para. 2. The lithology of the Ogallala Formation is not described. The description should include a brief discussion of the complex heterogeneity of the Ogallala because the variation in sediment types controls ground water flow in the formation. The significance of the fine-grained zone as well as gravels in buried channels beneath the plant should be explained.

P. 3-164, para. 2 or 3. No attempt is made to describe the role of salt dissolution and subsidence in the formation of playa basins. High solute loads in streams draining the region indicate that these processes are active regionally. No mention is made of the potential effects, if any, of dissolution-induced subsidence at the plant.

P. 3-164, para. 5. No attempt is made to point out that Randall clay soils are Vertisols and that deep desiccation cracks and root tubules, which are potential pathways for recharge, are characteristic of these soils. Furthermore, these soils have a udic moisture regime, which means that water moves down through the soil at some time in most years. That is, recharge occurs through even these clay soils.

Page 4-187, para. 1. It is stated that the TNRCC projects that there will be adequate water until the year 2040. In fact this projection is probably from a Texas Water Development Board report from the early or mid-1980's.

Page 4-187, para. 3. It is stated that "I'o additic al impacts to groundwater quality are anticipated because there are no direct discharges to groundwater". This seems at least a little misleading in two areas. First, exactly how does one define direct discharge? The contaminants east of Zone 12 south document a fairly direct pathway for recharge water from the surface to the aquifer. Second, the current plans for treating contaminated water at the plant rely on the reinjection

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of treated water into the aquifer. This injection would also qualify as direct discharge to the aquifer.

Page 4-194, para. 1. Data from seismic surveys and playa basin cores acquired by the Bureau of Economic Geology suggest that playas 3 and 5 and Pantex lake are surface expressions of local subsidence related to dissolution of underlying Permian salt beds. Estimated average subsidence rates are low (about 0.01 mm/yr), but vertical movement may be episodic.

Page 4-859. The amount of ground-water decline that will result from projected production rates is given as 1.5 ft/yr. What is the source of this number. The writer also fails to mention that this incremental increase will be in addition to the drawdowns resulting from the Amarillo well field. Current rates of decline in the area of the Pantex well field are approximately 2 ft/yr. It would seem appropriate in a discussion of ground-water resources to include the impact of the Amarillo well field on the ground-water resources at the Pantex Plant.

If you have any questions concerning these comments please call me at (512) 471-0232.

Sincerely yours,

Thomas C. Gustavson
Senior Research Scientist

TCG:dc

cc: R. Mulder, Governor's Office
T. Grimshaw, BEG
J. Raney, BEG
D. Ratcliff, BEG

Office of the Attorney General
State of Texas

DAN MORALES
ATTORNEY GENERAL

May 13, 1996

The Honorable Hazel R. O'Leary
Secretary of Energy
7A257 Forrestal Bldg.
1000 Independence Ave., S.W.
Washington, D.C. 20585

Re: COMMENTS REGARDING FUTURE ACTIVITIES AT PANTEX

Dear Secretary O'Leary:

1/40.73

Upon review of the three interrelated environmental impact statements ("EISs") regarding the reconfiguration and future of the Department of Energy's nuclear weapons complex,[1] I am becoming increasingly concerned that the Department of Energy ("DoE") may soon decide to process plutonium pits at the Pantex facility. I am furthermore concerned--once again--that the Texas Panhandle will become the *de facto* permanent dump for the nation's surplus plutonium supply. Given the 24,000 year half-life of plutonium and the distinct possibility that the environmental, political, and social issues surrounding any other permanent disposition of plutonium will not be resolved in the foreseeable future, this is an ominous development for Texas.

I have attached previous correspondence between DoE and my office dating back to 1991. As is readily apparent from that correspondence, I have long been firmly opposed to both propositions. Unfortunately, it now appears that we are moving closer to decisions by DoE that will unfairly burden Texans during the coming decades and needlessly impose risks on the farmers and ranchers who depend upon the Ogalalla Aquifer underlying Pantex.

A decision by DoE to begin plutonium reprocessing, with its attendant problems and risks for residents throughout the Panhandle, or a decision to store surplus plutonium (*i.e.*, nuclear waste) on a medium- or long-term basis, is unacceptable to this office. Accordingly, I have instructed my staff to renew its efforts to develop all available legal options to prevent DoE from turning the Texas Panhandle into a *de facto* nuclear waste dump, or another Rocky Flats.

I realize that you and your office have made great strides in incorporating the concerns of all stakeholders in your decision-making process. For that, you deserve much credit. Unfortunately, I do not believe that the

[1] The three EISs are: (a) the PEIS on Storage and Disposition of Weapons-Usable Fissile Materials (which discusses, *inter alia*, the mixed-oxide fuel option in the most detail and discusses the alternatives, including a facility to cut the pits in two and process them into metal or oxide, to process other types of plutonium; and to mix plutonium with uranium to make mixed oxide fuel (MOX) to be used in nuclear power plants); (b) the Site Wide EIS for Pantex (which discusses the Pit Reuse facility in lesser detail), and (c) the PEIS on Stockpile Stewardship and Management.

512 463-2100 P.O. BOX 12548 AUSTIN, TEXAS 78711-2548

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1/40.73 continued | solutions that DOE appears to be adopting solve the environmental and bureaucratic problems associated with storing and/or disposing of plutonium for decades, centuries, and even millennia.

Sincerely,

Dan Morales

Dan Morales
Attorney General

Enclosure

c: DOE-Office of Fissile Materials Disposition
c/o SAIC-PEIS
P.O. Box 23788
Washington, DC 20026-3786

Ms. Nanette Founds
U.S. Department of Energy
Albuquerque Operations Office
P.O. Box 5400
Albuquerque, NM 87185-5400

Jay Rose
Office of Reconfiguration
1000 Independence Avenue, S.W
Washington, D.C. 20585

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COMMENT LETTER

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United States Senate
WASHINGTON, D.C. 20510-4302

May 5, 1996

The Honorable Hazel O'Leary
Secretary
U.S. Department of Energy
Forrestal Building
1000 Independence Avenue, S.W.
Washington, DC 20585

Dear Secretary O'Leary:

Thank you for the opportunity to comment on the U.S. Department of Energy's (DOE) Programmatic Environmental Impact Statements (PEISs) on Stockpile Stewardship and Management (SSM) and Storage and Disposition (S&D) of Weapons-Usable Fissile Materials. Please also consider this our comment on the Pantex Site-Wide Environmental Impact Statement, since most of the issues addressed in these documents are identical.

1/40.52 | First and foremost, we are adamant that any current and future functions at Pantex be conducted in a safe and environmentally sound manner. Our first priority is to ensure that any expansion at Pantex be implemented in a way that does not impair the health or safety of area residents or have an adverse effect on the environment. These goals serve as a prerequisite to any current and future activities at Pantex, including expansion.

2/40.66 | We are pleased that DOE selected Pantex as the preferred alternative for assembly/disassembly, thereby abandoning earlier plans to transfer those functions to the Nevada Test Site (NTS). However, by failing to recognize Pantex as the preferred candidate site for new and/or consolidated stockpile management facilities, the DOE overlooked the best site for maintaining the integrity of the U.S. nuclear stockpile and attaining maximum efficiencies and cost savings.

Pantex is perhaps the most cost-effective alternative for any new construction of SSM facilities. First, labor costs, utility rates, and water and land availability at Pantex, as well as public support, are more amenable than those at any other Complex site. It is appropriate to consider Pantex as an alternative site for all future defense-related facilities to complement activities at the national labs (such as the planned Atlas Facility and plutonium pit fabrication site at Los Alamos National Laboratory [LANL]). DOE makes no mention of a strategic plutonium reserve that we believe is important to our future national security needs, even though the PEIS mentions that strategic storage should be co-located with disassembly. We believe Pantex should be the preferred site for such a mission in coordination with its management functions. The location of additional defense-related activities at Pantex would ensure that core technical capabilities are preserved at a location that can secure them at the most efficient cost to the American people. In its deliberations, DOE should insist that budgetary comparisons between Pantex and other sites are accurate, and include capital, transportation, training, remediation, and other costs.

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3/34.01 Consistent with the strengths identified above for increased stewardship and management duties, the high explosives (HE) functions should also remain at Pantex. Because the production assembly/disassembly functions remain at Pantex, the HE fabrication duties should be present at the corresponding site. After all, the SSM draft admits that Pantex must retain HE capabilities to process the inventories already on site from dismantling. Therefore, the least expensive alternative is to maintain HE functions at Pantex. We adamantly disagree with the statement in the PEIS that there are no advantages to siting high explosives at Pantex rather than the national labs. The capitol outlay alone necessary for transfer is cost prohibitive. In addition, should future need arise for new weapons production, it will be critical to have the HE facilities at the weapons production/assembly site.

4/40.20 As the sole DOE-authorized facility for assembly and disassembly of nuclear weapons, Pantex has historically handled these functions in a safe and efficient manner for more than 40 years. One of the challenges faced after dismantling a significant portion of the nuclear stockpile is the processing or disposal of the materials that remain. In meeting this challenge, Pantex could continue to store plutonium which is already at the site and upgrade facilities for any and all storage options being considered by DOE with minimal cost and difficulty. Pantex currently safehouses more than 8,000 surplus pits, and plans are being made to ship additional pits from Rocky Flats to Pantex. It makes little sense to re-create storage facilities at another site and then unnecessarily transport large amounts of plutonium across the county from Pantex.

We also believe Pantex should be designated the preferred site for any disposition options and related functions. It makes budgetary and policy sense to site disposition where storage already exists. Furthermore, it makes no sense from any perspective, budget or otherwise, to site strategic storage at one site and surplus at another. Pantex should be selected for both storage functions. Pantex has the necessary safety, security, and surveillance capabilities to accommodate an expanded role with minimal costs and it is the production site closest to Los Alamos, the planned pit fabrication site.

Based upon these reasons, we respectfully urge DOE to designate Pantex as the preferred alternative site for all existing and new stockpile management and stewardship functions as well as consolidation of all plutonium storage and disposition and any related functions. Thank you again for the opportunity to comment on these documents.

Yours respectfully,

PHIL GRAMM
United States Senator

KAY BAILEY HUTCHISON
United States Senator

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COMMENT LETTER

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Statement of Congresswoman Karen McCarthy
Fifth District of Missouri

before the

U.S. Department of Energy
Public Hearing on Stockpile Stewardship and
Management Programmatic EIS
Kansas City, Missouri
April 9, 1996

ALLIED SIGNAL PUBLIC HEARING
TESTIMONY OF CONGRESSWOMAN KAREN McCARTHY
MISSOURI'S FIFTH DISTRICT
KANSAS CITY, MISSOURI
TUESDAY, APRIL 9, 1996

Our nation has relied on Kansas City Plant to produce high quality, reliable weapons technologies since 1945. At that time, we were trying to recover from one of our nation's most volatile international conflicts. The memories of World War II left lasting impressions of ghastly dictatorships and unconscionable war tactics that threatened nations throughout the world.

1/31.01

In order to suppress future global threats and use our strength to encourage peace beyond our borders, our nation must maintain critical weapons technologies and highly skilled human resources like those found at the Kansas City Plant. Allied Signal is a leader in developing quality, cost effective materials and processes to preserve our current nuclear weapons stockpile.

1/31.01 continued

It is the only fully capable, non-nuclear production center which produces components designed to enhance these preservation efforts.

Kansas City has remained a top choice for locating and expanding industries primarily because of our outstanding work force. At Allied Signal dedicated plant employees work as a team to ensure the continued safety and reliability of our nuclear weapons stockpile. Last year the plant's quality system earned ISO 9000 status, the highest international certification level. Allied Signal also has been recognized for its outstanding safety record.

1/31.01 continued

As plant officials accomplish downsizing goals through budget cuts and staff reductions, they have proven themselves an integral part of the nuclear weapons complex through the Logistics and Manufacturing Center (LMC). The LMC aims to increase efficiency and lower costs, as well as integrate stockpile support functions. The plant currently supplies about 60 percent of DOE's logistics and nonnuclear manufacturing product and could expand to provide more vital products and services more resourcefully with the support of the Department of Energy (DOE).

Allied has successfully transitioned from a Cold War weapons factory to a high-tech national security center. The Kansas City plant enhances our nation's economic competitiveness by sharing the latest technological applications with government agencies, private companies and educational

1/31.01 continued

institutions. Employees have also developed new environmental technologies that can be applied to industries unrelated to defense.

Allied Signal is developing partnerships with the Sandia and Los Alamos National Laboratories to coordinate future efforts. They also plan to better meet the DOE's future production needs by changing from a production-based system to a process-based system.

The United States has the most powerful defense in the world thanks in large part to the efforts of Allied Signal and its employees. We in the Congress will be closely watching the DOE's decision making process during the coming months to ensure the nation's security is held in the highest regard.

I appreciate DOE's initial support of the Kansas City Plant through the draft Stockpile Stewardship and Management Programmatic Environmental Impact Statement (PEIS), and I hope DOE will continue to recognize the national significance and technological potential of Allied Signal as we prepare for the 21st century. Thank you for this opportunity to add my voice to the many others supporting Allied Signal, a valued corporate partner and employer in Kansas City, and a vital resource to our nation.

BILL BAKER

Congress of the United States
House of Representatives

April 10, 1996

**STATEMENT OF U.S. REP. BILL BAKER
ON THE STOCKPILE STEWARDSHIP PROGRAM AT
LAWRENCE LIVERMORE NATIONAL LABORATORY**

I appreciate this opportunity to share my thoughts with you about the maintenance of America's nuclear weapons stockpile, specifically how to enhance the reliability and safety of that stockpile through technology developed by the Lawrence Livermore National Laboratory.

Nuclear weapons have been a central component of the national defense posture of the United States for decades. They have deterred both superpower and non-superpower alike from aggressive action in many tense international situations. The credibility of the U.S. nuclear deterrent has never been questioned, in part because we have maintained a program in the science and technology of nuclear weapons at our national laboratories. The Lawrence Livermore National Laboratory can be justly proud of its very important role in this effort throughout its history.

1/21.06

The current easing of tensions with the former Soviet Union has led many to question the need for our existing stockpile of nuclear weapons. In a democracy such as ours, such discussions serve to reinvigorate our national dialogue concerning the nature of our nuclear deterrent and also what we need to keep pace with our potential adversaries in a rapidly changing world.

Regardless of the future of the Russian Confederation, thousands of nuclear weapons will continue to exist. Moreover, the prospect for proliferation is very real. While an indefinite extension of the Nuclear Nonproliferation Treaty has been agreed upon by its signatories, there is compelling evidence that some countries are seeking to develop nuclear or other weapons of mass destruction. In such an uncertain world, an effective American nuclear deterrent must be a top priority of our national defense effort.

At the same time, national and world opinion is predominantly against the resumption of nuclear testing. Thus, the Department of Energy and our national weapons laboratories have been asked by Congress and the Administration to develop a new program to assure the continued safety, reliability, and dependability of the nuclear stockpile without the use of nuclear testing.

The laboratories have responded to this challenge by developing a science-based stockpile stewardship and management program that will use advanced computer capabilities and a complete set of laboratory experimental facilities. They will thereby provide a full range of weapons data scientists need to verify computer models, evaluate problems that arise in the stockpile, and help scientists correct them.

1/21.06 continued

The National Ignition Facility (NIF) is a cornerstone of that program. The computers and the experimental facilities of the NIF are the main tools with which scientists will maintain our nuclear weapons stockpile.

The United States must also continue its historic commitment to arms control and nonproliferation of weapons of mass destruction. This is why we are pursuing a "zero"-yield Comprehensive Test Ban Treaty. We can do this today only by building a credible science-based Stockpile Stewardship and Management Program that contains all necessary elements. According to the preferred alternative of the draft Programmatic Environmental Impact Statement (PEIS) under consideration, these elements include the Accelerated Strategic Computing Initiative (ASCI), the NIF, the Atlas facility at Los Alamos, and the Contained Firing Facility at Site 300. Indeed, the recent study of the NIF and its relationship with nonproliferation concluded that the NIF can help implement our joint goals of nonproliferation and arms control.

The draft Programmatic Environmental Impact Statement makes several observations about the NIF. In its consideration of the so-called "no action alternative," which assumes that the NIF would not be built, the Statement says, "issues may arise that decrease confidence in the reliability of these weapons and increase the probability that the United States may need to invoke 'supreme national interest' and withdraw from any Comprehensive Test Ban treaty in effect." This warning underscores the critical importance of the NIF to maintaining confidence in our stockpile and its important for our arms control objectives.

In addition, I was pleased that the draft Statement confirmed earlier studies of the benign nature of the NIF with respect to environmental impact and safety issues. The analysis, done by an independent organization, confirmed that the NIF will have minimal on-site and negligible off-site effects during its construction and operation.

2/21.09

Finally, we must consider the assessed economic impact of the NIF. The analysis previously noted concluded that the NIF construction project would create 3320 jobs at its peak in Alameda, Contra Costa, and San Joaquin counties. Maintaining and operating the NIF after completion of its construction would create 890 permanent jobs, a conservative estimate that does not count the people in programs which would use the facility for experiments. Such an employment boost is welcome news to the greater East Bay region.

1/21.06 continued

The NIF is especially important to this discussion because Lawrence Livermore National Laboratory has been named the preferred site by the Department of Energy for the NIF's construction. With its multiple missions, the NIF is not only a key element of the Stockpile Stewardship and Management Program but it will also answer vital questions about how to develop inertial fusion energy. The NIF will also create a new capability for high temperature and density basic science. These exciting scientific challenges will attract the best scientists and engineers in the country to work at LLNL and contribute to the solutions of the questions noted above.

The Livermore community and the Tri-Valley region support construction of the NIF at Lawrence Livermore National Laboratory. I support the conclusions of the draft Programmatic Environmental Impact Statement and applaud the Department

1/21.06 continued

of Energy and the Lawrence Livermore Lab for their commitment to developing the NIF. Sound stewardship of our nuclear weapons is too important to leave to chance - - which is why I support the NIF at Lawrence Livermore Lab.

Thank you for letting me present my views to you today.

####

SSM-EH-ORR-001
COMMENT LETTER

PAGE 1 OF 2

JOHN J. DUNCAN, JR.

Congress of the United States
House of Representatives
Washington, DC 20515–4202

March 29, 1996

The Honorable Hazel R. O'Leary
Secretary
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585

Dear Secretary O'Leary:

I appreciate the opportunity to become better informed on the Programmatic Environmental Impact Statement (PEIS) which will determine a reasonable range of alternatives for carrying out the responsibilities of the Stockpile Stewardship and Management Program. In the months to come, I am sure this issue will receive much attention in the Congress.

I am most pleased with the decision that the Oak Ridge National Laboratory (ORNL) and the Y-12 core missions will remain in Oak Ridge, Tennessee. I sincerely believe that our constituents are best able to perform this function that is vital to national security.

However, I do have a few questions remaining. At a time when budget cuts affect virtually all federal programs, I agree that it is time to eliminate bureaucratic waste and abuse in DOE.

1/40.13 Specifically, what is the total cost for downsizing under the PEIS proposal? I am very concerned that the total cost of downsizing might not include the decontamination and decommissioning of specific sites, such as Y-12. Is clean-up at the Y-12 site a part of this plan and how would it be funded? How much money would be saved if the PEIS process were stopped today?

2/08.01 Also, while the PEIS talks about jobs being transferred, what assurances can you give that this will not result in a sharp decline in area-wide employment until the decontamination and decommissioning funds are available?

I have always been a strong supporter of the work done at Oak Ridge National Lab, Y-12, and K-25. Although the complex is not located in my Congressional District, more employees live in the 2nd District than in any other. As a result, I am certainly aware of the benefits this facility has to both East Tennessee and the Country.

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-2-

Thank you for your prompt response.

With kindest regards, I am

Sincerely,

JOHN J. DUNCAN, JR.
Member of Congress

JJD:jb

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COMMENT LETTER

PAGE 1 OF 2

Senate Chamber
State of Tennessee
NASHVILLE

March 26, 1996

Ms. Hazel O'Leary
Office of the Secretary of Energy
U. S. Department of Energy
S/7A-257/FORS Bldg.
1000 Independence Ave, S.W.
Washington, D.C. 20585

Dear Secretary O'Leary:

1/33.01 As long time residents and now State Senator and Representative for Oak Ridge, we each have a thorough understanding of the Y-12 Plant and its unique manufacturing capabilities for which our nation's defense has relied upon for several decades. We completely support the preferred alternative listed in the Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management that has Y-12 retaining its secondary and fabrication mission in a downsized in-place status. However, we still have a continued concern about the PEIS process.

2/41.10 In preparation for public comment meetings to be held in Oak Ridge on April 1 and 2, our community is being asked to review and comment on two separate draft PEIS statements that collectively are more than 12 inches thick. These volumes total ten times the size of the Anderson County telephone directory. While our community, loyal citizens, and regional political leaders are appreciative of the opportunity and continue to attend these public hearings, we are beginning to seriously question this public comment process. The number of public hearings and associated PEIS documents our community has been asked to review since the Complex Reconfiguration hearings four years ago have been overwhelming. The cost and credibility of the hearings is a concern. The fact remains that Y-12 is the one best place to perform secondary and fabrication missions as well as the associated uranium storage mission.

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COMMENT LETTER

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Ms. Hazel O'Leary
page two
March 26, 1996

2/41.10 continued We are not questioning the NEPA process, nor the need for public input and participation. We are questioning the cost and effectiveness of the multitude of PEIS efforts that are redundant and that often appear manipulated for the best interest of the weapons design laboratories at the expense of weapon production sites.

1/33.01 continued It is now time for a decision. We support keeping the Y-12 missions in place and we realize some downsizing will and must occur. We resent, however, the continued effort of some DOE officials to attempt to move these historic Y-12 missions to the weapons design laboratories and to "cherry pick" the technology associated with these missions. We will continue to diligently protect what is best not only for our community but for the national security of our country. Thank you for your consideration of our comments.

Sincerely,

Randy

Senator Randy McNally

David L. Coffey

Representative David Coffey

Hand-In Received from Congressman Mac Thornberry.

Thank you for allowing me the opportunity to make a few remarks.

Many of the others who will testify
will discuss the outstanding record of the Pantex plant,
the unparalleled level of community support which the plant enjoys,
and the willingness to consider other missions
as we sort out the nuclear weapons complex after the Cold War.

I'm going to focus on some broader questions
which certainly affect Pantex
but also the larger security needs of the country.

I do so not because I disagree with the other points
or because I don't think they are important.
1/40.52 Pantex's record, its people, its community support,
and its openness to other possibilities are its key strengths
and no one else can match them.

But during my tenure in Congress, [illegible]
I have attempted to make a serious study
of our nuclear weapons complex,
in part because I represent one of its crown jewels
and in part because I believe
that a modern, effective nuclear capability
is absolutely necessary to our national security.

I won't say that I have learned all I can or intend to,
and I won't represent to you that I know all the answers
during this time of change and turmoil.

But I am confident that I know enough to raise some serious questions
that relate to the subject today and to our children's security.

This is, of course, a time of great change
brought about by the end of the Cold War,
by the fact that the DOE was not as careful
in the past as it should have been,
and by this administration's decision to stop all nuclear testing.

Stockpile Stewardship and Stockpile Management

2/40.44 In my view, stockpile stewardship and stockpile management
are important for the nation
regardless of whether we conduct nuclear tests or not.

We should use a number of methods to make as sure as we can
that our nuclear weapons are safe and reliable.
In doing so, we are making a serious mistake
if we neglect to factor in the importance
of highly skilled workers at production plants.

I tend to agree with those who argue that we need smart people in labs
and maybe even that we need smart people at two labs
to compete against one another.

3/40.23 But every bit as much as we need smart people in labs,
we need experienced, knowledgeable people in production plants
who know how to take a design or a procedure
and produce a product that meets the requirements
safely and efficiently
time after time
so that we have weapons that are safe and reliable
on which we can stake our children's freedom.

That's what people at plants like Pantex do.

3/40.23 continued

It's like if you're building a house,
you need architects to draw up the blueprints and to consult with,
but there is absolutely no substitute
for skilled carpenters, and plumbers and painters
who know how to get the work done,
who know what problems there may be
in translating the blueprints and procedures into precise components;
and who have a proven track record
of having done it — time after time.

I am afraid that an undercurrent in DOE today,
that sometimes even rises to the surface,
is a lack of appreciation
for the importance of those workers on the assembly line
at Pantex and elsewhere.

If we lose them, we are a weaker nation
and no number of PhD's at the labs
will replace what we've lost.

I find it incredible that DOE would ask more and more
of at least one of our production plants
and yet allocate less money for it to fulfill its mission.

If we can't keep the trained, experienced personnel at Pantex,
the country won't reach its goals for Stockpile Stewardshp and Mgmt
We will begin to lose confidence in our nuclear deterrent,
and we will have been penny wise and pound foolish.

I am also concerned
that we are just focusing on dragging out the life
of current weapons
without taking positive steps

3/40.23 continued

toward replacing our existing weapons
which will all too soon be at the end of their intended design life.

A real question is whether we will be able to build nuclear weapons again
and how.
There are many improvements which could be made now,
others which we will want to make in the near future,
and all the while we have to be prepared
to deal with changes in Russia, China and elsewhere.
I'm not sure we're ready.

<u>High Explosives</u>

Let me address the one issue in the PEIS
for which no preferred alternative was included,
that is high explosives.

When you compare apples to apples,
no one seriously disputes
that the most cost effective option
is retaining the existing mission at Pantex.

4/34.01

The sole justification to moving high explosives
to Los Alamos and Livermore
is that we need to keep knowledge and competence
of high explosives in the Labs.
OK - but we need to keep it at the production level too.

You can do all the research you want
and have all the knowledge you can handle,
but if you can't reliably and safely translate that knowledge
into real production,
you have nothing.

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4/34.01 continued

There is no reason in the world
that the Labs can't continue to send people to Pantex as needed
for the manufacture of high explosives,
but to remove high explosives
completely out of the production complex
would be a big mistake.

<u>Disposition</u> -

The issue of what we're going to do
with the excess plutonium and uranium is of key concern here.

As you know, we've got several thousand pits stored here
with more being added every day.
I am disappointed that the PEIS gives so little guidance
on what's to be done.

We need to get on with making these key decisions.
Two weeks ago at Los Alamos,
I was able to see firsthand some of the work involved in the Aries project.

We have some very promising technologies,
but the country needs leadership.
and our area needs confidence that DOE knows what it is doing
and is doing the right thing.

As long as I am in the Congress,
I will be involved in making these decisions
and I will do everything I can
to see that our area is protected,
to see that our nation is secure,
and to see that our children have the opportunity to live in freedom.

SSM-EM-001
COMMENT LETTER

PAGE 1 OF 4

The Senate of
The State of Texas

TOM HAYWOOD
STATE SENATOR
DISTRICT 30

Committees
ECONOMIC DEVELOPMENT
EDUCATION
NATURAL RESOURCES
• SUBCOMMITTEE ON AGRICULTURE

CAPITOL OFFICE
[illegible]

DISTRICT OFFICE
[illegible]

April 19, 1996

U.S. Department of Energy
Office of Reconfiguration
P.O. Box 3417
Alexandria, VA 22302

U.S. Department of Energy
Office of Fissile Materials
P.O. Box 23786
Washington, DC 20026

RE: Comment on Stockpile Stewardship and Management (SSM) and Storage and Disposition (S&D) of Weapons Usable Fissile Material Draft Programmatic Environmental Impact Statements (PEIS)

To Whom It May Concern:

As the Texas State Senator representing 36 Northern Texas Counties, including Carson County in which the Pantex facility is located, I want to thank you for the opportunity to provide comment on the United States Department of Energy's (DOE) Draft Programmatic Environmental Impact Statements (PEIS) on Stockpile Stewardship and Management (SSM) and Storage and Disposition (S&D) of Weapons Usable Fissile Materials. This letter will also serve as my comment on the Pantex Site-Wide Draft Environmental Impact Statement, as most of the issues addressed in that document are identical to the issues addressed in the SSM and S&D PEISs.

1/30.01 I want to stress my support for DOE's earlier decision to abandon plans to transfer assembly/disassembly function to the Nevada Test Site. Your decision to select Pantex as the preferred alternative for those functions recognizes that transfer to Nevada would have been cost prohibitive, and would not have provided adequate facilities to meet future needs.

2/40.52 However, the failure to recognize Pantex as the preferred site for new and/or consolidated stockpile management facilities has overlooked the best site for maintaining the integrity of the United States nuclear stock-

U.S. Department of Energy
April 19, 1996
Page Two

2/40.52 continued

pile and attaining maximum efficiencies and cost savings.

Before addressing the two Impact Statements individually, I want to stress that any current or future Department of Energy functions at Pantex must be conducted in a safe and environmentally sound manner. While I am confident that current procedures are more than adequate, I also am adamant that any expansion at Pantex be implemented in the same fashion. The residents of the Texas Panhandle have come to expect Pantex operations to be handled in a way that does not impair their health or safety, and future plans should recognize that necessity.

Stockpile Stewardship and Management PEIS

Pantex is the most cost effective alternative for any new construction of SSM facilities. Labor costs, utility rates, and water and land availability at Pantex, as well as public and political support in the surrounding community, are more amenable to DOE needs than at any other site.

Pantex should be considered as a site for all future defense related programs to complement activities at the national laboratories, including the planned Atlas Facility and the plutonium pit fabrication site at Los Alamos National Laboratory. The location of additional defense related programs at Pantex would ensure that core technical capabilities are preserved at a location that can secure them at the most efficient cost.

While the Department of Energy makes no mention of a strategic plutonium reserve to meet future national security needs, the PEIS mentions that strategic storage should be co-located with disassembly. Pantex should clearly be the preferred site for such a mission in coordination with its management functions.

3/34.01

The strengths identified above supporting increased stewardship and management for Pantex also support the continuation of High Explosives (HE) fabrication at that site. Just as strategic and surplus storage should remain with disassembly, HE functions should remain co-located with assembly. The DOE SSM draft indicates that Pantex should retain HE capabilities on site to process inventories accrued from dismantling; therefore the continuation of HE functions at Pantex is clearly the least expensive alternative available to DOE. I strongly disagree with the draft PEIS statement that siting HE activities at Pantex offers no advantages over the national labs. The cost of transferring such functions is cost prohibitive, and such plans ignore the possibility of future weapon production activities, which would require a full HE capability at Pantex, and ignore the admitted necessity of continued limited HE activity at Pantex.

U.S. Department of Energy
April 19, 1996
Page Three

3/34.01 continued

I believe that many factors argue for the continued operation of HE activities at Pantex, in addition to an expansion of its existing stewardship and management activities. In all of the above cases, I want to stress that the Department of Energy should insist that budgetary comparisons between Pantex and other sites are accurate and include capital, transportation, training, remediation, and other costs.

Fissile Materials (Plutonium) Storage and Disposition PEIS

As the sole Department of Energy authorized facility for assembly and disassembly of nuclear weapons, Pantex has served our country for more than 40 years. It has handled these functions in a safe and efficient manner, and should continue to do so.

As our nation continues its program of dismantling a large portion of our nuclear deterrent, one of the challenges we face is processing, storing, or disposing the fissile materials that remain. Pantex clearly offers the best solution to this vexing problem.

Acknowledging the importance of cost savings, Pantex has the existing capability to store the plutonium already at the site, and could easily expand and upgrade existing facilities to meet any or all of the storage options being considered by DOE. For the reasons identified in the SSM PEIS, the Pantex facility could accomplish this with minimal cost and difficulty.

Pantex already houses more than 8,000 surplus pits, with more pits scheduled for transfer from the Rocky Flats facility. The re-creation of storage facilities at another site, and the costs and dangers associated with transporting large amounts of plutonium across the country, makes little sense budgetarily or politically. The common sense solution to this problem is to site strategic storage and surplus functions at the same place as disassembly. Since facilities for all three functions already exist at Pantex, this common sense solution is practical, reasonable, and unarguable.

All possible factors argue for Pantex's continued and expanded role in storage of disassembled fissile material. It has the necessary safety, security, and surveillance, it has the most cost efficient operations, it has existing structures and facilities, and it is the closest production site to Los Alamos, the planned pit fabrication site.

2/40.52 continued

Based on the reasons outlined in the above two comments on the draft Programmatic Environmental Impact Statements, I urge the Department of Energy to designate Pantex as the preferred alternative site for all existing and new stockpile management and stewardship functions, as well as consolidation of all plutonium storage, disposition, and related functions.

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U.S. Department of Energy
April 19, 1996
Page Four

Thank you for the opportunity to comment on these documents.

Sincerely,

Tom

Tom Haywood

TH/jai

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COMMENT LETTER

PAGE 1 OF 2

RICHARD W. POMBO

Congress of the United States
House of Representatives
Washington, DC 20515–0511

Statement by
The Hon. Richard Pombo (CA-11)
on the
Programmatic Environmental Impact Statement
for Stockpile Stewardship Management
April 15, 1996

1/21.06

I have had the opportunity recently to see the work that is being done in the Laser Program of the Lawrence Livermore National Laboratory and to review their plans to build, with their colleagues at Los Alamos, Sandia, and the University of Rochester, the National Ignition Facility. They are extremely competent people who have done a thoroughly professional job of considering all the pros and cons of taking this next step in the inertial confinement fusion program. The DOE's draft Programmatic Environment Impact Statement, which is the subject of this hearing, reinforces what I heard at LLNL. My conclusions can be summed up in a few simple statements.

- The NIF is needed as a part of the Stockpile Stewardship and Management program to assure the safety and reliability of our nuclear weapons without nuclear testing.
- Building the NIF and the other components of this program will enable the world to obtain a comprehensive test ban treaty, thereby strengthening the world's commitment to nonproliferation and arms control for weapons of mass destruction in general
- Building the NIF will produce benefits in non weapons' applications such as fusion energy and basic science and technology
- Building the NIF will not be an environmental nor a safety hazard and will produce significant economic benefits to the local region.

Whether you like them or not, nuclear weapons are a fact of life. Under the Start II agreements, assuming they are fully implemented, there will still be thousands of such weapons ten to twenty years from now. Even if the world someday were to find the political way to get rid of all such weapons, the knowledge of how to build them will not disappear

As long as this knowledge exists in the world it is critical that the U.S. has the best scientists and

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COMMENT LETTER **PAGE 2 OF 2**

1/21.06 continued

engineers available understanding them and that we, as a society, give them the tools necessary for that understanding. The weapon's scientists and the DOE have defined in this Stockpile Stewardship and Management program the minimum set of tools necessary to do the job. Just like a basic tool box, each tool does something different and a complete basic set is necessary to handle the jobs that are likely to arise. The NIF is a unique tool that will be the only one to produce fusion ignition and to reach the highest temperatures and pressures attainable on earth. We shouldn't short change our scientists on this. We all know what happens when we use the wrong tool for the job. Nuclear weapons are too dangerous for us to allow that to happen.

It is because the science and technology to build NIF and the other components of the Stockpile Stewardship and Management program are now available to the U.S. that we can now seek a Comprehensive Test Ban Treaty. This is an admirable goal in and of itself. However, it turns out that it is also cost effective. In spite of the fact that the NIF will cost $1.1 billion over seven years to build, the entire SSM program will still have lower annual costs by more than a factor of two than the program it replaces, ie. the program that depended upon doing nuclear tests

The decision to build NIF will depend upon its contributions to the National defense. However, it is a bonus that NIF will also contribute to the basic sciences, to technology that American industry can use, and to the possibility of fusion energy. All these things contribute to our economic security.

I was pleased to see that the draft PEIS concluded that building the NIF would be environmentally benign and would be safe for the public and for the employees. Frankly, when the LLNL study of hazards allowed the DOE to conclude that the NIF would be a "nonhazardous, non-nuclear, radiological facility" it sounded somewhat confusing. How could it be "non-nuclear" and still produce fusion ignition, which is a nuclear reaction? The answer, I learned, is that while there are nuclear reactions and radioactivity, the amounts are so small that there are minor on-site and negligible off-site hazards. The claims of extreme hazards made by some who oppose NIF just aren't true.

Finally, I was very interested to see the statements in the draft PEIS concerning the number of jobs created by this project in its so-called "region of influence," which includes Alameda, Contra Costa, and San Joaquin Counties. Contrary to the opponents claim that the project will produce a negligible number of temporary and permanent jobs, the draft PEIS detailed economic analysis (done by a laboratory in Illinois, not by LLNL) shows that during the seven-year construction period the peak number of jobs created in the region of influence will be 3320. After construction is complete, 890 permanent jobs will be created. That is hardly a negligible impact and this region can benefit from these jobs and this economic activity. Frankly, we are likely to benefit even more from the technology developed.

In summation, I want to urge support of NIF and praise the conclusions of the draft PEIS.

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COMMENT LETTER **PAGE 1 OF 4**

LARRY COMBEST

Congress of the United States
House of Representatives

DISTRICT OFFICES

March 2, 1996

U.S. Department of Energy
Office of Reconfiguration
P.O. Box 3417
Alexandria, VA 22302

To Whom It May Concern:

Please include my comments regarding the Department of Energy's Programmatic Environmental Impact Statements on Stockpile Stewardship and Management and Storage and Disposition of Weapons Usable Fissile Materials at Pantex as part of the formal record for the public hearings in Amarillo.

Thank you in advance for your cooperation in this matter. If you have any questions please do not hesitate to contact me.

Sincerely,

Larry Combest

LC/mrd
Enclosure

U.S. REPRESENTATIVE LARRY COMBEST
(TEXAS--19)
THE U.S. DEPARTMENT OF ENERGY'S
PUBLIC HEARINGS
AMARILLO, TEXAS
APRIL 22, 1996

I would like to thank the Department of Energy (DOE) for holding these series of public hearings in Amarillo so that our Panhandle neighbors can have an opportunity to share their views on the DOE's Programmatic Environmental Impact Statements (PEISs) on Stockpile Stewardship and Management (SSM) and Storage and Disposition (S&D) of Weapons Usable Fissile Materials. I am pleased to be a participant in these public hearings to discuss Pantex's future.

1/40.52 Since the Pantex Plant's earliest origins in World War II as a site that built conventional bombs for the U.S. Army, countless numbers of individuals from across the Panhandle have made instrumental contributions to the United States' winning of the Cold War. In the post-Cold War era, Pantex workers have once again answered the call to duty in peacetime and found a new role in disassembling nuclear weapons. I stand here today to tell you that Pantex is not only ready, but uniquely qualified to continue to enhance its role as a vital component of our nation's nuclear weapons industrial base as we prepare for our national security needs for the 21st Century.

I can fully appreciate the DOE's responsibility to reconfigure the country's nuclear weapons production complex for the 21st Century. As the Chairman for the U.S. House of Representatives' Permanent Select Committee on Intelligence, I recently conducted a year-long review of what is commonly referred to as the "intelligence community," the classified government agencies that collect information to advise the president and Congress on actions of foreign governments and terrorists. The legislative proposal I introduced as a result of this year-long review will ready the nation's secret intelligence-gathering efforts for the 21st Century. The approach I took in crafting this proposal brings these agencies to end unnecessary duplication and work efficiently for better intelligence to keep America safe from nuclear proliferation, from terrorism, and from narcotics.

2/40.04 America continues to need strong, highly-capable and ever-flexible intelligence community to provide the earliest-possible warning and analysis in a world that is still a very dangerous place. I want our nation to continue to meet the challenges of the next century, we should ask no less of our nation's nuclear weapon complex.

In the post-Cold War era, many have called for a retreat of our resources and readiness regarding national security. I believe that the post-Cold War era with nuclear proliferation leaves our nation more vulnerable than ever. Now that we no longer have the Soviet Union, we never know where our next threat is going to

2/40.04 continued

come from. I urge the DOE to reject these specious arguments, and ensure that the nuclear weapons complex of the 21st century maintains our nuclear deterrent for the foreseeable future. With nuclear weapons remaining a vital component of our national security into the 21st Century, Pantex is the only facility that can fulfill this mission.

1/40.52 continued

However, first and foremost I am adamant that any current and future functions at Pantex will be conducted in a safe and environmentally sound manner. The first priority for any expansion at Pantex is that it be implemented in a way that does not impair the health or safety of area residents or have an adverse affect on the environment. I believe these points serve as a prerequisite to any current or future activities at Pantex.

I do not take these points lightly. I was born and raised in the Panhandle. I grew-up not far from the Pantex Plant on a family farm. I would never support any proposal or effort that would endanger the lives or environment of this region. This is my home and members of my family reside here.

I am proud of the Pantex Plant's reputation as one of the cleanest facilities in the DOE's nuclear weapons complex. They have been good stewards of the land. As a matter fact, if I were not in Amarillo today talking about the importance of Pantex to our country, I would be singing their praises from back in Washington, D.C. Today, in Washington, the DOE's Pantex Plant is being recognized as a "Model Facility" and will receive the "White House Closing the Circle Award" for its efforts on waste minimization and recycling activities. Only twenty-two federal facilities from across the country received a "Closing the Circle" award. Clearly, Pantex takes its environmental safety responsibilities very seriously and I am pleased that this national award is highlighting their hard work.

3/30.01 In the DOE's draft PEIS, I am pleased that the department selected Pantex as the preferred alternative for assembly and disassembly. Wisely abandoning earlier plans to transfer those functions to the Nevada Test Site (NTS) which would have been cost prohibitive and painfully inadequate to meet future needs. In addition, I am pleased the DOE draft recognized the importance of Pantex to the country's nuclear weapons complex.

1/40.52 continued

Pantex is perhaps the most cost-effective alternative for any new construction of Stockpile Stewardship and Management facilities. Among many of the reasons, labor, costs, utility rates and water and land availability at Pantex, as well as public and political support, are more agreeable than those at any other site in the complex. Pantex should be considered as an alternative site for future defense-related facilities to complement activities at the national labs. Location of additional defense-related activities at Pantex would ensure that core technical capabilities are preserved at a location that can secure them at the most efficient cost to American taxpayers. In deliberations, the DOE

1/40.52 continued — should insist that budgetary comparisons between Pantex and other sites are accurate, and include capital, transportation, training, remediation, and other costs.

4/34.01 — With the production assembly and disassembly functions remaining at Pantex, the high explosives functions should be present at the corresponding site. Even the DOE draft admits that Pantex must retain high explosives capabilities to process the inventories already on site from dismantling. Therefore, the least expensive alternative is to maintain high explosives functions at Pantex. I would also take issue with the draft PEIS statement that there are no advantages to siting high explosives at Pantex as opposed to the national labs. The capital outlay alone necessary for transfer is cost prohibitive. Also of importance, should future need arise for new weapons production it will be critical to have the high explosives facilities at the weapons production and assembly site.

1/40.52 continued — As the DOE considers its options regarding the dismantling of a significant portions of the nuclear stockpile and searches for productive and environmentally sound uses for the dismantled components of our nuclear arsenal, Pantex and its functions are uniquely qualified for these new missions. Pantex has the necessary safety, security and surveillance capabilities to accommodate and expanded role with minimal costs to the federal government.

Once again, I would like to thank the Department of Energy for holding these hearings on the future of Pantex. I firmly believe the Pantex Plant will continue to play a vital role in our nuclear weapons complex well into the 21st Century. I applaud all of you who are here tonight to make your views known on this critical issue. I pledge to you that I will work with Representative Mac Thornberry and the rest of the Texas delegation in Congress to ensure that Pantex is a vital component of our country's nuclear weapons industrial base. I appreciate the opportunity to participate in this public hearing, and respectfully request the DOE to consider my recommendations. Thank you.

MAC THORNBERRY

Congress of the United States
House of Representatives
April 3, 1996

COMMITTEE ON NATIONAL SECURITY
COMMITTEE ON RESOURCES
JOINT ECONOMIC COMMITTEE

The Honorable Hazel R. O'Leary
Secretary of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585

Re: Comment on Stockpile Stewardship and Management (SSM) and Storage and Disposition (S&D) of Weapons-Usable Fissile Materials Draft Programmatic Environmental Impact Statements (PEISs), and the Pantex Site-Wide Draft Environmental Impact Statement.

Dear Secretary O'Leary:

I made oral comments at the April 22 hearing in Amarillo on the pending PEISs affecting Pantex and the nuclear weapons complex. I am writing to re-emphasize some of my remarks and provide additional comment on other issues.

I believe the analysis in the Draft PEIS for Stockpile Stewardship and Management is deficient for a number of reasons, as described below:

1/40.18 — The SSM PEIS does not deal adequately with the need to maintain adequate production capacity over the next ten or more years. During this period, it will be the Stockpile Management program at the four production plants which will replace weapons components, rebuild weapons, and maintain the capability and expertise to reconstitute the nuclear weapons stockpile should world events require it. However, the draft PEIS focuses almost exclusively on preserving the capabilities and core competencies of the national nuclear weapons laboratories. I recognize that preserving the weapons capabilities of these laboratories reflects essential national requirements. But too little attention has been paid to preserving the critical capacity and unique assets that exist at the department's productions plants. I am concerned that the planned reductions at Pantex and the other production plants, as portrayed in the PEIS, are so severe that they will seriously impact the plants' ability to properly support the near-term and long-term safety and reliability of the nation's nuclear weapons stockpile.

The entire SSM analysis regarding the size of the stockpile and associated manufacturing capacity is based on optimistic, rather than conservative, assumptions about future arms control agreements. The SSM PEIS relies too heavily on a workload assumption of 1,000 warheads in the future stockpile, a number far lower than even the 3,500 set in the unratified START II treaty. The administration's budget request also reflects this unjustified optimism. We must not cede the victory we gained in the Cold War through the planned obsolescence of our production capability, which can only be regained at greater cost in later years.

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2/40.62 The SSM PEIS analysis and preferred alternatives are based on incomplete national security policy considerations. The most dramatic deficiency is the failure to include current Congressional legislation (e.g. the National Defense Authorization Act for Fiscal Year 1996) and associated national security policy guidance in the PEIS assumptions, analyses, and conclusions. This PEIS needs to be redone based on the full range of national security policies, both Presidential and Congressional. The conclusions of the just completed House and Senate markups for Fiscal Year 1997 should also be taken into consideration in the final PEIS.

3/34.01 Regarding where the high explosives production mission should be sited, I have been to Los Alamos and Pantex and talked to officials at both sites. However, I have yet to hear a credible explanation as to why that mission should not remain at Pantex. The public hearings only served to strengthen my conviction that Pantex is the best and most economical site. At the hearing, an official from the Albuquerque Operations Office admitted that Pantex presently has all of the needed capability and that it would be more expensive to move high explosives functions to the labs. I urge you to select as the preferred alternative the best and most cost-effective site -- Pantex.

Regarding the Pantex Site-Wide Draft Environmental Impact Statement, I believe the analysis of the "airplane crash" scenario is deficient. How can it be that the probability of a crash causing a release has increased since your 1994 Finding of No Significant Impact, particularly after Pantex and the Amarillo Airport have worked together to reduce overflights of the plant and taken other preventative measures? I urge the DoE to correct the analytical errors and act to avoid wrongfully depriving Pantex of future functions for which it may be selected.

4/40.48 As a final note, I am very concerned about the Albuquerque Operations Office criticizing DoE and contractor officials for having contractor employees comment at the hearings. In effect, Albuquerque is censoring those individuals on issues, such as cost, on which they are the best source of information. I find it remarkable that the exercise of First Amendment rights at a hearing of this importance, which has the stated purpose of eliciting information and public comment, would cause officials at Albuquerque to call on the Amarillo Area Office to "control their people." That this occurred in the aftermath of the "gag order" incident is even more egregious.

I look forward to our continued work together on these issues. I would appreciate a response from you on these matters.

Sincerely,

Mac Thornberry
Member of Congress

SSM-ET-ORR-001
COMMENT LETTER

DEPARTMENT OF ENERGY

STOCKPILE STEWARDSHIP & MANAGEMENT

DRAFT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

AND

STORAGE & DISPOSITION

DRAFT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

PUBLIC MEETINGS

OAK RIDGE, TENNESSEE

MORNING SESSION - April 2, 1996

PART I

8:30-10:30

LESLIE A. ZINNKE

MILLER & MILLER COURT REPORTERS

12804 UNION ROAD, KNOXVILLE, TENNESSEE 37922

Phone (423) 675-1471

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CONGRESSMAN WAMP: Concerns have not been about Oak Ridge jobs. They have been genuine concerns about the future of the free world and what we must do to maintain our capability and preserve freedom for the citizens in our country and in doing so literally lead the world into the future.

I also commend Senator Thompson and Senator Frisk, and for that matter Vice President Gore, for their involvements and support of what we have done here in the past at Y-12 and what we are doing today and what we should do in the future.

We were able to secure — Senator Thompson, Senator Frisk, and myself -- basically full funding for Y-12 from the fiscal '95 budget to the fiscal '96 budget.

When we analyze the actual revenue, the actual allocations to Y-12 with Lockheed Martin Energy Systems in December, we realized that in fact it was pretty close to level funding; basically level funding from FY '95 to FY '96.

1/40.18 When I met with, as I do very often, Secretary O'Leary about this potential threat of relocating our nuclear weapons capability --

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1/40.18 continued production capabilities here in Oak Ridge to anywhere other than Y-12, she literally said that was a no brainer; quote, no brainer. That we should leave the weapons production capabilities at Y-12 and downsize in place.

Now that's reassuring, except all the other activities that we know of that are going on would not reassure you quite so much.

It's been frustrating for me to see that in 1994 the stand down that set into Y-12 has probably actually given rise to some of the concerns that we have and justifiably are vigilant about, about any relocation of our core functions.

It's given rise for some to say, "Well, Y-12 is not in full operation so possibly some of these functions may need to be considered for a short period of time or permanently for other areas." It's been very frustrating for me.

The Defense Safety Board obviously is requiring a new culture to come to Y-12, and I understand that. I commend Admiral Gustavson for his leadership bringing Y-12 into this new culture, but I have a genuine concern because it seems to me that this prolonged stand down --

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and while we are making great strides towards lifting it and moving forward and resuming full operations at Y-12, the timing of this stand down left us in an awkward position in recent months while all of the confusion and chaos broke out through this PEIS process.

And to me it seems that there has been a tremendous amount of money spent that might not have been necessary. And it seems to me that a lot of what is involved in this new culture -- it seems to slow down the process; it seems -- some of it seems to be unnecessary.

With all of this in mind, I chose to go to Los Alamos in February and physically see all that I could see there at the production facilities at Los Alamos in New Mexico.

And I took Margaret Morrow with me. And I want to say for those of you who have worked with her in the past, she is a jewel and does a great job for us here at Y-12; a very capable lady. And for her and I to go and be prepared as we went I think was a very productive effort.

Not only did we ask a lot of questions while we were there and actually toured the facilities that we heard so much about in recent

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months here in Oak Ridge, but we left eighteen or so questions in writing. I have the answers in writing to all eighteen of those questions here today.

My staff members, Jack Copeland and Ann Cook, actually will begin at this time, if you don't mind, handing out for all of your perusal and anyone else in the community that would like a copy of what they had to say about their activities.

We asked as you will see some very specific questions about what are you doing and for what purpose, where are you going, how do you see all of this change shaken out with your -- their assuming of Rocky Flats Mission with regard to pits, and what's the traditional relationship between Oak Ridge and Los Alamos as it involves uranium and secondaries of case manufacturing, et cetera, et cetera.

And I think these answers will enlighten you on what the position of our friends at Los Alamos is today with regard to what their responsibilities are and with regard to what our responsibilities are.

I think the PEIS process, while it's

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frustrating for a lot of people to go through this PEIS process, is good certainly for some reasons.

One of those is that it allows input from some people who really know what they're doing. And I commend to you Bill Bibb, who I believe knows his stuff. I commend to you other members of Citizens for National Security who have decades of experience in the precision manufacturing of nuclear weapons components here at Y-12.

2/41.03

These people understand why we did what we did, how we did what we did, and how we were able to win the Cold War as a result of this detailed precision and near perfect execution of our missions here. And it's very important for our current friends at DOE to listen to those who have come before us. Just like we should learn from our history, DOE needs to -- through this PEIS process -- to listen to those who have come before us.

3/41.06

One of the most unfortunate results of this PEIS process or the actions that preceded the PEIS process is DOE actually pitted against each other the original partners in the

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Manhattan Project.

If you'll look at what happened with our friends at Los Alamos and you listen to the stories -- I'm sort of young; thirty-eight years old, and I've only been a student of Oak Ridge for a little over five years. So I yield to many of you and your decades of experience here.

3/41.06
continued

But to listen how Los Alamos and Oak Ridge had such a cooperative relationship throughout the Manhattan Project. How we shared personnel, and how we were all on the same team. And how through some of the, I think, DOE's desire to try to drive down costs by creating competition within the complex, we actually pitted the partners in the Manhattan Project against each other.

And I think that's real unfortunate because if there's ever a time were DOE needs to be a team, believe me, it is today. I am one of a very few Republican members of Congress that works cooperatively with DOE. That is a DOE supporter; a DOE backer. This is the time DOE needs to come together, not pull apart and start playing parochial games with one another and trying to preserve their own facilities at the

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expense of the entire complex.

In the tradition of Marilyn Wood, my predecessor -- who I respect and admire very much and did a great job working for Oak Ridge for twenty years -- I chose to work with DOE. To engage in bipartisan cooperation. To support Secretary O'Leary, who I again speak with regularly. I spoke with her in detail this past Friday.

I want to say however, though -- and I have very high regard and much respect for our Vice President and fellow Tennessean Albert Gore, Junior -- but I want to say today because I say it consistently. I say it in front of DOE audiences and I'm going to say it here in Oak Ridge.

4/40.04

I strongly disagree with what seems to be our new found fear of nuclear weapons, nuclear energy, and for that matter nuclear waste.

I think our country can handle this. I think we are smart enough; I think we work hard enough to deal with the complexities of the nuclear legacy and the nuclear weapons capability that has kept our country free and

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4/40.04 continued

strong. The nuclear deterrent is why our country has remained free and strong, and why we won the Cold War.

I see, feel, and hear a real fear of nuclear anything that involves a reactor or that involves waste. We can deal with these issues. We shouldn't close down every nuclear reactor in this country. We shouldn't retreat from our nuclear capabilities in our defense force.

We must maintain the nuclear deterrent. We must maintain our nuclear weapons stockpile. We must maintain our nuclear weapons production capabilities at the production sites.

My input is, don't even try to justify manufacturing cases and secondaries at the weapons lab. Leave uranium enrichment, shipping, and storage right here where it belongs at Y-12.

We don't manufacture surgical equipment at centers for disease control. So we shouldn't try to manufacture our nuclear weapon components at the weapons laboratories.

We should not move these facilities; we should downsize in place. Some friendly advice to our friends at DOE as we move through this

PEIS process is be careful not to violate the National Environmental Policy Act.

5/40.13

Do not allow green field sites to be developed and contaminated while we are taking brown field sites and moving them from defense programs to environmental management.

Of all things DOE -- which has a very high sensitivity level for environmental concerns and some of which I totally understand -- why it would even dream of going and contaminating new green field sites while we're taking brown field, already contaminated sites, and shrinking them down and moving them from defense programs over to environmental management while we're going to leave them in environmental management for a long time.

We as a nation have not even established what is the diminimous levels yet that we're going to take these brown field sites back to. How clean are we going to take them back up to. And here we're talking about contaminating new green field sites or even exploring the opportunity to contaminate new green field sites; that makes no sense to me. Downsize in place, yes; but slow down. Do not move so

quickly. Be careful about the process of moving our nuclear weapons capabilities anywhere.

6/40.18

And above all in closing let me say this. Please do not allow partisan or parochial politics to drive the future policy with regard to our nuclear weapons capabilities in this country. Too much is at stake for any parochial or partisan objectives to even come into the discussion at this critical time in the history of this country.

You need not look any further than the Middle East the Far East or the Soviet Union. All three areas -- North Korea today, the Persian Gulf today, Iran, Iraq. You look at the Soviet Union and the upcoming elections. Ladies and gentlemen, we better maintain our nuclear capabilities. We better maintain our nuclear deterrent.

7/40.08

And if we move away from the experience and the precision of the past that created the capabilities that kept the entire world at peace and literally broke the walls down and won the Cold War -- if we move away from that too quickly, we'll never get back to where we were in time.

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4/40.04 continued

And I would suggest to you today that this world is still very, very volatile. And we must go slow as we move to the future. Thank you all.

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COMMENT LETTER

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DEPARTMENT OF ENERGY

PUBLIC HEARING ON

* * * * *

STOCKPILE STEWARDSHIP & MANAGEMENT DRAFT PEIS

STORAGE & DISPOSITION DRAFT PEIS

PANTEX DRAFT SITE-WIDE EIS

* * * * *

OPENING SESSION
APRIL 22, 1996
6:00 P.M.

KAROLYN FARMER, CSR, RPR

SONDRA L. CARGLE & ASSOCIATES
CERTIFIED SHORTHAND REPORTERS
4103 W. 49th ST.
AMARILLO, TEXAS 79109
(806/355-8181)

Federal representatives who would like to speak? Then I would move on to the State. I understand that State Senator Teel Bivins -- is he here?

1/41.10 **SENATOR TEEL BIVINS:** Thank you very much. I too would like to thank the Department of Energy for making these public forums available. I have to admit that stacking EIS on EIS on EIS has gotten a little bit confusing, at least for me and my staff. But we're trying to keep up with the rapidly changing developments that I know the agency has to face.

2/30.01 First let me say generally that I'm pleased that the DOE has selected Pantex as the preferred alternative for assembly, disassembly, thereby abandoning their earlier thoughts of transferring those functions to the Nevada test site. I think that would have been cost prohibitive, and certainly that decision is based on common sense.

3/40.52 However, I would add that by failing to recognize Pantex as the preferred candidate site for new and/or consolidated stockpile management facilities, that the DOE overlooks the best site for maintaining the integrity of U.S. nuclear stockpile and obtaining maximum efficiency for cost and savings. With regard to the stockpile stewardship and maintenance, the PEIS, a couple of thoughts. First of all, I think that Pantex is clearly the best place to site new construction for

3/40.52 continued stewardship activities. Pantex is perhaps the most cost effective alternative to any of the new construction that is contemplated under this EIS.

4/34.01 Secondly, I would echo what Congressman Combest stated with regard to high explosives. I too disagree with the PEIS statement that there are no advantages to siting the continuation of high explosive work at Pantex. That is in the face of common sense. Clearly we have a trained work force who has been conducting this function for many years now. And secondly, the cost of physically moving the infrastructure needed to conduct the activities is cost prohibitive and doesn't make economic sense.

The EIS that deals with fissile materials, storage, and disposition is one that I have spent a good deal of time with. On the topic of storage, I feel like that we're seeing that Pantex in its current role is ideally sited for storage of plutonium pits. If it is anticipated that storage would be -- continue to be in that form, I don't think there's any question that Pantex, which is already contemplated to have, and I think the chart -- or will have 21,000 pits in storage of the -- I may be getting pits and tonnage mixed up. But certainly the vast majority of the pits in storage at Pantex, it makes sense to continue that function in that location. The issue of disposition and possibly the issue of storage, depending on how or what form the storage will be in, is one that I have given the most amount of thought to. In all the years that we've been looking at the future of Pantex here in Amarillo and concerned about its future, I think that the support for this institution has been demonstrated over and over again. And I believe that we would have that support for new missions in Pantex, but I believe there have to be three criteria that would be met before we should go forward. First of all, and I think probably most importantly, when we're thinking about disposition, as I understand it, the mixed oxide fuel process is probably the only one that would apply to Pantex, from my discussions. Vitrification and some of the other deep bore hole might not have a place in the Pantex future. But with regard to mixed oxide fuel reduction, I think that we've got to demonstrate that the process that is envisioned, the dry process, is one that is technologically feasible and is demonstrably safe. As I understand the process today, it is experimental and it shows great promise. But I think before we launch into such an exercise, we've got to demonstrate beyond a shadow of a doubt that that procedure can be done safely and environmentally soundly. The second criteria is that we've got to have community support for future missions at Pantex. To

date, Pantex has enjoyed incredible community support, not just the city of Amarillo but the whole 26-county area of this region of Texas. I believe that that community support will be forthcoming for future missions at Pantex if the first criteria is met. And finally, as I have said before, I would reiterate, and I believe the third criteria for this type of future mission at Pantex has to be coupled with independent regulatory oversight of the Department of Energy. As I understand today, nuclear materials at DOE are not subject to independent regulatory oversight. And I think because all politics is perceptional, we have got to give the perception and the reality to the people of this area that these missions will be conducted safely. I think when you think about the material we're dealing with, public policy demands that we have checks and balances to ensure that we won't make mistakes that quite frankly this agency has made in the past. With those three criteria in place, I believe that the support that this facility has had will continue well into the future, and the people that have worked here and have families here will be able to continue working and living in the best place in the United States.

Thank you very much.

COMMENT SUMMARIES AND RESPONSES

Comment Summaries and Responses

CHAPTER 3: COMMENT SUMMARIES AND RESPONSES

This chapter summarizes the comments the Department of Energy received on the* Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management *during the public comment period, and provides responses to those comments. Identical or similar comments provided by more than one commentor were grouped together in one comment summary for response. The responses indicate whether any changes were made to the Programmatic Environmental Impact Statement and the rationale behind those decisions. Section 1.3 describes the organization of this Comment Response Document and discusses the tables provided in chapter 1 to assist readers in tracking their comments to the respective comment summary and response.

01 LAND RESOURCES

01.01 A commentor is concerned that other Department of Energy (DOE) sites do not have a future use plan like the Savannah River Site (SRS). The commentor also states that the SRS future use plan restricts future development to areas with prior development. The commentor wants this to become a DOE-wide policy. Another commentor proposes a land-use concept of multiple use for SRS. Primary uses would be located within the center, and environmental uses would occur within the surrounding buffer area.

Response: *All sites in the Nuclear Weapons Complex (Complex) have future land-use plans. Each site structures its future land-use plan in accordance with DOE guidance, program needs, and security requirements. For the proposed action in this programmatic environmental impact statement (PEIS), SRS is an alternative for plutonium fabrication. That mission would be conducted in developed areas (F- and H-Areas) using existing facilities.*

01.02 On Pantex Plant (Pantex) figures 4.5–2 and 4.5.2.1–1, a commentor notes that the playas are incorrectly labeled as dry lakes; they should be described as ephemeral lakes. In addition, the commentor states that all playas shown on these figures, except playa 3, are approximately 900 to 1,000 meters (m) (2,953 to 3,281 feet [ft]) in diameter. Also, the scale on figure 4.5.2.1–1 is incorrect (compared with that of figure 4.5–2, which is correct). Another commentor notes that the maps of the Nevada Test Site (NTS) presented in the document need to depict Area 51.

Response: *The phrase "dry lake" has been deleted from figures 3.4.1.2–1, 4.5–2, 4.5.2.1–1, 4.5.2.4–1, A.1.4–2, and A.3.5.1–1. Furthermore, a definition of playa can be found in the glossary (chapter 9) of the* Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management *(Final PEIS). The scale on figure 4.5.2.1–1 has been changed to match that of figure 4.5–2. Regarding Area 51, the maps of NTS do not depict this area since it is not a part of NTS. Lands withdrawn under* Public Land Order 1662 *are used by the Department of Defense (DOD) for their ongoing operations and are not considered in this PEIS for use by DOE.*

01.03 The commentor asks if high explosives (HE) production is moved from Pantex to Los Alamos National Laboratory (LANL) or Lawrence Livermore National Laboratory (LLNL), where would the building be placed and the testing be done. The commentor also asks what the current and projected land use is around LANL and LLNL (particularly Site 300).

Response: *LANL HE fabrication process capability is already established. HE fabrication and storage functions would be supported in existing facilities at LANL Technical Areas (TAs) -9, -16, and -37. Since LANL HE plant facilities already exist and have sufficient capacity for stockpile management requirements, no new building construction and no significant modifications would be required. LANL assembles and detonates explosive test configurations in TA-15, TA-40, and TA-11 through TA-25. The commentor is referred to section 3.4.5.3 and appendix section A.3.5.2 for more information on the LANL HE alternative.*

The LLNL HE fabrication alternative would require construction of one new facility and would use 23 existing buildings, 66 existing magazines, and various utilities and services at Site 300. The new facility would be constructed at the HE storage area near M30 and M34. Energetic materials components are test fired at the HE Applications Facility, Building 191, at the Livermore Site. The remote firing facility, Building 851 at Site 300, is remotely located from HE fabrication operations and includes an outdoor firing capability to conduct large-scale explosives tests that cannot be performed in a test chamber. The commentor is referred to section 3.4.5.4 and appendix section A.3.5.3 for more information on the LLNL HE alternative. Regarding current and projected land use around LANL and LLNL, the commentor is referred to sections 4.6.2.1 and 4.6.3.1 for land use at LANL and sections 4.7.2.1 and 4.7.3.1 for land use at LLNL.

01.04 The commentor refers to section 4.9, Nevada Test Site, and suggests that the stated area be replaced with the legal size of 320,778 hectares (ha) (792,650 acres). The commentor notes that NTS may have been established in 1950, but it was not legally withdrawn until 1952. The commentor also believes that the PEIS should indicate all of the properties (underground nuclear explosion sites) that the Nevada Operations Office is responsible for such as Nellis Air Force Base Remote Sensing Laboratory, the Project Faultless site, the Project Shoal site, the Salmon site, the sites on Amchitka Island, as well as the Rulison, Rio Blanco, Gnome, and Gasbuggy sites.

Response: *The area given in the PEIS for NTS (approximately 350,866 ha [867,000 acres]) is based upon the definition of the land area presented in the* Draft Environmental Impact Statement for the Nevada Test Site and Offsite Locations in the State of Nevada *(NTS Site-Wide EIS) (DOE/EIS 0243) and is consistent with the NTS Site Development Plan. DOE is unaware of the origin of the legal size of NTS that the commentor asserts. In addition, this discrepancy in the size of NTS would not affect the impact analysis presented in this PEIS. For more information on public land orders and withdrawals concerning NTS, the commentor is referred to the response to comment summary 01.06 and the NTS Site-Wide EIS. Regarding the other properties for which the Nevada Operations Office is responsible, they are not discussed because they are not relevant to the analysis of the alternatives in the PEIS. None of these sites is considered as a candidate location for future activities within the Stockpile Stewardship and Management Program.*

01.05 The commentor refers to section 4.12, Environmental Impacts of Underground Testing, and asks that after the description of the land area ruined after each test, an infrared satellite image of the surface of Yucca Flat be provided.

Response: *Section 4.12 provides a programmatic evaluation of the potential environmental impacts of underground nuclear testing. The inclusion of an infrared satellite image of the surface of Yucca Flat would not be a meaningful contribution at this level of programmatic review. The commentor is referred to the NTS Site-Wide EIS for more detailed information on the potential environmental impacts of underground nuclear testing.*

01.06 The commentor states that the lands comprising NTS are, in fact, public lands that have been withdrawn for a specific national defense purpose, as stipulated in the current public land orders. That purpose, according to the commentor, does not include large scale weapons assembly and disassembly (A/D) and/or the siting of laser fusion technologies such as the National Ignition Facility (NIF). The commentor states that if NTS is chosen for one or more of these functions, an analysis must be contained in the Final PEIS that addresses the facility-use restrictions in the public land orders.

Response: *In 1983, the U.S. Bureau of Land Management, in accordance with the* Federal Land Policy and Management Act *of 1976 (Public Law 94-579, October 21, 1976), conducted a review of the existing four land withdrawals that comprise NTS. The Bureau of Land Management report compiled during its review, acknowledged that while the primary mission of NTS continued to be weapons testing, other activities and projects are also being pursued. The reports specifically referred the readers to the Final EIS (1977) for "a more detailed explanation of activities and projects." Thus, it is clear that the Bureau of Land Management was well aware of DOE's multiple land uses, including radioactive waste disposal, NTS farm experiments, emergency response tests, etc. Thus informed, the Bureau of Land Management District Manager concurred with the review's conclusion that the lands were still being used for the purpose for which they were withdrawn. The Bureau of Land Management found that any new land uses at NTS at the time were not inconsistent with that original use.*

The Federal Land Policy and Management Act *of 1976, implementing regulations, and the public land orders themselves, are silent on the use of withdrawn lands for related purposes or purposes in addition to those for which the land was originally reserved. There are no specific prohibitions against additional use, if the purpose for which the withdrawal was authorized remains valid. There is clearly no prohibition of the consideration of alternative uses, through an EIS or otherwise, of withdrawn lands as a management or administrative action to assess the potential for additional beneficial uses of such lands.*

The Department of the Interior is vested with oversight responsibility to review existing land withdrawals under the Federal Land Policy and Management Act *of 1976. The Department of Interior's San Francisco Office has suggested in its comments on the NTS Site-Wide EIS that substantial changes in land use at NTS may require a new land withdrawal. While DOE believes that any new or proposed land use at NTS is compatible with the primary purpose of each land withdrawal, the most recent comments from the San Francisco Office of the Department of Interior indicate that a review of the existing land withdrawals may be prudent.*

As has been its past practice, DOE continues to be committed to ensuring that all future activities contemplated at NTS, are conducted in compliance with the Federal Land Policy and Management Act *of 1976 and Federal land withdrawal policy. In this regard, DOE has begun informal consultation with the Department of Interior to ensure that the appropriate process is followed to enable DOE to fulfill this commitment.*

02 SITE INFRASTRUCTURE

02.01 Several commentors question the estimates for power requirements given in the PEIS, specifically tables 3.4.4.2–2 and 3.4.4.3–2. Commentors note discrepancies between the utility requirements for the secondary and case fabrication mission for the Y-12 Plant (Y-12) at Oak Ridge Reservation (ORR) (appendix section A.3.2.1), LANL (appendix section A.3.2.2), and LLNL (appendix section A.3.2.3), and believe that these numbers show little basis in fact. Y-12, LANL, and LLNL propose to use 118,000, 36,000, and 15,000 megawatt hours (MWh) of electricity; 250,000, 100,00, and 85,200 liters (L) (66,042, 26,417, and 22,507 gallons [gal]) of diesel fuel; and 1.5 billion, 55 million, and 36 million L (0.4 billion, 14.5 million, and 9.5 million gal) of water, respectively. However, the tables state that Y-12 will use 118,000 MWh with a peak of 19 megawatts electric (MWe), 17 million cubic feet (ft^3) (0.14 cubic meters [m^3]) of natural gas and 250,000 L (66,042 gal) of liquid fuel, but LANL will only use 36,000 MWh, 5 MWe peak, 100,000 L (26,417 gal) of liquid fuel, and no natural gas. Since the manufacturing processes require electricity and gas to operate and since each plant would produce the same number of parts, the commentors ask why the energy requirements at LANL are so low. According to the commentors these tables show an order of magnitude difference in the estimates for the power requirements for Y-12 and LANL to do the same job. The commentors also question why Y-12 would use 1.5 billion L (0.4 billion gal) of water and LANL only 55 million L (14.5 million gal) to do the same mission.

Response: *As stated in section 3.4.4 of the* Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management *(Draft PEIS), when comparing data between secondary and case manufacturing alternatives it is important to note that there are differences in the facility designs. The production capabilities of each of the three sites at surge capacity are different, with Y-12 the highest and LLNL the lowest. This is further explained in section 3.1.1.1.*

02.02 The commentor requests resolution of the discrepancy between table 4.13.1.5–1 which states that LANL will use 4,491,240 m^3/yr (158,608, 141 ft^3/yr) of natural gas and table 3.4.4.3–2 which states that LANL will use no natural gas.

Response: *Table 4.13.1.5–1 presents the site infrastructure combined impacts at LANL, that is, the total quantity of resources required to implement all missions for which LANL is a candidate. Table 3.4.4.3–2 provides the annual operating requirements to implement only the secondary and case fabrication mission. As presented in sections 3.3 and 3.4, LANL is a candidate for the stockpile stewardship alternatives associated with the physics of nuclear weapons primaries (ongoing work) and for the physics of nuclear weapons secondaries (ongoing work as well as NIF and the Atlas Facility). LANL is also a candidate for the stockpile management alternatives of nonnuclear fabrication, pit fabrication and intrusive modification pit reuse, secondary and case fabrication, and HE fabrication. Table 4.13.1.5–1 reflects the summation of all of the natural gas requirements to implement all of the above Stockpile Stewardship and Management Program missions at LANL.*

03 AIR QUALITY

03.01 The commentor states that with respect to air quality at LANL using in-house data is unacceptable to the State of New Mexico, the Environmental Protection Agency (EPA), and the citizens of New Mexico.

Response: *LANL is required to comply with the Federal* Clean Air Act *(CAA) of 1990 and amendments and the* New Mexico Air Quality Control Act *of 1978, as amended. The ambient air quality standards for the State of New Mexico were recently amended January 10, 1996. These acts establish ambient air quality standards, require permits for new sources, and set acceptable emission limits. To accomplish compliance with these regulations, LANL implemented a site-wide evaluation of chemical emissions from all routine and experimental operations in response to reporting requirements specified in the CAA. These regulations require the laboratory to report all air emissions of criteria pollutants, as well as all hazardous air pollutants. The estimates of air pollutant concentrations presented in the PEIS for LANL were based upon those emissions of air pollutants as reported by LANL in response to reporting requirements specified in the CAA. These emissions are monitored by DOE as specified in permits issued by the State of New Mexico and EPA.*

03.02 The commentor questions the use of 4.X.2.3 and 4.X.3.3 in appendix section B.1.1 and requests a statement, complete with verifying signature, on the level of quality assurance supporting the air quality sections.

Response: *A reference is made to appendix section B.1.1, Introduction, which states, "This appendix provides detailed data that support impact assessments for air quality addressed in sections 4.X.2.3, Affected Environment—Air Quality, and 4.X.3.3, Environmental Impacts—Air Quality." The "X" in* *the referenced section numbers is a generic symbol representing affected environment and environmental impacts for each site. This is an abbreviated format used in lieu of sections 4.2.2.3, 4.3.2.3, 4.4.2.3, 4.5.2.3, 4.6.2.3, 4.7.2.3, 4.8.2.3, and 4.9.2.3, Affected Environment—Air Quality, and 4.2.3.3, 4.3.3.3, 4.4.3.3, 4.5.3.3, 4.6.3.3, 4.7.3.3, 4.8.3.3, and 4.9.3.3, Environmental Impacts—Air Quality. The air quality analysis has received a complete internal quality assurance review.*

03.03 The commentor refers to table 4.6.3.3–1 in the PEIS and states that LANL will be out of compliance for nitrogen dioxide release (24-hour basis) if the work from Y-12 is moved to LANL. The commentor asks what treatment is planned for the nitrogen dioxide release and if the cost is estimated in the PEIS.

Response: *The PEIS is a multi-site study performed at the programmatic level with the intent of comparing the air quality impacts among alternative sites. Table 4.6.3.3–1 presents the estimated air quality impacts at LANL for each of the proposed alternatives. The estimated 24-hour nitrogen dioxide concentration for the secondary and case fabrication alternative indicates that mitigation measures may be necessary to ensure that compliance is achieved. The degree of mitigation would be determined in a site- or project-specific* National Environmental Policy Act *(NEPA) of 1969 document containing refined air quality modeling. Cost estimates are not included in the PEIS.*

03.04 Commentors refer to section 4.6.2.3, table 4.6.2.3–1, Comparisons of Baseline Ambient Air Concentrations with Most Stringent Applicable Regulations and Guidelines at LANL, 1990 and 1992. Referring to the statement that baseline concentrations are in compliance with applicable guidelines and regulations with the exception of the 1-hour photochemical oxidants, a commentor states that photochemical oxidants were out of compliance with New Mexico ambient air concentrations standards for these years. Another commentor states that it is inexcusable that many of the listed pollutants are not monitored and that the baseline concentrations for these pollutants are just assumed to be less than applicable standards. The commentor suggests that more recent data be used.

The commentors also raise the following questions concerning the air quality material: are the years 1990 and 1992 representative years for air emissions, are they a conservative/nonconservative example, are other years in compliance with air standards, and why not use more recent years, such as 1994 or 1995? A commentor refers to section 4.6.3.3, Air Quality, No Action, "No action air quality utilizes estimated air emissions data from operations at LANL in 2005 assuming continuation of current site missions to calculate pollutant concentrations at or beyond LANL site boundary." The commentor states that the photochemical oxidant concentration was not addressed. The commentor states that the estimated concentration of this pollutant was not in the table presented and asks why this pollutant was not included.

Response: *The estimated air quality concentrations at LANL represent a snapshot in time which is used for comparative purposes among the sites presented in the PEIS. The baseline air quality concentrations presented in table 4.6.2.3–1 are based upon the latest air quality emissions data (1990 to 1992) available at the time the air quality analysis was performed. These data are considered representative of recent air quality emissions when compared with those emission data presented in the* Environmental Surveillance at Los Alamos During 1993 (1993 Environmental Surveillance Report) *(LA-12973-ENV, October 1995).*

Table 4.6.3.3–1, Estimated Concentrations of Pollutants from No Action and Stockpile Stewardship and Management Alternatives at Los Alamos National Laboratory, no longer presents photochemical oxidants. In December 1995, the State of New Mexico removed photochemical oxidants from the State's Ambient Air Quality Standard (20 NMAC 2.3). Tables 4.6.2.3–1 and 4.6.3.3–1 and appendix table B.3.1–1 have been updated to reflect the changes in the New Mexico state standards.

03.05 The commentor points out that there is a recurrence of number sequences with LANL (appendix section A.3.5.2 emissions estimates [4,540, 22,700, 4,540, 227, 454, 4.5, 45.4, 22.7, and 22.7]), and on comparing these numbers with Pantex, where there is a history of HE production, Pantex shows no such patterns. The commentor believes the LANL numbers have been fabricated. The commentor states that since estimates of environmental, safety, and health (ES&H) impacts are driven by emissions, those estimates are inevitably suspect.

Response: *The commentor refers to appendix table A.3.5.2–6. The emissions presented in this table are estimates of emissions from the LANL HE fabrication surge operation. The emissions presented in this table represent an HE fabrication output which is different than the historical output at Pantex. Air emissions estimates provided in the PEIS have been confirmed with LANL as being correct.*

03.06 The commentor refers to section 4.6.3.3, Air Quality, subsection on Sensitivity Analysis, and the statement, "The concentrations of pollutants for the high case pit fabrication, HE, and nonnuclear fabrication missions are expected to be within applicable Federal and state regulations and guidelines. The 24-hour concentrations of nitrogen dioxide for the high case secondary and case fabrication mission may be above applicable standards and guidelines." (Table 4.6.3.3–1, Estimated Concentrations of Pollutants from No Action and Stockpile Stewardship and Management Alternatives at Los Alamos National Laboratory, is identified in neighboring sections for reference of the estimated emissions mentioned above.) The commentor states that the estimated concentrations of nitrogen dioxide in the combined program impacts is 276.69 micrograms per cubic meters ($\mu g/m^3$) and the most stringent guidelines are 188 $\mu g/m^3$ (24-hour average). The commentor also states that in appendix table B.3.1–1, Ambient Air Quality Standards Applicable to the Candidate Sites, the New Mexico guideline listed for nitrogen dioxide is 117 $\mu g/m^3$ (24-hour average). The commentor states that this air quality value was also exceeded and is more stringent than the 188 $\mu g/m^3$ value mentioned previously. The commentor suggests that the values should be rechecked or the text should be modified.

Response: *Section 4.6.3.3 has been changed in the Final PEIS to state, "The 24-hour concentration of nitrogen dioxide for the high case secondary and case fabrication mission is above applicable standards and guidelines." In addition, a change has been made in the heading of the last column in appendix table B.3.1–1, Ambient Air Quality Standards Applicable to the Candidate Sites, from "New Mexico (LANL and Sandia National Laboratories [SNL])" to "New Mexico (LANL/SNL)" and the entry for 24-hour nitrogen dioxide under this column changed from "117" to "145/117." This change indicates that the 24-hour nitrogen dioxide state standard for LANL is 145* $\mu g/m^3$ *while the city/county standard for SNL is 117* $\mu g/m^3$.

03.07 The commentor states that for LANL the Draft PEIS contains no plans to directly monitor the emissions from these projects or to conduct ambient monitoring in the community if the projects are implemented. The commentor notes that as of October 1994, with the termination of a 5-year contract between the New Mexico Environment Department and the National Park Service, nonradioactive ambient monitoring for criteria pollutants was discontinued at the Bandelier site on the southern boundary of LANL adjacent to the Bandelier National Monument. The commentor states that he is not aware of any other ambient monitoring for criteria pollutants being conducted at LANL or in the Los Alamos community. The commentor further states that the radioactive ambient monitoring being conducted by LANL focuses mostly on the Los Alamos Meson Physics Facility, which is currently the largest source of radioactive emissions. In the commentor's opinion, monitoring of actual conditions around the proposed projects is of prime importance to verify the modeled emissions presented in the Draft PEIS. In addition to monitoring, the commentor believes there should also be remediation plans in place in the event of actual emissions being measured higher than modeled ones.

Response: *The air quality analysis was performed at a programmatic level, which is a less detailed level of analysis than would be performed for a site-specific NEPA analysis. The goal of the analysis was to screen for potential major impacts and provide a means to compare air quality impacts among sites. If the site is selected for a specific mission then a more detailed air quality modeling analysis would be performed and appropriate mitigation measures would be undertaken to ensure compliance with Federal and New Mexico state standards.*

03.08 The commentor states that in LANL table 4.6.3.3–1, the environmental impact resulting from secondary and case fabrication shows that model estimates for 24-hour average concentrations of nitrogen dioxide would be 231 $\mu g/m^3$ and 277 $\mu g/m^3$ from the combined program, levels which greatly exceed the applicable state standard and worsen the air quality of the area. The commentor states that the State of New Mexico cannot permit such large exceedances of its standard and that the exceedance of the standard is even greater than that shown in tables 4.6.3.3–1 and 4.13.1.5–2. These tables show the most stringent regulation or guideline for nitrogen dioxide to be the state standard, which is listed as 188 $\mu g/m^3$. However, this figure does not reflect a correction for the altitude of LANL, which is approximately 2,194 m (7,200 ft) above sea level. Correcting for altitude, the state standard of 0.10 parts per million (ppm) is calculated to be 146 $\mu g/m^3$. The commentor states that LANL should be omitted as a possible site for secondary and case fabrication because of the high concentration of nitrogen dioxide that would be emitted. (See comment document SSM–M–123, page 5, for the equation used for adjusting the concentration of nitrogen dioxide for altitude.) Another commentor states that in table 4.6.2.3–1 and in other tables containing the most stringent regulations or guidelines for gaseous criteria pollutants, these concentrations have not been adjusted to LANL's altitude which is 2,194 m (7,200 ft) above sea level.

Response: *The PEIS is a multi-site study performed at the programmatic level with the intent of comparing the air quality impacts among alternative sites. Tables 4.6.3.3–1 and 4.13.1.5–2 present the estimated air quality impacts at LANL for each of the proposed alternatives and cumulative impacts, including other proposed actions, respectively. The estimated 24-hour nitrogen dioxide concentration for the secondary and case fabrication alternative indicates that mitigation measures may be necessary to ensure that compliance is achieved. The actual emissions and the degree of mitigation would be determined in a site- or project-specific NEPA document containing refined air quality modeling.*

The New Mexico state standard for 24-hour nitrogen dioxide, which is given as 0.10 ppm in state regulations, when adjusted for a site altitude of 2,255 m (7,400 ft) above sea level converts to 145 $\mu g/m^3$. The Final PEIS has been changed to reflect the adjustment for altitude for those New Mexico state standards given as ppm.

The New Mexico state ambient air quality standards for sulfur dioxide, carbon monoxide, nitrogen dioxide, hydrogen sulfide, and total reduced sulfur are given in ppm in state regulations. These standards were converted to $\mu g/m^3$ at 1 atmosphere and 25 degrees Celsius (°C) 77 degrees Fahrenheit (°F) to be consistent with other Federal and state standards. The results of the modeling were then compared to these standards with the result that the 24-hour nitrogen dioxide concentration exceeds the state standard for the secondary and case fabrication alternative. Adjusting the standards for altitude results in the same conclusions.

If LANL is selected for a new or enhanced mission, then a refined air quality modeling analysis would be performed and appropriate adjustments for altitude would be made to the state standards to ensure compliance with Federal and New Mexico state standards. Performing the adjustment for altitude of the LANL site (2,255 m [7,400 ft] above mean sea level) results in the following New Mexico state standards: sulfur dioxide annual, 40 $\mu g/m^3$, 24-hour, 202 $\mu g/m^3$; carbon monoxide 8-hour, 7,689 $\mu g/m^3$, 1-hour, 11,578 $\mu g/m^3$; nitrogen dioxide annual, 73 $\mu g/m^3$, 24-hour, 145 $\mu g/m^3$;

hydrogen sulfide, 1-hour, 11 µg/m³; and total reduced sulfur, 30-minute, 3 µg/m³. The tables presenting New Mexico state standards have been changed to reflect standards adjusted for altitude in the Final PEIS.

03.09 The commentor states that the emission rates reported in appendix B and the estimated pollutant concentrations listed in the Pantex table 4.5.3.3–1 are the same as discussed in the *Weapons-Usable Fissile Materials Draft Programmatic Environmental Impact Statement* (Storage and Disposition Draft PEIS) (DOE/EIS-0229-D, February 1996). Therefore the comments regarding the discrepancy between estimated concentrations and Texas Natural Resources Conservation Commission monitored concentrations of particulate matter holds true for the Draft PEIS. In addition, the commentor believes that the conclusion that the No Action alternative and the downsize A/D and HE fabrication alternative will not produce air pollutant concentrations exceeding Federal and state regulations and guidelines is acceptable.

Response: *The concentrations presented for Pantex in the Stockpile Stewardship and Management Draft PEIS and Storage and Disposition Draft PEIS represent the results of modeling using EPA's Industrial Source Complex Short-Term Model 2 and Industrial Source Complex Long-Term Model 2. The concentrations represent the maximum estimated concentration of particulate matter (PM_{10}) based upon a base case surge level of activity discussed in section 3.1.1. The PM_{10} monitoring data from Texas Natural Resources Conservation Commission monitors at Pantex were not used since these data do not reflect the anticipated future level of activity at the site.*

03.10 The commentor states that there is a factual error in section 4.13.1.5, in the paragraph titled Air Quality. According to the commentor, the last sentence describing LANL as a nonattainment area for ozone is incorrect. The commentor states that attainment is determined by comparison with the Federal standard, which for ozone is 0.12 ppm/hour average. The rule for determining a nonattainment area is explained in section 4.5.2.3. At the ambient air monitoring site operated by the New Mexico Environment Department at the southern boundary of LANL, adjacent to Bandelier National Monument, the highest value measured for ozone between 1989 and 1994 was 0.090 ppm/hour average. The commentor also notes that there is no state standard for ozone and, as of December 1995, there is not a state standard for photochemical oxidants.

Response: *The commentor is correct. The sentence in section 4.13.1.5, Air Quality, "LANL is in a nonattainment area for ozone concentrations" has been deleted from the document.*

03.11 The commentor states that the New Mexico regulations alluded to in appendix section K.3.3.1 are obsolete or contain errors. The reference to "total suspended particulates" as "PM_{10}" is incorrect. Although both names refer to particulates, they are measured by different monitors and have different standards. The commentor also states that the reference to New Mexico standards for beryllium, asbestos, heavy metals, photochemical oxidants, and nonmethane hydrocarbons is now obsolete. In 1995, these pollutants were eliminated from the New Mexico regulations. Federal regulations remain in existence for some of these pollutants. The pollutants eliminated from state standards are also mentioned in tables in section 4 and in appendix B.

Response: *The commentor is correct. The text in appendix section K.3.3.1, "total suspended particulates (PM_{10}), including beryllium, asbestos, and heavy metals; sulfur dioxide; total reduced sulfur; carbon monoxide; nitrogen oxides; photochemical oxidants; and nonmethane hydrocarbons" has been changed to "total suspended particulates (TSP), particulate matter less than or equal to 10 microns in diameter (PM_{10}), sulfur dioxide, total reduced sulfur, hydrogen sulfide, carbon monoxide, and nitrogen oxides." Tables in section 4 and in appendix B have also been changed to reflect the pollutants eliminated from state standards.*

03.12 The commentor points out that the Draft PEIS states that "the irregular terrain of Los Alamos affects wind motion and spreading. Localized wind gusts may not be in the same direction as average wind patterns" (appendix section K.3.3.1). In light of this information, the commentor suggests LANL correlate ambient air monitoring to the complex topography.

Response: *DOE agrees with the comment regarding the correlation between air quality and LANL's complex topography. Air monitoring does correlate to the topography of LANL. The local meteorology is just one of many factors considered in the design of the air sampling network as a whole and when locating individual air quality monitoring stations.*

04 WATER RESOURCES

04.01 A commentor indicates that the proposed construction of NIF and other upgrades at SNL would violate the city of Albuquerque's water use and discharge policies. The commentor suggests that water conservation issues in the city of Albuquerque should be discussed in the document relative to the proposed action at SNL.

Response: *As discussed in sections 4.8.2.4 and 4.8.3.4, SNL receives only 30 percent of its water from the city of Albuquerque. The remaining 70 percent is pumped from water supply wells on Kirtland Air Force Base, which has groundwater rights of 7,900 million liters per year (MLY) (2,089 million gallons per year [MGY]) and is currently operating at only a 50-percent capacity. NIF would increase SNL's water usage by 152 MLY (40 MGY) over No Action water use; this equates to less than 0.2 percent of the city of Albuquerque's annual consumptive water rights. Nonnuclear fabrication would increase SNL's water usage by 893 MLY (236 MGY) over No Action water use; this would total less than 1 percent of the city of Albuquerque's annual consumptive water rights. In addition, the city of Albuquerque also receives a 50-percent return flow credit for sanitary wastewater discharged to the Rio Grande, and the city has the rights to 56,800 MLY (15,005 MGY) of San Juan Chama water. The potential water used by NIF and the nonnuclear fabrication mission would meet the city of Albuquerque's water usage, discharge, and water conservation policies. Discharges from NIF and nonnuclear fabrication would be treated and monitored to meet the standards of the city of Albuquerque's Sewer Use and Wastewater Control Ordinance as well as National Pollutant Discharge Elimination System (NPDES) permits. Discharges would not exceed wastewater treatment capacities. As discussed in section 3.8, the preferred alternative is to downsize nonnuclear fabrication at Kansas City Plant (KCP) and construct and operate NIF at LLNL.*

04.02 A commentor states that section 4.6.2.4 indicated that LANL water resource allotment would be used up by the year 2000, and questions how LANL can produce weapons such as Y-12 has done without an adequate water supply.

Response: *The Draft PEIS incorrectly stated the projected groundwater requirements. Section 4.6.2.4 has been revised based on more accurate No Action water use estimates. The present groundwater allotment at LANL, based on the new data, would be fully used by about 2052 instead of the previously estimated year of 2000. If San Juan Chama water is included, the site would not require the total available supply until 2072.*

04.03 The commentor, referring to section 4.2.3.4, asks what the increased operating requirements of the existing Y-12 secondary and case fabrication facilities are in the No Action case.

Response: *The Y-12 No Action estimates for various resource consumption and waste generation show an increase over current values primarily due to increased dismantlement activity projections. This increased workload is expected because Y-12 would be working down the backlog of canned subassem-*

blies received from weapons dismantlement activities at Pantex. The Y-12 dismantlement rate has been lower than the Pantex rate because of a production stand-down during portions of 1994 and 1995.

04.04 The commentor states that a contaminated water plume is drifting offsite at LLNL, yet budget cuts may not allow for cleanup.

Response: *The Livermore Site was placed on the National Priorities List (NPL) for Superfund cleanup in 1987. Several documents assessing the area and planning remedial action have been published since that date. As stated in section 4.7.2.4, approximately 150 million L (40 million gal) of groundwater in the southwest corner of the facility have been treated to remove volatile organic compounds (VOCs). Five treatment facilities, A, B, C, D, and F, built from 1989 to 1994, currently treat VOC-contaminated water. As of 1994, over 470 million L (124 million gal) of water with approximately 50 kilograms (kg) (110 pounds [lb]) of VOCs and 300 L (79 gal) of gasoline have been treated. Facilities E and G were in the planning stages at the time this document was being written.*

At Site 300, ongoing remedial investigations, feasibility studies, and remedial actions are being performed as part of the environmental restoration project. Site 300 was placed on the NPL under the Comprehensive Environmental Response, Compensation, and Liability Act *(CERCLA) in August 1990. During 1993 and 1994, 903,000 L (238,545 gal) of groundwater containing 2,350 grams (g) (5 lb) of VOCs were treated by an air sparging groundwater treatment and vapor extraction system. In addition, pilot vapor extraction treatment of VOCs is ongoing. Environmental restoration budgets are outside the scope of this PEIS.*

04.05 One commentor believes that to expand the Pantex role is irresponsible in view of the fact that the plant lies above the largest freshwater aquifer in the United States, and that the aquifer is the lifeblood of the area's agriculture industry. Why the Ogallala aquifer has not been classified as a Class 1 water source is puzzling to the commentor. Another commentor states that the document fails to address the issue of the location of Pantex over the Ogallala aquifer. One commentor states that it is a contention by Pantex boosters that no substantial water pollution has occurred except for the perched water above the Ogallala aquifer. The commentor wants to know how much contamination levels will rise if Pantex's role is expanded and if an expansion is worth the risk. Another commentor believes that concerns about the Ogallala aquifer are unfounded. One commentor also notes that there is no significant discussion of recharge to the Ogallala aquifer, nor is there discussion of groundwater flow in either the perched or Ogallala aquifers. Also, a discussion of the fact that contaminants in the perched aquifer have already moved off Pantex to the east is lacking.

Response: *The only Pantex alternatives discussed in the Stockpile Stewardship and Management PEIS are downsizing (with the establishment of nonintrusive pit reuse) and phaseout of existing missions. As mentioned in section 4.5.3.4, these alternatives, as well as the No Action alternative, will reduce the water requirements at Pantex by at least 69 percent from current use. No expansion is taking place under the Stockpile Stewardship and Management Program.*

Sections 4.5.2.4 and 4.5.3.4 address the issue of the location of Pantex over the Ogallala aquifer. Despite the decreases in groundwater use, at the conclusion of every alternative in the groundwater impact sections is the statement "although Pantex water use would decrease, operational water use would still contribute to the overall decline of the Ogallala aquifer because the area groundwater withdrawal rate would exceed the recharge rate."

A detailed discussion of groundwater recharge exceeds the scope of the Stockpile Stewardship and Management PEIS. For more specific information, the reader should refer to the Draft Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear

Weapons Components (Pantex Site-Wide Draft EIS) (DOE/EIS-0225 D, March 1996). This PEIS summarizes the recharge data available and draws conclusions from that data. Estimates of groundwater recharge are given in section 4.5.2.4 as 0.02 to 4.1 centimeter (cm)/yr (0.0079 to 1.6 inches [in]/yr) in comparison with withdrawal rates of 0.6 to 2 m/yr (1.97 to 6.56 ft/yr). The extent of the contaminants in the perched aquifer moving off Pantex to the east is under investigation as discussed in the groundwater quality section of the Pantex Site-Wide Draft EIS.

04.06 A commentor states that the information presented on groundwater quality at LANL is misleading. The commentor further states that contaminant levels have fluctuated over time and that there is evidence that contaminants are reaching the deeper aquifer from surface discharges and shallower, more contaminated areas. The commentor cites considerable mobility of contaminants in the subsurface at Mortandad Canyon which has been discovered and states that this is an area into which LANL currently discharges a significant portion of its liquid radioactive waste.

Other commentors express concern about the nuclear laundry in Santa Fe and suggest that it be closed. Another commentor states that the public does not want LANL wandering up Cerrillos Road, two blocks up beyond the old Ramada Inn, pumping radioactive waste into the Santa Fe water table.

Response: *The information presented in the PEIS is based on the best available data. Since publication of the Draft PEIS, the 1993 Environmental Surveillance Report data was published in October 1995. This new data shows four monitoring well locations in Los Alamos, Pueblo, and Mortandad Canyons with low levels of tritium contamination. The highest tritium concentration is approximately 2 percent of the Federal drinking water limit. Other contaminants were not found in measurable amounts. This is consistent with past monitoring results. As stated in section 4.6.3.4, no process wastes would be discharged directly to the groundwater. All treated wastewater discharges to the canyons would be monitored to comply with NPDES permits and other applicable discharge requirements.*

The commentor is referring to a privately operated commercial laundry, located in the vicinity of Cerrillos Road in Santa Fe. The facility launders laboratory coats, booties, and other clothing used in operations around radioactive materials. LANL has been a customer of this laundry for several years, but not the only customer. The vendor operates several laundry facilities around the country. Discharges from the commercial laundry are monitored by the New Mexico Environment Department, which has permitting authority over the facility.

04.07 The commentor refers to the NTS section 4.9.2.4 and suggests that the word "affected" be replaced with the word "contaminated." In addition, the commentor suggests that the sixth line be removed or corrected because the statement does not make sense. According to the commentor, tests conducted below the NTS water table contaminate the surrounding groundwater with radionuclides. The commentor also refers to section 4.12 and states that groundwater that may be potentially contaminated is water that people are likely to avoid. The subsistence farmer, in the distant future, may not have his well water checked on a regular basis. The commentor feels phrases such as "quality," "some," "impacts," and "could be expected" should be replaced with "purity," "extensive," "damage," and "would take place," respectively, when describing the unavoidable impacts that underground testing has on groundwater.

Response: *The terminology used in the Stockpile Stewardship and Management PEIS is accepted within the environmental community to characterize conditions at the site and is consistent with the terminology used in the NTS Site-Wide EIS. In reference to the commentor's suggestion about the sixth line, the following statement in section 4.9.2.4 has been removed from the Final PEIS, "subsurface migration of tritium to offsite areas is possible, but the probability of tritium reaching offsite wells or springs is minimal."*

As stated in section 4.12, underground testing would be expected to have a significant impact on groundwater quality only if the testing is conducted in, or near, the water table. In this event, large scale contamination of the near-test groundwater resources could occur. However, because of the conditions at NTS (low hydraulic conductivities, high absorption geologic media, and slight hydraulic gradients), it is not considered likely that any significant impacts would occur in areas downgradient of the underground testing locations.

04.08 The commentor states that maximum groundwater concentrations at LLNL, reported in the PEIS, of gross alpha, nitrate/nitrite, trichloroethylene, and tritium exceeded water quality criteria/standards in 1993. According to the commentor, VOC-contaminated water is present under 85 percent of the Livermore Site and various other examples of groundwater contamination exist. The commentor asks what measures are proposed to mitigate further groundwater contamination at LLNL resulting from proposed actions.

Response: *DOE agrees that the current groundwater monitoring system is inadequate. LLNL has implemented a system of satellite monitoring stations positioned at strategic locations within the main sewer system. Each station has an automatic sampler which, in the event of a release, can be used to find the origin of the spill. During 1993, no releases warranted a sewer diversion. In comparison, during 1991 and 1992, 15 and 13 releases, respectively, were detected. In addition, all building drains were tested to determine their points of discharge and all deficiencies were categorized and are being corrected (major deficiencies were remedied immediately). Relining of the major laterals of the sanitary sewer system also began in 1993.*

The preferred stockpile stewardship alternative site for NIF is LLNL. The increase in wastewater discharges due to NIF is 3.9 percent over No Action. Since there are no direct discharges to surface or groundwater, no adverse impacts are anticipated. At Site 300, the Contained Firing Facility (CFF) is the preferred stockpile stewardship alternative. Wastewater discharge is expected to increase 6.8 percent over No Action. Wastewater is discharged to leach fields and septic systems at Site 300. These discharges are monitored and must comply with NPDES permits and waste discharge requirements.

04.09 The commentor states that the radiological sources in the groundwater section of the NTS Site-Wide EIS should be included in the Stockpile Stewardship and Management PEIS. According to the commentor, the text in question extends from page 4–159, line 8 to page 4–163, line 24 and should include table 4–27. Further, the commentor disputes the amount of plutonium-239 buried under the NTS testing grounds.

Response: *Section 4.9.2.4 discusses groundwater monitoring at NTS. As stated in this section, tritium is the only radionuclide that appears in sampled groundwater at significant levels. These levels (120 picocuries [pCi]/L for 1993) are well below the National Primary Drinking Water Regulations (40 CFR 141) of 20,000 pCi/L. In section 4.12 of the PEIS, the effects of underground nuclear testing on several resources, including groundwater, are discussed. In addition, radiological impacts are discussed in the Radiation and Hazardous Chemical Environment sections 4.2.9.3 through 4.9.9.3. For more detailed analysis beyond the scope of the Stockpile Stewardship and Management PEIS, site-specific documents such as the NTS Site-Wide EIS should be reviewed.*

04.10 The commentor asks why the uranium in water values in tables 4.2.2.4–1, 4.5.2.4–1, and 4.6.2.4–1 are different (20 pCi/L and 20 μg/L). In addition, the commentor asks why these tables state that the uranium value of 20 pCi/L or 20 μg/L is a National Primary Drinking Water Standard, when it is only a proposed standard.

Response: *The proposed National Primary Drinking Water Standard (56 FR 33050) for uranium (20 μg/L) only applies to table 4.6.2.4–1. The other tables reflect Derived Concentration Guides in* *pCi/L as the standard because the samples reflect total uranium concentrations which do not apply to the proposed National Primary Drinking Water Standard.*

04.11 The commentor believes that the PEIS should evaluate hydrology of surface and subsurface waters at LANL and SNL, not just potable water sources. Hydrology involves the potential for subsurface travel of materials such as petrochemicals and the resultant contamination of the Southern Valley of Albuquerque, according to the commentor. Another commentor asks where hydrology is discussed in the PEIS.

Response: *Surface water quality at LANL and SNL is evaluated in sections 4.6.2.4 and 4.6.3.4, and 4.8.2.4 and 4.8.3.4, respectively. Groundwater monitoring wells exist at several depths, both in perched aquifers and deeper aquifers, potable and nonpotable. Drinking water standards are listed in tables 4.6.2.4–1 and 4.8.2.4–1 for comparison purposes only.*

All treated wastewater discharges would be monitored to comply with NPDES permits and other applicable discharge requirements. The preferred alternatives of pit fabrication and the Atlas Facility at LANL would only increase wastewater discharges by 1.8 percent. These discharges would be treated before release to the canyons. No adverse impacts to either surface or groundwater are expected. There are no stockpile stewardship and management preferred alternatives identified for SNL.

04.12 The commentor expresses concern about the quality of the drinking water at Pantex. The commentor notes that Pantex is monitored for 160 contaminants, the majority of which ended up being discharged to groundwater. The commentor wants a broader spectrum of contaminant analysis for drinking water.

Response: *Pantex is monitored to comply with all Federal, state, and site-specific regulations. The groundwater monitoring program is constantly being updated based on past results to provide the best analysis possible. As discussed in sections 4.5.2.4 and 4.5.3.4, there are no direct discharges to groundwater. All wastewater is processed at the Pantex wastewater treatment facility before release to the playas. All discharges comply with NPDES permits and surface water monitoring is conducted regularly.*

04.13 The commentor asks if, in section 4.2.3.4, the statements are correct that the phaseout of work at Y-12 would reduce the flow in the East Fork of Poplar Creek to zero and would have no impact on the water quality in the creek, and that there are no natural springs beneath some buildings in the plant that run continuously into the East Fork of Poplar Creek (very low flow rates). The commentor asks further, if it is not correct that the city of Oak Ridge must have a flow in the East Fork of Poplar Creek in order to discharge the treated sewerage water from the city, and if the flow from Y-12 is zero, would the city of Oak Ridge be allowed to continue to discharge the treated water into the creek.

Response: *In section 4.2.3.4, the statement should read that the phaseout of secondary and case fabrication would decrease the discharges from the mission to zero; other missions at Y-12 would continue to discharge to East Fork Poplar Creek. Phaseout would not be expected to impact the city of Oak Ridge discharge of treated sewage water.*

04.14 According to the commentor, section 4.5.2.4 does not provide adequate information for the reader to determine if environmental impacts could result from the proposed alternative actions at Pantex.

Response: *Chapter 4 of the PEIS is broken down into two sections, the affected environment and environmental impacts. Section 4.5.2.4 is intended to provide only the affected environment, or a* *baseline for comparison of environmental issues. Water impacts due to No Action and proposed alternatives at Pantex are discussed in section 4.5.3.4. In addition, all of the alternatives considered for Pantex decrease the amount of water used and discharged.*

04.15 Commentors ask if an analysis has been made of the impact on the Las Vegas municipal water supply of NTS workers and their families associated with the 2,253 new jobs at NTS (Stockpile Stewardship and Management Summary section S.4.1) who are likely to reside in Las Vegas.

Response: *Based on the population of Las Vegas (327,878), the 2,253 new workers associated with the A/D mission at NTS would represent less than a 1-percent population growth. The population growth in the area is approximately 7 percent per year. Because this increase in population is within normal growth rates, minimal impacts to the municipal water supply are expected and no specific analysis was included in the PEIS.*

04.16 The commentor states that there are numerous factual errors in section 4.6.2.4, Water Resources at LANL. The commentor points out that the 1992 data is being used and suggests using more recent data (for example, the 1993 Environmental Surveillance Report). The commentor notes that in Parajito Canyon, Homestead Spring feeds a perennial stream only a few hundred yards long. The stream is fed by other springs in addition to Homestead Spring. According to the commentor, only during periods of heavy precipitation or snowmelt would water from Pueblo, Los Alamos, or Sandia Canyons extend beyond LANL boundaries and reach the Rio Grande. The commentor suggests that this information be supported by good volumetric data which can be obtained from the data provided by the gauging stations.

Response: *The water resource data has been updated with information from the 1993 Environmental Surveillance Report, which had not been published at the time the Stockpile Stewardship and Management Draft PEIS was prepared. DOE agrees with the commentor that Homestead Spring feeds a perennial stream 3 to 5 kilometers (km) (2 to 3 miles [mi]) long, and the Final PEIS has been corrected accordingly (see section 4.6.2.4); however, the 3- to 5-km (2- to 3-mi) distance is largely due to contributions from other springs and runoff, and not solely to Homestead Spring discharge.*

The following volumetric data regarding surface water runoff beyond LANL boundaries is provided at the commentor's request. At the LANL boundary during water year 1995 (fiscal year 1995), the last year for which data is available, the streams mentioned in the PEIS flowed as follows:

Pueblo: 365 days with flow (typically about 0.03 m^3 [51 ft^3] per second)
Los Alamos: 94 days with flow
Sandia: 6 days with flow
Mortandad: 0 days with flow

In addition, visual and chemical observations from Mortandad Canyon since 1960 by U.S. Geological Survey and LANL hydrologists have not noted any continuous flow from the upper canyon to the LANL boundary.

04.17 The commentor points out that according to the PEIS, groundwater in the LANL area exists in three modes. The commentor advises that there is a fourth mode-shallow perched in the Bandelier Tuff. In addition, the commentor states that in the PEIS, under Groundwater Availability and Use, downgradient users beside the communities of Los Alamos and White Rock are not mentioned. The commentor asks about other possible usage by pueblos such as San Ildefonso and Santa Clara.

Response: *The commentor notes a fourth occurrence of groundwater: shallow perched water in the Bandelier Tuff. This mode of groundwater occurrence is known to be present west of LANL on the flanks* *of the Jemez Mountains. While it is possible that this form is present beneath LANL, it is not known to be present, and hydrologic studies would have to be performed to confirm this condition.*

04.18 The commentor is of the opinion that there is little consistency in the placement of groundwater monitoring wells at LANL and that existing wells are inadequate. The commentor points out that the wells are very old (the most recent was drilled in 1963), and may not be thoroughly grouted and may be leaking. The commentor is concerned that contaminants may not be detected because of the lengthy intervals between sampling screens (some greater than 30.5 m [100 ft], e.g. DT-9 is screened at 317 m [1,040 ft] and 457 m [1,500 ft]).

Response: *DOE agrees with the commentor that the present groundwater monitoring network is inadequate. DOE and LANL have initiated a major upgrade to the monitoring network to include additional wells drilled to monitor all zones of groundwater beneath LANL (see the* LANL Groundwater Protection Management Program Plan, *January 31, 1996).*

05 GEOLOGY AND SOILS

05.01 The commentor states contamination in soils has been omitted almost entirely from the discussion of the current environment at LANL.

Response: *LANL has a long-standing soils monitoring program to identify potential contamination of soils; this is reported to the public annually in LANL's* Environmental Surveillance Report *and other publications. DOE is working with Federal and state regulatory authorities to address compliance and cleanup obligations arising from its operation of LANL and is engaged in several activities to bring its current operations into full regulatory compliance. Although LANL is not listed on the NPL, it is required to obtain a* Resource Conservation and Recovery Act *(RCRA) permit in accordance with the Hazardous and Solid Waste Amendments of 1984. This requires that permits for treatment, storage, and disposal facilities include provisions for corrective action to mitigate releases from facilities in operation and to clean up contamination in areas designated as solid waste management units at LANL. The commentor is referred to sections 4.6.2.10, 4.6.3.10, and appendix section H.2.5 of the Final PEIS for more information about waste management and identified release sites at LANL.*

05.02 Commentors believe that the description of the geology and soils at Pantex is inadequate. According to one commentor, section 4.5.2.5 does not provide adequate information for the reader to determine if environmental impacts could result from the proposed alternative actions at Pantex. It is therefore not possible to determine that "hazards posed by geological conditions are negligible at Pantex." The commentor also states that the role of salt dissolution and subsidence in the formation of the playa basins should be described, as well as the potential effects, if any, of dissolution-induced subsidence at the plant. Another commentor notes that Pantex is located on a geological fault that has been active enough in the last century to cause damage to farm buildings.

Response: *The discussion in sections 4.5.2.5 and 4.5.3.5 now includes the two main geological processes that are relevant to the Pantex area: subsidence and seismic activity. The following text has been added to section 4.5.2.5 in the Final PEIS, "In the High Plains area, salt dissolution in Permian formations is an active process which can lead to sinkholes and fractures. Such surficial expressions have not been identified in Carson County, where Pantex is located. Sinkholes and fractures have been identified, however, in adjacent Armstrong County to the south and Hutchinson County to the north." The following text has been added to section 4.5.3.5, "Potential subsidence impacts resulting from salt dissolution are considered negligible at Pantex because salt dissolution is a slow process relative to human activities." While there are no active faults identified beneath Pantex, it is true that seismic events have occurred in the region which have caused damage to residential buildings. The level of* *seismicity historically associated with the Pantex region, however, is low. The seismic risk at Pantex, therefore, is judged to be low.*

The commentors are referred to the geology and soils section of the Pantex Site-Wide Draft EIS for a more detailed discussion of salt dissolution and seismicity in the Pantex region. Aside from these geological processes, it should be noted that the proposed alternatives at Pantex involve no new construction. As a result, no adverse geological or soils impacts are anticipated.

05.03 The commentor states that the lithology of the Ogallala Formation is not described in the PEIS. The significance to groundwater flow of the fine-grained zone as well as gravels in buried channels beneath the plant should be described, according to the commentor.

Response: *A detailed discussion of the lithology of the Ogallala Formation is more information than necessary to evaluate potential aquifer impacts for a programmatic review. The commentor is referred to the groundwater section of the Pantex Site-Wide Draft EIS for a discussion of the fine-grained zone and buried channels beneath Pantex.*

05.04 The commentor refers to section 4.12, Environmental Impacts of Underground Nuclear Testing, and requests correction of the effects of subsidence to state that radioactivity is only partially confined and that the effects will persist for at least a quarter million years.

Response: *The commentor is correct, radioactivity from some materials in NTS soils would remain for a long time. As stated in section 4.12, radioactive noble gases and tritium may be released to the surface by gradual seepage from the cavities and by escape of gases during sampling operations. This statement is meant to indicate that the radioactivity is not entirely confined.*

05.05 The commentor notes that no mention is made that the Randall clay soils at Pantex contain potential pathways for groundwater recharge (i.e., deep desiccation cracks and root tubules).

Response: *The fact that Randall clay soils at Pantex contain potential pathways for groundwater recharge is considered in the estimates of annual recharge rates to the Ogallala aquifer. The commentor is referred to section 4.5.2.4, Water Resources, for a discussion of aquifer recharge.*

06 BIOTIC RESOURCES

06.01 The commentor is concerned that SRS is destroying the natural habitat along the Savannah River.

Response: *Impacts to natural habitat along the Savannah River would not be expected from either the No Action or management alternative (i.e., pit fabrication mission). Under the No Action alternative, there would be no change to current biological conditions of the site, including habitat along the Savannah River. The pit fabrication mission also would not be expected to adversely affect habitat along the Savannah River since existing facilities within the F- and H-Areas would be used and wastewater would be released through NPDES-permitted discharges.*

06.02 The commentor states that there is no discussion in section 4.6.2.6, Biotic Resources, of the effects that LANL contaminants may have on wildlife.

Response: *Section 4.6.3.6 discusses the potential impacts of the No Action, management, and stewardship alternatives at LANL on terrestrial resources, wetlands, aquatic resources, and threatened and endangered species. LANL conducts ongoing studies to monitor the effects of LANL operations on biota. LANL monitors plants and wildlife populations on and near laboratory property to determine if there* *are impacts from LANL activities to individual animals or entire populations. LANL has issued numerous publications over the past 20 years regarding its findings, which do not indicate significant adverse effects to laboratory biota as a whole.*

07 CULTURAL AND PALEONTOLOGICAL

07.01 One commentor asks what the Stockpile Stewardship and Management PEIS cultural and paleontological analysis involved.

Response: *The analysis involved is described in section 4.1.7 for the affected environment and environmental impacts descriptions. The affected environment descriptions resulted from documentary research, including examination of previous site documents such as archaeological and historic structure survey reports, reports of interviews with Native Americans, general texts about an area's history and geology, National Register of Historic Places (NRHP) guidelines, and discussions with the alternative sites and with the NRHP.*

The impacts analysis involved identifying the areas (and standing structures) that might be affected by the potential alternatives, comparing the affected environment resources data to the potentially affected areas, and determining whether or not the alternatives might affect cultural and paleontological resources.

07.02 The commentor states that DOE is taking and has taken land from the Western Shoshones. The commentor claims that DOE has ignored the native peoples who own the land at NTS and Yucca Mountain through treaties. Another commentor states that DOE should keep its word and return Indian land to its rightful owners.

Response: *DOE is aware that the Western Shoshone have disputed the U.S. Government's ownership of lands on NTS and Yucca Mountain. The land ownership issue has been brought to court on several occasions. In the early 1950s, the Western Shoshone filed a claim concerning the lands at issue under the* Indian Claims Commission Act *of 1946. This Act provided that if a claim against the Government for unkept treaty promises was upheld, the tribe making the claim could receive only a monetary award, not land or other remuneration. In 1962, the Commission ruled that all Western Shoshone land titles had been extinguished, and later, to establish valuation for a monetary award, set July 1, 1872, as the date the land was taken. In 1976, the Commission awarded the Western Shoshone $26 million as payment for the land. The Western Shoshone refused to accept payment, arguing that rejection of the money meant that they had not been compensated and their claim to the land was still alive. With interest, the award, held in the U.S. Treasury in trust for the Western Shoshone, is now more than $100 million.*

The land ownership issue has been brought to court on several occasions. In 1984, the U.S. Supreme Court agreed to hear the case, considering only the issue of whether "payment" for the land had been made. In 1985, the Supreme Court held that the payment had been made in accordance with the Indian Claims Commission Act *of 1946. This constituted full and final settlement for the land. Whether or not the Western Shoshone accepted the payment had no effect on the transaction; the land was ruled to belong to the United States. Subsequent challenges to this ruling have been made before the U.S. Court of Appeals who reiterated the Supreme Court decision: the Western Shoshone have no right to the land. In response to a subsequent appeal, the U.S. Supreme Court refused to hear the case, letting the appellate court decision stand.*

The U.S. Government (and DOE) must abide by the current U.S. Supreme Court rulings on this issue. The U.S. Government is aware of significant disagreement with the rulings, especially by the Western Shoshone, and realizes there are likely to be additional challenges and appeals. The U.S. Government must abide by any new rulings made on this subject.

08 SOCIOECONOMICS

08.01 Commentors express concern that the perceived mitigative effects of decontamination and decommissioning (D&D) jobs at ORR described in Summary section S.4.1 and table 3.7.1–5 would not materialize based on previous experience. The commentors are concerned about when the D&D work would be budgeted and whether these jobs would begin immediately or would be phased in. One commentor wants to know specifically what jobs are going to be created and if Washington agrees that these new jobs are going to be funded and asks that a table be provided showing employment and socioeconomic impacts through 2030. The commentors ask if Washington does intend on funding the (proposed 1,318) D&D jobs, is this a steady state requirement and how many years can the level of expenditure continue once it starts. A commentor states as an example that the D&D on Building 9201-4 has been scheduled for 15 years and does not seem to be a priority. A commentor is also concerned about who would do the D&D work (Lockheed-Martin people or contract workers), and how soon it would have to be scheduled in order for Lockheed-Martin workers to be kept on the payroll. Another commentor is concerned that people from K-25 are included in the D&D figures that are planned for Y-12. The commentor is concerned that DOE is just shifting people and money for D&D.

Response: *For base case single-shift operations, the total Y-12 workforce would fall to 3,916 from the No Action level of 4,721. The workforce would consist of 1,980 workers conducting nonstockpile management activities, 784 core stockpile management workers, and 1,152 workers performing landlord activities in preparation for D&D of the facilities. The projected D&D employment at Y-12 is shown in section 4.2.3.8. Workers performing landlord activities are necessary for transition of the facility and would be in place whether the funding comes from the Environmental Management program or continues to come from DOE's Office of Defense Programs (DP). Over the period 2005 to 2030, the number of these workers would range from a high of 1,522 in 2016 to a low of 557 in 2030. When D&D activities reach a peak in 2016, Y-12 would employ 435 fewer workers than under the No Action alternative.*

08.02 The commentor wants to know where the impacts to the agricultural economy were analyzed in the PEIS.

Response: *The Stockpile Stewardship and Management PEIS does not analyze the economic impacts to particular sectors such as the agriculture sector. Rather, the document evaluates impacts to the regional economy as a whole, which includes the agricultural sector. However, none of the proposed alternatives would make use of prime farmland or involve activities affecting farm production. Under normal operation, there would be no direct impacts to the agricultural economy. Any potential impacts to agriculture resulting from an accident are analyzed in appendix section F.4.*

08.03 Commentors state that the socioeconomic impact to Oak Ridge and the surrounding communities has not been appropriately analyzed. One commentor expresses concern about the data used for the socioeconomic study and the financial impact studies which show little impact on the city of Oak Ridge and the ORR region. Another commentor asks what the community will do with the unemployed workers that have been at ORR for 20 to 25 years. The commentors also indicate that the study's results must be questioned because personnel from the city of Oak Ridge were not directly involved in the analysis.

Response: *The socioeconomic impacts associated with the alternatives at ORR extend beyond the city of Oak Ridge and include all the jurisdictions within the four-county region of influence (ROI). The database used for the socioeconomic study was developed using the most recent information* *available from the Departments of Commerce and Labor, as well as financial reports provided by cities, counties, and school districts. The impacts were measured using the latest version of Regional Input-Output Modeling System II (RIMS II), a model developed by the U.S. Bureau of Economic Analysis. The model is used by Government agencies, university researchers, and private economists to measure economic impacts. The socioeconomic impacts for the alternatives considered for ORR are discussed in section 4.2.3.8. DOE has created the Office of Worker and Community Transition to help ease the unavoidable impacts associated with the restructuring of the contractor workforce at DOE sites. The office has issued its Interim Guidance for Contractor Workforce Restructuring which includes options to encourage voluntary separations and assist affected workers in transition to new careers. The final guidance also includes measures such as transferring employees to other missions or other sites, providing additional training and educational assistance, or counseling for the employees. In addition, DOE anticipates working closely with other businesses in the communities surrounding the sites to keep them informed of skilled personnel in the labor market.*

In accordance with the NEPA process, the city of Oak Ridge has been invited to provide comments on the proposed alternatives from the time of initial scoping to the Final PEIS. Any comments provided by the city or any other commentors are taken into account and incorporated into the Final PEIS.

08.04 Commentors recognize that downsizing the nonnuclear fabrication mission at KCP will result in a loss of possibly 300 to 900 jobs over a period of time. The commentors want to know what can be done, what resources can be utilized, and how the business community can help lessen the number of jobs lost. The commentors point out that even with the possibility of additional future work at KCP, there is concern and they want to know if it is possible to maintain a higher rate of employment in the Kansas City area.

Response: *In September 1994, DOE created the Office of Worker and Community Transition to help ease the unavoidable impacts associated with the restructuring of the contractor workforce at DOE sites. The office has issued its Interim Guidance for Contractor Workforce Restructuring which includes options to encourage voluntary separations and assist workers in transition to new careers. The final guidance also includes measures such as transferring employees to other missions or other sites, providing additional training and educational assistance, or counseling for the employees. In addition, DOE anticipates working closely with other businesses in the communities surrounding the sites to keep them informed of skilled personnel in the labor market. Because KCP is small relative to the large, diversified economy of the Kansas City region, the downsizing is expected to have little effect on the regional economy. Kansas City derives almost all of its employment growth from non-DOE activities.*

08.05 The commentor believes that the socioeconomic analysis does not consider the social and economic impact of the people at LANL who were laid off at the plutonium facility. The commentor believes that DOE needs to look at the integrity of the people in the socioeconomic analysis. The commentor also believes that the 22 people laid off at the plutonium facility should be interviewed for the socio-economic analysis.

Response: *The Stockpile Stewardship and Management PEIS identifies and analyzes potential impacts of the proposed Stockpile Stewardship and Management Program alternatives, including the reestablishing of pit fabrication at LANL. The PEIS does include in the analysis the impacts of previous actions, such as layoffs at the LANL plutonium facility. The commentor's concerns about downsizing and the effects on site employees are being addressed by DOE's Office of Worker and Community Transition. This office oversees DOE policies to facilitate worker transition, including* *worker retraining, education, and relocation assistance. The socioeconomic impact analysis estimates direct and indirect economic impacts, including employment and income. The PEIS also estimates impacts to the regional population and the housing market, as well as impacts to public finance.*

08.06 The commentor believes that any additional work that would come to Los Alamos from pit production should be contracted out to a private taxpaying company instead of going to the University of California, which does not pay taxes to the state or the community.

Response: *The economic analysis does not take into account what type of contractor would be managing the implementation of the proposed alternatives. The purpose of the economic analysis is to evaluate the socioeconomic impacts of the proposed alternatives on employment and income in the regional economic area. The socioeconomic impact analysis also addresses impacts to population, housing, and public finances. Selection of the preferred alternative would not be affected if LANL's contractor were a private in-state company instead of the University of California. This is because the benefits to the local communities from a private contractor as opposed to a non-profit contractor are likely to be small. Any revenues generated by corporate taxes levied on a private company would be the result of a state corporate income tax. This revenue could then be dispersed throughout the state, rather than remain in the LANL region. It is unknown what portion of these funds would actually be allocated to the LANL region. Impacts to the local community public finance would more likely stem from local taxes paid by workers directly associated with the facility. Furthermore, the process of selecting a contractor for performing proposed alternatives would be accomplished separately from the NEPA process.*

08.07 Several commentors believe that the laboratories do not understand the various processes at Y-12 to estimate accurate employment figures. The commentors state that a detailed breakdown of the job structure does not exist. The commentors wonder how the waste job structures at Y-12 will be moved to LANL and how many people for each function will be at all three of the sites. In addition, the commentors state that there is no description on a function-by-function basis of how the fabrication process can be implemented at another site, and this oversight allows for wildly unrealistic estimates at the other sites. Further, the commentors would like the PEIS to address the difference in worker experience between Y-12 and the laboratories and the cost of having to train a new workforce if the secondary and case fabrication mission were moved.

Response: *In developing the data used in the PEIS and in the cost estimates, DOE formed a working group for each functional area that included all affected sites in order to share information and provide consistent data for all of the proposed alternatives. In the case of secondary and case manufacturing, this included knowledgable personnel from both Y-12 and the laboratories so that all three alternatives would be evaluating the same mission and requirements. Appendix A gives a breakdown of employment by labor category for each alternative at each site, and also includes details on how the process would be implemented at each site. This functional breakdown estimates the workers needed at Y-12, LANL, or LLNL.*

08.08 Commentors ask about the difference between socioeconomics and environmental justice.

Response: *Environmental justice analysis, as defined in Executive Order 12898, is performed to assess whether the proposed alternatives would have a disproportionately high and adverse effect on minority and low-income populations. The analysis is accomplished by examining the size and distribution of these populations and determining if adverse health and economic impacts would be borne by these groups to a greater degree than the population as a whole. Socioeconomics has a* *broader focus. Socioeconomics addresses the impacts of the alternatives on the economic and social characteristics of a region, such as population, employment, housing, and public finances. The socioeconomic impact sections analyze the effect the alternatives would have on the entire region, rather than on particular populations.*

08.09 The commentor points out peculiarities, such as the concept that no indirect jobs would be generated for the 523 workers and 321 incremental workers associated with the secondary/case mission (table 3.4.4.3–2), that need to be resolved.

Response: *The number of indirect jobs generated by each alternative depends on the mission performed and the types of existing industries within the region. In the region around LANL, there are few or no industries that would support the secondary and case fabrication mission. Therefore, the increase in site employment (direct jobs) would not result in a corresponding increase in supporting industry employment (indirect jobs).*

08.10 The commentor states that the numbers included in the PEIS contain inconsistencies in logic and mathematics. For example, in section 3.4, the commentor notes surge operation is used for generating the operations analysis numbers, rather than the base case, which would presumably be the actual staffing levels and would be a more realistic identification of the manpower and socioeconomic impact. The commentor also wonders why the impact numbers calculated in the analysis in section 3.7.1.1 are based on the three-shift surge operation, when single-shift operation is the base case (table 3.1.1.1–1). The commentor feels this may have been done to reduce the socioeconomic impacts.

Response: *The Final PEIS assesses socioeconomic impacts using both the base case single-shift and the base case surge (three-shift) production scenarios. However, DOE has analyzed the base case surge scenario (as well as a high case scenario where appropriate) to fully capture the bounding case. This is because a surge operation would require more workers than a one-shift operation and could potentially cause greater disruption of the local infrastructure (e.g., housing and public finances).*

08.11 The commentor expresses confusion about the difference between direct and indirect jobs and requests that the glossary include these terms. Another commentor refers to the discussion in the Summary section S.4.1 and states that only direct employment impacts are considered in socioeconomics. The commentor questions whether negative factors (such as land use, waste management, hazardous operations, and transportation problems) would have negative socioeconomic impacts.

Response: *The socioeconomic analysis assesses both direct and indirect economic employment impacts. Indirect employment refers to jobs created or lost in industries that support activities associated with the proposed alternatives while direct employment refers to changes in site workforce. These definitions are included in chapter 9, Glossary. Waste management, transportation, and hazardous operations are assessed in terms of health risks to workers and the public.*

08.12 The commentor refers to figure 4.2.3.8–4 and states that the text under public finance only discusses ROI impacts when the city of Oak Ridge impacts are 5.5 and 7.5 percent. The commentor asks, since these numbers are for 2005 and the staffing levels in 2030 are only half of the 2005 level, how this affects projected impacts in 2030.

Response: *The text presents overall ROI impacts while the figures show the effects to individual cities and counties. In the Final PEIS, the range of the effects on cities and counties is included in the text.*

08.13 Commentors state there are inconsistencies between the Draft PEIS (figure 4.2.3.8-1) and the Stockpile Management Preferred Alternatives Report (page 39) regarding employment figures. The commentors note that the Draft PEIS projects a continuously decreasing employment level for the downsizing ORR alternative until the year 2030. The commentors note that section 4.2.3.8 is the only section which mentions Environmental Management support employment figures. The commentors point out that the Stockpile Management Preferred Alternatives Report contradicts the information in the Draft PEIS by reporting employment levels that will not continue to decline after the year 2008 and will in fact remain constant between the years 2008 and 2030. The commentors state the public is unsure which figures are accurate.

Response: *Figure 4.2.3.8–1 was incorrect and did not properly reflect the employment numbers presented in the PEIS which represent DOE's most recent estimates of the labor force required for the mission. The ORR labor requirements have been revised since the publication of the Draft PEIS. The base case single-shift core stockpile management workforce will be 784 in 2005, while the base case surge (three-shift) core stockpile management workforce would be 1,376 in 2005. In addition, D&D employment would begin in 2003, increase its employment requirements until 2016, and gradually decrease until 2030. This is shown in section 4.2.3.8. The preferred alternative number of workers expected at Y-12 is 1,080, which falls between the two bounding values analyzed in the PEIS.*

08.14 The commentor states that the 1,100 employees that have been added to the Pantex workforce in the past few years are mostly ES&H workers and not A/D workers.

Response: *Of the 1,100 worker increase at Pantex over the past 5 years, approximately 25 percent are associated with ES&H and waste management activities. About 75 percent of the additional workforce is employed in production and dismantlement operations.*

08.15 The commentor urges DOE to correct the socioeconomic impact portions of the PEIS to accurately reflect the impact of Pantex on the local economy, stating that employment related to Pantex represents over 12 percent of all jobs in the Amarillo metropolitan area. The commentor's assertion is based on the fact that the money Pantex brings into the local economy supports many retail, medical, educational, finance, insurance, and real estate jobs. Other commentors state that the dramatic employment reduction of 3,549 jobs forecasted in the Draft PEIS will severely impact the Panhandle economy and that any reductions should come only after intensive cost and technical analyses. The commentors feel the loss of 3,549 high paying jobs would have greater than a 1-percent impact.

Response: *The socioeconomic impact sections look at the entire regional economic area around the site, rather than the nearest metropolitan area. The jobs considered are those jobs associated with the mission at the site, and those jobs in other industries in the area that are related to and support the mission activities. Other changes to the local economy, such as changes in tax revenues and Government expenditures, are analyzed in the public finance portions of the socioeconomic sections. Total phaseout of Pantex would result in a loss of 3,549 jobs (1,644 direct and 1,905 indirect). This represents 1.4 percent of total employment in the Pantex regional economic area. The downsize A/D and HE fabrication alternative would result in a loss of 475 jobs (220 direct and 255 indirect), which is 0.2 percent of total regional economic area employment. While these job losses could negatively affect the Panhandle region, DOE's Office of Worker and Community Transition would work with the area to lessen any impacts.*

08.16 The commentor states that the PEIS does not address the social impacts that go beyond the direct number of jobs, such as unnecessary infrastructure and empty schools. The commentor believes the main adverse impacts of a stockpile stewardship program would be associated with the construction of new facilities and in the societal effects of shifting responsibilities among installations.

Response: *The socioeconomic impact analysis estimates direct and indirect economic impacts, including employment and income. The PEIS also estimates impacts to regional population and the housing market, as well as impacts to public finance for all sites and all alternatives. The analysis of population impacts indicates that any population change would be small relative to the resident population, and would not significantly impact school populations or existing infrastructure.*

08.17 The commentor notes that in the Summary section entitled Secondary and Case Fabrication, the proposed plan is to cut Y-12's manufacturing capability from 2,350 current DP workers to 870, but that the data presented at the April 1 and 2, 1996 meetings in Oak Ridge were 3,126 current DP workers at Y-12 to be reduced to a downsized level of 1,080 in the year 2003. The commentor points out that the meeting data indicate a cut of 2,046 employees while the PEIS shows a reduction in DP supported workers of 1,480 for the same years. The commentor wants to know the impact of the new data which calls for a cut of 2,046 workers which is 38-percent higher than the data in the Summary section S.4.1 and in section 4.2.3.8.

Response: *For base case single-shift production in 2005, the number of core stockpile management workers at Y-12 would fall from the No Action level of 2,741 to 784 while landlord responsibilities in preparation for D&D would require 1,152 workers. An additional 1,980 workers would be required for other program activities at the Y-12 facility under both the No Action or the downsize alternative. Total Y-12 workforce (core stockpile management and other programs) would be reduced from the No Action level of 4,721 to 3,916, a loss of 805 jobs. Employment in the ORR regional economic area would fall by less than 1 percent as a result of the change in site workforce.*

08.18 The commentor refers to the Summary section S.4.1 and the proposed plan to cut Y-12's manufacturing capability from the current 2,350 workers to 870. The commentor wants to know the skill mix that will comprise the proposed 131 craftworkers and the 93 operatives identified in order to evaluate the feasibility of meeting the proposed production requirements. The commentor is interested in knowing how many workers will be involved in quality and certification and process development.

Response: *The socioeconomic impact sections analyze changes to regional economics, employment, population, housing, and public finance resulting from changes in site employment. The detailed data requested by the commentor is not available because the types of craftworkers and operators were not needed for determining environmental impacts. The skill mix of the workers does not change the environmental impacts of the proposed alternatives. The* Stockpile Management Preferred Alternatives Report *presents an evaluation of the technical ability of the alternatives to meet the proposed production requirements. This report is available in the DOE Public Reading Rooms near each site.*

08.19 The commentor contends that substantial local public and private money was put into building infrastructure to support DOE operations (i.e., roads, schools, and utilities). The commentor states that the PEIS does not consider the total national impact on local socioeconomics (i.e., cuts at ORR, expansion at another site). The commentor suggests that the PEIS needs to account for and address these "stranded costs."

Response: *As seen in the socioeconomic analysis, the impacts to the regional economies from any of the proposed alternatives is small. In the case of the preferred alternative, the losses to the regional economy would be diminished by D&D activities associated with downsizing. Population* *decrease in any ROI jurisdiction would not exceed 4 percent as a result of downsizing to the preferred alternative. Therefore, there would be no large changes in the utilization of local services or utilities.*

08.20 The commentor requests clarification on the level of importance placed on the impact of jobs lost or jobs gained in any particular area in making recommendations.

Response: *The primary purpose of the Stockpile Stewardship and Management Program is to continue to support U.S. national security policies as directed by the President and Congress. The final decision to select a preferred alternative takes into account impacts to various environmental resources, including socioeconomics. The Record of Decision (ROD) will explain the rationale and the factors for DOE's decisions.*

08.21 The commentor states that DOE should have analyzed in more detail the socioeconomic impacts associated with each of the proposed alternatives, including impacts associated with loss of employment population, unnecessary infrastructure, and empty schools, as well as other financial impacts on the region's economy. The commentor believes that local government representatives should be included in this more detailed analysis.

Response: *The PEIS analyzes impacts to regional employment and income, as well as any changes to population or housing markets that could result from the proposed alternatives. In addition, impacts to local government and school district finances are assessed. Information on public finances were obtained from each city, county, and school district. Other data came from sources such as the U.S. Census Bureau and the U.S. Bureau of Economic Statistics. Input from local government officials and other stakeholders is obtained from public meetings, including scoping meetings.*

08.22 The commentor states that DOE should explain the statement in the Stockpile Stewardship and Management Draft PEIS, "The downsizing A/D and HE fabrication alternative would result in the addition of 280 workers at Pantex."

Response: *A majority of the worker reductions at Pantex would have already occurred under No Action. Under the base case single-shift scenario, downsizing Pantex (retaining A/D and HE missions) would result in the loss of 189 jobs from the No Action level of 1,644 jobs. A base case surge (three-shift) operation would require 1,927 workers. This represents an increase in employment requirements over No Action of 283 jobs. This number was rounded to 280 in the Draft PEIS.*

08.23 The commentor refers to the ORR section 4.2.3.8 on public finance and wonders who projected that total expenditures for the public area would increase an average of less than 1 percent per year from the year 2000 to 2030.

Response: *Section 4.2.3.8 on public finance at ORR states that total expenditures are projected to increase at an annual average of less than 1 percent during the period 2000 to 2005, and that this rate of increase should continue until 2030. The increase for the ORR combined ROI cities and counties expenditures between 2000 and 2030 is 9 percent. These projections are developed from financial forecasting models described in the methodology section and are based upon financial statements and budgets from these cities and counties; the latest available projections for population, income, and employment from the U.S. Bureau of Economic Analysis; and other data.*

08.24 The commentor requests that the Comment Response Document contain a description of the statistical rationale which supports the PEIS statement that direct and indirect jobs lost (from transfer of

HE mission to laboratories) would not change the Pantex regional economic area's unemployment rate, housing/rental vacancies, and public finance expenditures/revenues. Another commentor feels DOE should not consider 33 HE jobs as insignificant.

Response: *Under No Action, the HE mission at Pantex would employ 105 workers and generate an additional 122 jobs in related industries within the region. Phaseout of this mission would therefore result in a total loss of 227 jobs in the Pantex regional economic area. Total employment in the region is projected to be 248,442 in 2005. Therefore, the jobs lost as a result of the phaseout of the HE mission would result in a loss of less than one tenth of 1 percent of total regional employment and would not have a measurable effect on the unemployment rate. Even if all of the displaced workers were to leave the area, the impacts on population, housing, and public finance would be negligible. As described in section 3.8, the preferred alternative is to assign the HE mission to Pantex.*

08.25 The commentor requests an explanation be given in the Comment Response Document regarding the apparent inconsistencies between the Pantex Site-Wide Draft EIS, the Stockpile Stewardship and Management Draft PEIS, and the Storage and Disposition Draft PEIS regarding the numbers of indirect jobs created in the region for each direct job at Pantex. The commentor notes that the Pantex Site-Wide Draft EIS, page S–17; Stockpile Stewardship and Management Draft PEIS, Summary section S.4.1; and Storage and Disposition Draft PEIS, page 4–205 assume an economic multiplier of 1.65, 1.16, and 3.51 indirect jobs in the region for every direct job created at Pantex, respectively.

Response: *Projections of the number of indirect jobs generated depends on a number of factors, including the type of mission activity performed, the type of data used, and the methodology employed. This PEIS evaluates the socioeconomic impact of weapons A/D at Pantex, while the Storage and Disposition Draft PEIS evaluates the impacts from the storage and disposition of fissile material. The activities involved in the two programs are quite different and each requires vastly different inputs. The availability of inputs within the region is what determines the multiplier. For example, if the Pantex region contains industries that produce the inputs required for storage and disposition activities, but no industries that produce stockpile stewardship and management required inputs, the storage and disposition mission would generate a greater number of indirect jobs in the region. The Pantex Site-Wide Draft EIS impact analysis was conducted at a different level of detail, and the analysis employed a somewhat different methodology.*

08.26 The commentor requests an explanation in the Comment Response Document as to why DOE did not consult with the Amarillo Economic Development Commission and/or the city of Amarillo regarding the ratio of additional jobs in the region related to each job at Pantex and use the information that taxpayers had already paid for.

Response: *The number of indirect jobs generated by any of the alternatives was determined using RIMS II from the U.S. Bureau of Economic Analysis. This information is available for every economic region in the Nation, and therefore lends consistency to the analysis across sites.*

08.27 The commentor states that the resulting benefits to the regional economy, if the Stockpile Stewardship and Management PEIS alternatives were located at LLNL, would be less than 1 percent. Given the additional radioactive and hazardous materials and wastes to be shipped to and from LLNL and handled at the facility, which projects a certain radiological risk to the public (albeit small, as estimated by DOE), the commentor states that the PEIS should contain an explanation which details how regional/state costs resulting from the proposed action will be offset by benefits to the regional economy.

Response: *The benefits to the local economy in terms of increased regional income and employment and public finance impacts are discussed in the socioeconomic section 4.7.3.8. These benefits can be compared to the costs of the alternatives.*

08.28 The commentor feels the statement in the ORR section 4.2.2.8, that all jurisdictions have positive fund balances, may be misleading, since state law requires positive fund balances and jurisdictions deal with this by generating capital obligations, which are not included in fund balance calculations.

Response: *Not all states require positive fund balances. The statement that all jurisdictions have positive fund balances was used in all sections where applicable. Otherwise, local governments without positive fund balances were identified. The analysis of public finances includes past capital bonding obligations and the projected payout of these existing obligations. However, as stated in the methodology, there was no attempt to project capital bonding that may be made in the future. The purpose of analysis was to compare effects of the proposed alternatives to No Action. Both were projected using the same assumptions and methodology.*

09 INTERSITE TRANSPORTATION

09.01 One commentor asks DOE to comment on its methodology for choosing transportation routes, parking areas, and the overall transportation plan. Several commentors urge DOE to educate the public about the risks associated with hazardous shipments and to consult and coordinate with local communities and interested parties along proposed transportation routes regarding each community's transportation responsibilities and needs (such as additional roads); the routing of hazardous shipments and notification of interested parties; the effects of these additional shipments on traffic patterns; and the effect on property values. One commentor asks that DOE expand the ROI beyond 80 km (50 mi), as these people could be affected by transportation issues as well. Another commentor urges DOE to use every safeguard possible to ensure that the public is not at risk from transportation of nuclear materials.

Response: *The intersite transportation of Stockpile Stewardship and Management Program materials is discussed in section 4.10 of the PEIS. Hazardous materials transportation routes are predetermined by the Department of Transportation (DOT) in conjunction with the individual states. Parking areas are generally at DOE sites, military bases, and other predetermined locations. The transportation planning for plutonium and highly enriched uranium (HEU) shipments is carefully prepared by the DOE Transportation Safeguards Division to provide both safety and cargo security. The risk from normal (accident-free) transportation of radioactive materials by DOE is minimal. Even severe accidents are highly unlikely to cause injury or death from a radiological release because of the stringent Federal DOT/Nuclear Regulatory Commission (NRC) packaging design and transport safety requirements. In over 40 years of shipment activity, neither DOE nor its predecessor has ever experienced an injury or death from a radiological release during transportation. The volume of radioactive shipments associated with this PEIS would be small and would have negligible effects on the number of shipments in transportation corridors. The transportation risk analysis for the alternatives presented in section 4.10 of the PEIS included the entire route, which is beyond the 80-km (50-mi) ROI.*

09.02 Several commentors contend that DOE has not provided equal treatment to local communities and Native Americans in regard to transportation issues such as emergency response and preparedness, and urge DOE to inform all local communities of important transportation issues. Another commentor notes that there are no evacuation plans for the people of Santa Fe and Albuquerque in case of a transportation accident involving nuclear materials. The commentor feels that the PEIS does not adequately analyze the impacts of accidents at LANL on the Pueblo of San Ildefonso. One commentor states that DOE needs to provide better oversight and notification regarding shipments through the city of Pahrump and Nye County, specifically emergency preparedness, as Pahrump does not have the population to be trained. Another commentor states that the emergency response personnel along the transportation routes are not properly trained and equipped to handle an accident involving nuclear materials.

Response: *DOT is responsible for coordinating Federal training programs and for providing technical assistance to states, tribes, and local governments for emergency response training and planning. Evacuation plans and emergency response are local jurisdictional responsibilities. However, DOE voluntarily provides limited free training and technical assistance to local jurisdictions when there is a specific special interest (e.g., in areas most likely to be traversed by safe secure trailer shipments). Training is also provided separately to law enforcement and emergency services personnel to familiarize them with DOE's system for the safe transport of nuclear materials. Interested parties can request this free training through the DOE Community Advisory Board for each site. Regarding the impacts of accidents at LANL and their effects on the Pueblo of San Ildefonso, the PEIS describes postulated transportation accident impacts at LANL and their effects on surrounding communities in section 4.10.*

If NTS were selected as the weapons A/D site, it is unlikely that radioactive shipments would pass through Pahrump because of its out-of-the-way location. The Federal officers who escort plutonium and HEU shipments are trained to actuate the National Emergency Response System if they, themselves, cannot handle emergencies that may occur en route. First responders, such as state police or other emergency services personnel, also know how to actuate this system.

09.03 Commentors state that there is local concern about the transportation of nuclear weapons parts and materials on the highways of Nevada, Clark County in particular. The commentors do not want these types of materials to go through Clark County and urge implementation of a rail system through low-population areas. The rail system could serve a multitude of purposes (e.g., mining) in addition to DOE transportation, and would eliminate the danger of highway transportation. The commentors urge a study of this alternative and state that the rail system would provide equity to the people of Nevada.

Response: *The methodology for the safe secure transportation of nuclear materials (plutonium and HEU) is well established. Acceptable risk is not dependent upon the transportation mode (truck versus rail) but rather upon the rigorous packaging design requiring Federal safety certification. The packaging must retain its contents under the most severe accident conditions (i.e., fire, impact, puncture, or water immersion). Rail transportation for plutonium and HEU was abandoned in favor of the safe secure trailers several years ago and is not now considered a viable transportation alternative for these materials related to the Stockpile Stewardship and Management Program.*

09.04 The commentor believes that the PEIS should consider the risks of hijacking when looking at the intersite transport of nuclear materials.

Response: *All potential threats (including hijacking) to the safety and security of nuclear materials in transit are considered by DOE's Transportation Safeguards Division.*

09.05 The commentor questions the safety record of nuclear shipments in the Los Alamos area. Another commentor cites a safe secure trailer turnover in Colorado about 5 years ago as proof that there have been accidents with nuclear cargo.

Response: *Although DOE's transportation safeguards system has experienced traffic accidents involving vehicles carrying interstate shipments of radioactive materials, none, including the accident in Colorado referred to by the commentor, have resulted in a release of radioactive material. The safety of the system is attributable in part to the training and certification of vehicle operators and the design of the vehicles themselves. However, the safety of DOE shipments does not rely just on these measures. Primary containment of radioactive materials is provided by the containers within which the material is placed for shipment. These containers are designed to conform to the requirements for Type B packages as specified by the NRC in 10 CFR 71. The packages are fabricated and tested to ensure compliance with the standard under normal conditions of transport and hypothetical accident conditions including fire, impact, puncture, and water immersion.*

09.06 The commentor refers to the Summary section S.2.3, High Explosive Components, and states that safety issues related to shipment of shaped charges were not assessed in detail, either in terms of increased volume of shipments of shaped components over raw HE, or in terms of the technical vulnerabilities of the components. Another commentor questions whether hearings have been held to discuss main charge transportation through the appropriately affected states. Other commentors ask if an analysis has been made of the additional hazards of transportation of HE from either of the national laboratories to where it would be used, and what are the increased costs of intersite transportation of HE from either of the national laboratories to where it will be used. One commentor contends that the safety impact of transporting hundreds of HE hemispheres from the laboratories to Pantex (should HE manufacturing be moved) is not adequately evaluated. A commentor also asks if scrap explosives will be returned to the laboratories for disposal or if Pantex will be responsible for disposition. Another commentor states that separation of the explosive fabrication and A/D missions would require that explosives be transported over long distances in order to be mated with the physics packages. Therefore, the commentor believes that in the case of LLNL, the extensive fogs that create near zero visibility should be considered in any safety analysis.

Response: *Transferring the HE fabrication mission from Pantex to LANL and/or LLNL would require an estimated 150 rebuilds to be shipped per year from the HE fabrication site to the weapons A/D site. The accident risk from transporting this material would be no greater than the risk encountered by the public from industry's transport of similar explosives. Hearings are not required for shipments of HE made in compliance with Federal transportation regulations.*

Transferring all or part of the HE fabrication mission from Pantex to LANL and/or LLNL would require an estimated 12 round trips per year to transport HE materials including the return of scrap HE to the laboratories. The transportation of HE is described in section 4.10 and appendix G of the PEIS. There would be no impact from normal (accident-free) transportation. HE accident impacts from transportation are bounded by the risk analyzed and presented in the Facility Accident sections. Weapon component shapes are classified and are shipped using the appropriate safeguard measures in accordance with approved Federal regulations. HE main charges would not be shipped with detonators installed and would meet all DOT safety requirements.

09.07 The commentor asks how reliable the PEIS transportation computer modeling is.

Response: *The RADTRAN computer code has been used in risk analysis for over 10 years and is being constantly improved and updated. It is accepted by the International Atomic Energy Agency and its worldwide member countries as a reliable risk assessment tool. RADTRAN calculates the* *collective dose to the exposed population (workers and the public) from a postulated accident as well as the collective dose from accident-free transportation. It produces conservative estimates (those that tend to overstate impacts) of radiation dose rates in a way that can be supported by available data.*

09.08 The commentor recommends that DOE should (a) directly involve corridor states and tribes in preparing for large quantity radioactive material shipments associated with the Stockpile Stewardship and Management Program and other DOE programs; this would include developing rail and truck transport plans, preferred routes, and procedures prior to shipment (similar to the plans developed by DOE and the Western Governors' Association for transuranic [TRU] waste shipments to the Waste Isolation Pilot Plant [WIPP]); (b) use only shipping containers that can be manufactured to meet current Federal transport safety requirements; and (c) provide accurate projected shipment information (i.e., quantities, schedules), as well as necessary assistance and lead time for state emergency response preparation. The commentor feels the Draft PEIS should quantify the number, volume, transport mode, and characteristics of radioactive materials being transported under the proposed alternatives relative to baseline shipments.

Response: *Large numbers of radioactive shipments are not expected under the Stockpile Stewardship and Management Program. The actual route and quantity of material transported would be classified information for purposes of national security, including security of the shipments against attempts of diversion. However, DOE has, on occasion, been able to identify to specific concerned communities that shipments are not planned through their location. The analysis presented in section 4.10 of the PEIS shows the risk to the public to be low. Plutonium and HEU will be transported exclusively in a Government-owned and -operated transportation system that provides maximum safety and security. All shipments are escorted by Federal officers, and only packaging that meets stringent Federal standards for the shipment of these materials is used. The packaging and transportation vehicles have, for example, been extensively tested and certified to assure their safety against material dispersal to the environment in hypothetical accidents involving such events as crashes, fires, and water immersion. Packaging and transportation methods and impacts are discussed in section 4.10 of the PEIS and appendix G of the PEIS. Projected estimates of plutonium and HEU shipments for the proposed alternatives are considered in the transportation risk analysis. Information is provided by DOE to state law enforcement and emergency services personnel on a regular basis.*

09.09 The commentor asks if it would violate security to tell us how many shipments of radioactive material are going through Santa Fe at this time.

Response: *Appendix section G.3 summarizes the shipments of these radioactive materials between the sites. For the PEIS, shipment numbers, routing, and date and time of shipments of plutonium and HEU would be classified. See also the response to comment summary 09.08.*

09.10 Commentors express opposition to the transport of nuclear waste and other deadly toxins. One commentor states that the transportation risk numbers are terrifying.

Response: *Transport of nuclear materials has been ongoing safely for more than 40 years. The analysis in this PEIS for transporting nuclear materials shows that risks to the public are low. The plutonium and HEU would be transported exclusively in a Government-owned and -operated transportation system that provides maximum safety and security. These hazardous materials shipments would be escorted by Federal officers who can handle transport emergencies or actuate the National Emergency Response System for assistance.*

09.11 Commentors feel that transporting nuclear waste through New Mexico's cities and countryside is dangerous, irresponsible, and the chance for accident is too big to be taken. One commentor states that they do not want high-level waste (HLW) trucked to LANL or on New Mexico's highways. The commentor states that Federal Emergency Management Agency does not even have a protocol for dealing with a collision spill.

Response: *The Stockpile Stewardship and Management Program does not generate HLW; however, under the preferred alternative, there would be TRU waste shipments from LANL as discussed in section 4.6.3.10. The transportation of hazardous materials, including radioactive waste, is essential for national commerce. The methodology for the safe transport of these materials is well established. The packaging is federally certified for safety and must retain its contents under the most severe accident conditions (e.g., fire, impact, puncture, or water immersion). The transport of all hazardous materials is regulated by Federal hazardous materials laws that are applicable to DOE and other hazardous material shippers, and cannot be preempted by individual states.*

09.12 One commentor wants to know the extent of transportation (number of trucks, routes, safety precautions, accident mitigation, and such) of all nuclear materials along New Mexico's roads and the extent to which this will increase once the pit fabrication mission is implemented at LANL. Another commentor is concerned about the number of pits that would be transferred between Santa Fe and Pantex, and asks if there would be trucks going through Santa Fe with Hiroshima-size nuclear potentials on them. Finally, one commentor asks if there are trucks right now on the highway that are transporting waste between Pantex and LANL.

Response: *Pit fabrication is not a new function at LANL; they already have a research and development (R&D) pit fabrication mission. As discussed in section 4.10, pit transportation would include about four round trips per year of safe secure trailer shipments. For the transportation of pits under this PEIS, the shipment numbers, routing, and date and time of shipments would be classified. These materials, however, would be transported exclusively by the Government-owned and -operated transportation system that provides maximum safety and security. A pit would be shipped as a separate weapon component (without HE) and, as such, would be unable to explode as a nuclear weapon. The potential risk from transporting pits would be radiation exposure as a result of a traffic accident. Nuclear materials in shipment are contained in packages that have been designed and certified to meet NRC standards to prevent a radioactive release during an accident. There are currently no trucks on the highway transporting waste between Pantex and LANL.*

09.13 The commentor expresses concern about the transportation and safety of low-level radioactive waste on commercial carriers.

Response: *DOE low-level waste (LLW), which consists primarily of materials such as radioactively contaminated paper, protective clothing, or cleaning materials that result from industrial processes, has been transported safely and securely by commercial carriers for more than 40 years. DOT requires high-integrity packaging for such materials to the extent that potential exposure of radiation at the outside of the package is insignificant (typically less than 1 millirem (mrem) per hour per package at 1 m from the package). DOE selects its commercial motor freight carriers of radioactive material very carefully and subjects each carrier to routine evaluation of its operating practices to ensure that they meet DOE and DOT standards.*

10 Waste Management

10.01 One commentor states that DOE plans to continue the production of nuclear waste but does not talk about what they plan to do with the waste. The proposed expansion of Area G at LANL is unacceptable to the commentor. Another commentor asks what kind of waste will be put into the LANL expanded Area G and what safety measures will be used at the facility. Another commentor believes that the expansion of Area G would not have any adverse affects on the area. One commentor suggests that waste should be stored aboveground.

Response: *The PEIS describes impacts and management of wastes in the waste impacts analysis in chapter 4. Waste management activities that would support the Stockpile Stewardship and Management Program are assumed to be per current site practice and are contingent upon decisions to be made through the* Draft Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste *(Waste Management Draft PEIS) (DOE/EIS-0200-D, August 1995) and the LANL Site-Wide EIS. Thus, as currently envisioned, LLW would go to Area G for disposal. Appendix section A.3.3.1 provides a description of the kinds of LLW that would require disposal. The decision as to whether or not to expand the low-level disposal facility at Area G is not within the scope of this PEIS. Decisions concerning the Area G expansion will be made as a result of the LANL Site-Wide EIS. The proposed expansion of Area G is driven by existing and continuing operations.*

The potential human health risks, environmental impacts, and costs associated with waste management alternatives could be reduced or mitigated through the implementation of programmatic and site-specific mitigation measures. Chapter 12 of the Waste Management Draft PEIS provides a description of these programmatic and site-specific mitigation measures. Appropriate control procedures, engineered safety systems, and worker training programs are established and implemented to ensure compliance with all applicable ES&H regulations before beginning any radioactive operation of any facility. In addition to DOE assessments and independent internal appraisals, there are external appraisals such as those conducted by the New Mexico Environment Department to ensure the effectiveness of the ES&H program.

10.02 In section 4.2.3.10, a commentor inquires how DOE projects zero waste associated with the move of HEU to another location unless containers can be removed and shipped in existing trucks with no repackaging.

Response: *The paragraph referred to by the commentor has been rewritten in the Final PEIS as follows: "The waste volumes given in table 4.2.3.10–2 include the storage of the strategic reserve of HEU. The volume of waste associated with the storage of the strategic reserve HEU is very small (less than 0.01 percent) in relation to the total amount of wastes generated from the secondary and case fabrication mission and is an even smaller percentage of the total ORR waste generation volume. Therefore, the continued storage of the strategic reserve HEU would have a negligible impact on waste management at ORR. The impact of continuing to store the strategic reserve HEU as part of the total inventory of nonsurplus HEU at ORR is also addressed in the Storage and Disposition Draft PEIS. In addition, the Storage and Disposition Draft PEIS also analyzes moving the HEU to another DOE site location. Since the HEU is already packaged, it is expected that any waste generated from repackaging, health physics, and analytical chemistry activities would be very small in comparison to the total wastes generated at ORR. Therefore, the moving of HEU would have a minimal impact on ORR waste management."*

10.03 Commentors note that the Waste Management Draft PEIS summary shows a large amount of waste generation related to the Stockpile Stewardship and Management Program. The commentors also note that for LLW, mixed LLW, and TRU wastes, the volumes differ between the Stockpile Stewardship and Management Draft PEIS and Waste Management Draft PEIS. The commentors also believe DOE has not changed directions from the past practices of producing massive quantities of nuclear waste and express concern about the nuclear waste that would be generated. One commentor questions the statements in the cumulative impact section "that wastes would be minor."

Response: *The waste volumes presented in the Waste Management Draft PEIS are for all DOE facilities not just the Stockpile Stewardship and Management Program. The waste volumes from the Stockpile Stewardship and Management Program have been provided to Environmental Management to include in the Waste Management Final PEIS analysis. The statements in section 4.13, Cumulative Impacts, regarding whether wastes generated by stockpile stewardship and management alternatives would be minor compared to other programs have been deleted. DOE has a waste reduction policy that requires DOE sites to employ waste minimization and pollution prevention strategies. To implement these requirements, DOE issued the* 1994 Waste Minimization/Pollution Prevention Crosscut Plan *that establishes a DOE-wide goal to meet pollution prevention targets (Executive Order 12856* Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements*)—a 50-percent reduction in total releases and offsite shipment of toxic chemicals and pollutants by December 31, 1999. The 1994 Crosscut Plan calls for each DOE site to establish site-specific reduction goals for hazardous, radioactive, radioactive mixed, and sanitary wastes and pollutants.*

10.04 Commentors question the sites' estimates of waste streams. A commentor states that LANL and LLNL claim moving the secondary and case mission to their site is going to generate 102,000 m^3 (133,416 cubic yards [yd^3]) of sanitary waste and that they will be able to handle these huge volumes of waste with no changes whatsoever. One commentor does not believe that other sites have adequate infrastructure to handle waste without having to build new facilities. The commentor states that ORR has available infrastructure in the private sector that are outstanding and a model for the world.

Response: *The site estimates of waste volumes were coordinated among the sites through a coordination data committee chaired by a DOE official and represent the best estimates available. All of the DOE sites analyzed in the PEIS have adequate capability to handle the onsite waste volumes generated as a result of the Stockpile Stewardship and Management Program.*

10.05 The commentor wants to know what portion of the DOE budget is going towards site cleanup and solution of the nuclear waste problem. The commentor believes that new solutions need to be developed to handle the terrible problem of nuclear waste because the current practices are not working.

Response: *The entire DOE budget for 1996 is approximately $14.2 billion of which $6 billion is for environmental management. The DOE Office of the Assistant Secretary for Environmental Management through its Office of Research and Development (EM-53) is continually investigating and developing new technologies to treat radioactive waste.*

10.06 Commentors express negative feelings about LANL's record involving radioactive waste and emissions, and state that New Mexico is contaminated in many places and that DOE should not dump any more nuclear waste in the state.

Response: *DOE is committed to operating its facilities in compliance with all applicable Federal and state regulations, and DOE orders. To fulfill its mission under the* Atomic Energy Act *of 1954, as amended, the generation of radioactive, mixed, hazardous, and nonhazardous wastes is unavoidable. Per DOE policy, the facilities that would support the Stockpile Stewardship and Management Program incorporate waste minimization and pollution prevention. Appropriate control procedures, engineered safety systems, and worker training programs are established and implemented to ensure compliance with all applicable ES&H regulations before beginning any radioactive operation of any facility. In addition to DOE assessments and independent internal appraisals, there are external appraisals such as those conducted by the New Mexico Environment Department to ensure the effectiveness of the ES&H program. Radioactive wastes generated by the Stockpile Stewardship and Management Program would be managed in accordance with decisions made as a result of the Waste Management PEIS and any respective site-specific NEPA documentation. The Waste Management PEIS considers alternatives that include local, regional, and/or consolidated waste management facilities. Regardless of the decisions from the Waste Management PEIS or any respective site-specific NEPA documentation, wastes generated from the Program will be managed in accordance with all applicable Federal and state regulations, and DOE orders.*

10.07 A commentor believes that nuclear waste should be centralized into a repository to provide better safety monitoring for the material. The commentor does not believe that there would be significant risk in transporting nuclear materials to a repository. Another commentor believes that consolidating waste at one site would lead to increased risks due to the risks involved with transportation of the nuclear materials. Another commentor thinks there should be a concerted effort to open Yucca Mountain.

Response: *Decisions regarding the management (treatment, storage, and disposal) of radioactive and hazardous wastes from a DOE-wide perspective are not within the scope of this PEIS. Waste management activities that would support the Stockpile Stewardship and Management Program are assumed to be per current site practice and are contingent upon decisions to be made through the Waste Management PEIS and any respective site-specific NEPA documentation. The Waste Management PEIS will assist DOE in making decisions regarding the sites at which it should locate waste management facilities to include treatment and disposal facilities for mixed LLW, treatment and disposal facilities for LLW, treatment and storage facilities for TRU waste, storage facilities for treated HLW canisters until a geologic repository is available, and treatment facilities for hazardous nonwastewater. The Waste Management PEIS considers four broad categories of alternatives for each waste type: No Action, decentralized, regionalized, and centralized.*

10.08 The commentor wonders if the PEIS includes an analysis of the overall waste management plans at LLNL for the next 20 years.

Response: *Two site-specific waste management plan documents were used in the stockpile stewardship and management analysis at LLNL:* Waste Management Plan FY 1995 Update in Accordance with DOE Order 5820.2A, *and the* Federal Facility Compliance Act Proposed Site Treatment Plan for LLNL. *The full document reference citations are provided in the chapter 6 reference list see LLNL 1995d and LLNL 1995h). Radioactive waste generated by the Stockpile Stewardship and Management Program would be managed in accordance with decisions made as a result of the Waste Management PEIS and any respective site-specific NEPA documentation. Regardless of the decisions from the Waste Management PEIS or any respective site-specific NEPA documentation, wastes generated from the Stockpile Stewardship and Management Program will be managed in accordance with all applicable Federal and state regulations, and DOE orders.*

10.09 The commentor notes that in addition to waste created from the Stockpile Stewardship and Management Program, there is a proposal to construct an incinerator to handle mixed nuclear waste at Site 300.

Response: *Waste generated at Site 300 includes explosive waste from testing activities and waste from various other operations, and environmental restoration generated waste. The LLNL Site Treatment Plan once approved will include a description of the technology and capacity needs to treat each mixed waste stream, along with a preferred option. The LLNL Site Treatment Plan in its present form does not include a proposal for an incinerator at Site 300.*

10.10 The commentor's primary concern is that an increased stockpile and resulting waste disposal problems at LANL are a direct threat to the Penasco Valley watershed and communities.

Response: *The nuclear stockpile is not increasing. The nuclear stockpile level is set by a Presidential Decision Directive (PDD) and has been decreasing due to negotiated treaties and unilateral reductions. Due to waste minimization and pollution prevention practices, the volume of wastes generated from weapons program activities are decreasing. Wastes generated by the Stockpile Stewardship and Management Program would be managed in accordance with all applicable Federal and state regulations, and DOE orders. Waste management activities that would support the Stockpile Stewardship and Management Program at LANL are assumed to be per current site practice and are contingent upon decisions to be made through the Waste Management PEIS and the LANL Site-Wide EIS.*

10.11 The commentor believes that staggering rates of nuclear waste will be generated by the proposed stockpile stewardship and management activities thereby creating a need for more waste management and future cleanup costs. The commentor questions why we should put more of our environment at risk and cautions DOE to think carefully about producing new wastes given its inability to develop solutions for existing nuclear waste.

Response: *DOE is required by the* Atomic Energy Act *of 1954, as amended, to support a nuclear weapons stockpile as defined in a PDD signed by the President. All of the existing basic capabilities continue to be needed even though there have been changes in national security policy since the end of the Cold War. To fulfill its mission under the* Atomic Energy Act *of 1954, as amended, generation of radioactive, mixed, hazardous, and nonhazardous wastes are unavoidable. All of the alternative sites have adequate capability to manage the wastes generated from the Stockpile Stewardship and Management Program in accordance with all applicable Federal and state regulations, and DOE orders. Under the preferred alternative of downsizing and consolidating A/D, nonnuclear fabrication, and secondary and case fabrication, the waste generation would actually decrease at Pantex, KCP, and ORR.*

10.12 The commentor states that the PEIS activities will have a significant impact on the numbers and quantities of nuclear and hazardous materials and wastes moved in and out of the LLNL site and to and from NTS. The large number of nuclear waste shipments anticipated in the Waste Management Draft PEIS and the Stockpile Stewardship and Management Draft PEIS, combined with waste shipments from other DOE proposed activities at LLNL, including environmental restoration activities, would be unprecedented. Commentor states that in the Draft PEIS the No Action alternative estimates of cumulative waste impacts should use current waste generation annual rates at LLNL, not waste generation rates from a nonexistent waste treatment and disposal facility at LLNL. The commentor adds that the Draft PEIS should state what options are available for LLW and mixed LLW disposal in the event that NTS and the proposed LLW/mixed LLW treatment and disposal facility at LLNL are not available.

Response: *The amount of hazardous waste requiring shipment to RCRA-permitted treatment and disposal facilities, and LLW requiring shipment to NTS is described in section 4.7.3.10. These waste shipments must meet the packaging (containment) requirements prescribed by DOT under 49 CFR and other applicable Federal regulations. The transportation analysis in section 4.10 of the PEIS and in the Waste Management Draft PEIS illustrates that the risks associated with the movement of these wastes are minimal. The use of current generation rates (1994) for No Action would not provide an accurate representation of the LLNL site in 2005. However, the 2005 projection was based on 1994 generation rates with the appropriate adjustments made for those changing operational requirements where the volume of wastes generated is identifiable. The projection does not include wastes from future, as yet uncharacterized, environmental restoration activities. For the purposes of analysis, waste management activities that would support the Stockpile Stewardship and Management Program are assumed to be per current site practice. If the LLNL Site Treatment Plan, when approved, or the ROD from the Waste Management PEIS change the site practice, the waste management activities that would support the Stockpile Stewardship and Management Program would change accordingly. In any case, wastes generated from the Stockpile Stewardship and Management Program will be managed in accordance with all applicable Federal and state regulations, and DOE orders.*

10.13 The commentor asks what DOE and "we" will do with all the waste that will be generated for at least the next 20 years. Commentor states there are no licensed facilities to accept the wastes that are piled up on facilities throughout the DOE Complex at this time and asks, "Why generate more than needs to be generated?" The commentor adds that we are now faced with storage and disposition of surplus fissile materials and that every option considered has tremendous waste streams attached to it. The commentor asks where this waste will go. It seems quite evident that the site that creates the waste, keeps the waste. Commentors ask if that will saddle communities across this country with the economic and environmental problems of hosting waste treatment, storage, and processing facilities.

Response: *It is incorrect to state that there are no licensed facilities to dispose of waste generated at DOE facilities. At most DOE sites, hazardous waste is shipped to offsite commercial RCRA-permitted treatment and disposal facilities. LLW is shipped to one of the DOE low-level disposal facilities in accordance with the waste acceptance criteria of that facility. Mixed waste would be treated and disposed of in accordance with the site treatment plans that have been negotiated between the DOE sites and the appropriate state regulatory authority. TRU waste is destined for a geologic repository. The Stockpile Stewardship and Management Program would not generate any HLW. To fulfill its mission under the* Atomic Energy Act *of 1954, as amended, the generation of radioactive, mixed, hazardous, and nonhazardous wastes is unavoidable. Per DOE policy, the facilities that support the Stockpile Stewardship and Management Program incorporate waste minimization and pollution prevention. The storage and disposition of surplus fissile materials are not within the scope of the Stockpile Stewardship and Management PEIS; however, it is addressed in the Storage and Disposition PEIS, section 4.7, Potential Cumulative Impacts of the Storage and Disposition Program.*

10.14 The commentor asks how LANL treats current nitrate liquid waste and if the site is planning any new treatment plants for the future nitrate liquid waste that would be generated if the uranium processes are moved to LANL.

Response: *Nitrate liquid waste from uranium processes is currently treated at TA-50. No new treatment plants would be required to treat the nitrate liquid waste from the secondary and case fabrication mission if it were moved to LANL.*

10.15 The commentor states that both LLNL and SRS are still practicing shallow land burial of radioactive wastes and this practice must be stopped, not continued and increased as contemplated in the Draft PEIS.

Response: *Only solid LLW is suitable for shallow land burial. LLNL does not dispose of LLW onsite as it ships its LLW to NTS for disposal. Shallow land burial for SRS was analyzed in the* Savannah River Site Waste Management Final Environmental Impact Statement *(DOE/EIS-0217, July 1995). Radiological performance assessments are conducted to ensure that disposal facilities meet the performance objectives of DOE Order 5820.2A,* Radioactive Waste Management. *At SRS, only stabilized LLW forms and selected LLW (suspect soils and naval hardware) are planned for shallow land burial.*

10.16 The commentor states that WIPP must not be opened without meeting environmental standards. Another commentor asserts that the reason DOE wants to move all the waste to WIPP is so that they can continue plutonium production.

Response: *There are a number of requirements that must be met before the Secretary of Energy will approve the opening of WIPP. The State of New Mexico must issue the RCRA Part B Permit. This permit application has been submitted to the state. EPA must (1) grant the no-migration variance petition and (2) certify compliance with requirements that WIPP is safe to operate. The no-migration variance petition and the application for certification have been submitted to EPA. The NRC has already approved the TRUPACT II container for shipment of contact-handled TRU waste, and has yet to approve the application for certification of the container for remote-handled waste. A supplemental EIS covering the phased development of WIPP is currently being prepared.*

10.17 The commentor cites section 3.5.2, Uranium Fabrication and Processing, and asks is it not true that recycled materials are defined as a "solid waste." Commentor asks what DOE's legal interpretation of their statement is, what the definition of "recycled" is and if EPA and the Department of Justice concur. Commentor asks, "If I machined lead, are the residuals a hazardous waste?" The commentor also asks what is meant by the term "residue production," and if it is DOE's policy to prevent and minimize residue, not produce it.

Response: *The paragraph referred to by the commentor is addressing the machining of HEU. "Source, special nuclear or by-product material as defined by the* Atomic Energy Act *of 1954, as amended, 42 U.S.C. 2011 et. seq." is not solid waste as defined by 40 CFR 261.4. Residues are materials that contain sufficient quantities of recoverable fissile material. It is part of DOE's waste minimization policy to minimize the production of residues. The processes that would be used in the secondary and case fabrication facility would not generate any residue that would require long-term storage. No residues would be generated in which the HEU could not be recovered. Materials contaminated with HEU would only be declared waste if the HEU can no longer be recovered and the materials meets one of the radioactive waste definitions as outlined in chapter 9, Glossary. Guidance provided in 40 CFR 261.2 would determine whether or not the lead residuals would be considered a hazardous waste.*

10.18 The commentor refers to section 3.7.1, Stockpile Management, and asks if it is true that both NTS and Pantex have adequate waste management facilities to treat, store, and/or dispose. Commentor thought NTS mixed waste disposal was limited to environmental remediation activities from certain projects. The commentor asks if there is mixed waste disposal for operational waste streams. Commentor also asks if it is not true that at Pantex they are planning to treat mixed waste but currently have limited disposal. Commentor asks how many offsite disposal shipments they have done since 1984 and since 1987.

Response: *The existing waste management infrastructure at NTS and Pantex is adequate to manage the anticipated waste streams from the Stockpile Stewardship and Management Program. Waste management activities that would support the Stockpile Stewardship and Management Program were assumed to be per current site practice which includes the use of offsite RCRA-permitted treatment and disposal facilities such as Envirocare, Inc., in Utah and offsite disposal such as LLW from Pantex being shipped to NTS. No new waste management facilities will be constructed for the expressed purpose of supporting the Stockpile Stewardship and Management Program. Any mixed waste generated in the State of Nevada that meets the Land Disposal Restrictions of RCRA can be disposed of at NTS in the Area 5, Mixed Waste Disposal Unit (Pit 3). Mixed waste generated at NTS or Pantex would be managed in accordance with the site treatment that was developed to comply with the* Federal Facility Compliance Act *of 1992 and in accordance with any decisions resulting from the respective site-wide EISs for continued operations.*

10.19 The commentor references section 4.1.10 and asks if it is prudent to include waste minimization in the analysis. Commentor says the impact assessment is reduced and does not bound the impacts.

Response: *The waste minimization and pollution prevention strategies employed in the waste estimates are achievable with current technology. In addition to following waste-disposal policies, DOE is committed to and expects to further reduce the waste generated from the Stockpile Stewardship and Management Program.*

10.20 One commentor cites appendix figure A.3.1–2, and asks if an unusable part is a waste or inherently waste-like. The commentor asks for a description of sanitize and demilitarize, if it is a treatment process, and what are the processes and their purpose. Another commentor cites appendix figure A.3.1.1–5 and asks if classified waste (parts) are solid waste as the figure shows classified waste being sent to sanitization, since it is the commentor's understanding that classified material is sent to sanitization before becoming waste. The commentor also asks where the exit arrows are for sanitization and demilitarization, and if sanitizing is a RCRA treatment. A commentor also cites appendix table A.3.5.1–2 and asks where the sanitization and demilitarization facilities are; if the Burning Ground is limited to explosives disposal; and if it completes sanitization and demilitarization through open burning. Another commentor also cites appendix figures A.3.3–1 and A.3.3.1–3 and states that according to these figures, explosive components are solid waste. The commentor asks where treatment and disposal fit into demilitarization, sanitization, and disposition.

Response: *Weapons components or parts of a component that are not being reused cannot be declared waste until they have been demilitarized and sanitized. As noted in chapter 9, Glossary, sanitization is the irreversible modification or destruction of a component or part of a component to the extent required to prevent revealing classified or otherwise controlled information; whereas, demilitarization is the irreversible modification or destruction of a component or part of a component to the extent required to prevent use in its original weapon purpose. These are not considered waste treatment processes but procedures in order for DOE to meet its statutory requirements of the* Atomic Energy Act *of 1954, as amended. For example, sanitization and demilitarization of classified HE components is accomplished at the Burning Ground. The Burning Ground is used for the burning of HE components and disposal of HE waste, HE-contaminated waste, and various HE-contaminated liquids and solvents. Disposal of solvents at the site was discontinued in the early 1980s. Once materials are declared waste, they would be managed in accordance with all applicable Federal and state regulations, and DOE orders. Appendix figure A.3.1.1–5 has been redone in the Final PEIS to more clearly show how sanitization and demilitarization fit in process flow at Pantex.*

10.21 Commentors refer to section 3.5.1, Plutonium Fabrication and Processing, and ask, based on the discussion of reduced scrap, waste, and residue, if plutonium and HEU pits, scrap, materials, and residue placed into storage are considered a solid waste. One commentor cites appendix section A.3.2.1 and asks, what the statement, "Classified wastes enter a declassification step resulting in classified and unclassified waste" means. The commentor asks if DOE is stating that some materials will be classified no matter what physical or administrative actions occur.

Response: *The purpose of the declassification step for waste in the secondary and case fabrication facility is to process material or weapon components to the point where they no longer reveal classified information. The vast majority of this material is successfully declassified or processed to enable reuse of the classified constituents. A very small amount of material cannot readily be declassified. Of this material, a small amount is disposed of onsite in a permitted land-fill as nonhazardous classified waste. Additionally, a very small amount of hazardous or mixed classified waste is stored until treatment/processing capabilities are established to eliminate the hazardous or mixed waste component of the classified material. This then enables either reuse of the classified material or disposal onsite as a nonhazardous classified waste. No classified waste is disposed of offsite.*

10.22 The commentor references appendix section A.3.5.2, which states HE-contaminated process water is not a waste, but HE-contaminated process water is collected in tanks and then treated with activated carbon filters. Commentor asks if this means "filtered." The commentor suggests a change from waste minimization and recycle to pollution prevention, and adds, technically speaking, one cannot minimize or recycle a material that is not a waste. The commentor also cites the waste management text in appendix section A.3.5.3 and has the same comments. Another commentor cites the waste management text in appendix section A.3.5.2, and asks why recycling scrap HE is not a waste (both recycle and scrap are clearly associated with solid waste definition in 40 CFR 261); and under what solid waste exclusion in 40 CFR 261 does DOE claim.

Response: *Scrap HE that is recycled is not considered a solid waste as it is returned to the HE fabrication process to be used as a substitute for raw material feedstock (40 CFR 261.2[e]). Scrap HE that is excess to needs is thermally treated and disposed of in accordance with applicable Federal and state regulations. HE-contaminated process water is filtered before being collected in holding tanks. From the holding tanks, it is returned to be used as cooling water for the HE fabrication process. At LANL, recycled process water that can no longer be used is sent to the LANL HE waste- water treatment facility where it is treated using activated carbon filtration. In the Final PEIS the paragraph has been rewritten for clarification.*

10.23 The commentor refers to section 4.2.2, Oak Ridge Reservation, and states that the PEIS should provide an estimate of the volume, in km^3, of TRU waste, affected rock, soil, and groundwater at NTS as a result of underground tests. The text should also indicate whether this material comes under the *Federal Facilities Compliance Act* and if it does, if it will require treatment.

Response: *Estimates of the waste volumes that would be generated from environmental restoration activities in the Central Nevada Test Area of NTS have not been determined. The waste volumes generated during environmental restoration activities would be greatly dependent on the cleanup criteria which have not been established. Any wastes generated as part of these activities would be managed in accordance with all applicable Federal and state regulations, and DOE orders to include the* Federal Facility Compliance Act *and the NTS Site Treatment Plan which was developed to comply with the* Federal Facility Compliance Act.

10.24 Commentors ask that waste be stored where it happens to be, not shipped from all around the country to further endanger American citizens. One commentor adds that waste should be stored aboveground.

Response: *Waste shipments must meet the packaging (containment) requirements prescribed by DOT under 49 CFR and other applicable Federal regulations. The transportation analysis in section 4.10 of the PEIS and in the Waste Management Draft PEIS clearly illustrates that the risks associated with the movement of these wastes is minimal. It is impractical and in some cases not permissible under the law (e.g., RCRA) to store wastes aboveground indefinitely.*

10.25 The commentor feels that DOE should focus massive attention on the subject of transmutation; it is critical that we learn how to neutralize nuclear waste onsite.

Response: *Environmental Management, through its Office of Research and Development (EM-53), is continually investigating and developing new technologies to treat radioactive waste. Radioactive wastes generated from the Stockpile Stewardship and Management Program will be treated in existing onsite radioactive waste treatment facilities.*

10.26 The commentor urges DOE to figure out a way to dispose of plutonium onsite.

Response: *The disposition of surplus weapons-usable fissile materials such as plutonium is not within the scope of the PEIS. The* Storage and Disposition Draft PEIS *analyzes the disposition of surplus weapons-usable fissile materials. Due to environmental considerations, it is not always possible to dispose of waste contaminated with plutonium onsite. Radioactive waste generated from the Stockpile Stewardship and Management Program will be categorized according to the definitions in chapter 9, Glossary, and will be managed in accordance with all applicable Federal and state regulations, and DOE Order 5820.2A,* Radioactive Waste Management.

10.27 The commentor feels that efforts should be concentrated towards D&D.

Response: *None of the manufacturing and surveillance capabilities of the current industrial base can be eliminated on the basis of the post-Cold War changes in national security policies. The industrial base possesses core competencies, such as manufacturing product, process, and quality control know-how. However, with a smaller stockpile and no new-design weapons production, industrial capacity can be reduced to meet anticipated manufacturing requirements for stockpile repair and replacement activities. This reduction in industrial capacity would lead to deactivation of some facilities. After proper characterization these facilities would be transferred to Environmental Management for eventual D&D. The waste volumes associated with D&D have been estimated and presented in the waste management impacts analysis in chapter 4.*

10.28 The commentor cites section 3.5.1, Plutonium Fabrication and Processing, and asks when plutonium and HEU meet the definition of a solid waste. Commentor asks if stored plutonium and HEU in any form is a solid waste as defined under RCRA. Commentor asks DOE to provide independent confirmation of this issue by EPA and the Department of Justice.

Response: *Weapons-usable fissile materials such as plutonium and HEU are not considered waste. The President has declared that some quantities of fissile materials are declared surplus to national defense and defense-related program needs. DOE is developing an integrated strategy for storage and disposition of weapons-usable fissile materials. The Storage and Disposition Draft PEIS is focused on the storage of all plutonium and nonsurplus HEU, and the disposition of surplus plutonium. The* Disposition of Surplus Highly Enriched Uranium Final Environmental

Impact Statement *(DOE/EIS-0240-F, June 1996) addresses the disposition of surplus HEU. Materials contaminated with plutonium and HEU would only be declared waste if the plutonium and HEU are at levels defined as discard limits and the materials meets one of the radioactive waste definitions as outlined in chapter 9, Glossary. "Source, special nuclear, or by-product material as defined by the* Atomic Energy Act *of 1954, as amended, 42 U.S.C. 2011 et. seq." is not solid waste as defined by 40 CFR 261.4. Under 10 CFR 962, all DOE radioactive waste contaminated with hazardous constituents as defined by RCRA is subject to regulation under both RCRA and the* Atomic Energy Act *of 1954, as amended.*

10.29 The commentor states that LANL has not shown good faith in developing and maintaining safety standards while involved in nuclear weapons research and application. The commentor is concerned about exposure to radioactive waste that is produced in the name of "safety and reliability" of nuclear stockpiles.

Response: *To fulfill its mission under the* Atomic Energy Act *of 1954, as amended, DOE will unavoidably generate radioactive, mixed, hazardous, and nonhazardous wastes. Appropriate control procedures, engineered safety systems, and worker training programs are established and implemented to ensure compliance with all applicable ES&H regulations before beginning any radioactive operation of any facility. In addition to DOE assessments and independent internal appraisals, there are external appraisals such as those conducted by the New Mexico Environment Department to ensure the effectiveness of the ES&H program.*

10.30 Commentors feel that it is immoral and unfair to consider New Mexico as an empty state into which garbage can be piled with no opposition. One commentor adds that nuclear waste should be treated properly onsite and if it cannot then it should not be produced. Another commentor is opposed to increasing activities at LANL that would increase production of radioactive waste because by implementing this project, DOE is creating a nuclear waste dump upwind of most of northern New Mexico.

Response: *LANL was identified as the preferred alternative because it ranked highest in the selection criteria: basic production capability to support scheduled work, capability of production infrastructure to support scheduled work, and minimized cost. LANL has adequate capacity through its TA-50 and TA-55 facilities to treat the radioactive waste that would be generated in support of the Stockpile Stewardship and Management Program. These facilities would treat and package all radioactive waste into forms that would enable long-term storage and/or disposal in accordance with the* Atomic Energy Act *of 1954, as amended, other applicable Federal and state regulations, and DOE orders.*

10.31 The commentor would like the PEIS to discuss the capability of existing processing facilities and disposal sites to handle the projected quantities of radioactive and mixed waste generated by the Stockpile Stewardship and Management Program.

Response: *Under each alternative description in chapter 3, it is explicitly stated that the existing site "waste management infrastructure can be applied to manage and treat all anticipated waste streams from this alternative." Appendix H lists the existing waste treatment capability by waste category for each of the alternative sites. All hazardous, radioactive, and mixed waste generated would be managed in accordance with all applicable Federal and state waste regulations.*

10.32 The commentor wants to know where the nuclear waste from the pit fabrication mission at LANL will be stored, how much it will cost, and where will the money come from.

Response: *There are no plans to store radioactive waste from the pit fabrication mission at LANL indefinitely. LLW would be treated and then disposed of in Area G per current site practice. Radioactive mixed waste would be treated and disposed of in accordance with the LANL Site Treatment Plan which was negotiated between LANL and the State of New Mexico. TRU waste would be stored temporarily at Area G until the Federal geologic repository is approved by EPA and NRC and a supplemental EIS is completed. Costs associated with the Stockpile Stewardship and Management Program can be found in the* Analysis of Stockpile Management Alternatives *report produced by the DOE Albuquerque Operations Office. Congress funds the Stockpile Stewardship and Management Program through the* Defense Appropriations Bill.

10.33 The commentor questions the readiness of the environmental treatment systems placed in cold standby at ORR, should future increases in production occur.

Response: *The preferred alternative does not put any of the waste management facilities into cold standby at ORR. The buildings designated to be placed in cold standby as a result of downsizing the secondary and case fabrication mission are buildings that have a production mission only.*

10.34 The commentor states that the Radioactive Liquid Waste Treatment Facility (TA-50) at LANL does not have a treatment permit issued by the State of New Mexico as stated in appendix section A.3.3.1.

Response: *The commentor is correct. The text has been changed in the Final PEIS to read, "the waste would be processed, with radioactive constituents removed, in accordance with the NPDES permit."*

11 RADIATION AND HAZARDOUS CHEMICALS

11.01 The commentor asks DOE to address a worst-case accident analysis for a "parking lot" nuclear weapons accident for Pantex and NTS, and asks how on a safety-to-the public basis DOE can justify operations at Pantex instead of at NTS. The commentor states that DOE is taking special mitigating actions at Pantex to keep site boundary dose under 100 rem per person in the event of an accident at Pantex. The same accident at the NTS Device Assembly Facility must be less than 1 percent of this, according to the commentor, since no one lives at the NTS site boundary. The commentor asks what the dose to the public is if there is an aircraft accident at Pantex, since that site is in the flight path of Amarillo airport and has a much greater risk of experiencing an accident than does NTS, which is in completely controlled airspace. Commentor asks how can DOE justify exposing the public to this additional risk in order to save money.

Response: *The accident analyses assume a hypothetical member of the public (the maximum exposed individual) resides at the nearest site boundary. Based on the accident analysis for NTS and Pantex, the maximum exposed individual at Pantex would have a fatality risk of $5.6x10^{-8}$, while at NTS that risk would be $8.1x10^{-9}$. While it is true there is a lower risk at NTS than at Pantex, the risk at both sites is low. The potential for severe accidents including those involving an aircraft at Pantex, is provided in sections 4.5.3.9. Additional details on potential accidents are also given in appendix F and in a topical report:* Supporting Documentation for the Accident Impacts Presented in the Stockpile Stewardship and Management Programmatic Environmental Impact Statement, *(HNUS Report No. ARP-96-042) which has been placed in the DOE Public Reading Rooms near each site. The final selection of a site for the A/D mission will be announced in the ROD, which will take into account all relevant factors including accident risks.*

11.02 The commentor asks why we use the year 2030 staff levels for radiation doses (section 4.3.2.9) and use 2005 for economic impacts.

Response: *The cumulative effects of both radiation and socioeconomics are calculated over a 25-year period from 2005 to 2030.*

11.03 The commentor believes that DOE uses different risk standards for different programs (specifically Yucca Mountain versus other programs) and that the public does not understand the risks associated with DOE activities. The commentor voices concern over the 300 million curies (Ci) at NTS. The commentor urges DOE to use one risk standard in its analyses and educate the public about the risk numbers and what they mean.

Response: *To ensure a consistent set of risk standards in the preparation of environmental assessments (EAs) and EISs, DOE has established recommended guidelines for the preparation of human health impact sections in these documents (*Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements, *Office of NEPA Oversight, May 1993). The public and occupational health risk for normal radiological operations analyzed in the Stockpile Stewardship and Management PEIS uses the two dose-to-risk conversion factors for the public and workers recommended by DOE's Office of NEPA Oversight and established in the National Research Council's Committee on the Biological Effects of Ionizing Radiation* Health Effects of Exposure to Low Levels of Ionizing Radiation BEIR V *(BEIR V Report) published in 1990. These risk factors are 0.0005 deaths per person-rem to the general public and 0.0004 deaths per person-rem to workers (the lower number for workers accounts for the absence of children in the workforce).*

Appendix E, Human Health, presents a detailed discussion of the methodology used to determine the radiological impacts to human health. The appendix also includes a section on the development and use of the risk factors presented in the Stockpile Stewardship and Management PEIS.

11.04 The commentor believes that a 160-km (100-mi) radius would be more appropriate for the analysis of radiation health effects to the public.

Response: *The 80-km (50-mi) radius for calculating collective dose is a practical limitation for analytical purposes in this PEIS. NRC guidance requires that an 80-km (50-mi) radius be investigated for potential impacts to the population living within 80 km (50 mi) of a radiation source. Studies have shown that at some distance, frequently within 80 km (50 mi), the magnitude of variations in doses from background radiation becomes greater than the doses from radiological releases from DOE and NRC sites.*

11.05 The commentor asks if the PEIS considers multigenerational problems in the analysis of cancer fatalities. The commentor also asks if the cancer statistics and studies from Chernobyl and Nagasaki are taken into consideration in the calculation of the PEIS cancer fatality numbers.

Response: *When modeling is performed to determine human health impacts, "nonfatal cancer" risks and "genetic (multigenerational) effects" risks are tabulated in appendix section E.2.1.2. Cancer statistics and studies from Nagasaki are included within the risk estimation parameters associated with presented cancer fatality numbers (refer to the BEIR V Report). The methodology outlining these "multigenerational effect" tabulations is presented in appendix section E.2.1.2 of the PEIS. The data available from the Chernobyl incident are still being analyzed and have not been used in the human health analyses investigated in this PEIS. However, national and international regulatory bodies continually review the results of new research in order to determine whether changes should be made to recommended dose limits.*

11.06 Several commentors believe that DOE downplays the dangers of radiation and that the PEIS accident analysis tends to trivialize accidents. One commentor states that DOE should investigate the elevated levels of thyroid and breast cancer in Los Alamos, Bernalillo County, and surrounding towns. Another commentor disagrees, stating that cancer rates in Los Alamos are in line with cancer rates expected from a town at an elevation of 2,438 m (8,000 ft). Another commentor believes that DOE should initiate a series of health studies to determine the extent of contamination in the State of New Mexico. The commentor believes that these studies have not been carried out in the past because it would indicate public health problems.

Response: *The accident analyses were performed in accordance with DOE guidance (refer to the Office of NEPA Oversight document). A set of accidents have been analyzed that include high-probability/low-consequence accidents as well as low-probability/high-consequence accidents that are not expected to occur during the lifetime of the facility but have been included to show the consequences of an accident. The levels of thyroid and breast cancer are discussed in section 4.6.2.9, Health Effects Studies. Additional information is presented in appendix section E.4.6. DOE puts a great deal of emphasis on protecting the public and occupational workers from radiation exposure. There are numerous promulgated DOE orders which establish conservative dose limits to both the public and workers at risk of exposure.*

In section 4.1.9.1, subsection on Epidemiological Studies, there is a statement that defines DOE's program to monitor health effects on workers and the public in the communities surrounding DOE facilities. An independent agency, Health and Human Services, has been conducting a health effects research program on DOE facilities under a 1991 Memorandum of Agreement. The National Institute for Occupational Safety and Health initiated a study in 1994, but does not expect results before 1997. However, extensive health studies have already been conducted on the public within the State of New Mexico in the counties surrounding both LANL and SNL, as well as workers within those facilities. Summaries of the results of the studies at LANL and Los Alamos County are presented under Health Effect Studies in section 4.6.2.9, with details presented in appendix section E.4.6. Summaries of the results of the studies at SNL and the surrounding county, Bernalillo, are presented in section 4.8.2.9 under Health Effects Studies, with details presented in appendix section E.4.8. All studies reported are referenced. Past and present radiation and hazardous chemical releases have been documented and are used as one of the bases for predicting future releases when the proposed actions, if approved, are implemented.

The impacts of potential accidents at LANL are discussed in section 4.6.3.9. Figure 4.6.3.9–1 and tables 4.6.3.9–3 through 4.6.3.9–7 present the impacts of accidents. The graph in figure 4.6.3.9–1 indicates the probability of fatalities due to accidents associated with the proposed actions.

11.07 The commentors refer to LANL section 4.6.3.9 and the following text, "The average annual dose to involved workers for this alternative would be 380 mrem. The dose to the entire facility workforce would be 55.6 person-rem. As stated in the methodology, section 4.1.9, all worker doses were referenced either from alternative-specific working group data reports or from the Radiation Exposures for DOE and DOE Contractor Employees 1992 Database which reports doses for similar types of operations...." A commentor asks if the 1992 database is representative for the projected years and if working group data contain situation-specific source terms and shielding considerations. Another commentor asks if linear extrapolation was used to determine the doses to the workers at LANL and SRS in the Summary section S.4.1. The commentor believes that these are overestimates of what would happen to the workers. The commentor asks if LANL ever had pit production capacity and if data on worker safety, accidents, and contamination were used in the PEIS. The commentor also asks how the radiation doses to workers calculated in the PEIS for pit fabrication at LANL compare to the doses that were observed at Rocky Flats when pit fabrication was performed there.

Response: *The conservative 380 mrem/yr dose to involved workers at LANL and SRS for pit fabrication operations was arrived at through direct measurement and calculation. In 1995, LANL started work on Defense Nuclear Facilities Safety Board Recommendation 94-1, processing a full load of pits for the pit surveillance program and the Cassini project. Many of the operations for these programs at LANL are considered comparable to "pit manufacturing" operations. The total annual dose for TA-55 personnel during full operations was 153.8 person-rem. By dividing this number by 405, the number of personnel who received a nonzero dose during that period (i.e., the hands-on workers and support personnel, but not office workers), the resulting average dose for plutonium manufacturing personnel is approximately 380 mrem per worker.*

Comparing the historic Rocky Flats Plant pit fabrication activities and doses to workers to the proposed pit fabrication mission at LANL would not be appropriate. The pit fabrication mission at Rocky Flats used a different process than the one proposed for LANL, and the production volume at Rocky Flats was much larger because of the larger stockpile levels at that time.

LANL currently maintains a limited capability to fabricate plutonium components using its Plutonium Research and Development Facility and provides safety and reliability assessments of the stockpile (section 3.4.3.1). Sections 4.6.2.9 and 4.6.3.9 provide a description of the radiation and hazardous chemical environment at LANL, including descriptions of health effects studies, a brief accident history, and emergency preparedness considerations. Data on worker safety, accidents, and contamination at LANL were analyzed in the preparation of this PEIS. The safety analysis report prepared by LANL for the TA-55 plutonium operations was a source of considerable data used in this PEIS for identifying and estimating the impacts of accidents.

The 1992 database is representative of worker dose data for the year 1992. This report provides a recent source of dose data through which estimations of potential doses to stockpile stewardship and management involved and noninvolved workers can be made. These doses are based on actual dosimeter measurements and therefore take into account existing shielding at the work site. The working group data report does contain source terms associated with this Stockpile Stewardship and Management Program activity.

11.08 The commentor asks what DOE considers to be an accident and if there is enough historical data to constitute a fair analysis of pit fabrication related accidents. The commentor asks if the analysis examines risks to the workers in the workplace. The commentor also asks if the accident modeling included real accidents at TA-55 reported to the Occurrence Reporting System.

Response: *DOE considers an accident to be an unplanned sequence of events that results in undesirable consequences. More information on accidents is provided in a DOE standard,* (DOE DP-STD-3005-93 Proposed, Definitions and Criteria for Accident Analysis, *DOE, March 8, 1993). Accidents that are of the highest concern have high consequences and low probabilities of occurrence and therefore have never occurred. However, even without historical data, techniques are available to predict the sequence of events that may lead to an accident and to estimate the accident's impacts. The PEIS contains an evaluation of the risk of accidental exposure of a hypothetical worker located at either 1,000 m (3,281 ft) or the nearest site boundary, whichever is smaller, to radioactive substances released during an accident. An important source of data for accidents at LANL is the safety analysis report recently prepared for TA-55, which includes any applicable accidents reported to the Occurrence Reporting System.*

11.09 Commentors question the exposure limits for noninvolved and involved workers in the ORR table 4.2.3.9–2. Commentors are concerned that the exposure limits for noninvolved workers is higher than for involved workers and wants to know where the D&D workers are in the table. In addition, commentors are concerned with the quality of estimated health impacts to the general public.

Response: *The exposure limits (i.e., average worker dose) to the noninvolved worker represents the estimated average dose to all noninvolved workers from all radiological sources at ORR. Conversely, the average worker dose to the involved worker represents the estimated average dose from the downsized secondary and case fabrication three-shift operation only. The average dose to the involved worker does not include the average dose from all other sources. If one were to include the additional dose from all other sources at ORR, the average dose to the involved worker is expected to be slightly higher than the average dose to the noninvolved worker. D&D workers are not included here, because they are not present during the normal operation of the stockpile management alternative at ORR. Site-specific information was used in the preparation of this analysis.*

In regard to the integrity (quality) of the general public dose estimates, the analytical "worker dose" methodology and associated data used in the PEIS were independent of those utilized for public dose calculations. For public health impacts, an indepth assessment was made using the GENII computer code. This type of analysis uses site-dependent factors including meteorology, population distributions, agricultural production, and an assumed facility location on a given site.

11.10 The commentor questions the accident history in section 4.2.2.9, which states that the most noteworthy accident at Y-12 resulted in temporary radiation sickness for a few ORR employees. The commentor would like to know whether the employees involved in this accident view its effects as temporary radiation sickness.

Response: *All accidents at DOE facilities are investigated in detail in order to understand the root causes and to identify corrective actions to prevent their recurrence. The health of workers following an accident is closely monitored to ensure every opportunity is taken for a complete recovery. There are a number of DOE orders in effect to protect the health and safety of workers. The requirements for investigation and documentation of the circumstances surrounding an accident are specified in DOE O 232.1,* Occurrence Reporting and Processing of Operations Information. *Other DOE orders that address a worker's health and safety include DOE O 231.1,* Environment, Safety, and Health Reporting, *and DOE O 440.1,* Worker Protection Management for DOE Federal and Contractor Employees.

11.11 Commentors express concern about the health of area residents. One commentor believes that the breast cancer rate in Livermore is the highest in the nation. Other commentors state that activities at LLNL have created plutonium pollution at nearby parks, tritium contamination of the water, and onsite contamination from leaking drums. Another commentor states that workers at LLNL are 400 percent more likely to develop malignant melanoma than the general public. The commentor also contends that the children of Livermore are 6 times more likely to develop skin cancer as a result of activities at LLNL.

Response: *The environmental impacts associated with radiological and hazardous chemical operations at LLNL are described in section 4.7.3.9, in appendix E for normal operations, and appendix F for potential accidents. The human health analyses presented for LLNL in the PEIS, conclude that "adverse health effects to the public and to workers will be small." This conclusion pertains only to the "alternatives" presented in the PEIS. Historical contamination and cancer incidences are discussed in section 4.7.2.9, the subsections on Accident History and Health Effects Studies.*

11.12 The commentor states that the PEIS does not clearly differentiate the safety risks associated with each alternative if an accident were to occur.

Response: *The composite risk value for accident impacts provided for each alternative in the main body of the PEIS and in appendix F can be used to differentiate the safety risks associated with each alternative. Appendix F also provides risk information for individual accidents in terms of accident consequences and probability of occurrence which can also be used to differentiate between alternatives. In addition, complimentary cumulative distribution functions are provided for each alternative at each site in the PEIS as an indication of the full range of probable impacts.*

11.13 The commentor believes that none of the Draft PEISs have adequately addressed what would happen to the area's farm and ranch economy if a significant accident, releasing substantial quantities of radionuclides, were to occur, regardless of how well it were to be cleaned up. The commentor thinks that the public's perception of the contamination would be such as to make local products unmerchantable not just for the immediately affected area, but for the entire Panhandle's products.

Response: *The likelihood of a significant accident that would impact the area's farm and ranch economy is very small. The PEIS identifies several potential accidents that can result in undesirable offsite consequences, measured in terms of the risk of cancer fatalities to the workers and members of the public. Secondary impacts of accidents affecting elements of the environment other than humans are also presented in a new section, appendix section F.4. This section identifies the extent of radiological releases due to accidents that may result in the contamination of farmland, surface and groundwater, recreational areas, industrial parks, cultural resources, or habitat of endangered species. The accident analyses were performed in accordance with DOE guidance (refer to the Office of NEPA Oversight document).*

11.14 The commentor would like the PEIS to address the impacts which would result from a nuclear explosion, including the resulting deaths, the cancers created, and the spread of radioactivity.

Response: *The devastating effect of a nuclear explosion is clearly recognized and has been the driving force to prevent any accidental or intentional occurrence. Within the DOE system, strict compliance with DOE orders and procedures is enforced to minimize the probability of any technical or human cause of an inadvertent nuclear explosion. Some examples of applicable DOE orders are DOE O 452.1,* Nuclear Explosive and Weapons Surety, *and DOE O 452.2,* Safety of Nuclear Explosive Operations. *Inadvertent detonation of a nuclear weapon has a probability of occurrence which is much less than 10^{-7} per year or once in 10 million years and is not evaluated. The risk of an explosive dispersal of nuclear materials is evaluated for weapons A/D operations at Pantex and NTS where work is performed on nuclear components in the presence of explosive materials.*

11.15 The commentor suggests that DOE provide additional information and clarity concerning the accident risk analysis. Another commentor believes that the accident analysis tends to trivialize accidents and notes that very low-probability events that have very catastrophic consequences are difficult to comprehend.

Response: *The accident analyses were performed in accordance with DOE guidance (refer to the Office of NEPA Oversight document). A set of accidents have been analyzed that include high probability/low consequence as well as low probability/high consequence events to show the range of possible impacts. The low probability/high consequence accidents are not expected to occur during the lifetime of the facility but have been included to show the worst possible consequences of an accident.*

11.16 The commentor does not share DOE's confidence that operating its new weapons complex at surge capacity can be done largely without waste management and capacity difficulties, and more than proportionally increased risk of both routine and accidental releases of radioactive and hazardous materials and of worker exposures.

Response: *The PEIS analysis bounds potential environmental impacts by assuming operations at a surge capacity. This means greater wastes and greater radiation doses are assessed than we would normally expect. It provides a reasonable level of conservatism such that DOE can be confident that any impacts would stay within the bounding envelope provided in the PEIS.*

11.17 The commentor views the reservations near Los Alamos, NM, as a "dump" (i.e., nuclear waste and radiation) and believes the populations are affected.

Response: *LANL health effects studies are presented in section 4.6.2.9 and appendix section E.4.6 of the PEIS. Several key facets of concern including cancer incidences among the general public (including those who may reside on the nearby reservations) have been addressed. Table 4.6.2.9–2 conveys data on the total annual radiological dose incurred to the LANL surrounding population (within an 80-km [50-mi] radius). The extremely small annual population-dose imparted in this table yields an associated cancer risk which is also very small (i.e., 0.0015 of one fatal cancer per year).*

11.18 The commentor wants to know to what extent the analysis of cancer risk factors into different schools of thought. The commentor notes that others have different views on exposure to radiation and its effects. The commentor wants a balanced view in the PEIS.

Response: *To ensure a consistent set of risk standards in the preparation of EAs and EISs, DOE has established recommended guidelines for the preparation of human health impact sections in these documents (refer to the Office of NEPA Oversight document). The public and occupational health risk for normal radiological operations analyzed in the PEIS uses the two dose-to-risk conversion factors for the public and workers recommended by DOE's Office of NEPA Oversight and established in the BEIR V Report. These risk factors are 0.0005 deaths per person-rem to the general public and 0.0004 deaths per person-rem to workers (the lower number for workers accounts for the absence of children in the workforce). Appendix E, Human Health, presents a detailed discussion of the methodology used to determine the radiological impacts to human health. The appendix also includes a section on the development and use of the risk factors presented in the Stockpile Stewardship and Management PEIS.*

11.19 The commentor asks if the PEIS projects what would be considered a safe dose of radiation in the future. The commentor notes that what we may have considered safe 25 years ago is much different based on today's knowledge.

Response: *Radiological doses during normal operations (to both the public and workers) associated with all future Stockpile Stewardship and Management Program activities would be well below regulatory standards established by the NRC and EPA. Over the last 20 to 30 years, enormous progress has been made in the study of biological effects resulting from radiation exposure; today's "conservative" exposure limits are a reflection of these research results. Over the past 25 years, a concept known "as low as reasonably achievable" has been the benchmark goal of all nuclear-oriented facilities licensed in the United States. Regularly "lowered" dose limits are a prime example of how much emphasis has been placed upon radiation safety in recent years. As to whether the dose limits will conservatively change in the coming years will be subject to the results of further data analyses, such as from the Chernobyl accident.*

11.20 The commentor states that Savannah, GA, is known to be a cancer site. The commentor asks if the PEIS contains statistics on the amount of radiation that flows through Savannah via SRS plus the existing high cancer rate.

Response: *For the purposes of this analysis, a radius of up to 80 km (50 mi) around a site was investigated for potential radiological impacts to public health. The city of Savannah is beyond this 80-km (50-mi) zone (roughly 160 km [100 mi]) and therefore has not been analyzed for potential impacts from SRS radiological airborne releases. However, potential radiological impacts to the Savannah area through the drinking water pathway are routinely assessed via the monitoring of offsite water treatment plants at Beaufort-Jasper and Port Wentworth, which are both located in reasonably close proximity to the city of Savannah. The PEIS reports these normal operational radiological impacts (incurred from the liquid pathway) in table 4.3.2.9–2. These liquid doses include constituents from drinking water, sampled at the site boundary—downstream to the Atlantic Ocean (i.e., Savannah River). The cancer risks per year associated with these modeled liquid doses are extremely small (0.0008 of one fatal cancer is estimated within the total population under investigation). For further information on health risk studies involving communities around the SRS area, see appendix section E.4.3.*

11.21 The commentor wants to know how old the epidemiological studies are that were used in the PEIS.

Response: *They began as early as 1942, but some reports are as recent as 1996.*

11.22 The commentor is concerned that a direct link cannot be identified between SRS radiation releases and latent cancer. The commentor also states that at the same time, it cannot be proven scientifically that radiation from Federal facilities does not cause cancer.

Response: *In 1984, Sauer and Associates examined mortality rates in Georgia and South Carolina by distance from SRS (see Volume I, chapter 6, SR duPont 1984b). Rates for areas near the plant were compared with U.S. rates and with rates for counties located more than 80-km (50-mi) away. Breast cancer, respiratory cancer, leukemia, thyroid cancer, bone cancer, malignant melanoma of the skin, nonrespiratory cancer, congenital anomalies or birth defects, early infancy death rates, stroke, or cardiovascular disease in the populations living within 80 km (50 mi) of the plant did not show any excess risk compared with the reference populations. Historical data and associated statistics have indicated that there have been essentially no significant health risk increases as a result of normal operation radiological releases. EPA and NRC regulatory standards are designed to protect the public from potential health impacts resulting from normal operational radiological releases.*

11.23 The commentor wants to know the impact of radiation as a result of the Stockpile Stewardship and Management Program on children, particularly birth defects. Another commentor believes that the PEIS's risk analysis is one-dimensional and not accurate; it cannot take into account the future legacy of radioactivity, the future health and genetic consequences, or the environmental impacts.

Response: *Radiological impacts to the public (including children) from planned Stockpile Stewardship and Management Program activities are presented in section 4.3.3.9 of the PEIS. Modeling has shown that potential doses to adults and children alike, would be extremely small (billions of times lower than that incurred from natural background radiation). Appendix section E.2.1.2 of the PEIS presents risk estimations for "genetic effects." The risk of incurring these effects are even smaller than that for fatal cancer (about 75-percent smaller).*

11.24 The commentor asks for the basis of the assumption that, in the accident scenarios, the worker is assumed to be a kilometer away.

Response: *In general, exposures to workers decrease with increasing distance away from the location of the accident. The evaluation of impacts to noninvolved workers (i.e., workers that are located on the site independent of the proposed action) assumed a hypothetical noninvolved worker located at 1,000 m (3,281 ft) from the location of the accident or the nearest site boundary, which ever is closer. For distances less than 1,000 m (3,281 ft), modeling techniques are less effective because of the effects of buildings on meteorology and dispersion.*

11.25 Referring to the uncertainty of potential, long-term health effects due to exposure at Pantex, the commentor would like to know how DOE can be so sure of the consequences of future missions that may be brought to the site.

Response: *Section 4.5.2.9 presents a discussion of health effects studies which have been previously conducted in the communities surrounding Pantex. These studies indicated that there have been no significant excess cancer mortality incidences in the Pantex area; thus, there have been no verifiable indicators as to any short- or long-term health impacts at the Pantex site. Public exposure to radiological effluents has conventionally been of extremely small quantity due to DOE safeguards and the nature of the missions conducted at the facility. In addition, DOE orders and required standard operating procedures have been established in order to ensure the safe and reliable operation of DOE facilities. The planned stockpile management program options at Pantex would not alter these circumstances. DOE's utilization of radiological dose modeling techniques quantitatively estimates exposure to the public and workers as a result of potential future stockpile management missions. Appendix section E.2.2 describes the methodology used to estimate radiological impacts during normal operations from DOE facilities analyzed in the PEIS such as tritium in the environment.*

The risk analysis employed in the PEIS for normal radiological releases takes into account the potential future health consequences which may occur from planned Stockpile Stewardship and Management Program activities. Expected radiological release quantities from each Program alternative are modeled to determine potential doses which may be incurred to members of the public in future years. Hypothesized future residential populations are included within the calculations in an effort to calculate future population-dose values. The future "behavior" (or "legacy") of radiological material(s) related to Stockpile Stewardship and Management Program operations are analyzed for anticipated characteristics which are to be expected over the coming years, including: decay rates, transport through air and water media, and uptake frequencies. When modeling is performed to determine human health impacts, "genetic consequences" can be calculated from information presented in appendix section E.2.1.2 of the PEIS. The risk of incurring "genetic effects" is even smaller than that for fatal cancer (about 75-percent smaller).

11.26 The commentor, a landowner near Pantex, is concerned about the integrity of her property and her personal safety, claiming that past accidents and explosions at Pantex have adversely affected her and others in the neighborhood of Pantex.

Response: *All facilities at Pantex and other DOE facilities are operated in strict compliance with DOE orders to minimize the chances of an accident that would release radioactivity to the surrounding area and to also mitigate the effects of a release if one were to occur. Any accident that has occurred is thoroughly investigated to identify its cause. Corrective actions that minimize or eliminate any repetition of the accident are also identified and implemented to maintain operations that are safe for workers and the public. For the preparation of the PEIS, a variety of potential* *accidents that may be initiated by operational causes, such as an explosion, or by natural phenomena, such as earthquakes, were identified and their impacts estimated using appropriate analytical methods. The results, as well as the history of Pantex accidents, are discussed in section 4.5.3.9 of the PEIS.*

11.27 The commentor states that Santa Fe is the capital of New Mexico and therefore has an increasing populace. The commentor is concerned that the area surrounding LANL is very near Santa Fe. The commentor feels possible contamination of the water, groundwater, and radioactive accident or sabotage, if they would occur, would make Santa Fe and the surrounding area uninhabitable. Another commentor suggests that the mere perception that an accident is possible could damage the tourist industry in New Mexico. Other commentors state that one nuclear accident would destroy the tourist, manufacturing, and agrarian industries in the State of New Mexico.

Response: *For the PEIS, a variety of potential accidents that may be initiated by operational causes or by natural phenomena, such as earthquakes, were identified and their impacts estimated using appropriate analytical methods. The results are documented in the PEIS. Appendix section F.4 discusses the secondary accident impacts to these types of resources for each site. In addition, other recent NEPA reviews for prior or interim actions (such as the Dual Axis Radiographic Hydrodynamic Test [DARHT] Facility EIS, DOE/EIS-0228) have analyzed the potential impacts of specific hypothetical facility accidents on the environment around LANL, including Santa Fe.*

11.28 The commentor states that the PEIS needs to document more fully why the assumptions associated with the PEIS accident scenarios are reasonable, and how these assumptions and other inputs are used by the Melcor Accident Consequence Code System model.

Response: *Additional information on accident scenarios and source terms for the accidents described in the PEIS are documented in a topical report (refer to HNUS Report No. ARP-96-042), which has been placed in the DOE Public Reading Rooms near each site. The Final PEIS contains an expanded discussion to further explain how data and assumptions are used by the Melcor Accident Consequence Code System model.*

11.29 The commentor refers to the ORR section 4.2.3.9, Radiation and Hazardous Chemical Environment, and asks if it is true that hazardous impacts would be reduced to zero as a result of secondary and case fabrication phaseout, unless we completely greenfield the site, including recovery of material from burial grounds.

Response: *Phaseout of these activities would reduce the added burden (beyond No Action) to zero because only other unrelated No Action activities would remain.*

11.30 The commentor refers to the ORR table 4.2.3.9–4 and asks how accident numbers were generated, and states that it is not clear why the probability of a significant beryllium oxide release is so high.

Response: *Additional information on accident scenarios, frequencies and source terms for the accidents described in the PEIS is documented in a topical report (refer to HNUS Report No. ARP-96-042), which has been placed in the DOE Public Reading Rooms near each site. The accident scenarios and related parameter values are based on safety analyses of facilities that perform operations at Y-12. The probability of a release is conservatively high in order to bound the impacts of the event.*

11.31 The commentor notes, with regard to nuclear weapons "safety," that morbidity and mortality in the cleanup crews at nuclear weapons accidents have not been studied, and long-term effects at these sites are unknown. The commentor states that with these possible exceptions, no one is known to have ever been injured from a nuclear weapon in an accident. Another commentor states, with regard to nuclear weapons "safety," that a risk of death from a nuclear weapons accident appears to be about a million times smaller than other causes of accidental death and about 100 to 1,000 times smaller than the public health risks from exposure to environmental pollution at current health standards.

Response: *The PEIS presents a full disclosure of all the human health risks associated with each of the alternatives based on best available data. All new construction and modifications to existing structures would meet or exceed applicable environmental, health, and safety standards for the public and workers. Because of these factors, the measures taken by DOE to limit impacts to human health from normal operations, and to prevent accidents which would impact human health, the analysis in this PEIS shows the risks associated with these technologies to be low.*

11.32 The commentor contends that the analysis of radiological impacts is too limited. It omits entirely the impacts of radioactive releases on aspects of the biosphere other than human health (see section 4.1.6). The commentor states that the analysis for radiation releases for normal operations of the proposed stockpile stewardship and management facilities is difficult to follow, and appears to be based on assumptions which may substantially understate potential impacts. The explanation of the health effects calculations in appendix E states that source terms for radiological releases are for "stockpile management alternatives," and there is no reference to or data for releases from stockpile stewardship alternatives provided in appendix section E.2.3. The source terms include "only atmospheric releases, because liquid radiological discharges are not expected from any of the alternatives at any of the sites" (appendix section E.2.3). The commentor believes there is no explanation of why this is so.

Response: *As discussed in section 4.1.6 of the PEIS, impacts on biotic resources from the release of radionuclides would be expected to be less than that on the human population based on studies which have shown humans to be the most sensitive organism to radiation release.*

Regarding the analysis of radiation releases for normal operations, section 4.1.9.1 discusses the methodology that was employed to estimate potential impacts. Appendix E provides greater detail of how health effects were estimated, including the reasons why the analysis in the PEIS is conservative.

The source terms for radiological releases from stockpile stewardship alternatives are not included in appendix E of the PEIS. Because each of the stockpile stewardship facilities are addressed in greater detail in appendix I (NIF), appendix J (CFF), and appendix K (Atlas), source term information for each of these facilities is addressed in those appendices, as appropriate.

The statement, "source terms include only atmospheric releases because liquid radiological discharges are not expected from any of the alternatives at any of the sites" found in appendix section E.2.3 of the PEIS is correct. During normal operations, no liquid releases of radionuclides are expected. This is because the facilities are designed to have no liquid radionuclide discharges.

11.33 The commentor cites section 3.7.1, Stockpile Management, "Worker exposure to radiation is expected to be about equal" and asks if it is reasonable to believe that NTS workers might receive higher doses for several years because of the lack of experience compared to Pantex workers. Commentor believes nothing replaces actual experience and thinks DOE should consider a learning curve at NTS.

Response: *The worker dose estimates presented (i.e., the 10 mrem/yr) are tabulated via historical worker dose data for comparable operations. These data provide the most accurate values available for the planned program activities being analyzed in the PEIS.*

11.34 The commentor cites section 4.1.9.1, Hazardous Chemical Impacts, and asks why CERCLA guidance was used. Commentor does not believe the CERCLA guidance bounds the issue because the higher risk occupations such as medical personnel, fire fighters, radiation workers, HE workers, roofers, machine operators, security personnel, and such would not be covered.

Response: *This section has been modified to reflect that CERCLA does not override the Occupational Safety and Health Administration's (OSHA) regulations for workers and EPA guidance for calculating risk to the public and workers relative to cancer risk. Instead, CERCLA should be correctly used in setting the cancer deminimus risk of 10^{-6} and the range of acceptable cancer risks for specific carcinogens based on how they are used and their mechanism of action (i.e., threshold versus nonthreshold carcinogens); the range of 10^{-4} to 10^{-6} specified under CERCLA covers the chemical-specific assessment as to whether a cancer risk is acceptable. Calculations for worker exposures were always done based on OSHA regulations for exposures to noncarcinogens and guidance for safety required for carcinogens.*

11.35 The commentor believes, contrary to the statement in appendix section E.3.1, that exposure to hazardous chemical releases to surface water, groundwater, and soils should be included when assessing the risk to the public and site workers.

Response: *The text cited by the commentor in appendix section E.3.1 refers to conditions under normal operations. Under such conditions hazardous chemicals are not released into surface water or groundwater or onto soil; therefore, inhalation is assumed to be the only route of exposure. For accident scenarios involving the release of hazardous chemicals into the environment, refer to appendix F, Facility Accidents.*

11.36 The commentor expresses concern that the hazard indexes and total cancer risk provided for the phaseout alternative at Pantex (appendix table E.3.4–12) are not properly evaluated. The commentor points out the risks for the phaseout of Pantex are lower than the risks cited for the other programmatic alternatives, with the exception of the A/D and HE fabrication alternative, which essentially equal the risk of the phaseout alternative. However, the amounts of hazardous and mixed LLW generated during phaseout of Pantex are anticipated to be 100 to 1,000 times greater than the other alternatives (tables 4.5.3.10–2 and 4.3.5.10–3). According to the commentor, section 4.5.3.9 of the PEIS states that no hazardous chemical emissions are anticipated for the phaseout alternative at Pantex, and the hazard index and cancer risk to the public and onsite workers would be zero. The commentor believes that it is more reasonable to assume that some exposure will occur during a phaseout of Pantex when over 6 million m^3 of waste is generated.

Response: *The fact that all hazardous chemical emissions are lower than other programmatic alternatives is attributed to the emissions that would no longer occur should this activity cease (i.e., the greater the contribution of an activity the more the reduction when it is phased out). In fact, table 4.5.3.10–2 shows that there is a reduction in solid hazardous waste generated from No Action and no change in liquid waste from No Action whereas solid mixed LLW is reduced and liquid wastes are reduced slightly. However, disposing of wastes using state-of-the-art technologies is not expected to result in increased releases to the environment. In fact, as is shown by appendix table E.3.4–12, the hazard indexes would be between 4- and 5-fold below a safe level (1.0) and the cancer risks contributed would be 2 to 3 orders of magnitude below that in the general unexposed population.*

11.37 The commentor refers to the NTS section 4.9.2.9, Radiation and Hazardous Chemical Environment, and suggests that the word "radioactivity" be removed, and the phrase "radioactive activity level" be inserted before the word "approximately." The commentor also suggests the words "were accidental" be replaced with "was an accidental release" in the sentence. The commentor further states that the NTS Accident History is inaccurate and has been manipulated to exclude the Baneberry venting accident (1970), and that NTS atmospheric tests released 1.2×10^{10} Ci into the atmosphere.

Response: *The releases from underground tests stated in the Draft PEIS are for the period from 1971 to 1988. Tests prior to 1971 were the cause of releases totaling 25,300,000 Ci, which includes the Baneberry release in 1970 (6,700,000 Ci). The discussion of NTS accident history has been expanded in the Final PEIS to include the Baneberry release and other atmospheric test releases. Additional details on accidental releases are documented in the report,* The Containment of Underground Nuclear Explosions, *Congress of the United States (OTA-ISC-414, October 1989).*

11.38 The commentor refers to section 4.1.9.2, Facility Accidents, "Accident risk to collocated workers was calculated for a hypothetical worker at 1,000 m (3,281 ft) from the facility, or at the site boundary, whichever is closer." The commentor states that usually in EISs, EAs, and safety analysis reports, the collocated workers are located at a much closer distance, such as 100 m (328 ft) and then at increments to 1,000 m (3,281 ft). The closer distances provide a more conservative (and more realistic) risk analysis for accidents.

Response: *In general, exposures to workers decrease with increasing distance away from the location of the accident. The programmatic level evaluation of impacts to noninvolved workers (i.e., workers that are located on the site independent of the proposed action) assumed a hypothetical noninvolved worker located at 1,000 m (3,281 ft) from the location of the accident or the nearest site boundary, whichever is closer. For distances less than 1,000 m (3,281 ft), the screening model techniques used in the programmatic level analyses are less effective because of the effects of buildings on meteorology and dispersion. For site-specific assessments, specialized modeling techniques would be used for estimating exposures at closer distances.*

11.39 The commentor refers to the LANL section 4.6.3.9, "... the presented noninvolved worker impacts were not modeled due to the unavailability of certain site-specific information. There also may be small risks to construction workers who are involved with tasks that are in close proximity to potentially contaminated areas." The commentor states the following: 1) noninvolved workers were not modeled; and 2) if risks to construction workers were not modeled, how can they be quantified as "small." If the source term of contaminated soil that they may be exposed to is a low activity or limited to a small area, it should be indicated in text. In addition, the commentor refers to the SNL section 4.8.3.9, "The presented total dose to noninvolved workers was not modeled due to the unavailability of certain site-specific information." The commentor states that radiological impacts to noninvolved workers were not performed.

Response: *Impacts to noninvolved workers and construction workers may be described in this manner because historical data and experience indicate that these workers would primarily be subjected only to radiation exposure from their designated job tasks. There are no verifiable "contaminated soil" source terms available to model radiological impacts to construction workers.*

A dose (impact) assessment for the LANL and SNL noninvolved worker was performed for the PEIS (sections 4.6.3.9 and 4.8.3.9, respectively). Noninvolved worker impacts were determined from information presented in the annually published report Compilation of Doses to Workers at DOE

Facilities, *for the year 1992. This report (database) provides a recent source of dose data from operations which are comparable to planned stockpile stewardship and management activities. Estimations of potential doses to stockpile stewardship and management workers were calculated from this historic record.*

11.40 The commentor refers to the LANL section 4.6.3.9, "... there are potential impacts to involved workers who would be located in the facilities. Quantitative statements of these impacts cannot be made until design details are developed further, at which time the number and location of facility workers can be estimated to support accident impact analyses. However, depending on the type of accident, facility workers in close proximity to the point of the accident could receive high levels of exposure to radiation, with potentially fatal impacts." The commentor states that impacts to workers were not modeled for accident analysis, however, fatalities may occur and the number of deaths is not estimated nor projected.

Response: *The design and layout of facilities, operating procedures, protective features, training and other safety measures all serve to prevent the occurrence of accidents and mitigate its effects if one were to occur. This is not a discriminator for mission siting and not addressed at the programmatic level. However, for any alternative that is selected, tiered NEPA studies and safety analysis reports required before operations are permitted to commence, will include estimates of impacts to involved workers that are based on well-defined safety measures.*

11.41 The commentor states that it is not clear whether DOE's risk assessment includes those hazardous constituents that do not meet the narrow definition of hazardous waste under RCRA or toxic substances under the *Toxic Substances Control Act* (TSCA). The commentor suggests DOE consider the risk posed to human health and the environment by what DOE defines as nonhazardous waste constituents (appendix table H.1.1–1).

Response: *DOE's risk assessment includes chemicals considered hazardous under RCRA or TSCA, and any others regulated by EPA or OSHA for which there is information that describes the nature of the hazard (e.g., National Institute of Safety and Health handbook, American Conference of Governmental Industrial Hygienists [threshold limit values and biological exposure indices], etc.). The nonhazardous waste constituents are not included in the assessment because they are not considered to pose a human health or environmental hazard. However, many of these constituents are considered in the air quality and water quality sections of the document.*

11.42 The commentor refers to appendix section E.2.2 and the statement, "For use in design basis accidents, the 50-percentile option was used." The commentor states that the 50-percentile option depicts conditions that are "average." Usually in EISs, environmental assessments, and routine site analyses for risk from accidents, risks are analyzed under "worst-case" conditions, which are also known as 95-percentile conditions (when using certain codes). Accident risks were not analyzed under worst-case conditions in the PEIS, and an underestimation for accidents under extreme conditions could result.

Response: *The accident analyses were performed in accordance with DOE guidance. This guidance states that "Analyses generally should be based on realistic exposure conditions ... and characterize the "average" or "probable exposure conditions ..." and therefore the results in the Draft PEIS are based on 50-percentile meteorological conditions (refer to the Office of NEPA Oversight document, page 21). Other conservative assumptions are made in the accident analyses in order to bound potential impacts. In addition, a spectrum of accidents is evaluated ranging from low-consequence/high-probability events to high-consequence/low-probability events to reflect bounding-case impacts. The complimentary cumulative distribution functions included in the Final PEIS also show the bounding-case impacts.*

11.43 The commentor refers to appendix F, Accidents, and states that solid uranium and plutonium liquid criticalities were modeled; however, no plutonium metal criticalities (solid) were analyzed. This accident analysis may not have been performed in the past; however, the accident scenario should be considered due to the projected increases in the number of pits under the "Pit Fabrication alternative." In addition, the commentor states that the methodology section should mention how the source terms for the criticalities are determined, and source terms should be listed by radionuclide and activity, not only as the number of fissions. From the information presented in the PEIS, the commentor says it is not possible to determine whether the criticality analyses are valid.

Response: *The PEIS identifies appropriate accident scenarios based on existing safety analysis reports and operating procedures which are analyzed to estimate bounding impacts. In this case, the liquid plutonium criticality was selected because it has higher impacts to workers and the public than a solid criticality. Additional information on accident scenarios and source terms for the accidents described in the PEIS are documented in a topical report (refer to HNUS Report No. ARP-96-042), which has been placed in the DOE Public Reading Rooms located near each site.*

11.44 The commentor states that in appendix section E.4.6, the discussion revolves around an investigation undertaken to assess melanoma risk at LANL because of worker exposure to low-level ionizing radiation. The study was the result of "a reported three-fold excess of melanoma among laboratory workers" at LLNL in California. The study was applied to LANL because of the similarity of the work done at both labs. At the end of the first paragraph in column 2, it is stated that "the only significant association with diagnosis of melanoma for males was being a college graduate ... or having a graduate degree...." To the commentor, it follows obviously that the vast majority of workers at both LLNL and LANL are males who are college graduates or who have graduate degrees and that the workers at LANL are significantly at risk for melanoma resulting from exposure to low-level ionizing radiation. The commentor asks if workers will be informed of the risk, if this is an acceptable risk, and if anything can be done to diminish it.

Response: *The commentor fails to mention that no excess risk for melanoma was detected at LANL among 11,308 workers between 1969 and 1978 (see Volume I, chapter 6, Lancet 1982a:883-884). Other studies clearly established no association between external radiation or chemical exposures in the workplace and melanoma. The association between melanoma and a college graduate or graduate degree (as the only association) then takes on lifestyle rather than work-related cause and effect (e.g., college graduates and those with graduate degrees have lifestyles that may differ from the general population, which could well be associated with how they spend their leisure time). DOE workers receive occupational safety and health training, which places a prime emphasis on "as low as reasonably achievable" principles. Through an "as low as reasonably achievable" program, workers are made aware of potential risks, and are trained to minimize (diminish) these risks to the lowest levels possible.*

11.45 Commentors state that the New Mexico Environment Department is sometimes referred to by its previous name, Environmental Improvement Division, or by the incorrect form, New Mexico Health and Environmental Department. Examples of incorrect naming can be found in appendix section K.3.3.1 and table 5.3–4. The commentor states that these should all be changed to New Mexico Environment Department.

Response: *In accordance with the commentor's suggestions, these changes have been made in the Final PEIS.*

11.46 The commentor identifies the following errors in appendix section E.4.6: there is repetition of the sentence "Population exposures are confounded by occupational exposures," and the word "countries" should be "counties."

Response: *Appendix section E.4.6 in the Final PEIS has been rewritten and the errors the commentor noted have been corrected.*

11.47 The commentor identifies the following errors in appendix F: in section F.2.2.1, there is jumbled spelling of the word "national," and in section F.2.3.1, the sentence, "The fire releases the plutonium contamination from the inner surfaces of the gloves" should read "... the inner surfaces of the glovebox."

Response: *The spelling has been corrected in the Final PEIS. The contamination that is released is from the outer surface of the gloves that are in the glovebox. The statement has been modified in the Final PEIS.*

12 ENVIRONMENTAL JUSTICE

12.01 The commentor believes that DOE has unfairly placed their nuclear facilities in low-income areas. The commentor notes that New Mexico, "the home of the bomb," has a low per capita income and a high minority population. Another commentor believes that the PEIS minority population maps for LANL and SNL have errors in them.

Response: *LANL and SNL were established in 1943 and 1945, respectively. These sites were selected, in part, due to their isolation from large population centers. The fact that the State of New Mexico has a relatively low per capita income played no role in siting these facilities and does not influence DOE decisions on whether to continue operating these facilities. Los Alamos and Bernalillo Counties, where most of the LANL and SNL workers reside, both had 1993 per capita incomes ($28,753 and $19,854, respectively), significantly higher than the average for the State of New Mexico ($16,346). The per capita income of these counties approached or exceeded the national average per capita income, of $20,800. Only one county (Rio Arriba) in either ROI had a per capita income significantly lower than the State of New Mexico. Less than 5 percent of the SNL workforce resides in Rio Arriba County.*

The environmental justice maps have been reviewed and revised, as appropriate. Several counties and census tracts were improperly categorized for both low-income and minority populations. The Final PEIS contains revised maps that are demographically correct.

12.02 The commentor states that DOE has polluted Western Shoshone land and that, as a result, cancer rates are high in the area. The commentor urges moving activities at the site elsewhere.

Response: *Appendix section E.4.9 describes epidemiological studies performed in the area around NTS, which includes the Western Shoshone land. These studies were performed to evaluate adverse health impacts on the exposed populations in Nevada and Utah from aboveground nuclear testing carried out by DOE at NTS in the 1950s. The results of the studies are inconclusive and contradictory. Underground testing that followed did contaminate land on NTS, but resulted in no additional exposure to surrounding populations. None of the proposed alternatives would result in adverse health impacts to the surrounding populations or cause disproportionate adverse health impacts to the Western Shoshone.*

12.03 The commentor wants to know exactly what was analyzed under environmental justice in the Stockpile Stewardship and Management Draft PEIS, the Pantex Site-Wide Draft EIS, and the Storage and Disposition Draft PEIS.

Response: *Environmental justice is the equal treatment of all races, cultures, incomes, and educational levels with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. The environmental justice analyses examine the distribution of low-income and racial and ethnic minority populations in the areas surrounding the alternative sites. Demographic analyses are performed at the census tract level for the area within 80 km (50 mi) of the alternative sites. Proposed alternatives are assessed to determine if these populations would receive disproportionate adverse health and socioeconomic impacts.*

12.04 Commentor asks if it is a Government policy to view certain demographic groups as less valuable or more expendable than institutions like SRS.

Response: *No, the Government has no such policy.*

12.05 Commentor believes that African Americans and low-income populations are being affected by SRS activities.

Response: *The analysis of demographic data for the communities surrounding SRS, as well as the health data presented elsewhere in the document, shows that any air or chemical releases would not exceed the threshold of regulatory concern, and that these impacts would not disproportionately affect minority or low-income groups.*

12.06 Commentor wants the impact analyses to include the combined exposure of not only SRS, but other non-DOE industrial uses on low-income and affected communities.

Response: *The PEIS assesses potential impacts from proposed DOE stockpile stewardship and management alternatives. The impacts of other sources of pollution are taken into account as a part of the No Action alternative in the human health analysis. For example, the air and water analyses evaluate whether incremental emissions from the proposed alternatives would lead to any exceedance of air and water quality standards. As noted in the document, DOE will operate in full compliance with all Federal, state, and local regulations. Furthermore, the impacts of other potential DOE and non-DOE activities are explicitly evaluated in section 4.13, Cumulative Impacts.*

12.07 Commentor requests an explanation in the Comment Response Document regarding the apparent failure of the PEIS to comply with Executive Order 12898 *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, and President Clinton's memo to heads of all departments and agencies of February 11, 1994, on the subject of environmental justice in minority populations and low-income populations. The commentor states the PEIS did not address the social and economic effects, as required.

Response: *DOE is committed to full compliance with all provisions of Executive Order 12898. The environmental justice sections explicitly analyze the proposed alternatives at each alternative site to determine if any of the proposed actions would result in disproportionate adverse health impacts on low-income or minority populations. The PEIS also addresses socioeconomic impacts, including impacts to employment, income, housing, population, and public finances, for all of the proposed actions. The socioeconomic impact analyses indicate that none of the proposed actions* *would result in either significant impacts to the entire affected populations or disproportionate adverse impacts to low-income or minority populations.*

12.08 The commentor states that LANL has had, and threatens to continue to have, disproportionate impacts on the Pueblo of San Ildefonso, and that because of this, the issue of environmental justice is not given adequate attention in the PEIS. The commentor states that LANL's use and disposal of radioactive materials has caused serious contamination to the air, soil, and water, and continued operations threaten the destruction of sacred sites.

Response: *Continued operations of the LANL mission will be conducted in compliance with Federal, state, and local regulations. The PEIS assesses the potential health impacts from chemical and radioactive emissions during normal operations as well as from accidents. The analysis indicates there would be no disproportionate adverse health impacts to the Pueblo of San Ildefonso.*

12.09 The commentor states that in the environmental justice sections of the PEIS, human health is covered, but no socioeconomic analysis is done.

Response: *The environmental justice section addresses potential disproportionate adverse impacts to minority populations and low-income populations. The socioeconomic analyses include impacts to regional economies, population, housing, and public finance characteristics. These impacts are determined at a regional level. The analyses performed for the PEIS indicate that none of the downsizing alternatives would result in significant economic impact on the affected regional economies. For those alternatives involving new workers at alternative sites, there would be small economic benefits. Therefore, there would be no environmental justice impacts. For the proposed phaseout alternatives, impacts would be larger but would still not be economically significant. Both the regional economic area and ROI around each site include areas where environmental justice principles apply. The impacts to these areas are included in the regional impact analysis.*

12.10 According to the commentor, Executive Order 12898, requires special attention to be given to subsistence consumption of fish and wildlife. The commentor adds that the order requires Federal agencies to publish guidance reflecting the latest scientific information available concerning methods for evaluating the human health risk associated with the consumption of pollutant-bearing fish and wildlife. The commentor feels that consumption issues are important to address in the PEIS because of their uniqueness in minority and low-income populations and the detrimental range of impacts they may have.

Response: *Subsistence is defined as the traditional use by rural residents of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation. Subsistence populations heavily rely on local fish and wildlife to meet their food supply. DOE is unaware of any identified subsistence populations residing on or near any of the alternative sites.*

DOE also notes that because none of the proposed alternatives would lead to radiological releases to water, there would be no impacts to fish or other edible aquatic life in the areas surrounding the alternative sites. All chemical releases would be regulated by NPDES permits and would be in compliance with Federal and state regulations. Furthermore, chapter 4 in the PEIS evaluated doses to the surrounding population through air and liquid exposures for all of the proposed alternatives, including No Action. The analysis indicates that there would be no adverse disproportionate impacts to minority or low-income populations.

13 CUMULATIVE IMPACTS

13.01 The commentor expresses concern about the cumulative impact of different programs on local communities. The commentor urges DOE to adopt a "local community" perspective and create a document that would detail the cumulative impacts (e.g., in transportation and waste management) of different programs. DOE should present this document to the public to increase their awareness of the overall impact of DOE activities.

Response: *The cumulative impact analysis of the Stockpile Stewardship and Management Program is discussed in section 4.13 of this PEIS. Other Federal, state, and local actions all have the potential to contribute to cumulative impacts, and all planned, reasonably foreseeable actions are considered in the cumulative impact analysis of this PEIS. However, as stated in section 4.13, programs planned for beyond the 2005 No Action baseline considered in this PEIS would be in such a preliminary stage as to make detailed analysis speculative; these activities are more effectively addressed in site-specific, tiered NEPA documentation.*

13.02 The commentor quotes from the cumulative impact section of the Council on Environmental Quality (CEQ) regulations and asks why past socioeconomic actions (that led to reductions in employment and that are still felt today) are not discussed in the cumulative impact section of the PEIS. Specifically, the commentor mentions the cancellation in 1988 of the DOE program of a mine geologic repository for spent nuclear fuel and high-level radioactive waste in Deaf Smith County.

Response: *Although the socioeconomic effects of past actions are not specifically addressed in the cumulative impacts section, these effects are reflected in the affected environment discussion for each site. As shown in appendix section D.2, Deaf Smith County is one of 26 counties included in Pantex's regional economic area; however, Deaf Smith County is not located within the ROI used in the PEIS. Information on the current and projected civilian labor force, employment, unemployment, personal income, and per capita income were considered for each of these counties in the PEIS. Yucca Mountain Site in Nevada has been selected for detailed study as the candidate for the Nation's first geologic repository. The disposal of HLW and commercial spent nuclear fuel in a radioactive waste geologic repository is discussed in the* Environmental Assessment, Yucca Mountain Site, Nevada Research and Development Area, Nevada *(DOE/RW-0073, May 1986). The impacts described in that EA are included in section 4.13, Cumulative Impacts, of this PEIS.*

13.03 The commentor believes that DOE should look at the cumulative impact of the Stockpile Stewardship and Management, the Storage and Disposition, and the Pantex programs.

Response: *Section 4.13 of this PEIS discusses the cumulative impacts of the Stockpile Stewardship and Management Program, the Storage and Disposition Program, and other proposed actions. As stated in section 4.1.12, Cumulative Impacts, continuing DOE missions and any reasonably foreseeable changes to these missions are addressed as part of the affected environment baseline, or No Action. The Pantex Site-Wide Draft EIS which analyzes impacts associated with conducting nuclear weapons operations at Pantex for the next 5 to 10 years, is included in No Action for the PEIS. The ROD for this PEIS will determine which facilities at Pantex should be upgraded, downsized, or replaced as part of the Stockpile Stewardship and Management Program and will take into consideration all of Pantex's current and reasonably foreseeable activities.*

13.04 The commentor argues that the Draft PEIS cumulative impacts analysis is more like an incremental impact analysis, illustrating the relative insignificance of the proposed action's contribution to ongoing, similar degradation of the environment, instead of determining the aggregate or cumulative effects of related impacts in order to judge whether those impacts, taken together, are significant. The commentor cites waste management as an example, contending that there is no real analysis of whether the proposed Draft PEIS alternatives, in combination with other foreseeable activities in the same area, will have significant waste management impacts. The commentor further states that the use of resources and impacts on the biosphere and on human health from routine and accidental releases from waste management facilities are not analyzed in the waste management cumulative impacts discussion for each site. The commentor also states that the cumulative impacts analysis is not done on an alternative-by-alternative basis, so it is difficult to compare alternatives to one another. The commentor calls the cumulative impacts analysis cursory and conclusory, offering no supporting analysis and no indication where such analysis could be found. The commentor cites section 4.13.1.1 where the cumulative impacts analysis for nonaccident radiological impacts for rebuilding the complex is one paragraph long.

Response: *Impacts from past actions and continuing actions contribute to the affected environment at each of the sites as described in sections 4.2.2 through 4.9.2. In sections 4.2.3 through 4.9.3, the impacts from continuing actions are presented in the No Action alternative. The impacts from the proposed action and the alternatives are also discussed in those sections to allow for comparison to the No Action alternative. Section 4.13 of the PEIS includes a site-by-site discussion of cumulative impacts, focusing not only on the future impacts from the Stockpile Stewardship and Management Program, but also on the future impacts from other reasonably foreseeable programs and actions. As discussed in that section, many other significant programs are included in that cumulative impact analysis, including Environmental Management and Materials Disposition Programs. That analysis focuses on those resources that were judged to have the greatest potential to be impacted. Depending on the particular site of concern, these resources included air quality, water resources, socioeconomics, radiation and human health, and waste management.*

The cumulative impact assessment was done for a bounding analysis on a site-by-site basis. This means that at a given site the contribution from stockpile stewardship and management alternatives was based on the maximum number of potential missions added to other programs' potential impacts at that site. The intent of the analysis was not to illustrate the relative significance of the Stockpile Stewardship and Management Program alternative impacts, but rather to determine whether the Stockpile Stewardship and Management Program potential impacts, in combination with other programs' potential impacts, could produce significant impacts.

13.05 The commentor questions where the supporting analysis was for the statements in the Draft PEIS that "all program totals would be within radiological limits to the public and the effects to workers would be small," and that "[c]umulatively, radiological impacts are expected to be within radiological limits."

Response: *Section 4.13 in the Final PEIS has been expanded to include tables identifying the normal operation cumulative radiological doses and resulting health effects for the potential stockpile stewardship and management alternatives at each site alongside other potential site activities.*

13.06 A commentor questions cumulative impacts associated with accidents. Specifically, the commentor questions the potential radiological impacts associated with earthquakes affecting multiple facilities.

Response: *For purposes of analyzing the potential cumulative environmental impacts associated with accidents, the information presented is based on the conservative assumption that the worst consequence accident for the activity has occurred, based on existing NEPA analyses.*

20 STEWARDSHIP—CONTAINED FIRING FACILITY

20.01 The commentor asks how much CFF will cost.

Response: *Design and construction of CFF is expected to total $53 million. While cost and whether and how the President and Congress should allocate funds for CFF is outside the scope of the PEIS, cost is one of the many factors which will be considered by decisionmakers in the PEIS ROD as it relates to CFF.*

21 STEWARDSHIP—NATIONAL IGNITION FACILITY

21.01 The commentors believe the technical justification for NIF in the PEIS is poor and not cogent and the facility will only benefit an elite few. Commentors believe that NIF is the least relevant alternative as far as safety and reliability and it will provide only marginal information on reliability. Commentors question whether there are alternative means of obtaining each of the categories of data that NIF is intended to provide. Another commentor asks if DOE could identify a single past safety or reliability issue that NIF would have the ability to evaluate. The commentor states that the PEIS does not acknowledge that DOE cannot assure high confidence in achieving ignition at NIF and that construction of NIF should be delayed.

Response: *The President has declared that the maintenance of a safe and reliable nuclear weapons stockpile will remain a cornerstone of national security policy for the foreseeable future. Changes to U.S. national security policies in the post-Cold War have placed two significant constraints on the way DOE has traditionally accomplished its statutory nuclear mission: the United States has declared a moratorium on underground nuclear testing, and has stopped the production of new-design nuclear weapons. In August 1995, the President declared that the United States was seeking ratification of a zero-yield Comprehensive Test Ban Treaty (CTBT). Within these constraints, the proposed actions in the Stockpile Stewardship and Management PEIS will enable DOE to maintain the core intellectual and technical competencies necessary to ensure the continued safety and reliability of the stockpile under a CTBT. In this situation, the United States needs a comprehensive computational ability and a set of experimental facilities that can replicate conditions expected to occur within a nuclear detonation. NIF is one of those experimental facilities. It is a key component of the Stockpile Stewardship and Management Program and is necessary to help maintain confidence in the reliability of the nuclear deterrent.*

As stated in the appendix section I.2.2, the purpose and need for NIF is to achieve fusion ignition and to use inertial fusion technology for helping nuclear weapons scientists maintain the safety and reliability of the nuclear weapons stockpile in the absence of nuclear testing. Therefore, NIF experiments can be used to verify computer models associated with the reliability of nuclear weapons and assess the impact of age- or remanufacture-related changes in the weapon. NIF would reach temperatures and pressures closer to those in a nuclear detonation than any other technology and is the only facility in the program capable of fusion ignition. This national security mission is the principal justification for NIF; it is necessary to help maintain confidence in the reliability of the nuclear deterrent. However, the high energy density experiments proposed to be performed at NIF would also help determine if inertial fusion can be developed as a practical energy source. The challenging science at NIF would help attract the best scientists and engineers to work on these issues of national importance (appendix section I.2.2.3).

The facilities for enhanced experimental capability would complement each other and produce more sophisticated and comprehensive computer models which would be able to provide data on all processes in the seven relevant physical regimes (appendix section I.2.2.2) that occur in *weapons. NIF was designed to be a minimum-sized facility that has a reasonable probability of achieving ignition and the same ability to access high temperatures and densities that occur in weapons materials. NIF would address weapons processes that occur in five of the seven regimes, including some of the processes that occur in weapons' primaries and secondaries. The purpose of NIF is to study isolated phenomena in weapons in the stockpile. In the future, the complex interactions which occur in the detonation of a complete weapon would be investigated through advanced computer modeling.*

There is a high probability that NIF would achieve ignition and an even higher probability that NIF would achieve its weapon physics mission. A 1990 National Academy of Sciences study, Second Review of the Department of Energy's Inertial Confinement Fusion Program, Final Report, *September 1990 (1990 National Academy of Sciences study) (cited as NAS 1990 in appendix I), concluded that the probability of achieving ignition was great enough to justify proceeding with the next steps in designing such a facility. It also recommended that DOE establish a standing review group to continue tracking progress in target physics. That group, the Inertial Confinement Fusion Advisory Committee, has followed the program for more than three years and concluded (Inertial Confinement Fusion Advisory Committee Report, January 1996) that there is a high probability of achieving ignition if NIF is built as currently designed.*

To fulfill its mission in stockpile stewardship, NIF is designed to achieve ignition and, in addition, to perform experiments at high temperatures and densities using the laser energy alone. Many of the needs of the weapons program can be met with these ignitionless experiments. Indeed, experiments are planned well before it is expected that ignition is likely to occur. Ignition would enhance NIF's capabilities for weapons studies but NIF is not necessary for many of them. In 1994, the JASONs group of independent academic scientists reviewed the science-based stockpile stewardship program and concluded that NIF is "... the most scientifically valuable of the programs proposed for SBSS [science based stockpile stewardship]..." In 1996 JASONs reiterated this position and stated its "... support for proceeding to the next step of achieving ignition with NIF because of NIF's expected value to science-based stockpile stewardship as well as its collateral scientific and energy interest." In summary, the Inertial Confinement Fusion Program and NIF have been reviewed by many independent expert groups, such as the National Academy of Sciences, Inertial Confinement Fusion Advisory Committee, and the JASONs, over the years and all have endorsed moving ahead quickly with a facility as currently designed.

*A projection from past experience with the stockpile (*Stockpile Surveillance: Past and Future, *SAND95-2751, January 1996) indicates that there will be cases that will require a weapon scientist to make a judgment about a change that could affect safety or reliability. NIF would be able to help with many of them.*

If NIF would not achieve ignition, the environmental impacts associated with construction would not change; however, the potential environmental impacts associated with operation could be smaller, but probably similar, to those presented in the PEIS. Delaying the construction of NIF would not cause any planned differences in the inertial confinement fusion R&D nor change the environmental impacts which are described in the PEIS.

21.02 A commentor notes that with respect to environmental impacts the public should be skeptical with the statement "... there will be no significant impacts." Another commentor notes that LLNL's environmental report claims "no significant impact" yet over a million Ci of radiation has been released in the air. The commentor states that 120 cancers and 60 cancer deaths resulted from the top 10 accidents that occurred at LLNL. A commentor points out that tritium levels in rainwater and drinking water in Livermore has been measured to be over seven times the acceptable level. The commentor also points out that plutonium-contaminated soil was discovered at a local playground.

Response: *Over the past 40 years of operations at LLNL, tritium gas was released as a result of accidents and normal operations. The releases consisted of mostly tritium gas which is much less of a hazard to human health than tritiated water which can be absorbed more easily into the body. Additional information concerning radiological health impacts can be found in appendix section E.2 of the PEIS.*

The 1994 LLNL Environmental Monitoring Report *states that the tritium activity levels in drinking water in the Livermore Valley are less than 1 percent of the EPA drinking water standard. Over the past 40 years, there was one rainwater sample that read seven times the EPA guideline for tritium in potable water. This occurrence may have been caused by tritium releases during cleanup operations.*

There is some groundwater (not drinking water) tritium contamination greater than EPA standards for drinking water under the eastern portion of the LLNL site. However, the tritium in this groundwater will decay (due to radioactive disintegration) to levels well below EPA standards before it leaves the site boundary. Therefore, it presents no health impact to humans or the environment. In addition, LLNL monitors the groundwater under the site on a regular basis (as reported in the annual LLNL Environmental Monitoring Reports*) and can ensure that the public will not be exposed to tritium at levels that exceed EPA standards. Additional information concerning accidental release can be found in a report by Myers, et al.,* Health Physics Aspects of a Large Accidental Tritium Release, *published in 1993.*

Routine releases from NIF are estimated to be about 30 Ci/yr (0.003 g/yr), which is roughly 100 times lower than the routine average annual releases that took place from the LLNL tritium facility prior to 1989. Therefore, the use of standard risk coefficients for the extremely low doses and dose rates under discussion in the PEIS is at the least, extremely health conservative, and may, in fact, be significantly overestimating the risks (if any) associated with such low doses.

The commentor refers to levels of plutonium that were detected in soil samples taken from Big Trees Park in Livermore. The plutonium levels in two of the 16 areas sampled in the park were found to be above the normal range of global fallout levels (from aboveground nuclear weapons testing many years ago). The soil in this park was investigated for plutonium in 1995 as a joint effort among LLNL, EPA, and the California Department of Health Services. The investigation of park soils also involved various community stakeholders—the city of Livermore, the park and school districts, the local homeowners association, and Tri-Valley Citizens Against a Radioactive Environment. The investigation found that there is no soil at the park that has plutonium levels above the current EPA risk-based preliminary remediation goal of 2.5 pCi/g for residential areas. The EPA concluded that there is no health risk from this plutonium and that no remedial action is necessary.

21.03 Commentor wants to know what the key factors were in the NIF preferred alternative decision and if the timetable for NIF is the same as the PEIS.

Response: *The Secretary of Energy stated in a press release in October 1994, "Lawrence Livermore National Laboratory was chosen as the preferred site because it contains the Nation's leading experts in large laser facilities. Lawrence Livermore National Laboratory has con-*

structed five consecutive versions of the world's largest laser, including the currently operational Nova laser. The National Ignition Facility would be the successor to Nova. Alternative sites will be examined, and a final site selection will be not be made until completion of the National Environmental Policy Act *process, which includes public meetings." In the letter approving Key Decision 1 (approval for start of a major new project), the Secretary supported the statement "The* National Environmental Policy Act *requires that any preference related to the siting of a facility be stated by the Department of Energy. Given the resident technical expertise and existing infrastructure at LLNL, we believe that Lawrence Livermore National Laboratory is preferable at this time to other candidate sites."*

Following completion of the Final PEIS, but at least 30 days after it is issued, DOE will issue an ROD. The ROD will explain all factors, including environmental impacts, that DOE considered in its decisions for NIF. The timetable for NIF is within the envelope for the PEIS. It is anticipated that NIF would be constructed between late 1996 and 2002, with operations commencing in 2003.

21.04 Several commentors do not support NIF, a new experimental $4.5 billion facility, feeling that it is not the policy direction the United States should undertake and the public should inform elected officials that NIF is not necessary. Some commentors disapprove of the funding allocation on the basis that NIF competes for funds with cleanup programs and waste management. Other commentors feel it costs too much and the funds could be better spent on health care, social services, low-income housing, education, and infrastructure. Still others prefer funds spent on socially beneficial programs, such as conservation, renewable energy, and clean cars.

Response: *The cost of NIF is estimated at $1.1 billion for construction (including escalation and contingency) through 2002. After construction is complete, NIF operating costs are anticipated to be $60 million per year (in fiscal year 1996 dollars) to provide approximately 600 experiments per year. The incremental cost of the Inertial Confinement Fusion Research Program is estimated to be $55 million per year (in fiscal year 1996). Cost is one of many factors which will be considered by decisionmakers in the ROD for NIF.*

DOE has the responsibility for ensuring the safety and reliability of the downsized U.S. nuclear weapons stockpile, a policy priority for the President and Congress. Congress determines how the funds are allocated among programs.

21.05 Commentors believe that the discussion of NIF in the PEIS is inadequate in scope and content. A commentor believes that a reasonable range of alternatives is not provided for the NIF in the NEPA context. The commentors also question whether there are alternative means of obtaining each of the categories of data that NIF is intended to provide. A commentor states a fair and impartial environmental analysis of NIF, as required by NEPA, should include the extensive concomitant environmental impacts from the potential for nuclear weapons proliferation resulting from the spread of inertial confinement fusion technology and the environmental impacts from the successful deployment of fusion as a commercial power source. Several commentors state that in regard to the site-specific review of the various stockpile stewardship facilities, and NIF in particular, that it is inappropriate to include site-specific reviews in the PEIS.

Response: *DOE believes that appendix I, the National Ignition Facility Project-Specific Analysis, was adequate. The NIF project-specific analysis assessed the direct, indirect, and cumulative environmental impacts of the proposed action (appendix section I.3.2), which is to construct and operate NIF (two operational options—Conceptual Design Option and Enhanced Option) and the*

No Action alternative (appendix section I.3.3). NIF was designed to be the minimum-sized facility that has a reasonable probability of achieving ignition and achieving its high temperature density weapon physics goals. No other known technologies are capable of achieving ignition and the high temperatures and densities that occur in weapons materials. Specifically, the pulsed-power technology alluded to in a commentor's letter is not a substitute for NIF capabilities. In general, high intensity laser facilities, like NIF, can achieve temperatures and pressures closer to those in a weapon than can pulsed-power facilities. On the other hand, pulsed-power facilities can put more but less concentrated energy on target than laser facilities, and are, therefore, able to follow certain phenomena for longer times, albeit at much lower temperatures. Thus, rather than providing the same capabilities, laser and pulsed-power facilities complement one another. There are no other design alternatives that would enable NIF to perform its intended mission, therefore, no others were assessed. Thus, the only alternatives that are judged reasonable are to build NIF or not to build it, and if so, where. These two alternatives were explained in detail in appendix I.

Section 1.5 of the PEIS explains the DOE NEPA strategy for the Stockpile Stewardship and Management Program. During the second phase of the NEPA strategy, which would follow the ROD, DOE would prepare any necessary tiered project-specific NEPA documents to implement any programmatic decisions. However, for the three facilities in the proposed action for stockpile stewardship—NIF, CFF, and Atlas—the Stockpile Stewardship and Management PEIS is intended to include sufficient project-specific analyses to complete NEPA requirements for siting, construction, and operation, and thus, satisfy both phases of the NEPA strategy. Including the project-specific analyses for the three facilities in the PEIS does not prejudice the programmatic review. In addition, the CEQ regulations do not preclude this approach.

NIF is not capable of being a prototype for a commercial inertial confinement fusion reactor. As stated in the Justification of Mission Need, the purpose of NIF is to achieve fusion ignition and to use inertial fusion technology for helping nuclear weapons scientists maintain the reliability of the nuclear weapons stockpile in the absence of nuclear testing. This national security mission is the principal justification for NIF. However, the high energy density experiments done at NIF would also help determine if inertial fusion can be developed as a practical energy source. In this context, obtaining ignition on NIF at the lowest laser energy possible would be an important set of experiments. If this is successful, other experiments would study target science that is applicable to any laser or particle accelerator driver that may be used in the future to study inertial confinement fusion as an energy source. NIF experiments could also provide the data necessary to design an engineering test facility, which would be the true engineering basis for a commercial reactor.

*A comparative study of the four driver concepts under consideration (*Laboratory Microfusion Capability Study Phase I Report, *DOE/DP-0069, April 1989)—the solid state laser, the krypton flouride laser, the heavy ion accelerator, and the light ion driver—was done in the late 1980s for what was called the Laboratory Microfusion Facility. This study provided a technical analysis of each driver, a description of their respective research programs, their status, cost, and, in general, the features asked for in the above comment. The Laboratory Microfusion Facility was designed to achieve ignition and high gain, with fusion yields of 200 to 1000 megajoules (MJ), a much larger facility than NIF. During 1989 and 1990, the National Academy of Sciences reviewed the Inertial Confinement Fusion Program and all of these drivers. It was given the information from the previous comparative study. Some of the drivers required several intermediate facilities before the technologies would be mature enough to propose as the driver for a machine of the scale required. In its 1990 study, the National Academy of Sciences recommended that DOE plan on building an ignition facility (eventually this was called NIF) rather than the Laboratory Microfusion Facility and it recommended that DOE pursue this option quickly. Indeed, it suggested that* *start of the project be in 1992. Finally, the study also concluded that the only driver capable of achieving ignition within the next decade or so is the neodymium glass laser.*

DOE accepted the recommendations of the 1990 National Academy of Sciences study and began concentrating resources on NIF, driven by a neodymium glass laser. Four inertial confinement fusion laboratories participated in the conceptual design study for a neodymium glass driven NIF. A prototype beamline of the NIF neodymium glass laser was built and tested successfully. While there has been progress in all driver technologies since the 1990 National Academy of Sciences study, it is clear that the neodymium glass laser's readiness to perform the NIF mission has grown faster than that of any other driver. Thus, for NIF's mission, the neodymium glass laser was judged to be the only reasonable option that would meet program goals.

The programs and facilities that make up the existing weapons program have evolved to their present state because of diverse technical, programmatic, and budgetary considerations. The present programmatic change is the need for improved science-basis to ensure the safety and reliability of our nuclear weapons within a zero-yield test ban. In the case of inertial confinement fusion, technical reviews by the JASONs and the Inertial Confinement Fusion Advisory Committee specifically questioned the technical status, issues, and activities mix of the program within the context of changed programmatic need. Neither the programmatic changes nor the technical reviews have provided any basis for defining a change in the existing program other than adding the significant new capabilities that NIF could contribute. The technical reviews provide a strong basis for continuing today's program and facilities except that the NOVA laser might reasonably stop operation after "NIF construction is well underway ..." (JASONs JSR 96-300 p.16).

Since there is no reasonable basis for defining an option for inertial fusion that is a reduction from today's program, no such option has been considered in the PEIS. Like most research programs, inertial fusion can be adjusted in pace and level of effort based on scientific findings or budget considerations. Any required changes in the program, including reductions, would be accommodated but there are no apparent break points for existing facilities and activities, in a programmatic or environmental sense, that suggest analysis of a particular reduced case.

The addition of an ignition facility to the program has been technically defined and endorsed since 1990. The addition of NIF is considered because it addresses science-based stockpile stewardship needs and is technically consistent with the logic and status of inertial fusion research. Technical reviews have not identified any alternatives to NIF for the mission needs. Any follow on facilities are, at present, too ill defined and speculative to analyze.

Issues such as the environmental impacts from nuclear weapons proliferation resulting from the spread of inertial confinement fusion technology and the environmental impacts from the successful deployment of fusion as a commercial power source are beyond the scope of the PEIS. Knowledge does not, in itself, have environmental impacts, and thus is not analyzed in the PEIS.

21.06 Many commentors support the NIF project on the basis of their perception that NIF would: 1) ensure world peace; 2) maintain a safe, reliable, and viable stockpile through science-based stewardship; 3) keep weapons scientists knowledgeable and equipped with the best available tools; 4) increase security of the United States; 5) continue the evolutionary process for eventual cessation of nuclear weapons and final disarmament; 6) not contribute to proliferation; 7) provide economic benefits; 8) create data on enhanced nuclear fusion energy; 9) help negotiations for the Nuclear Nonproliferation Treaty (NPT) and CTBT; 10) justify the need to eliminate underground nuclear testing; 11) create many employment opportunities in the region as a result of new fusion technology; and 12) have a benign environmental and safety impact with mitigation measures minimizing any possible impacts.

Response: *The purpose of and need for the Stockpile Stewardship and Management Program, and NIF's role within a science-based stockpile stewardship program, are detailed in chapter 2 of the PEIS. The purpose of and need for the NIF project are detailed in appendix section I.2.1. NIF is one of the technologies that is enabling the United States to seek a CTBT. The study,* The National Ignition Facility (NIF) and the Issues of Nonproliferation, Draft Study, Office of Arms Control and Nonproliferation, *August 23, 1995 (citation: U.S. Department of Energy, 1995a in appendix I) concluded that NIF can contribute positively to the U.S. nonproliferation policy and arms control goals. NIF would perform a key role in ensuring the reliability of the Nation's nuclear weapons stockpile without the need for underground testing. Performing this function requires extensive research and experimentation in the areas of weapons physics and advanced computation that can only be provided at the proposed NIF. In addition, through the same scientific accomplishments resulting from stockpile stewardship, science and technological research endeavors can be advanced, including optics, lasers, materials, and measurement techniques, fostered by the challenges of constructing and operating this facility (appendix section I.2.3).*

21.07 The commentors believe the NIF superlaser affords excellent nonweapons research opportunities into the potential of thermonuclear fusion energy without damaging the environment. Commentors believe advancing research into areas such as new energy sources are vital to our civilization considering there may be a lack of natural resources in the 21st century. A commentor states there is no programmatic discussion of the full Inertial Confinement Fusion Program and the follow-on facilities to NIF or other inertial confinement fusion programs in operation. Other commentors state NIF's justification of inertial confinement fusion as a commercial energy source is suspect because inertial confinement fusion cannot serve as the basis for a commercial reactor since it has high cost, low driver efficiency, and the needed repetition rate of target implosions cannot be obtained with neodymium glass lasers. The commentors also state that the NIF design should be modified to increase driver energy to a higher level to give a greater confidence that ignition could be achieved. A commentor believes that no nuclear waste will be generated because fusion will be studied, not fission. Another commentor notes that if NIF is to be used for civilian purposes like DOE claims, then let private companies compete for the funding for this program.

Response: *Research opportunities and scientific and technological benefits would derive from NIF being a multipurpose, multi-use facility. NIF would be constructed for its national security and weapons research role, but it also would present the scientific community with a range of civilian applications. The unique properties of NIF are attracting a broad spectrum of interest from the international community for basic science applications. Although diverse programs of scientific and technological research have been conducted at large lasers in the United Kingdom, France, Germany, and Japan, information on equivalent research in the United States has been restricted because of past substantial classification requirements on much of the research and development associated with the Inertial Confinement Fusion Program.*

Recent changes in U.S. classification guidelines have modified the atmosphere for research at NIF, with the result that U.S. scientists are designing programs of basic and applied research that could be accomplished openly at NIF. The NIF role in fusion energy would be to demonstrate ignition, optimize target gain curves, provide initial data on fusion reactor materials, and allow sound decisions to be made concerning inertial confinement energy development. These data would determine if inertial confinement fusion can be a viable source of electrical power in the future. NIF is not intended to be the basis for a commercial inertial confinement fusion reactor. The neodymium glass laser that would power NIF is recognized not to be a good *candidate for a reactor. Several other drivers, including crystalline solid state lasers, krypton flouride lasers, heavy ion accelerators, and light ion diodes are under development. The National Academy of Sciences stated that ignition should be the next goal for inertial confinement fusion and that the only way to achieve that in the next decade or so is with a neodymium glass laser driver (1990 National Academy of Sciences study). The Inertial Confinement Fusion Advisory Committee stated that achieving ignition by any driver was the most important next step in development of inertial fusion energy.*

NIF would also establish new capabilities in many other potential areas of study, including: astrophysics, hydrodynamics, material properties, plasma physics, radiation sources, radiative properties, and other potential applications, such as nonlinear physics, geophysics, other atomic physics applications, and optical physics. NIF could also spur high-technology industries in optics, lasers, materials, high-speed instrumentation, semiconductors, and precision manufacturing. Further discussion is included in appendix section I.2.3.

Any follow-on facilities to NIF are, at present, too ill defined and speculative to include. For accomplishing the mission of NIF, there are no reasonable alternatives.

Article IV of the NPT commits parties to facilitating the "fullest possible exchange of "... scientific and technological information" related to peaceful uses of nuclear energy. This commitment was included in the NPT at the insistence of nonnuclear weapons states that were concerned that they would suffer scientific and technological disadvantages compared to the nuclear weapon states.

Environmental impacts associated with the construction and operation of NIF are detailed in appendix sections I.4.1.2, I.4.2.2, I.4.3.2, I.4.4.2, and I.4.5.2. The comment that no nuclear work would be generated by NIF is incorrect; however, the small quantities of low-level radioactive wastes estimated to be generated by NIF can be handled by current or planned waste management capabilities at each alternative site for NIF.

21.08 The commentor suggests the unevenness of LLNL's early expenditure estimates, coupled with the rapid growth of spending a year ahead of when it would be expected to occur based on past projects, leads commentor to conclude that NIF may overspend early in the project cycle and may experience significant delays due to the attempt to "push" the project in the first four years.

Response: *The proposed NIF funding profile is based on the annual funding necessary to construct a facility which begins operation in 2003. The apparent rapid growth of funding "a year ahead of when it would be expected to occur based on past projects" is required so that initial construction contracts and long lead procurements can be placed near the end of fiscal year 1997 for actual accomplishment during fiscal year 1998.*

21.09 Commentors note that there are several varying estimates regarding the number of jobs which would be created each year by NIF and the regional economic impacts were misleading. One commentor notes that the regional economic impacts from building NIF cited in the Conceptual Design Report are inflated and misleading. According to the commentor, the regional economic effects of the construction and pre-operation of NIF will be small over the 7-year construction period. A large influx of construction employees during years 3, 4, and 5 of the construction period and a correspondingly large decrease in construction employees during 6 and 7 has the potential to create a boom-and-bust scenario in the Livermore region since approximately 1,200 people would move in and out during the last 4 years of the construction of NIF. The commentor states that the jobs will vary during each year of construction from 22 jobs the first year to 600 jobs the fifth year. The commentor contends that construction jobs would decrease to 120 by year 7 and only about 230 long-term jobs will stay at NIF.

Response: *The socioeconomic analysis provides data on the peak number of jobs, in-migrating population, number of housing units required, increase in local jurisdiction (revenues and expenditures), and number of daily vehicle trips associated with the construction and operation of NIF. Several other sources have analyzed the impact of NIF on employment, and have reached different conclusions regarding the employment impact of the facility. The differences are attributable to different data, methodologies, and assumptions used in the studies. For example, the project-specific analysis supporting NIF in appendix I is of greater depth than that performed for the PEIS alternatives.*

Socioeconomic impacts were measured using the latest version of RIMS II, an accounting framework model developed by the U.S. Bureau of Economic Analysis (section 4.1.8). The model is used by Government agencies, university researchers, and economists to measure economic impacts. The database used for the socioeconomic study was developed using the most recent information available from the Departments of Commerce and Labor, as well as financial reports provided by cities, counties, and school districts. The model estimates impacts occurring in the local area surrounding each site and those that occur in the regional and national economy as well. Appendix table I.3.6.1–1 provides a comparison of socioeconomic impacts across the five candidate sites.

Appendix section I.4.1.2.6 provides information on the effects of constructing and operating NIF at LLNL in the San Francisco Bay area economy. A number of related industries are located outside the San Francisco Bay area, and therefore, some of the economic benefits would be gained elsewhere in the U.S. economy. However, in terms of impacts across all industries that would provide inputs to NIF, the majority of employment created from construction at LLNL would occur in the San Francisco Bay area economy. The expected demand for housing for in-migrating construction workers is less than 2 percent of the housing units available, therefore NIF construction would not create a boom-bust effect in the local housing market (appendix section I.4.2.6). Text has been added in appendix I to explicitly address the issue of retained jobs.

The analysis performed for the NIF project-specific analysis (appendix section I.4.1.2.6) estimated that a total of 1,900 construction-related workers and their families would move into the LLNL area from the start of construction in 1996 to the peak in 1998. The project-specific analysis estimates that this would result in the demand for an additional 690 housing units in the area surrounding LLNL. Baseline projections show that 54,000 housing units would be available over this period in the local area, indicating that NIF-related in-migration would use less than 2 percent of locally available housing. It is unlikely, therefore, that NIF construction would create the boom-bust effect in the local housing market described by the commentor.

21.10 Commentors feel that jobs being created by NIF would be costly, not prosperous, come at the risk to other LLNL programs, ignore those created from technological inventions, and are at risk because of the annual budget process. Other commentors support NIF at LLNL and feel that NIF is a responsible project which would not be trivial work and should not be minimized.

Response: *NIF would be a unique, state-of-the-art scientific facility whose primary mission would be to ensure the continued reliability of the nuclear weapons stockpile. Creating employment at the site chosen and for the surrounding economy is secondary to this objective. Many commercial facilities are likely to create more employment than NIF at a lower cost of investment, but many of these facilities do not have a research mission and none use comparable technologies. It is not,* *therefore, possible to compare the costs and benefits of NIF versus commercial facilities solely on the basis of the number of jobs created.*

The estimates of employment impacts associated with NIF do not include the economic benefits of any additional new technologies and scientific enterprises that might result from experimentation at NIF and that could be transferred to the commercial sector. For example, no assessment was made of the potential economic benefits from a possible development of inertial fusion as a source of electrical power for use by the commercial sector. As the nature, scale, and timing of any future benefits of new technological and scientific developments associated with NIF are uncertain, these are not currently included in the assessment of economic impacts in the EIS.

As with any government research facility and program funded through the annual appropriation process, funding for NIF would be dependent on annual decisions by the President and Congress. The purpose and need for NIF are tied directly to U.S. decisions to maintain a safe and reliable weapons stockpile as a key element of the deterrence policy. In the appropriations process, all Government programs compete for funding based on their merits. There is no direct causal relationship between funding one program and an increase or decrease in funding for another program at the same site.

21.11 The commentor feels the construction of NIF will be delayed because the decision regarding NIF will drag on for the next few years.

Response: *DOE has developed a timeline of numbered sequential Key Decisions, now known as critical decisions. This management system will be used to ensure the orderly progress of the proposed NIF project. The Secretary of Energy in Key Decision 0 (January 1993) affirmed the need for NIF. Key Decision 1 (October 1994) approved the preliminary engineering design and site evaluation. Critical decision 3, scheduled in 1997 after the PEIS ROD, would authorize construction and major procurements. Critical decision 4, scheduled in late 2002, would authorize operation and first experiments.*

21.12 The commentors state that DOE cannot state that the radiological health threat of NIF is small with certainty from a threshold exposure basis. Commentors are concerned that the use of tritium and deuterium fuel at NIF will add to the amount of tritium and other toxic chemicals being released into the environment and create radioactive waste. Another commentor is concerned that plutonium-239 or tritium would be produced at NIF. Other commentors express confidence that NIF is a safe facility which is not hazardous to the environment and that they believe that LLNL will accept and diligently implement any mitigation measures contained in the NIF appendix.

Response: *Appendix section I.3.6.7 summarizes and compares the radioactive and hazardous chemicals impacts from normal operations at NIF, a low hazard radiological facility, to the general public surrounding all candidate sites. Conservative assumptions were used to ensure estimated potential radiological doses were maximized in the PEIS analysis. The calculated doses were then multiplied by 0.0005 fatal cancers per rem to obtain radiological health effects, assuming no threshold exposure limits. Results indicated that no cancer deaths would occur among workers and in the general public due to construction and operation of NIF.*

The maximum tritium effluent (atmospheric release) from normal operations would be 10 Ci/yr (0.001 g/yr) for conceptual design operations and 30 Ci/yr (0.003 g/yr) for enhanced operations (appendix sections I.3.2.2.1 and I.3.2.2.2). No latent cancers are projected from NIF's 30 years of operation at any of the candidate sites. The quantities of hazardous chemicals used are small and the only emissions would be from the small quantities of volatile materials used for optics cleaning.

Under the postulated accident conditions at any candidate site over the 30-year lifetime, the risk of radiation-caused cancer fatalities to the public would be essentially zero (less than 1 in 700,000) when the anticipated extremely low accident frequency during NIF operations is taken into account. Modeling of four release scenarios covering a wide range of nonradiological chemical releases for each candidate site for NIF revealed that offsite nonradiological impacts would be negligible and no fatalities would occur (appendix section I.3.6.7).

The fuel for NIF experiments would consist of a mixture of tritium and deuterium and the experiments would create small amounts of activation products. The ratio of the mixture of tritium to deuterium, however, has not been determined. The unignited fuel and any activation products would be removed from the target chamber as described in the NIF appendix (appendix section I.4.1.2.8.1) and disposed of according to established procedures. The amount of low level radioactive waste projected to be generated is small and it is analyzed in the PEIS (appendix section I.3.6.8) for all candidate sites. Although each alternative site would implement waste minimization practices, the generation of additional wastes would be unavoidable. All alternative sites have current or planned capacity to handle wastes associated with construction and operation of NIF; however, this would entail offsite shipment of some of the wastes for all sites, except at LANL.

Experiments that use fissile material, such as plutonium-239, have been postulated, but not defined. However, no experiments of this type are foreseen in planned NIF operations and thus are not considered in this document. Any future determination to conduct experiments that have implications beyond the currently defined operational envelope and safety analysis would require both additional safety analysis and NEPA action in addition to possible facility modifications. Additional information can be found in appendix section I.3.5 of the PEIS.

NIF would monitor the release of elemental tritium and tritiated water. In addition, the tritium air monitoring system would measure NIF tritium emissions as part of the total from all site operations. Since tritiated water is 25,000 times as toxic as tritium in the hydrogen gas form, the site monitoring system concentrates on measurement of tritiated water. These measurements would be peer reviewed and would be done in accordance with the procedures approved by the respective regulatory agencies.

NIF would be constructed and operated in compliance with all applicable statutes, regulations, and standards (see appendix section I.5). In addition, specific mitigation measures that the selected site would implement are addressed in appendix section I.4.7. If specific mitigation measures, monitoring, or other conditions are required, they will be adopted as part of the ROD.

21.13 The commentor states that a "total systems life-cycle-cost" study should be performed, and updated every few years, for NIF. This would be similar to what is required of the Yucca Mountain project under the *Nuclear Waste Policy Act*. Another commentor states that whatever the estimate of how much NIF is going to cost, the life-cycle cost will probably end up being greater than the estimate.

Response: *The individual elements of the NIF life-cycle costs such as design, construction and equipment procurement, installation and inspection, start-up testing, environmental and safety reviews, operations, and D&D were estimated in the* Conceptual Design Report, *which is available in the DOE Public Reading Rooms near each site. These cost elements, except for D&D, were independently reviewed in 1994. The review of D&D costs was performed in 1996. DOE requires that all projects conduct a life-cycle cost study, though not in the depth and complexity of that performed for the Yucca Mountain project under the* Nuclear Waste Policy Act.

NIF would perform a life-cycle cost study as part of the design process. The life-cycle cost study would be updated if any significant assumptions change.

21.14 The commentor suggests that both the proposed areas considered for "laydown" or temporary staging of equipment, materials, and supplies at LLNL, in the construction of NIF, be designated in the project-specific assessment in appendix I. The commentor also suggests that the potential impacts of the staging of NIF construction equipment and supplies at LLNL, as well as the impacts of construction of the proposed NIF, also be addressed in appendix I, as well as in the PEIS text.

Response: *The proposed areas considered for "laydown" or temporary staging of equipment, materials, and supplies at LLNL, in the construction of NIF, are designated in appendix section I.3.4.1.3 and shown in appendix figure I.3.4.1.1–2 of the project-specific assessment in appendix I. The potential impacts of the staging of NIF construction equipment and supplies at LLNL, as well as the impacts of construction of the proposed NIF are addressed in appendix section I.4.1.2, as well as in the main text of the PEIS. Discussions of this same topic are also included in the appropriate sections of appendix I for the other alternative sites for construction and operation of NIF.*

21.15 Commentors believe that the purpose of NIF is to advance nuclear weapons research, science, design, development, and testing. Commentors believe new materials require new designs, as occurred from the 1960s through the 1980s, and the combination of new materials and NIF will help contribute to new designs today. One commentor states that it is already known and certified through nuclear tests that the secondaries will operate as designed, if driven by the test certified primary, and questions the need for NIF for stockpile stewardship. Another commentor thinks NIF will probably have a major role in weapons research and design, wants an analysis of the long- and short-term impacts. Another commentor states that because NIF will continue weapons development that the PEIS should evaluate the impacts of nuclear explosions. A commentor is concerned with NIF being like a "super-oven" and is opposed to it being sited at LLNL.

Response: *The President has declared that the maintenance of a safe and reliable nuclear weapons stockpile will remain a cornerstone of national security policy for the foreseeable future. Changes to U.S. national security policies in the post-Cold War period have placed two significant constraints on the way DOE has traditionally accomplished its statutory nuclear mission: the United States has declared a moratorium on underground nuclear testing, and has stopped the development and production of new-design weapons. In August 1995, the President declared that the United States was seeking ratification of a zero-yield CTBT. Within these constraints, the proposed actions in the Stockpile Stewardship and Management PEIS will enable DOE to maintain the core intellectual and technical competencies necessary to ensure the continued safety and reliability of the stockpile under a CTBT. In this situation the United States needs a comprehensive calculational ability and a set of experimental facilities that can access the physical regimes that exist inside exploding weapons. NIF is one of those experimental facilities. The Stockpile Stewardship and Management Program was constructed with the national mission of maintaining U.S. security in response to requests from the President and Congress.*

In the science-based stockpile stewardship program, NIF nuclear weapons research experiments can be used to verify increasingly sophisticated and comprehensive computer models and codes of the performance (reliability) of nuclear weapons and to assess the impact of changes in that performance due to age- or remanufacture-related changes in the remaining weapons stockpile in the absence of nuclear testing. This type of evaluation can be done for a weapon that has been tested before. NIF experiments, in combination with the existing nuclear test database, would be *used in the computer calculations to determine if changes detected have an adverse effect on weapon reliability.*

A study of the technical vertical and horizontal proliferation concerns surrounding NIF occurred between September 1994 and December 1995, including external reviewers, interagency coordination (DOD, Department of State, the Central Intelligence Agency, and the National Security Council), and public meetings. The unclassified results were published in the DOE document, NIF and the Issues of Nonproliferation Draft Study. *In that study, the weapons design capabilities of NIF were extensively examined. It concluded that the development of new weapons requires integrated testing, such as occurs in nuclear explosive tests, in order to determine if the thousands of individual events interact properly. NIF by itself cannot perform such integrated testing of new concepts and, therefore, cannot replace nuclear testing for development of new nuclear weapons designs.*

21.16 The commentor wants DOE to take a leadership role in preventing NIF from polluting the San Francisco Bay area.

Response: *The construction and operation of NIF would not pollute the San Francisco Bay area. The analysis has shown that NIF would have no significant impacts to workers, the environment, or the public. The public would be exposed to a very small dose of radiation over the 30-year operating lifetime of NIF. No cancer fatalities would be expected to occur from exposures associated with routine operations (appendix section I.3.6.7). The release of volatile organic materials used for optics cleaning is small. All candidate sites have current or planned waste management capability to handle the wastes generated by operation (appendix section I.3.6.8).*

21.17 Commentors feel that NIF will contribute to proliferation and lead to a less secure nation. Several commentors request that the short- and long-term nonproliferation aspects of NIF be further analyzed and included in the EIS. One commentor states that the detailed analysis in the report, *National Ignition Facility and the Issue of Nonproliferation*, does not support its conclusions. A commentor states there is no substantial analysis of the ongoing controversy on potential proliferation impacts of NIF. Another commentor believes that the only way NIF contributes to U.S. nonproliferation goals is by making the test ban acceptable to the U.S. weapons establishment. One commentor feels that discussions to determine the impacts of NIF on proliferation had occurred. A commentor states that the Draft PEIS does not have substantive detailed discussions about specific experiments NIF will do, such as studies of mixing of fissionable material into fusion fuel, on which to base a conclusion about NIF's worth and effect on nonproliferation.

Response: *The Secretary of Energy committed the DOE's Office of Arms Control and Nonproliferation, an independent branch of DOE, which has no programmatic responsibility for NIF, to examine whether the facility would aid or hinder U.S. nonproliferation efforts before proceeding with substantial budgetary commitments to construct NIF. A study of the technical vertical and horizontal proliferation concerns surrounding NIF occurred between September 1994 and December 1995, including external reviewers, interagency coordination (DOD, Department of State, the Central Intelligence Agency, and the National Security Council), and public meetings. The original draft was classified so that all aspects of NIF operations could be analyzed. An unclassified version was then prepared and both versions were reviewed by seven independent experts in the technical, policy, and arms control fields to ensure accuracy, comprehensiveness, and consistency. The unclassified results were published in the DOE document,* NIF and the Issues of Nonproliferation Draft Study *and submitted to the Secretary of Energy for her decision. It concluded that the technical vertical and horizontal proliferation issues of NIF are manageable and can be made acceptable, and that NIF can contribute positively to the U.S. nonproliferation policy and arms control goals. DOE believes that the conclusions of the report are supported by* *the body of the report and the process that was followed assured that all views were accounted for and dealt with.*

Article VI of the NPT calls for all of the parties to the NPT to "undertake to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a Treaty on general and complete disarmament under strict and effective international control." NIF and other stockpile stewardship programs are designed to provide the United States with the confidence that its arsenal is adequately maintained during size reduction without testing.

The NIF and the Issues of Nonproliferation Draft Study *does discuss, to the extent allowed by classification, the areas of weapons physics that can be addressed by NIF and the types of transparency and access control measures that can be used to assure support of the U.S. goals for nonproliferation. Detailed discussions, such as the mixing of fissionable material into fusion fuel, and its specific relevance to weapons physics issues remains classified. Such specific issues were addressed in detail in the classified version of the study and in classified discussions with the independent expert reviewers. These reviewers determined the conclusions of the unclassified report were supported by the full content of the study.*

21.18 The commentor believes that NIF may contribute to exceedances of state standards for PM_{10} and VOC emissions and that complying with air quality standards will help sustain economic growth and vitality in the San Francisco Bay area. Therefore, the commentor recommends that NIF obtain offsets to mitigate its emissions of PM_{10} and VOC from operation even if they are not legally mandated.

Response: *NIF would have small PM_{10} emissions during construction and small VOC emissions from operation largely from optics cleaning. Emission offsets will be provided for this project as required by air district regulation. California law prohibits any air district from issuing a permit which represents a growth in emissions after January 1, 1988. The air districts comply with this requirement by offsetting emissions from other sources. Each permit application is evaluated and offsets are provided from the Small Facility Bank, which is operated by the district or by the facility making the application in the form of emission reductions or emission banking certificates. Sources such as LLNL, with very small total emissions, may use the Small Facility Bank until their growth reaches a trigger level where the facility is required to offset all they have borrowed from the Small Facility Bank plus the emissions for the permit tripping the requirement. This offsetting policy provides for economic growth while at the same time reducing emissions. Facilities must offset to "permitted" emission levels and operate at "actual" emissions levels. The difference between "permitted" and "actual" levels is a reduction in the district's total emissions as required by California law. Also facilities may only obtain banking certificates for "actual" emissions while offsetting to "permitted" levels for their next project. This also provides for a reduction in emissions and is often referred to as the "transaction cost."*

21.19 The commentor feels LLNL is not accurately reporting tritium in the yearly annual environmental report and values presented are underestimated. The commentor feels the tritium released from NIF will probably not be reported accurately as well. The commentor points out that the problem exists because the values reported represent contaminated water only. The commentor notes that tritium organically bound in organic surroundings, such as grass and tritiated water, is not being measured and it represents a hazard which is approximately 25,000 to 2,500,000 times more toxic than tritium gas.

Response: *As described in the* 1994 LLNL Environmental Monitoring Report. *LLNL collects vegetation samples (usually annual grasses) quarterly from about 15 different locations throughout the Livermore, San Joaquin, and San Ramon Valleys. Vegetation samples are analyzed using a freeze-drying method, which removes essentially all of the water (which would, of course, include any tritium) from the sample. It is possible that some small fraction of tritium in the vegetation may be "organically bound," and not recovered in the freeze-drying process. However, this small fraction of unrecovered tritium would not add significantly to the amount of tritium reported. These measurements have been peer reviewed and are completely accepted by state and Federal agencies.*

NIF would emit less than 30 Ci/yr (0.003 g/yr) of tritium. The impact of this small release to the public or the environment would be negligible. NIF would continuously monitor the release of elemental tritium and tritiated water. The LLNL sitewide monitoring system will monitor tritium emissions as part of the total from laboratory operations.

21.20 Commentors ask how LLNL became the preferred site, several encourage a Federal decision to proceed with NIF at the LLNL site because of the site's advantages and the analyses of environmental impacts showing any adverse impacts are generally not significant. Commentors desire to know if there was any possibility that NIF may come to NTS or LANL. Commentors are troubled by political siting decisions, including that elected officials lobby for NIF at LLNL on the basis of jobs and economics.

Response: *Five locations (LLNL, LANL, NTS, North Las Vegas Facility [NLVF], and SNL) are considered in the PEIS for the NIF based on a two-step process for selection (appendix section I.3.4) and DOE has assessed the impacts of constructing and operating NIF at all of the candidate locations at the candidate sites. The PEIS provides information to decision-makers and the public to allow a comprehensive assessment of the purpose and need, and to compare potential environmental impacts of constructing and operating NIF at all of the candidate sites. In the ROD, the Secretary of Energy will make a final site selection taking into account the results of the PEIS and other considerations such as cost differences, availability of scientific and technical personnel, and capability of facility infrastructure to support NIF. In the ROD, to be published at least 30 days after the Final PEIS is completed, DOE will explain all the factors, including environmental impacts, that DOE considered in reaching its decision on siting NIF.*

In her October 20, 1994 approval letter for Key Decision 1, Energy Secretary Hazel O'Leary announced LLNL as the preferred site (appendix section I-5.6) because of its prominence as a leading center for laser science, engineering, and technology. LLNL has the required combination of existing facilities, equipment, infrastructure, and technical and management personnel required. The other weapons laboratories, SNL and LANL, meet all of the criteria, but not to the extent of LLNL. NTS meets four of the five primary siting criteria, lacking only a significant inertial confinement fusion infrastructure.

The environmental analysis for the construction and operation of NIF at each of the alternative sites is described in appendix sections I.4.1.2, I.4.2.2, I.4.3.2, I.4.4.2, and I.4.5.2. Impacts to human health from NIF operations would be within regulatory limits. NIF would be operated in accordance with applicable statutes, regulations, and standards (appendix section I.5) and enacting appropriate mitigation measures, including the development of a monitoring and mitigation plan which accompanies the ROD.

22 STEWARDSHIP—ATLAS FACILITY

22.01 The commentor asks why a new Atlas Facility is under construction in Los Alamos when DOE already has an Atlas Facility in North Las Vegas, NV. The commentor questions why both are needed if they are the same. If they are different, the commentor states, the name of the new one should be changed to avoid confusion.

Response: *The two facilities are not the same and have different purposes. The Atlas Facility in North Las Vegas was developed by LLNL from a plan called the Augmented Test Logistics Assembly System (ATLAS). The purpose of the facility was to provide a location for canister fabrication, instrumentation preparation, and other prestaging operations prior to vertical emplacement for underground nuclear testing at NTS. These activities were related to mechanical operations of the past experimental program. As a potential future stockpile stewardship facility, the purpose of Atlas at LANL is to perform high-energy pulsed-power experiments to simulate certain hydrodynamic and radiation effects and to predict the effects of aging on the weapons in the existing stockpile.*

22.02 The commentor states that the description of the Atlas Facility is limited in both the executive summary and in section 3.3.2.3 of Volume I. Commentor recommends that DOE expand the discussion of the uses of the facility since it is unclear and, therefore, difficult to review the potential environmental impacts.

Response: *A detailed description of the Atlas Facility and its potential environmental impacts and accidents are included in appendix K, Volume III of the PEIS.*

22.03 The commentor states that the Atlas Facility is not needed because defects in secondaries (the primary area of research for Atlas) are quite rare. The commentor, noting that the Pegasus II Facility is used for up to 24 experiments annually while Atlas is supposed to perform up to 100 experiments, asks what is the need for the dramatic rise in experiments.

Response: *This stockpile stewardship facility would be used to gauge the safety and reliability of weapons in the enduring stockpile. As noted in section 2.3.3, of the approximately 400 defects which required some corrective action since 1958, 110 were in the nuclear package. Of these the majority (approximately 90) were indeed associated with the weapon primary. However, the remaining number were still associated with the weapon secondary. The lower frequency of these relative to the primary related defects does not imply that DOE need not develop capabilities to address such defects, which might otherwise compromise stockpile reliability, when they arise. The existing weapons will age beyond the point in which DOE has historical experience. Furthermore, even defects which are determined to not require corrective action would have to be evaluated by DOE through the stockpile stewardship program including relevant experiments such as those for which Atlas is proposed.*

There is no correlation between the number of experiments conducted annually at the Pegasus II Facility and the design capacity for Atlas because Pegasus II currently supplies limited data regarding weapons physics and Pegasus II's power capacity is insufficient to reach the conditions necessary for experiments planned for Atlas. Pegasus II, which was developed before the cessation of nuclear testing, does not readily support larger numbers of experiments because of operational procedures related to the facility design. The capability of Atlas to support up to 100 experiments per year, to meet anticipated programmatic needs, would be enabled by the design of that new facility.

30 MANAGEMENT—WEAPONS ASSEMBLY/DISASSEMBLY

30.01 Several commentors express support for continued operation of Pantex, citing lower costs, sound environmental and safety record, and local support. Some commentors specifically endorse continuance of the weapons A/D and HE fabrication missions.

As the commentors note, the preferred alternative for the weapons A/D mission is to downsize operations at Pantex. The HE production mission includes HE procurement, formulation, component fabrication, characterization, surveillance, disposal, and storage. As discussed in the Analysis of Stockpile Management Alternatives *report, DOE's goal for the HE fabrication mission is to assure core competency maintenance while achieving cost efficiencies. At the time the Draft PEIS was issued, the HE production mission which best achieved these objectives was not clear, therefore DOE deferred identification of a preferred alternative for the HE production mission while further analysis was performed. Since that time, DOE has completed the analysis and has identified the preferred alternative for the HE production mission which is to downsize the production mission at Pantex. The decisions on the A/D mission and the HE fabrication mission will be documented in the ROD. The* Analysis of Stockpile Management Alternatives *report is available for public review at the DOE Public Reading Rooms near each site.*

30.02 Several commentors request additional cost information or express dissatisfaction with the selection of Pantex as the preferred alternative over NTS. Information requested includes specific differences in security guard costs and estimated dollar savings for Pantex versus NTS. Another commentor requests that DOE use a "fair and open cost comparison" of all alternatives in analyzing sites and that this information be shared with the public.

Response: *The preferred alternative for the A/D mission is to downsize the current operations at Pantex. The final decision will be documented in the ROD. Cost effectiveness is only one of the many factors DOE used to arrive at the preferred alternative. The PEIS analysis shows that while there is some potential for adverse environmental impacts associated with continuing A/D operations at Pantex, the impacts would be less for the downsized facilities than for the No Action alternative. Additionally, there is less technical risk associated with the Pantex alternative because Pantex personnel are currently performing this mission, whereas similar operations for assembly of nuclear test devices at NTS have historically been performed by laboratory personnel. Specific program and alternative costs are not part of the PEIS analysis. Stockpile management alternative costs have been analyzed in two supplementary documents provided by the DOE Albuquerque Operations Office. These reports, the* Analysis of Stockpile Management Alternatives *report, and the* Stockpile Management Preferred Alternatives Report, *are available for public review at the DOE Public Reading Rooms near each site.*

30.03 Several commentors express support for NTS and for moving the A/D mission to NTS. Commentors state that NTS has the established infrastructure, trained workforce, and ideal location to accept such a mission. Commentors also state that even with the past nuclear activities conducted at the site, tourism and area growth was not affected. Some commentors suggest that NTS has not been properly represented in the Draft PEIS.

Response: *For the weapons A/D mission, only Pantex and NTS were considered as reasonable alternatives because no other DOE sites possess the experience and infrastructure to perform this mission. The preferred alternative is to downsize at Pantex because analysis discussed in the* Analysis of Stockpile Management Alternatives *report and the* Stockpile Management Preferred Alternatives Report *shows that Pantex is a lower cost and lower technical and schedule risk alternative than NTS. The preferred alternatives were developed by DOE using data and* *studies on such factors as cost, technical feasibility, technical risk and schedule, ES&H, and national security. Retaining the weapons A/D mission at Pantex presents less cost and technical risk than relocating to NTS because Pantex personnel are currently performing this mission, whereas similar operations for assembly of nuclear test devices at NTS have historically been performed by laboratory personnel. Hence, additional risk is added to the NTS alternative due to: the support that would be required from the laboratories to assist in the qualification of production operations, the uncertainty of laboratory personnel availability, the significant amount of construction required on a very aggressive schedule, and the 1-year gap in operations which would result from transition of the mission to NTS. The two stockpile management alternatives reports are available for public review at the DOE Public Reading Rooms near each site.*

30.04 The commentor cites section 3.7.1, Stockpile Management, and thinks the last sentence of the last paragraph should read "in the unlikely event ... of an accident instead of "... in the event of an accident."

Response: *The sentence in question is correct as stated since it refers to the consequences of a postulated accident, not the probability that it would occur. The PEIS analysis, as detailed in appendix F and as discussed in section 4.1.9.2, Facility Accidents, includes both the probability and the consequences of selected representative accidents. These accidents include both beyond design basis (high-consequence, low-probability) and design basis (low-consequence, high-probability) accidents.*

30.05 The commentor cites appendix table A.3.1.1–1, states that the table should include the Burning Ground, and inquires about the location of the sanitization and demilitarization facilities and the waste treatment facilities.

Response: *The Burning Ground is not considered part of the A/D operation, but is covered separately in the HE fabrication function (see appendix table A.3.5.1–2). There is some uncertainty associated with the time period for the elimination of projected inventories of HE from weapon dismantlement, and consequently there is currently no approved schedule for this activity. A completion date of fiscal year 2000 is assumed in the PEIS and is considered conservative, as it allows for 2 additional years to complete the disposition of HE that would be generated at Pantex through 1998. In other words, the HE waste produced during dismantlements should be disposed of prior to the implementation of the downsized facility at Pantex. Appendix table A.3.1.1–1 is not intended to include all of the facilities needed to support A/D operations, only "key" facilities. Although some sanitization and demilitarization actions are conducted at Pantex, there are no facilities dedicated solely to these activities. Parts resulting from the A/D operations may be recertified and staged for reassembly, shipped to the originating site for evaluation or disposition, or processed as residual material in the waste management process. Waste management affected environment and environmental consequences of proposed stockpile stewardship and management actions at Pantex are discussed in sections 4.5.2.10 and 4.5.3.10, respectively, and appendix section H.2.4.*

30.06 The commentor wants to know what DOE means by stating they would like to keep the stockpile as young as possible and asks if A/D will continue in order to keep the stockpile fresh. In addition, the commentor asks what happens to pits that come out of the disassembled weapons.

Response: *Weapons would be refurbished, modified, and retrofitted as needed for components that have, or are expected to be, degraded due to age. In many cases, the A/D site would be involved in fixing those components. The pits from disassembled weapons are either used in rebuilt weapons or are surplused and disposed of by the DOE Office of Fissile Materials Disposition.*

30.07 The commentor thinks that there is no recognition throughout the PEIS that the Device Assembly Facility is a backup to Pantex, which could be critical to the successful implementation of treaty requirements. The Device Assembly Facility could act as a backup facility should Pantex be shut down as a result of a natural disaster or a safety violation. The commentor states that the PEIS process has analyzed two options: (1) to keep A/D operations at Pantex and (2) to transfer those operations to NTS. The commentor believes that the option to combine operations in a way that more completely protects the national options of the President has been completely disregarded.

Response: *The design of the Device Assembly Facility is identical to the facilities at Pantex and was recently built to support the underground testing program at NTS. It does not, however, have the space and capacity to serve as a complete backup to Pantex without significant construction that would take many years to accomplish. In addition, many of the existing bays and cells at Pantex would not be utilized by A/D operations but could be rapidly put to that use if some of the other facilities become inoperable.*

At one time there was another site performing A/D work, but the need for a redundant operation was not considered necessary; therefore, that site was closed. Given that the need for a backup facility was considered unnecessary during the Cold War, it is not reasonable to plan to have this capability at NTS at this time.

30.08 Referencing page 7–17 of the *Analysis of Stockpile Management Alternatives* report, the commentor believes a stockpile of 1,000 weapons was analyzed in order to increase the chance that production work would be moved to the laboratories. The 1,000 level favors lower production capability at the laboratories and makes Pantex look extremely large in cost, according to the commentor.

Response: *DOE established the baseline workload based on the best estimate of the future size and composition of the stockpile. In addition to the base case, two other workload levels were established as a means of providing a sensitivity analysis among the various alternatives. As such, the 1,000 weapon stockpile was considered to be a reasonable lower stockpile level and was used by all sites for all missions. It was not devised as a means to make one site appear more favorable than another.*

31 MANAGEMENT—NONNUCLEAR COMPONENTS

31.01 Several commentors express support for KCP and the Secretary of Energy's decision to downsize the nonnuclear fabrication mission at KCP rather than transfer this mission to an alternative site; however, they are concerned about the loss of expertise and skill base. One commentor wants to know what level of flexibility is built into decisions should things change in the future, and one suggests an expansion of KCP's role in providing nonnuclear fabrication support.

Response: *As the commentors noted, the preferred alternative for the nonnuclear fabrication mission is to downsize KCP. The preferred alternatives were developed by DOE, using data and studies on such factors as cost, technical feasibility, technical risk and schedule, ES&H, and national security. The PEIS does not analyze how well the preferred alternative meets operational needs. This analysis can be found in the* Stockpile Management Preferred Alternatives Report *and the* Analysis of Stockpile Management Alternatives *report, which show that the KCP alternative is lower in cost and has less technical risk than relocation to the laboratories. Technical risk is greater for the laboratory alternatives because KCP currently has an existing production infrastructure to support scheduled work, whereas the laboratories currently do not possess the required production capacity, and their production capability and infrastructure are less mature* *than that of KCP. The design of the downsized production alternative at KCP provides the technical capability, production capacity, and flexibility necessary to allow KCP to support scheduled nonnuclear production and a wide range of unanticipated production requirements. The two stockpile management alternatives reports are available for public review at the DOE Public Reading Rooms near each site.*

32 MANAGEMENT—PITS

32.01 Several commentors are concerned that reestablishing pit production would lead to either increased weapons production, larger scale pit production capacity, or new designs of weapons. The commentors want clarification of proposed pit production capacities at LANL, historical pit production capacities at Rocky Flats, and the relationship between replacement pit production and the possibility of pit processing leading to new or improved weapons design. One commentor opposes continued production of plutonium pits and is of the opinion that the nuclear industry is the greatest threat to life on this planet.

Response: *The mission of the pit fabrication facility would be to reestablish the national security capability required to provide replacement pits for any stockpile weapon. Safety improvements to existing weapons pit designs could be incorporated if necessary and if directed by the President. Although there are presently no plans to develop any new weapons, the facility would be capable of fabricating new pit designs, should the President so direct in the national interest. DOE does not propose to establish higher manufacturing capacities than are inherent with the basic manufacturing capability. As discussed in section 3.1.1.1, stockpile management facilities analyzed in the PEIS are sized to support a base case stockpile size consistent with the Strategic Arms Reduction Treaty (START) II protocol and are therefore consistent with U.S. arms control policy. The capacity of the LANL pit fabrication facility is discussed in appendix section A.3.3.1, and is shown as a maximum of 80 pits per year, assuming surge (multiple-shift) operation, and use of equipment at full capacity. The capacity of Rocky Flats for pit production was about 2,000 per year. Actual production numbers are classified. With regards to larger-scale pit production, in sizing pit fabrication for the foreseeable future, consideration was given to establishing a larger fabrication capacity in line with the capacity planned for other portions of the Complex. However, after review of historical pit surveillance data, larger capacity was rejected because of the expected small demand for the fabrication of new replacement pits for the foreseeable future covered in this PEIS. Section 3.6 of this PEIS explains this in greater detail.*

32.02 A few commentors question specific historical and proposed pit processing technologies. Specifically, commentors ask if the fissile materials will be melted and purified before being remanufactured and wonder if DOE would replace the pits with a different alloy or use the same alloy if a pit metal problem developed. If a different alloy is used, the commentors question whether DOE currently has the technology to change the plutonium alloy mix if a problem develops. One commentor states that the complex metallurgical structure of plutonium limits the processing possibilities and as an example gave the perceived failure of the near-net shape casting process employed at Rocky Flats. In the commentor's opinion, better computer modeling will not change the problem.

Response: *The mission of the pit fabrication facility would be to provide replacement pits for any stockpile weapon. Thus, the pit design and alloys would remain the same. New alloys or designs would relate to new weapon designs which are presently not planned, but may be implemented, should the President direct it in the interest of national security. The facility would have the capability to develop and fabricate new pit designs in that case. This capability would include testing and analysis to address the complexities inherent in plutonium processing.*

32.03 The commentors oppose or express concern about reestablishing pit production at LANL and the oversight of ES&H issues by site management and personnel. Some commentors feel that a sound ES&H culture does not exist at LANL and that LANL has failed to implement "Conduct of Operations" successfully. These commentors also suggest that DOE institute a separate "chain of authority" for ES&H personnel to eliminate a conflict of interest that can currently occur when such personnel report to line management. Other commentors express concern about LANL's security and relationship with DOE, personnel management, plutonium handling, and waste management.

Response: *As stated in section 3.1.1, Planning Assumptions and Basis for Analysis, DOE will emphasize compliance with applicable laws and regulations and accepted practices regarding industrial and weapons safety, safeguarding the health of workers and the general public, and protecting the environment. Section 4.14 describes the regulations and requirements under which all DOE sites conduct their operations during the normal course of their work activities, including potential accidents and associated human health and environmental consequences of an accident. Although the commentor correctly points out that operations at LANL have occasionally been found to be out of compliance with various environmental laws, DOE and LANL management have made good faith efforts to bring laboratory facilities into compliance in a timely fashion. DOE expects its management and operating contractors operate its facilities in compliance with all Federal, state, and local laws. As explained in section 3.1.1.1, No Action Alternative Assumptions, conservative estimates were purposely used in the PEIS to provide a bounding analysis for the environmental impacts. New or better processes as described in section 3.5, Emerging Technologies, can reduce waste streams and lower the environmental impacts. Analyses discussed in the* Analysis of Stockpile Management Alternatives *report show that the LANL alternative is lower in cost and has less technical risk than the SRS alternative. Technical risk is lower for LANL because of recent experience in providing pits for nuclear explosive testing. The* Analysis of Stockpile Management Alternatives *report is available for public review at the DOE Public Reading Rooms near each site.*

32.04 The commentor asks how often a flaw in a pit applies to an entire weapon type.

Response: *Whether or not a flaw in a pit applies to an entire weapon type depends on whether the flaw is a result of a design shortcoming or the manufacturing process. In the case of either a design or manufacturing shortcoming resulting in a flaw, the entire weapons type may well be affected, but these shortcomings could make only some units, subject to a particular history, susceptible. Similarly aging defects can affect a few weapons or many, depending on whether they uniformly affect the system or whether individual history of some of the units, is a factor in how the system ages or responds to an aging-related defect. A more detailed unclassified discussion of weapon defect history can be found in the tri-laboratory report* Stockpile Surveillance: Past and Future *(SAND95-2751, January 1996).*

32.05 The commentor asks what the economic impacts associated with pit production would be at LANL. The commentor also inquires about the budget for the pit fabrication facility.

Response: *The economic effects of pit production at LANL on regional economy and employment, population and housing, and public finance are discussed in section 4.6.3.8. The budget for the pit fabrication facility is not part of the PEIS. However, estimates of the operating costs for stockpile management alternatives at the various stockpile levels can be found in the* Analysis of Stockpile Management Alternatives *report, prepared by the DOE Albuquerque Operations Office. This report is available in the DOE Public Reading Rooms near each site.*

32.06 Several commentors express support for SRS and its continued operation in support of existing and new DOE missions. One commentor asks if pit fabrication at SRS would be shut down. Another asks if Pantex or other sites would conduct pit fabrication. Several commentors express specific support for SRS to conduct pit fabrication activities.

Response: *SRS currently has no pit fabrication capability. SRS does maintain a major role in tritium recycling and is the preferred alternative site for tritium supply if accelerator production of tritium is ultimately chosen, as discussed in the Tritium Supply and Recycling ROD. As discussed in section 3.2.1, Site Selection, only those sites with existing infrastructure or facilities capable of supporting a given stockpile stewardship or stockpile management mission were considered reasonable site alternatives for detailed study in the PEIS. DOE analyzed only two sites as reasonable alternatives for pit fabrication and intrusive modification pit reuse: LANL and SRS. SRS was considered a reasonable alternative for only the pit fabrication mission because of its plutonium processing infrastructure. Although the final decision as to where this specific mission would be located will not occur until the ROD, the preferred alternative site for the mission is LANL.*

The analysis discussed in the Analysis of Stockpile Management Alternatives *report shows that the LANL alternative is lower cost and has less technical risk than the SRS alternative. Technical risk is greater for the SRS alternative because LANL has recent experience in providing pits for nuclear explosive testing, whereas SRS has no experience with the kind of capabilities required for precision nuclear component manufacturing. Additionally, the LANL capability could be in place 2 years earlier than the SRS capability. The* Analysis of Stockpile Management Alternatives *report is available for public review at the DOE Public Reading Rooms near each site. As discussed in section 2.4.2, the Rocky Flats Plant formerly produced pits, and is no longer available for this mission. Therefore, DOE currently has no pit fabrication capability except for the limited R&D capabilities at LANL and LLNL.*

The weapons A/D mission, for which Pantex is the preferred alternative, includes provisions for nonintrusive modification pit reuse. This is not pit fabrication. As discussed in section 3.4.1 and appendix section A.3.4 of the PEIS, nonintrusive modification pit reuse does not involve plutonium processing or disassembly of the pit. The modifications would be to external features of the pit and would not result in handling exposed plutonium. After modification and inspection, the pit would be mated to main charge HE, which is a function of the A/D mission. Since the nonintrusive modification function is essentially a step between receipt of the pit and assembly with HE, DOE considers it reasonable and prudent to perform this function at the A/D facility.

32.07 The commentor notes that the stated objective in the PEIS is to preserve "core competency," but the Program fails to address this issue with regard to pit manufacturing. The commentor feels that a pseudo-manufacturing capability in an R&D laboratory is not the same. Another commentor believes that the No Action alternative description for pit fabrication was inadequate.

Response: *Currently, there is an R&D plutonium capability at LANL. The No Action alternative discussed in section 3.4.3.1 of the PEIS would maintain only a limited plutonium component fabrication capability at LANL and a less extensive capability at LLNL, and therefore would not provide sufficient pit fabrication capability to meet the requirements stated in section 3.1. Reestablishing pit fabrication at LANL would allow for the entire pit-related workload to be accomplished at the laboratory, which would preserve core competency better than having less work at each of two sites, the laboratory and the fabrication site. Analysis discussed in the* Analysis of Stockpile Management Alternatives *report shows that the LANL alternative is lower in cost and has less technical risk than the SRS alternative. Technical risk is lower for LANL because of recent experience in providing pits for nuclear explosive testing. The* Analysis of Stockpile Management Alternatives *report is available for public review at the DOE Public Reading Rooms near each site.*

32.08 The commentor questions where pit components and beryllium components will be manufactured. The commentor believes that Y-12 has the experience and capability for recycling chips.

Response: *The manufacturing of pit components is an integral part of the pit fabrication mission and would be included with that mission which, in the preferred alternative, is LANL. The mission of fabrication of beryllium components that was formerly assigned to the Rocky Flats Plant was reassigned to LANL as a result of the Nonnuclear Consolidation Program in 1993. The Y-12 Plant would continue its historical role of manufacturing HEU parts for pits.*

32.09 The commentor believes that SRS should close down and operations be transferred to another DOE site, preferably ORR or Pantex. Other commentors wonder what impact their comments on closing SRS have on the decisionmaking process, and what the best way is to do this.

Response: *Closing of SRS was not an alternative under consideration in the PEIS. The only alternative relating to SRS was for reestablishing pit fabrication and LANL was identified as the preferred alternative site for that mission. Over the past several years, some DP missions at SRS have been terminated and the majority of facilities turned over to Environmental Management. The remaining DP activities are associated with tritium, and are primarily located in H-Area, a small portion of the entire site.*

32.10 The commentor notes that the environmental impacts per pit produced would be reduced by using advancements such as new welding techniques, dry machining, and the reduction of oils and organic solvent usage. The commentor also points out that the actual environmental impacts may be less than the impacts outlined in the document since conservative estimates were used in the analysis of the impacts.

Response: *New or better processes can reduce waste streams and lower the environmental impacts. Section 3.5 describes the emerging technologies for the stockpile management processes. The baseline flow sheet for plutonium fabrication did assume dry machining as suggested by the commentor, consequently a waste stream consisting of cutting oils is not analyzed in this PEIS. As explained in section 3.1.1.1, No Action Alternative Assumptions, conservative estimates were purposely used in the PEIS to provide a bounding analysis for the environmental impacts.*

32.11 The commentor asks if the need for pit production outweighs the additional risks to the citizens of Los Alamos. The commentor asks what the citizens of Los Alamos will gain from bringing pit production to LANL.

Response: *Section 4.6.3.9, Radiation and Hazardous Chemical Environment, presents the incremental risk to members of the public in the LANL vicinity. Table 4.6.9.3–1 shows the annual exposure to the maximally exposed member of the public would be 8.7 mrem, which is 2.6 percent of the natural background radiation exposure of 340 mrem to the average individual. The total dose to the public within 80 km (50 mi) of LANL would be 1.4 person-rem, which is approximately 0.15 percent of the natural background total dose. Hazardous chemical exposures are also presented in section 4.6.3.9. For the pit fabrication alternative, the incremental hazard index (HI) for the maximally exposed member of the public would be $2.18x10^{-4}$ which is approximately 0.16 percent of the No Action HI of 0.0135. This increase in HI corresponds to essentially a 0-percent increase in cancer risk. Benefits to the community are largely socioeconomic in nature. Section 4.6.3.8, Socioeconomics, provides information concerning jobs to be generated by the pit fabrication alternative. Facility modification activities would generate approximately 140 direct and 90 indirect jobs during the peak year of construction. Operation of the facility would generate about 260 direct jobs.*

32.12 The commentor wants to know the pit production capacity at TA-55 in LANL. The commentor also wants to know how easily the pit production capacity at TA-55 could be expanded. Another commentor states that there should not be any further capital investment above maintenance or steady state costs.

Response: *The TA-55 facility currently has the ability to make a few pits per year as part of the stockpile surveillance and rebuild program, but it is not a production facility or program. The expansion of TA-55 is discussed in section 3.4.3.2. Stockpile management facilities analyzed in the PEIS are sized to support a base case stockpile size consistent with the START II protocol, and are therefore consistent with U.S. nonproliferation policy. The capacity of the proposed LANL pit fabrication facility is discussed in appendix section A.3.3.1, of the PEIS, and is shown as a maximum of 80 pits per year, assuming surge (multiple-shift) operation, and use of equipment at full capacity. For information on cost and schedule for modification of the TA-55 plutonium facility, the commentor is referred to the* Analysis of Stockpile Management Alternatives *report which is available at the DOE Public Reading Rooms near each site.*

32.13 The commentor asks how long pits can remain in the stockpile before buildup of decay products become a design or handling concern.

Response: *Modern nuclear weapons were designed with a minimum design life of 20 to 25 years. Based on existing surveillance data, DOE expects the pits to last at least this long, and probably considerably longer. However, very little historical and applicable data exists beyond 30 years. With regard to the buildup of decay products alone, DOE does not currently believe this will become a problem in less than 50 years. Other combined effects (radioactive and chemical) are not as well understood. Science-based stockpile stewardship, and enhanced surveillance technology in particular, will focus on improved predictive capability in this area.*

32.14 The commentor points out a disparity in the amount of chemicals being used for fabricating pits at LANL and SRS. According to the commentor, SRS proposes to use 3,420 kg (7,536 lb) and LANL 32,886 kg (72,461 lb) which is a difference of a factor of about 10.

Response: *The processes at both SRS and LANL are the same. These numbers show only annual make-up after recycling of nitric acid (annual usage after the first year of surge production). The LANL number shows the first year requirement for surge production (e.g., 32,886 kg [72,461 lb] the first year with 3,420 kg (7,536 lb) of make-up each following year). Usage in subsequent years would be comparable to the SRS figure. Appendix tables A.3.3.1–4 and A.3.3.2–4 have been changed to reflect this fact in the Final PEIS.*

32.15 The commentor wants to know if there will be waste management associated with the pit fabrication mission at LANL.

Response: *Waste generated from the pit fabrication mission would be managed within the existing and planned waste management infrastructure at LANL. No new waste management facilities would be needed to support the pit fabrication mission.*

32.16 The commentor asks, if laboratory facilities are so capable, why are we investing in new facilities at LANL and why postulate that it will be another 5 years before LANL can make a production pit.

Response: *The laboratories are indeed capable, but are presently established as R&D facilities, not as production facilities. The assumed 5-year timeframe includes necessary equipment and facility modifications and establishment of appropriate quality and process control measures to* *ensure quality requirements would be met. The TA-55 plutonium facility is approaching 20 years of service, and many components of the facility need replacement or upgrading in order to sustain the R&D mission of the laboratory. This refurbishment constitutes the major portion of the DOE investment at the TA-55 plutonium facility. Reconfiguration of the internal arrangements of one of the wings of the building to provide for pit fabrication is a relatively minor part of the total task.*

32.17 The commentor wants to know, for the pit production mission at LANL, if DOE will focus its attention on the greater hazards of processing and handling of plutonium and the eventual disposal of the waste or on simply the shipment of the finished product.

Response: *As stated in section 3.1.1, Planning Assumptions and Basis for Analysis, DOE will emphasize compliance with applicable laws and regulations and accepted practices regarding industrial and weapons safety, safeguarding the health of workers and the general public, and protecting the environment. Section 4.14 describes the regulations and requirements under which all of the DOE sites conduct their operations during the normal course of their work activities. This also includes potential accidents and associated human health and environmental consequences of an accident.*

32.18 One commentor questions whether waste volumes include nonintrusive pit reuse operations, and whether the pit fabrication and nonintrusive pit reuse can be carried out simultaneously.

Response: *Waste volumes are analyzed for three-shift pit fabrication operations. This analysis is designed to bound the environmental impacts for any reasonably foreseeable workload. As discussed in section 3.4.1 and appendix section A.3.4 of the PEIS, nonintrusive modification pit reuse does not involve plutonium processing or disassembly of the pit. The modifications would be to external features of the pit and would not result in handling exposed plutonium. Estimated waste volumes from nonintrusive modification pit reuse are included in the weapons A/D estimates.*

33 MANAGEMENT—SECONDARIES AND CASES

33.01 Several commentors express support for continued operation of Y-12 and for retaining the secondary and case fabrication mission there. Reasons cited include past frequent upgrades of the facilities and processes at Y-12, historical expertise, and the exceptional troubleshooting and problem-solving experience of Y-12 personnel. Commentors suggest laboratory personnel are not experienced in manufacturing processes and cannot replace the experience of Y-12 personnel, and were concerned that the PEIS implied the Y-12 processes were out-of-date.

Response: *As noted by the commentors, the preferred alternative for the secondary and case fabrication mission is to downsize at Y-12. In addition to the No Action alternative at Y-12, DOE considered three alternative sites for the future secondary and case fabrication mission: Y-12, LANL, and LLNL. DOE considered the weapons laboratories at LANL and LLNL for secondary and case manufacturing as reasonable alternative sites to be evaluated as part of the NEPA process because of their design and existing limited R&D manufacturing capabilities. In appendix section A.3.2.1, the PEIS does state that Y-12 has performed the secondary fabrication mission in the Complex for over 40 years. This was not intended to imply that the production facilities are old and use old processes. In this section, the PEIS recognizes that during the past 12 years major restoration projects have brought the infrastructure support of this facility (Y-12) up to current standards and should allow the use of these facilities for up to an additional 40 years.*

Analyses discussed in the Analysis of Stockpile Management Alternatives *report show that the Y-12 alternative is lower in cost and has less technical risk than either of the laboratory alternatives. DOE considers the existing infrastructure and personnel resources at Y-12 as important and valuable Complex assets in implementing Program requirements. The existing facilities and worker skills at Y-12 were taken into account in the ranking system used by DOE in the* Analysis of Stockpile Management Alternatives *report. In this analysis, Y-12 received a much higher score in "Basic Production Capability" and in "Capability of Production Infrastructure" than either LANL or LLNL. These scores were important in the selection of Y-12 as the preferred alternative site for performing future secondary and case component production. Technical risk is lower for the Y-12 alternative because it is the current secondary and case fabrication facility for DOE and has produced components for all weapons in the current stockpile. Although some process development would be required to fully satisfy this mission at Y-12, the risk is low. Both the LANL and LLNL alternatives would involve modifications to Y-12 processes or a new process, which would require additional process development, qualification, and prove-in, and thus the technical risks are higher. The* Analysis of Stockpile Management Alternatives *report is available for public review at the DOE Public Reading Rooms near each site.*

33.02 The commentor would like the PEIS to provide specific examples of the HEU recycling purification or processing technology as well as lithium processing technology that exists to a comparable extent with either of the design agencies as well as Y-12.

Response: *As stated in the PEIS Summary, Y-12 produces the secondary and case components and uniquely possesses the complex technological capability for processing HEU and lithium materials. The design agencies, LANL and LLNL, do not have in place the HEU and lithium processing facilities or infrastructure to any extent comparable to Y-12. These design laboratories have a uranium technology base and facility infrastructure which are only capable of supporting a very limited R&D fabrication capability.*

33.03 One commentor states that the A/D activities at ORR/Y-12 should be moved to SRS because there is more acreage to provide an environmental impact buffer zone.

Response: *In referring to "the A/D activities at ORR/Y-12," DOE assumes that the commentor means the secondary and case fabrication mission. SRS was not considered a reasonable alternative for this mission for several reasons. Although SRS has processed uranium fuel, it does not have the necessary equipment and facilities for large scale machining and processing of HEU and other special materials needed for secondaries and cases. Y-12 and both of the laboratories have existing facilities which could, with some modifications, fulfill the secondary and case fabrication mission. The* Analysis of Stockpile Management Alternatives *report discusses the secondary and case fabrication alternative in more detail and is available for public review at the DOE Public Reading Rooms near each site.*

33.04 The commentor wonders what will happen to the buildings and infrastructure if downsizing of Y-12 occurs.

Response: *Downsizing of Y-12 would result in the plant being multi-program sponsored. Seventy-six percent of the building floor area and associated infrastructure would be transferred to Environmental Management; 14 percent would belong to DP departments engaged in conducting the stockpile management mission; and the remaining 10 percent would belong to other programs such as Materials Disposition, Nuclear Energy, and Work for Others. After transfer to Environmental Management, a transition plan is developed, detailing the cleanup plans, disposition of equipment, and ultimate disposition. There is an established process for including the adjacent* *communities in this process and DOE's Office of Economic Assistance has grants and other support services to assist in the retraining and out-placement of all adversely affected employees.*

33.05 The commentor is of the opinion that the proposals of LANL and LLNL in the Summary suggest some lack of appreciation for what is involved. According to the commentor, LANL and LLNL claim to do the downsize secondary and cases fabrication mission with 321 and 290 workers, respectively. The commentor points out that Y-12 will require 1,080 workers for the mission which is 3 to 4 times, as many workers as the laboratories proposals. The commentor wants to know if DOE believes the laboratories proposals and is concerned that at some time in the future DOE or some oversight group may be misled (by the apparently large savings) into assuming the laboratories can do the job as well as Y-12, and subsequently transfer the mission. The commentor believes this would be a major loss to the Nation in abandoned stretch capacity, overall cost, safety, and quality.

Response: *For the secondary and case fabrication mission, the data supplied by Y-12, LANL, and LLNL differ in many factors such as surge capacity, facility designs, processes, work plans, floor plans, and the utilization of in-house production versus vendor supplied materials. These factors account for the large differences in the workers requirements at Y-12 versus those presented for the weapons laboratories. These considerations were reflected in the evaluation performed by DOE and documented in the* Analysis of Stockpile Management Alternatives *report. Data for the PEIS were developed by working groups for each stockpile management mission. These working groups consisted of experts from each of the potentially affected sites. A review of data for consistency and accuracy was performed at both the working team level and at a senior management level. To bound the potential environmental impacts at each site, the PEIS uses data reflecting "surge," or maximum production scenario. Because it is expected that this workload would be performed in existing facilities, not surprisingly the maximum potential environmental impacts varied somewhat between the sites for this bounding surge case. In addition, however, each alternative was assessed for the same single low and high single shift workloads.*

33.06 The commentor refers to section 4.6.3 and questions whether anyone really believes that only minimal modification to existing facilities at LANL would be required for the secondary and case fabrication mission. The commentor states that no facilities exist for large lithium hydride fabrication and processing, that only minimal uranium and assembly facilities exist, and that facilities must be adequate to deal with potential surge requirements. In addition, the commentor states that this type of equipment costs tens of millions of dollars.

Response: *Section 4.6.3 addresses the environmental impacts by disciplines (land use, water resources, and site infrastructure) of proposed stockpile stewardship and management alternative actions. Section A.3.2.2 describes in some detail the modifications of existing facilities that would be required at LANL to support the relocation of secondary and case fabrication. The statement in section 4.6.3.1, "Only minimal modifications to existing facilities at LANL would be required," is made in the context of land-use impacts due to the relocation of the secondary and case fabrication mission. The minimal land-related modification is associated with providing a nominal area for equipment staging, material laydown, and parking during the modification of LANL facilities. As indicated in section 2.4.2, DOE recognizes that the cost of transferring production technologies to the weapons laboratories and the re-creation of capital facilities are major Program considerations. These were important factors in the selection of Y-12 as the preferred site for performing the future stockpile management secondary and case fabrication mission.*

33.07 The commentor asks, who, by name, are the supposed experts at the laboratories in uranium and lithium hydride, and what are their qualifications.

Response: *There are numerous experts at the laboratories. However, their names have no bearing on the environmental impacts addressed in this PEIS.*

33.08 The commentor states that the analysis with regard to this study discusses the preproduction of a supply of enriched uranium and lithium hydride sufficient to provide for needs for up to 100 years. The commentor questions if past experience does not indicate that this will guarantee the loss of the associated technology.

Response: *Not providing in-house production capability does not guarantee the loss of the needed supplies of these materials or the requisite technologies to support the weapons program needs. Sufficient supply of enriched uranium and lithium hydride would be removed from existing stocks, processed, and stored during the transition period (in fiscal year 1998) to supply DP needs for greater than 100 years at the current PEIS base case workload, therefore there is little justification for providing in-house production capability. Various contingencies are readily available to justify not providing the capability for lithium hydride/deuteride and enriched uranium purification. These contingencies include: feed material preproduction and storage, increased direct recycle of the materials, commercial procurement of service as a backup, disposition of material to other DOE programs, and placing processing equipment in cold standby for reactivation. If unforeseen stockpile problems or demands increase the secondary workload significantly, contingency plans to reactivate equipment in cold standby or to procure additional processing can be developed. The preferred alternative at Y-12 includes a small capability for lithium salt production.*

33.09 The commentor points out the differences in the amounts of chemicals being used for the same mission at different sites. One commentor cites table 4.17–4 and asks how LANL is going to use only 1,568,333 kg/yr (3,455,665 lb/yr) of chemicals when Y-12 plans to use 6,488,333 kg/yr (14,296,393 lb/yr) of chemicals (a 76-percent reduction) or whether the LANL chemical use is only an estimated amount. Another commentor questions specified differences in nitric acid and sulfuric acid consumption at Y-12, LLNL, and LANL.

Response: *Table 4.17–4 provides estimates of the irreversible and irretrievable consumption of annual operating resources for the stockpile management alternatives. The differences in the secondary and case fabrication chemical usage between Y-12 and LANL is a direct result of differences in the proposed processing techniques utilized at Y-12 versus those proposed to be used at LANL. As given in appendix table A.3.2.1–6, the annual chemical requirement for Y-12 is a total of 19,088,334 kg/yr (42,059,235 lb/yr), of which 14,000,000 kg/yr (30,847,600 lb/yr) is argon and 5,000,000 kg/yr (11,017,000 lb/yr) is nitrogen. Of this total quantity, 6,488,333 kg/yr (14,296,393 lb/yr) are estimated to be irretrievably lost. LANL did not propose to duplicate the current processes or work plans in use at Y-12 for the secondary and case fabrication mission, consequently a direct comparison on gaseous chemical consumptive use cannot be made. For example, the Y-12 enriched and depleted uranium processes utilize vacuum induction casting furnaces with leakage rate of approximately 30 microns/minute whereas LANL proposes to utilize furnaces with lower leakage rate (5 microns/minute) eliminating the need to employ an argon purge (Argon Lance). LANL also proposes to utilize commercial and government furnished products to the maximum extent possible and may well incorporate an optimistic view of vendor availability and qualifications. Therefore LANL's quantities are considered estimates based on reasoned judgment. The nitric acid and sulfuric acid figures given in appendix table A.3.2.2–6 for LANL were in error and have been corrected. The values are now the same as for Y-12 (1,000 kg [2,203 lb] of nitric acid and no sulfuric acid). The LLNL values are less than either Y-12 or LANL due to the smaller capacity of the LLNL facility in the surge mode.*

33.10 The commentor requests an explanation of the impacts on downsizing Y-12 should the secondary and case component fabrication/downsize at Y-12 alternative be chosen. Specifically, explanations are requested regarding the impacts on the D&D program at Y-12, the impact to future continued operation of the facilities, operating systems, and programs.

Response: *The environmental impacts resulting from downsizing Y-12 are discussed in detail in section 4.2.3 of this PEIS.*

33.11 Commentor recommends that DOE have the funding mechanisms for proposed downsized Y-12 facilities in place prior to the ROD.

Response: *Funding for the downsizing of Y-12 would follow the normal Government budgetary process with a submission to Congress for this project after the ROD is issued.*

34 **MANAGEMENT—HIGH EXPLOSIVES COMPONENTS**

34.01 A large number of commentors believe that HE functions should remain at Pantex. The commentors note that the Draft PEIS states that Pantex must retain HE capabilities to process the inventories already onsite from dismantling. Therefore, the least expensive option is to maintain HE functions at Pantex, according to the commentors. Commentors also indicate their disagreement with the statement in the Draft PEIS that there are no advantages to siting HE at Pantex as opposed to the national laboratories. The commentors cite the capital outlay for such a transfer as being cost prohibitive and the fact that if the need arises in future for new weapons production, the commentors believe it will be critical to have the HE facilities at the weapons production/assembly site.

Response: *The HE production mission includes HE procurement, formulation, component fabrication, characterization, surveillance, disposal, and storage. As discussed in the* Analysis of Stockpile Management Alternatives *report, DOE's goal for the HE fabrication mission is to assure core competency maintenance while achieving cost efficiencies. At the time the Draft PEIS was issued, the HE production mission which best achieved the overall objectives was not clear, therefore DOE deferred identification of a preferred alternative for the HE production mission while further analysis was performed. Since that time, DOE has completed the analysis and the preferred alternative for the HE production mission is to downsize the production mission at Pantex. The preferred alternative for HE fabrication was developed by DOE using data and studies on such factors as cost, technical feasibility, technical risk and schedule, ES&H, and national security. The analysis of these factors are presented in the* Analysis of Stockpile Management Alternatives *report, and the rationale for the preferred alternative is found in the* Stockpile Management Preferred Alternatives Report. *Both reports are available for public review at the DOE Public Reading Rooms near each site.*

34.02 Some commentors state that the HE mission be moved from Pantex to another site. Specifically, one commentor believes that the HE mission should be brought to LANL because a synergism exists between the research and design mission and the production of HE. Another commentor believes that the A/D and HE operations currently at Pantex and HE operations at Site 300, LLNL, should be consolidated at NTS.

Response: *NTS was not considered a reasonable alternative for the HE fabrication mission for several reasons. First, unlike the A/D mission, NTS does not have existing facilities designed for HE fabrication. As a result, transfer of the HE fabrication mission to NTS would require construction of a completely new facility. Second, both LANL and LLNL have existing facilities capable of meeting the HE fabrication requirements analyzed in the PEIS. However, in determining reason-*

able alternatives for these missions, DOE considered that, should weapons A/D be relocated, that it would be reasonable and prudent to use existing HE fabrication facilities at LANL or LLNL, rather than constructing new facilities, which would be required at NTS. The analysis of these factors are presented in the Analysis of Stockpile Management Alternatives *report, and the rationale for selecting Pantex as the preferred alternative for A/D and HE fabrication can be found in the* Stockpile Management Preferred Alternatives Report. *Both reports are available for public review at the DOE Public Reading Rooms near each site.*

34.03 The commentor states that the HE mission is to be assigned only to facilities with existing infrastructure. The commentor notes that according to the *Draft Analysis of Stockpile Management Alternatives* report, LANL is currently establishing a production infrastructure for the manufacture of detonators. As late as December 1995, however, no detonators have been produced. Also, the commentor notes that according to the Activity Implementation Plan, LLNL will restructure Site 300 to meet manufacturing requirements.

Response: *Four alternatives for the HE production mission were evaluated according to three ranking criteria. One criteria is capability of production support infrastructure. The* Analysis of Stockpile Management Alternatives *report provides a summary of all ranking criteria scores and explains the basis for these scores. DOE sought future Complex configurations that simultaneously maintained technical competence, minimized technical risk, and minimized costs. All technologies required for the HE mission have been previously demonstrated at LANL and LLNL. Both have in the recent past produced HE components in numbers greater than and at specifications comparable to those required for future production. The LANL and LLNL formulation, synthesis, and fabrication processes would require production qualification. Establishing the production and control processes necessary for production qualification represents a risk at an R&D laboratory; however, DOE has successfully qualified laboratory processes for production applications in the past.*

34.04 The commentor states that in the PEIS, four HE alternatives are proposed and discussed, but in the Draft *Stockpile Management Preferred Alternatives Report*, only two options are recognized—downsizing of Pantex and the two-laboratory concept.

Response: *As shown in the* Stockpile Management Preferred Alternatives Report, *four HE production alternatives have been analyzed and ranked: downsize at Pantex, relocate to LANL, relocate to LLNL, and the two-laboratory alternative. DOE is also required by NEPA and CEQ to describe and evaluate the environmental impacts of a No Action alternative. The PEIS does not attempt to quantify or analyze the impacts of the two-laboratory alternative because the environmental impacts at either LLNL or LANL from the two-laboratory HE production alternative would not be greater than the environmental impacts which are analyzed in the PEIS for the entire HE production mission at LANL or at LLNL singularly.*

34.05 The commentor believes that the transfer of operations from Rocky Flats to the laboratories was unsuccessful and that the lessons learned from that transfer should carry weight in the decision to site HE operations.

Response: *DOE assigned several missions previously conducted at Rocky Flats to LANL—pit surveillance, pit support, beryllium technology, and joint test assembly support. The transfer of the pit surveillance mission from Rocky Flats has been successfully completed and is currently being conducted at LANL. Transfer of remaining processes are in progress. Lessons learned from the transfer of the processes from donor to the receiver sites in the Nonnuclear Consolidation Program, including those from Rocky Flats to LANL are being recorded. This information would be used to improve the future transfers of operations under the stockpile management program. The technical* *risk of transferring the HE mission to the laboratories was analyzed in the* Analysis of Stockpile Management Alternatives *report. This report determined the risk of transferring HE operations to be minimal.*

34.06 The commentor questions what the operating cost for the HE fabrication mission is in the Laboratory Implementation Plan.

Response: *It is not a straightforward exercise to estimate the annual costs to operate the HE plant. DOE chose to assume that the costs of operating the HE plant at each site would be estimated as increments to the assumed site missions. Pantex was assumed to have the weapons A/D mission, and the HE costs were estimated as incremental to that mission. Likewise, LANL and LLNL were assumed to continue their R&D mission, and the HE costs were estimated as incremental to that mission. The LLNL projected incremental increase in cost for manufacturing HE components is $560,000 per year; LANL incremental cost increase was estimated at $2.3 million; and Pantex incremental cost increase was estimated at $2.25 million. Details for these cost estimates can be found in the* Analysis of Stockpile Management Alternatives *report which is available for public review at the DOE Public Reading Rooms near each site.*

34.07 The commentor wants to know if the HE manufacturing facilities at the weapons laboratories are as new and technologically advanced as the facilities at Pantex.

Response: *The HE facilities at LANL were designed and built for production scale operations, and were in fact, operated as production facilities supplying nuclear weapons HE components for many years. LANL has continually upgraded and modernized processing equipment in these existing facilities to provide prototype HE components to meet hydrodynamic and NTS program requirements. The equipment and processes used at LANL are very similar and in some cases identical to those used at Pantex for production. The HE facilities at Pantex were built during the 1980s, and are newer than LANL or LLNL facilities. The equipment in all three facilities was procured at about the same time (sometimes on the same purchase order).*

Similarly, the production scenarios envisioned for LLNL are well within their current capabilities using equipment and processes that are similar if not identical to Pantex. The LLNL High Explosives Application Facility is DOE's most recently activated major HE facility and meets or exceeds all modern ES&H requirements for explosive research, development, and production support.

34.08 In regard to HE fabrication, the commentor asks if the primary work is in the development program as opposed to fabrication.

Response: *For HE fabrication there is a minimum level of effort in both the development program and in the production mission that must be achieved to maintain competence. DOE has sought to address the level of expected future production requirements, and whether this level of work is sufficient to maintain competence. There is also synergy between HE fabrication work required for the development program and for the production mission. The level of effort for either is not steady and can be cyclical. DOE has taken these factors into account in determining its preferred alternative for the HE production mission.*

34.09 The commentor states that according to the ranking criteria process, the two-laboratory concept ranks significantly lower than Pantex, which itself received a rating of 100 in all categories. The commentor notes that as the Ranking Criteria Process was applied to each category throughout the Stockpile Stewardship and Management PEIS, the facility which ranked highest received the mission, but HE fabrication is the only category which seems to run contrary to that rule.

Response: *DOE sought future Complex configurations that simultaneously maintained technical competence, minimized technical risk, and minimized costs. In the case of HE fabrication, downsizing operations at Pantex or relocation to one of the weapon laboratories would be the low cost alternative. However, concerns about potential loss of competency in HE at one or both of the laboratories may make the low-cost alternative a higher technical risk alternative. While the ranking criteria process shows the two-laboratory concept lower than Pantex, the decision as to a preferred alternative is not automatic. At the time the Draft PEIS was issued, the HE production mission which best achieved the overall objectives was not clear, therefore DOE deferred identification of a preferred alternative for the HE production mission while further analysis was performed. Since that time, DOE has completed the analysis and the preferred alternative for the HE production mission is to downsize the production mission at Pantex. The preferred alternative for HE fabrication was developed by DOE using data and studies on such factors as cost, technical feasibility, technical risk and schedule, ES&H, and national security. The analysis of these factors is presented in the* Analysis of Stockpile Management Alternatives *report, and the rationale for selecting the preferred alternative is found in the* Stockpile Management Preferred Alternatives Report. *Both reports are available for public review at the DOE Public Reading Rooms near each site.*

34.10 The commentors question why 432 people are required at the weapons laboratories to manufacture explosive components when Pantex has identified about 50 people to perform the operation, and how DOE justifies this additional cost.

Response: *The numbers 432 and 50 cannot be compared. The employment at the laboratories, 200 at LANL (table 3.4.5.3–2) and 232 at LLNL (table 3.4.5.4–2) include both HE workers and various direct support workers, while the employment at Pantex, revised to 37 in the Final PEIS (table 3.4.5.2–2) includes only HE workers, since the A/D support workers would be sufficient to also cover HE fabrication. Each site's employment impacts assume that site takes on the entire HE production mission; therefore, these numbers should not be added. To bound the potential environmental impacts at each site, the PEIS estimates the number of workers that could be used in a "surge," or maximum production scenario. Because it is expected that this workload would be performed in existing facilities (in the case of Pantex they were downsized current facilities), not surprisingly the maximum potential environmental and employment impacts varied somewhat between the sites for this bounding surge case. In addition, however, each alternative was assessed for the same low and high single-shift workloads.*

34.11 The commentors request the locations of proposed HE fabrication and testing facilities at LANL. One commentor refers to Summary section 5.3.7, Relocate to Los Alamos, and states that the statements that LANL R&D facilities currently possess sufficient (operational) capacity with little or no building construction/modification was not based totally on fact, as evidenced by the failure to adequately address concerns expressed in the April 22 and 23, 1996, Amarillo public meeting. In addition, the commentor states that further review of the *Stockpile Management Preferred Alternatives Report* and the *Analysis of Stockpile Management Alternatives* report verified that the DOE requirements for certification of those buildings to current standards was apparently ignored.

Response: *LANL HE fabrication process capability is already established. HE fabrication and storage functions would be supported in existing facilities at LANL TAs -9, -16, and -37. Since LANL HE facilities already exist and have sufficient capacity for stockpile management requirements, no new building construction and no significant modifications would be required. DOE requirements for certification of these buildings to current standards is an ongoing process and would continue as required. To assure that the laboratories would successfully implement HE production on the magnitude necessary to meet national security needs, the LANL formulation, synthesis, and fabrication processes would require production qualification.*

34.12 The commentor refers to the LANL table 3.4.5.3–1 and states that this table contains insufficient information for analysis. The commentor states that the baseline numerical information contained in table 3.4.5.2–1 cannot be compared reasonably with "minimal" resource requirements. The commentor states that based upon simple comparison between tables 3.4.5.2–2 and 3.4.5.3–2, the missing "baseline" data should have been readily available for insertion in the table.

Response: *The tables in question display consumption requirements for the construction period and for 1 year of operations. Because the LANL HE fabrication process capability is already established, quantifying the minimal consumption requirements for construction/modification at LANL would not be useful to DOE in decisionmaking. HE fabrication and storage functions would be supported in existing facilities at LANL TAs -9, -16, and -37. Since LANL HE facilities already exist and have sufficient capacity for stockpile management requirements, no new building construction and no significant modifications would be required.*

34.13 Several commentors ask when the preferred alternative for HE fabrication will be identified. One commentor states that the *Stockpile Management Preferred Alternatives Report* gives the impression that the decision has been made to transfer HE work to the laboratories. The commentor asks if this is true. If not, the commentor would like to know on what basis the decision on the preferred alternative for HE fabrication will be made.

Response: *Pantex, LANL, and LLNL were candidate sites for the HE fabrication mission. As discussed in the* Analysis of Stockpile Management Alternatives *report, DOE's goal for the HE fabrication mission is to assure core competency maintenance while achieving cost efficiencies. At the time the Draft PEIS was issued, the HE production mission which best achieved the overall objectives was not clear, therefore DOE deferred selection of a preferred alternative for the HE production mission while further analysis was performed. Since that time, DOE has completed the analysis and has determined that the preferred alternative for the HE production mission is to downsize the production mission at Pantex. The preferred alternative for HE fabrication was developed by DOE using data and studies on such factors as cost, technical feasibility, technical risk and schedule, ES&H, and national security. The analysis of these factors are presented in the* Analysis of Stockpile Management Alternatives *report, and the rationale for selecting the preferred alternative is found in the* Stockpile Management Preferred Alternatives Report. *Both reports are available for public review at the DOE Public Reading Rooms near each site.*

34.14 The commentor expresses concern about HE fabrication continuing at Pantex because of existing contamination problems from HE work. The commentor states that the first priority at Pantex should be the protection of the environment and public safety.

Response: *Pantex will continue operations in compliance with all applicable Federal, state, and local ES&H requirements, as well as all DOE-mandated standards that insure the protection of the environment and public safety.*

34.15 The commentor believes it is unfair to provide the laboratories the economic benefit of taking over the Pantex HE manufacturing mission while Pantex and the citizens of Amarillo will retain the environmentally problematic mission of disposing of the replaced HE components and suffering economically by losing the environmentally cleaner manufacturing mission.

Response: *DOE's preferred alternative for the HE production mission is to downsize the production mission at Pantex. The preferred alternative for HE fabrication was developed by DOE using data and studies on such factors as cost, technical feasibility, technical risk and schedule, ES&H, and* *national security. The analysis of these factors are presented in the* Analysis of Stockpile Management Alternatives *report, and the rationale for selecting the preferred alternative is found in the* Stockpile Management Preferred Alternatives Report. *Both reports are available for public review at the DOE Public Reading Rooms near each site.*

34.16 The commentor points out that there is a disparity in the air emissions data being presented for sites conducting the same missions. According to the commentor, for the HE fabrication mission, Pantex, LLNL, and LANL propose to emit 413, 1,315, and 4,530 kg/yr (910, 2,897, and 9,981 lb/yr) of carbon monoxide; 122, 45, and 4,540 kg/yr (269, 99, and 10,003 lb/yr) for organics; 1,560, 349, and 22,700 kg/yr (3,437, 769, and 50,017 lb/yr) of nitrous oxides; and 0.02, 4.5, and 454 kg/yr (0.044, 9.9, and 1,000 lb/yr) of ammonia, respectively. In addition, the amount of HE powder required is different at each site. The commentor does not understand the reason for the disparity in both inputs and emissions for the same mission at different sites and wants to know where the numbers are coming from.

Response: *To bound the potential environmental impacts at each site, the PEIS estimates the workload that could be performed in a "surge," or maximum production scenario. Because it is expected that this workload would be performed in existing facilities (in the case of Pantex they were downsized current facilities), not surprisingly the maximum potential environmental impacts varied somewhat between the sites for this bounding surge case. The differences in the amounts and types of explosives shown in appendix tables G.3-2 and G.3-3 are due to the overall differences in work done by the three sites. This work includes at the laboratories both stockpile stewardship and potentially stockpile management workload in addition to reimbursable work for other customers. For Pantex, it includes potential stockpile management work plus an estimate of work for other Federal agencies. In addition, however, each alternative was assessed for the same low and high single-shift workloads.*

The differences in air emission numbers relate to inherent differences in the existing facilities and air emission control equipment at the three sites. Each alternative would utilize essentially the same production processes, and few of the criteria pollutant air emissions stem directly from these production processes.

DOE recognized the apparent differences in these numbers between the alternatives during the development of the PEIS source data. Reviews were conducted to assure consistency and comparability by a team of technical experts with representation from each site. The numbers reflected in the PEIS reflect the consensus opinion of this intersite team.

34.17 The commentor believes that the HE fabrication mission at Pantex is the root of the excellent safety record at Pantex, and that separating the two missions at Pantex would destroy the synergistic safety benefits. The commentor expresses concern about accidental explosions that might result from A/D activities at Pantex without benefits of the safety expertise generated by the HE fabrication mission.

Response: *DOE has established procedures to ensure the safety of its workers at all sites. The preferred alternative for HE fabrication was developed by DOE using data and studies on such factors as cost, technical feasibility, technical risk and schedule, ES&H, and national security. The analysis of these factors is presented in the* Analysis of Stockpile Management Alternatives *report, and the rationale for selecting the preferred alternative is found in the* Stockpile Management Preferred Alternatives Report. *Both reports are available for public review at the DOE Public Reading Rooms near each site.*

40 Nuclear Weapons Policies

40.01 The commentors suggest that underground testing should be resumed and/or that the capability to resume nuclear testing should be maintained. Commentors state that the proposed stewardship facilities are new and unproven and are skeptical about the future safety and reliability of the Nation's stockpile without underground testing at NTS. Other commentors state that the United States is required by the *National Defense Authorization Act* to maintain a readiness posture, and that to be without testing capability with the possibility of unanticipated international developments would be unrealistic and perhaps foolhardy. Other commentors feel that the capability and reliability of our nuclear weapons will be greatly reduced without underground testing, and that the effects of changes or modifications to weapons can only be verified through testing.

Response: *As part of the August 1995 announcement to pursue a CTBT, the President stated that he had been assured "that we can meet the challenge of maintaining our nuclear deterrent under a Comprehensive Test Ban Treaty through a science-based stockpile stewardship program without nuclear testing." However, the President cautioned that, "while I am optimistic that the stockpile stewardship program will be successful, as President I cannot dismiss the possibility, however unlikely, that the program will fall short of its objectives." The President went on further to say that, "In the event that I were informed by the Secretary of Defense and Secretary of Energy... that a high level of confidence in the safety or reliability of a nuclear weapons type which the two Secretaries consider to be critical to our nuclear deterrent could no longer be certified, I would be prepared, in consultation with Congress, to exercise our 'supreme national interests' rights under the Comprehensive Test Ban Treaty in order to conduct whatever testing might be required."*

Thus, it is possible—although not probable—that under a CTBT, the United States might one day exercise its "supreme national interests" rights to conduct underground nuclear testing to certify the safety and reliability of its nuclear weapons. Consequently, section 4.12 of the PEIS includes a programmatic evaluation of the environmental impacts of underground nuclear testing at NTS.

40.02 The commentors question the rationale, timing, purpose, and need for planned subcritical testing at NTS. One commentor believes that the Draft PEIS fails to consider the programmatic decision on whether to proceed with proposed subcritical hydronuclear experiments as part of the Stockpile Stewardship and Management Program and, if so, where to conduct such experiments. The commentor also believes that the proposed subcritical tests are clearly part of DOE's Stockpile Stewardship and Management Program and that there is no justification for failing to analyze the proposed subcritical tests in the Draft PEIS. Specifically, the commentors are concerned about the need for these tests since the stockpile has been certified to be safe and reliable as recently as November 1995. One commentor asks if subcritical tests are included in the NTS Site-Wide EIS. Other commentors express concern that these tests would be seen internationally as nuclear tests, and that they may affect the Russian elections and the CTBT. One commentor states that weapon configurations could result in fission yields that, while small, would nevertheless contradict the express goal of achieving a zero-yield CTBT. Another commentor states that subcritical testing is a necessary component of the stockpile mission and can only be performed at NTS. Other commentors state that the PEIS does not adequately consider or analyze these tests, that they should be included in the Final PEIS, and that the tests should be postponed if necessary for inclusion. One commentor states that these tests are necessary, but should be carried out at LANL or LLNL, not NTS. Another commentor questions whether the subcritical tests are a legitimate interim action.

Response: *DOE believes subcritical experiments do not constitute a new activity at NTS. In addition, the Lyner Complex is not a new facility. Subcritical experiments have been conducted* *at NTS over many years. Historically, operations at NTS have included tests or experiments that included both HE and special nuclear materials that were intended to produce no nuclear yield or negligible nuclear energy releases. These experiments frequently remained subcritical (i.e., they did not achieve a self-sustaining fission chain reaction). They were often performed as dedicated, stand-alone experiments. Such experiments were described, for example, as one point safety tests and equations of state tests, and, in the prior terminology, were included under the broad umbrella of nuclear testing since testing with nuclear explosive yield was the predominant activity. Some of these earlier subcritical experiments were conducted on the surface while others were conducted underground in shafts, shallow boreholes, and tunnels. However, environmental considerations resulted in a decision to conduct these experiments only underground so that radioactive materials would not be introduced into the surface environment. The environmental impacts of the surface experiments were principally due to dispersal of special nuclear materials, such as plutonium, and other materials, by the detonation of HE. Subcritical experiments were mentioned in environmental statements prepared by the predecessors of DOE in the early 1970s, as well as in the 1977 NTS EIS under the names mentioned above.*

DOE is considering conducting the subcritical experiments referenced by the commentor in the Lyner Complex. Initial work on what is now known as the Lyner Complex began in the late 1960s, but it was not used at that time. Further work took place in the 1980s and early 1990s to develop a complex that could be used to perform intentionally designed low-yield tests or experiments, which, among others, would have included some experiments which would be expected to remain subcritical or provide negligible energy release. The Lyner Complex was completed under the 1977 NTS EIS and was subsequently used for testing purposes. With the moratorium on nuclear testing and the anticipated CTBT, Lyner will be dedicated solely to the conduct of dynamic experiments (including subcritical experiments) and hydrodynamic tests.

The term, "subcritical experiments," does not define a new form of activity at NTS. The use of the term is intended to clarify the fact that such experiments could not achieve the condition of criticality and that they would meet current and prospective U.S. commitments to the moratorium on nuclear testing and the anticipated CTBT. Although the specific term "subcritical" was not used in the previous EISs, some tests and experiments conducted over the past four decades, as well as the impacts of those tests and experiments, are substantially the same as those contemplated by the new terminology.

The principal diagnostic tools that DOE currently uses to study nuclear weapons primaries are hydrodynamic tests and dynamic experiments. The PEIS identifies that DOE, under the No Action alternative, would continue to use testing facilities currently available at NTS and the national laboratories. Additionally, section 3.1.2 of the Final PEIS has been expanded to discuss the issue of subcritical testing.

Note that nuclear detonation does not occur with subcritical testing. The environmental impacts of these tests are well within the previous operational impacts at NTS and are bounded by analyses performed in the NTS Site-Wide EIS as well as this PEIS. The remoteness, large size, and infrastructure at NTS make it a logical location to conduct these experiments.

An analysis of subcritical tests is included in the NTS Site-Wide EIS as part of the continue current operations (No Action) alternative. The impacts which result from operation of the Lyner *facility are analyzed in chapter 5, and a description of the facility is located in appendix A of the NTS Site-Wide EIS. Further Lyner Complex details are addressed in a classified appendix to the NTS Site-Wide EIS.*

Subcritical experiments are a long standing part of NTS's mission and DOE believes that the provisions of CEQ regulations regarding interim actions are inapplicable to a decision by DOE whether to continue conducting these experiments at NTS after completion of the NTS Site-Wide EIS. In the Stockpile Stewardship and Management PEIS, DOE is proposing ways to augment the existing nuclear weapons stockpile stewardship program for the specific purpose of accommodating the lack of underground nuclear testing, rather than reconsidering the entire stewardship program. Ongoing activities, such as the subcritical experiments at NTS, that are not affected by the decisions to be made in the Stockpile Stewardship and Management PEIS process are not interim actions under the regulations. Therefore, if DOE decides to conduct subcritical tests at NTS in the future, that decision will be made after considering the analysis contained in the NTS Site-Wide EIS, and will be documented in an ROD for that EIS.

40.03 Several commentors ask about the circumstances and people responsible for making the recommendations to resume underground nuclear testing under the "supreme national interest" clause of the CTBT. Specifically, who could make the decision to resume testing and how the decision would be implemented if the stockpile were judged to be unreliable. Commentors are specifically concerned about the pressures experienced by laboratory directors while making the certification of reliability, and what other options were available to them instead of resuming underground nuclear testing. Another commentor is concerned that the responsibility for certification of nuclear weapons rests solely in the hands of the weapons laboratories, with no outside review by unbiased parties.

Response: *Every decisionmaker has certain pressures placed upon him or her. The checks and balances designed into the national laboratory system as well as our Nation's system of government help ensure that decisions are made with the best available knowledge and that numerous viewpoints are taken into account. In announcing U.S. plans to pursue a CTBT, the President also announced a decision and coordination process which would require other military and civilian officials (including Congress), in addition to the laboratory directors, to join in any recommendation to resume underground nuclear testing.*

40.04 Several commentors state that nuclear deterrence is necessary and must be maintained and that having a nuclear deterrent permitted the nonproliferation process to work and put the United States in a position to promote peace. Commentors state that our safety and national security has been based on our deterrence policy and that our technological advances, particularly those made by LANL and LLNL, led to the collapse of the Soviet Union. Other commentors state that nuclear deterrence provides for common worldwide security and that a deterrent remains necessary in light of the threats from other nations and terrorist groups.

Response: *The President has declared that the maintenance of a safe and reliable nuclear weapons stockpile will remain a cornerstone of national security policy for the foreseeable future. Changes to U.S. national security policies in the post-Cold War period have placed two significant constraints on the way DOE has traditionally accomplished its statutory nuclear mission: the*

United States has declared a moratorium on underground nuclear testing and is not producing new-design weapons. In August 1995, the President declared that the United States was seeking ratification of a zero-yield CTBT. Within these constraints, the proposed actions in this PEIS would enable DOE to maintain the core intellectual and technical competencies necessary to ensure the continued safety and reliability of the smaller and aging stockpile under a CTBT.

40.05 The commentors believe that DOE is assuming a nuclear war-fighting posture instead of a deterrence posture, that U.S. policy relies on violence and that this threatens the rest of the world. Other commentors state that the Stockpile Stewardship and Management Program is driven by the Nuclear Posture Review (NPR), which is based on U.S. first-strike capability, and that DOE has coupled the terms "deterrence" and "first-strike" in order to diminish the difference between the two. Another commentor states that the PEIS did not clearly state if the Stockpile Stewardship and Management Program is only intended to maintain nuclear retaliation capability, and how it would compare two strategies based on first-strike capability or retaliation against a non-nuclear adversary. Other commentors believe that the safety of the weapons is not in question and that DOE is orienting the Program towards examining the explosive yield of the weapons or towards designing new and/or improved weapons. The commentor states that the deterrence would be just as effective with a lower yield weapon. A commentor feels that DOE should develop skills of mediation to be used nationally and universally, instead of threats of weapons and military might, where everyone loses and nobody wins. Other commentors express opposition to the Program stating that we need to wage a war of peace and have a Department of Peace in this country. Another commentor wants to stop the connection between technical research and development and war and killing, stating that if our scientists would benefit from the development of a super computer then it should be placed in one of our great universities, hospitals, or at the Peace Institute and not used for new bomb making.

Response: *One benefit of science-based stockpile stewardship is to demonstrate the U.S. commitment to NPT goals; however, the U.S. nuclear posture is not the only factor that might affect whether or not other nations might develop nuclear weapons of their own. Some nations that are not declared nuclear states have the ability to develop nuclear weapons. Many of these nations rely on the U.S. nuclear deterrent for security assurance. The loss of confidence in the safety or reliability of the weapons in the U.S. stockpile could result in a corresponding loss of credibility of the U.S. nuclear deterrent and could provide an incentive to other nations to develop their own nuclear weapons programs. Also see the response to comment summary 40.60 for additional discussion of the stockpile stewardship and management alternatives and arms reduction goals.*

40.06 The commentors state that nuclear weapons are not a deterrent; do not maintain peace; are unnecessary, immoral, and unethical; and should be eliminated. Commentors also state that the United States should pursue a policy of complete national and worldwide disarmament and denuclearization, and these options should be considered in the PEIS. The commentors state that these policies would strengthen our national security and our international relations, particularly with respect to our treaty obligations, and that most people worldwide favor the elimination of nuclear weapons. Commentors feel that the United States needs to lead by example and to encourage the rest of the world to follow our lead in disarmament, and that this is the only course of action that will result in nonproliferation. Other commentors state that it is this action that will result in nonproliferation. Other commentors state that the creation and/or maintenance of jobs is not an adequate excuse to continue to build nuclear weapons. One commentor cites the successful disarmament of mustard gas, nerve gas, and antipersonnel weapons as examples for the nuclear weapons industry to follow.

Response: *As a result of the START I Treaty, START II protocol, and NPR, the Nation's nuclear weapons stockpile is being significantly reduced. However, even in the post-Cold War period, international dangers remain, and nuclear deterrence will continue to be a cornerstone of U.S. national security policy for the foreseeable future. Thus, DOE's responsibilities for ensuring the safety and reliability of the U.S. nuclear weapons stockpile will also continue. Stockpile stewardship contributes positively to U.S. arms control and nonproliferation policy goals by allowing the United States to pursue ratification of a zero-yield CTBT and by providing the United States with continued confidence in its weapons to allow for further reductions and to meet its NPT Article VI obligations.*

40.07 The commentors state that the proposed Stockpile Stewardship and Management Program, and specifically the proposed stewardship facilities, violate existing and proposed treaties, specifically the CTBT and NPT, and agreements on nonproliferation. The commentors believe that these facilities will lead to new and more powerful weapons designs, continued weapons testing, increased competition among nuclear weapons states, advancement of weapons technology, and provide the impetus and capability to other countries and terrorists to develop nuclear weapons. One commentor states that DOE has decoupled the terms "design" and "development," and "nonproliferation" and "disarmament" and that the United States says there are no plans to produce new weapons but that design activities continue. Commentors also state that the Program will give other nations the impression that the United States is moving forward in its nuclear weapons program (e.g., W-76 re-certification, W-88 pit rebuild, and B-61 Modification 11) and is therefore encouraging others to continue with weapons development as well. Commentors state that the long- and short-term nonproliferation impacts have not been fully addressed and analyzed in the PEIS. Other commentors point out that in their view, reestablishing pit fabrication at LANL is against nonproliferation goals and the spirit of the treaties. One commentor states that the nuclear weapons life-extension program is contrary to the NPT. Another commentor feels that the United States should lead the way internationally in START I and II, CTBT, NPT, and all future "nuclear deterrence treaties." International oversight of the stockpile stewardship program could help solve nonproliferation concerns, according to one commentor.

In addition, commentors believe that the PEIS fails to mention that the stewardship program will be used to maintain the expertise of weapons development, research, design, testing, prototyping, and certification. One commentor states that the rationale for designing new weapons to keep the scientists from getting rusty is not enough to warrant continued design of weapons. Another commentor believes the PEIS should consider a future treaty that may require DOE to disclose whether or not the stewardship program does weapon designing. The commentor believes that DOE should separate the advancement of the science of nuclear weapons from the maintenance work. The commentor also states that we do not need to alter the designs to meet new challenges from other countries.

Response: *The issue of nonproliferation is addressed in section 2.6. As stated in that section, on August 11, 1995, the President announced his commitment to seek a zero-yield CTBT. He also established several safeguards that condition U.S. entry into a CTBT. One of these safeguards is the conduct of science-based stewardship, including the conduct of experimental programs. This safeguard would enable the United States to enter into such a treaty while maintaining a safe and reliable nuclear weapons stockpile consistent with U.S. national security policies.*

One benefit of science-based stockpile stewardship is to demonstrate U.S. commitment to NPT goals; however, the U.S. nuclear posture is not the only factor that might affect whether or not other nations might develop nuclear weapons of their own. Some nations that are not declared nuclear states have the ability to develop nuclear weapons. Many of these nations rely on the U.S. nuclear deterrent for security assurance. The loss of confidence in the safety or reliability of the *weapons in the U.S. stockpile could result in a corresponding loss of credibility of the U.S. nuclear deterrent and could provide an incentive to other nations to develop their own nuclear weapons programs.*

The experimental testing program would continue to be used to assess the safety and reliability of the nuclear weapons in the remaining stockpile. Much of this testing is classified and could not lead to proliferation without a breach of security. Use of classified data from past U.S. nuclear tests is also a vital part of the overall process for validation of new experimental data. Most of the component technology used for the proposed enhanced experimental capability is unclassified and is available in open literature, and many other nations have developed a considerable capability.

Proliferation drivers for other states, such as international competition or the desire to deter conventional armed forces, would remain unchanged regardless of whether or not DOE implemented the proposed action analyzed in the PEIS. In the NPT, the parties agree not to transfer nuclear weapons or other devices, or control over them, and not to assist, encourage, or induce nonnuclear states to acquire nuclear weapons. However, the treaty does not mandate stockpile reductions by nuclear states, and it does not address actions of nuclear states in maintaining their stockpiles. Section 3.1.2 of the Final PEIS has been expanded to address these issues. As explained in that section, the national security policy framework discussed in this PEIS seeks a new balance between U.S. arms control and nonproliferation objectives and U.S. national security requirements for nuclear deterrence while pursuing these objectives (section 2.2). In addition, a discussion is provided on some of the more difficult issues that must be considered in determining the balance, including a discussion of experimental capability (section 2.6). In particular, the issue of nonproliferation and the proposed NIF was studied in detail. The NIF and the Issues of Nonproliferation Draft Study, prepared by the DOE Office of Arms Control and Nonproliferation, has been the subject of extensive public involvement, interagency review, and review by outside experts. The study concluded that the technical proliferation concerns of NIF are manageable and can therefore be made acceptable and that NIF can contribute positively to U.S. arms control and nonproliferation policy goals (appendix section I.2.1 of Volume III). NIF is a proliferation concern because of its broader scientific applications and expected frequent use by researchers worldwide and, like the other proposed enhanced experimental facilities, because of its possible relevance to the development of new weapon designs. However, the development of new weapon designs requires integrated testing. None of the proposed facilities, either alone or together, could perform such integrated testing of new concepts and, therefore, cannot replace nuclear testing for the development of new weapon designs. The national security policy framework and the technical issues that drive the proposed action for enhanced experimental capability remain the same.

DOE is directed to maintain nuclear weapon capability, including the capability to design, develop, produce, and certify new warheads. In addition, maintenance of the capability to certify weapon safety and reliability provides a limited inherent capability to design and develop new weapons. However, no new-design nuclear weapon production has been directed. DOE has not advanced a rationale of new weapon design "to keep scientists from getting rusty." Instead, DOE has advanced a comprehensive program of stockpile stewardship and management which maintains essential capabilities for stockpile safety and reliability while meeting other legal and policy directives.

Regarding the comment on the Life Extension Program, the Nation is no longer developing new-design weapons to replace existing weapons. Consequently, weapons' lifetimes are expected to extend beyond their original design goal of about 20 years. In accordance with our international treaty obligations, the Nation's nuclear weapons stockpile is being significantly reduced, and the Nuclear Weapons Stockpile Memorandum (NWSM) accounts for these reductions. The Life Extension Program is a term used to describe the planning activities which ensure that the nuclear *weapons remaining in the stockpile will continue to be safe and reliable. The Life Extension Program is consistent with the NWSM and our international treaty obligations.*

Regarding comments that enhanced experimental capabilities are directed more at the capability to design new weapons in the absence of nuclear testing than at maintaining the safety and reliability of the existing stockpile, this PEIS explains why these capabilities are needed to maintain the safety and reliability of a smaller, aging stockpile in the absence of nuclear testing (chapter 2). The existing U.S. stockpile is highly engineered and technically sophisticated in its design for safety, reliability, and performance. The stewardship capabilities required to make technical judgments about the existing stockpile are likewise technically sophisticated; therefore, it would be unreasonable to say that these stewardship capabilities could not be applied to the design of new weapons, albeit with less confidence than if the weapons could be nuclear tested. The development of new weapon designs requires integrated nuclear testing such as occurs in nuclear explosive tests. Short of nuclear testing, no single stockpile stewardship activity, nor any combination of activities, could confirm that a new-design weapon would work. In fact, a key effect of a zero-yield CTBT would be to prevent the confident development of new-design weapons. National security policy requires DOE to maintain the capability to design and develop new weapons, and it will be a national security policy decision to use or not use that capability. Choosing not to use enhanced experimental capability for new weapon designs would not change the technical issues for the existing stockpile and, therefore, the stewardship alternatives would not change.

The issue of new-design weapons is separate from DOE's need to perform modifications to existing weapons that require research, design, development, and testing. The phrase used in this PEIS, "without the development and production of new-design weapons," is meant to convey the fact that the historical continuous cycle of large-scale development and production of new weapons designs replacing older weapon designs has been halted. For example, during the 1980s, about a dozen new-design weapons were in full-scale development or production. Over the decade, production of new-design weapons replaced dismantled weapons nearly one for one. Today, only modifications to parts of existing weapons are being performed or planned; dismantlement has continued. This results in a smaller aging stockpile that must be assessed and certified without nuclear testing. This is now the primary focus of the stewardship program.

40.08 Some commentors believe that there was no willful collusion among laboratories to further their weapons complex activities; however, the commentors question the ability of the proposed plan to get the job done. A number of commentors believe that political and laboratory interests were influencing the Stockpile Stewardship and Management Program plan and alternatives and that the focus should be on national security and not politics. Commentors state that the laboratory scientists and contractors responsible for developing the program were using "inside" and classified knowledge and influence to advise decisionmakers on furthering their weapons program activities while reducing the manufacturing mission at production plants, and that this could have detrimental long-term effects. A commentor states that the PEIS attempts to justify the stewardship facilities which will primarily benefit the western laboratories, which already provide redundant capabilities. Another commentor refers to the statement made by Dr. Smith to the Armed Forces Subcommittee that, "Today, we do not have the capability to manufacture replacements for warheads that comprise our existing stockpile," and questions why DOE was proposing to slash production capabilities while building up basic programs at the weapon laboratories. Other commentors believe that there were others, such as retired scientists and experts, who should be involved in the study and that the focus on the laboratories and their input was a mistake.

Response: *Production and laboratory functions are different, but the difference is reduced as the size of the production requirements becomes smaller. The first atomic weapons were not only designed but also constructed at the weapons laboratories. The laboratories have always had the capability for small lot production principally in order to test out designers' theories. In some respects, this could be considered an advantage by increasing the synergism between the two activities. Based on the environmental, cost, and technical analyses that have been performed, the preferred alternative is to downsize the stockpile management functions at ORR, KCP, and Pantex, and not transfer them to the laboratories and NTS.*

In the PEIS preferred alternative, the only "production capability" which is being considered for one of the national weapons laboratories is the reestablishment of pit fabrication. This function does not presently exist within the Complex and has not existed for some time due to the 1991 shutdown and subsequent closing of the Rocky Flats Plant. Two sites were considered as alternatives for the pit fabrication mission: LANL, which already has an active program involving both fabrication and recovery of plutonium and has fabricated pits for nuclear explosive testing, and SRS, which has separated and produced plutonium metal from reactor targets and has recovered plutonium from scrap materials. Analysis discussed in the Analysis of Stockpile Management Alternatives *report shows that the LANL alternative is lower in cost and has less technical risk than the SRS alternative. Technical risk is greater for the SRS alternative because LANL has recent experience in providing pits for nuclear explosive testing, whereas SRS has no experience with the kind of capabilities required for precision nuclear component manufacturing. Additionally, the LANL capability could be in place two years earlier than the SRS capability. The* Analysis of Stockpile Management Alternatives *report is available for public review at the DOE Public Reading Rooms near each site.*

It is true that projected needs may actually turn out to be higher or lower than the actual needs. This is one reason why the downsize-in-place alternative is the preferred option for most stockpile management missions. The proposed action for stockpile management would downsize facilities over a number of years, but this action can be reversed if necessary.

In the event science-based stewardship proposals could not assure the continued safety and reliability of the nuclear weapons stockpile, the resumption of underground testing at NTS would be considered. On August 11, 1995, the President stated that if he was informed by the Secretaries of Defense and Energy that a high level of confidence in the safety or reliability of a nuclear weapons type considered critical to the nuclear deterrent could no longer be certified that he would be prepared, in consultation with Congress, to exercise our "supreme national interests" rights under the CTBT to conduct whatever testing might be required.

Chapter 2 of the PEIS discusses the national security policy considerations and the role they play in defining the purpose of and need for the Stockpile Stewardship and Management Program. DOE participates regularly in Congressional hearings on defense issues in which the stockpile stewardship and management issues are discussed. Congress determines how funds are allocated, and DOE spends monies consistent with Congressional direction. Therefore, Congress ultimately determines whether the preferred alternatives of the program will be implemented.

The majority of the U.S. core competencies and capabilities in nuclear weapons reside at the weapons laboratories. Proposing to locate new stewardship facilities at the weapons laboratories and NTS would expand existing facilities at sites with an experienced knowledge base and infrastructure and would help maintain the core intellectual and technical competencies of the weapons laboratories. Proposing to locate stewardship facilities at sites without the knowledge base and infrastructure would be counterproductive to the development of science-based stockpile stewardship.

40.09 One commentor refers to an article in the *New York Times* in February that stated DOE was having trouble verifying that sources of weapon grade materials in Russia were actually coming from the dismantlement of weapons. The commentor suggests that DOE not only look at downsizing, but look at what they are going to do in terms of verifying sources of weapons grade materials in Russia.

Response: *The PEIS does not address actions to secure and dispose of excess fissile materials. A major objective of the programmatic alternatives addressed in the Storage and Disposition Draft PEIS, however, is to demonstrate and encourage bilateral actions on both U.S. and Russian weapons grade plutonium. The commentor is referred to the purpose and need in the Storage and Disposition Draft PEIS for a more complete discussion of this subject.*

40.10 The commentor would like DOE to consider site location (proximity to population centers) in the decisionmaking process and urges DOE to perform their missions somewhere else.

Response: *An indepth analysis was conducted to identify the potential environmental impacts associated with the reasonable alternatives. This analysis included proximity to population centers, along with many other factors so that absolute and comparative impact analyses can be made. Specifically, chapter 4 utilizes proximity to population centers in calculating both normal operational exposures and exposures resulting from accident scenarios for each of the alternatives considered.*

40.11 Several commentors express concern about the optimism of world peace in the future and that we are not protecting the option that the world might revert to a more hostile place. Commentors state that the laboratories need to maintain a complete understanding of nuclear weapons, particularly in light of the CTBT. Commentors would like the PEIS to consider the possibility of nonratification of START II and noncompliance with the CTBT and discuss the possibility that we may need stockpile levels higher than START I. Other commentors note that even if the United States and Russia honor nonproliferation agreements other nations or groups may not and that the United States should prepare for this eventuality. Another commentor states that the Stockpile Stewardship and Management Program fails to meet its objective of protecting the Nation's ability to respond to changing national security needs.

Response: *The base case analyzed in the PEIS assumes a START II-sized stockpile. The PEIS also analyzes a higher case, which represents a START I-sized stockpile. DOE cannot speculate about the pace of Russian nuclear weapon dismantlement. However, by structuring the Stockpile Stewardship and Management Program consistent with the DOD NPR and associated PDDs, DOE has built flexibility into the Program to respond by maintaining at START I stockpile levels (which Russia has ratified) or making faster and deeper stockpile reductions in response to further arms reduction agreements.*

DOE continues to carefully evaluate the size of the weapons complex necessary to support projected stockpile and national security needs. It is true that projected needs may actually turn out to be higher or lower than the assumed needs. This is one reason why the downsize-in-place alternative is the preferred option for most stockpile management missions. The preferred alternatives for stockpile management would downsize facilities over the coming years, but this action can be reversed if necessary. If DOE were to transfer stockpile management missions from a site, those facilities would be less amenable to rapid expansion. Therefore, the downsize-in-place option gives DOE the most flexibility in the next several years to react to changing world events should the need arise.

40.12 Commentors state that the money spent on nuclear weapons and the Stockpile Stewardship and Management Program should be spent on other more needy social programs, and that the jobs created are not worth the negative ramifications of the Program. One commentor believes that enormous amounts of taxpayer money are being wasted on militarily unusable weapons. Other commentors believe that the money should be spent on more useful programs such as medical care, day care, education, feeding the hungry, housing, infrastructure, conservation, renewable energy, and environmental cleanup. Another commentor feels the United States should invest in peace, trust, and equality. Commentors also believe that the Stockpile Stewardship and Management Program is a pork barrel project for the nuclear military industrial complex and the corporations that serve the complex. A commentor also states that national security is really about having a well-educated, nonviolent, clean, and safe community, and not nuclear weapons. Other commentors ask why the public should feel comfortable with a plan that is very costly and gives us less, not more, nuclear deterrent.

Response: *Since the end of the Cold War, the DOE nuclear weapons program budget has been reduced significantly from its Cold War level. The Stockpile Stewardship and Management Program proposes further facility downsizing to optimize U.S. capabilities to meet future reduced stockpile levels. DOE proposes to the Congress a level of funding each year which meets Administration and Congressional policy directions. DOE is not in a position to make the difficult tradeoffs that may be required between alternative Federal programs.*

40.13 Many commentors question the Stockpile Stewardship and Management Program costs and request clarification and more discussion of the details and assumptions used in the cost analysis. Several commentors want to see the cost analysis presented in the PEIS. Specific issues expressed by the commentors include the request for more information on D&D costs, life-cycle costs, transportation costs of moving pits, site transition costs, enhanced experimental program costs, training costs of new workers, remediation and cleanup costs, and program cumulative and annual costs.

Several commentors, concerned with the cost of the stockpile stewardship facilities, ask if current facilities could be used since millions of dollars have been spent on maintaining these capabilities at the Complex sites. Other commentors state that there may be more cost-efficient ways of achieving stockpile stewardship and management goals, such as "piggy-backing" onto the current sites rather than transferring these activities elsewhere. One commentor also asks what is the annual cost of the proposed Stockpile Stewardship and Management Program for the next decade and how does this cost compare to the cost of a conventional surveillance program, such as the one that has been used successfully for the last 50 years. Commentors also express concern that with the current cutbacks in the Federal budget, spending money on new facilities is counterproductive. One commentor asks how much money will be saved by rightsizing the weapons complex as proposed. Another commentor states that the cost analysis was faulty in showing the downsizing of Pantex was more cost-effective than relocating the A/D and HE missions to NTS.

Response: *The PEIS provides documentation on the potential environmental impacts associated with the reasonable alternatives. Cost is one of the factors considered in developing the alternatives and identifying the preferred alternatives. Two separate reports have been prepared, the* Analysis of Stockpile Management Alternatives *report, and the* Stockpile Management Preferred Alternatives Report *which outline the costs of the various alternatives and the role costs play in the rationale for selecting the preferred alternatives. These documents are available for public review at the DOE Public Reading Rooms located near each site.*

The downsize-in-place alternatives were chosen for several reasons including the availability of a trained workforce, existing mission site infrastructures, the ability to expand capabilities in the event of a change in world events, as well as other factors. Clearly cost is an important factor, not only the cost of D&D of surplus facilities but the costs of constructing new facilities and their eventual D&D must also be considered as well.

The cost analysis that DOE has performed to address alternative sites for accomplishment of the stockpile management missions has been performed with participation from all weapons complex sites. To assure peer review of cost estimates, each site was given the opportunity to review and critique the cost estimates provided by the competing sites. In addition, DOE commissioned an independent validation of the cost estimates. Relocation of the HE mission from Pantex to NTS was not considered a reasonable alternative and was not addressed in the PEIS.

In the No Action alternative, the PEIS analyzes the alternative of relying on existing facilities and capabilities to perform the stockpile stewardship mission. However, as explained in section 3.1.4, relying on existing facilities would not ensure DOE's ability to maintain core competencies in nuclear weapons in the long-term while also maintaining a safe and reliable, smaller, aging, U.S. stockpile. Thus, enhanced experimental facilities are proposed and evaluated in the PEIS.

40.14 Commentors state that underground testing should cease, the capability to resume testing should not be maintained, and the NTS testing area should be closed. Commentors state that there is no technological justification for testing, that closing the test site would demonstrate U.S. resolve in ending its weapons programs, and that it would be more fiscally responsible to stop testing. Other commentors state that underground testing contaminates the land and produces more nuclear waste. One commentor compares the Stockpile Stewardship and Management Program to the Safeguard C program, which maintained atmospheric testing readiness but was discontinued when Congress learned of its costs. Another commentor questions the need for funding NTS at such an enormous cost.

Response: *The United States has ceased underground nuclear testing and is pursuing a CTBT. The President also stated that he had been assured "that we can meet the challenge of maintaining our nuclear deterrent under a Comprehensive Test Ban Treaty through a science-based stockpile stewardship program without nuclear testing." However, the President cautioned that, "while I am optimistic that the stockpile stewardship program will be successful, as President I cannot dismiss the possibility, however unlikely, that the program will fall short of its objectives." The President went on further to say that, "In the event that I were informed by the Secretary of Defense and Secretary of Energy... that a high level of confidence in the safety or reliability of a nuclear weapons type which the two Secretaries consider to be critical to our nuclear deterrent could no longer be certified, I would be prepared, in consultation with Congress, to exercise our 'supreme national interests' rights under the Comprehensive Test Ban Treaty in order to conduct whatever testing might be required."*

Thus, it is possible—although not probable—that under a CTBT, the United States might one day exercise its "supreme national interests" rights to conduct underground nuclear testing to certify the safety and reliability of its nuclear weapons. Consequently, section 4.12 of the PEIS includes a programmatic evaluation of the environmental impacts of underground nuclear testing at NTS.

40.15 Several commentors state that DOE should not spend funds to continue the production and maintenance of nuclear weapons, but instead should divert the funds and technical expertise to developing methods of neutralizing radioactive waste and to clean up from past activities.

Commentors state that legacy waste from past weapons complex activities should be cleaned up first (e.g., the Chemistry and Metallurgy Research building at LANL) before any new projects or programs are started and additional wastes are created. One commentor believes that classification issues are hindering cleanup efforts. Another commentor states that contamination problems at NTS should have been addressed earlier in the process before the Draft PEIS was prepared. Commentors are concerned about the availability of funds for proposed cleanup of excess facilities once turned over to Environmental Management for disposition. One commentor states that the Nation could only afford to maintain a minimal stockpile since we are faced with the immense cost of cleaning up the environmental problems caused by the nuclear weapons industry.

Response: *DOE has a program to decontaminate and make available for other uses its excess facilities. The budget for this activity has increased significantly since the end of the Cold War. DOE has made every effort to prioritize the cleanup of these excess facilities based on risk. Therefore, as the commentor alludes, some low risk facilities may wait a significant time period for decontamination because the higher risk facilities are addressed first. However, DOE has demonstrated a commitment to bring excess facilities to a safe shutdown condition awaiting decontamination, and to maintain these excess facilities in a safe condition until decontamination can proceed. DOE is committed to both the cleanup of its excess facilities, but also to maintain a nuclear weapons stockpile to meet national policy directives.*

As stated in section 3.1.1, Planning Assumptions and Basis for Analysis, DOE would emphasize compliance with applicable laws and regulations and accepted practices regarding industrial and weapons safety, safeguarding the health of workers and the general public, protecting the environment, and ensuring the security of nuclear materials, weapons, and weapons components. DOE would also minimize the use of hazardous materials and the number and volume of waste streams consistent with programmatic needs through active pollution prevention programs and waste minimization. The Chemistry and Metallurgy Research building at LANL is an analytical chemistry laboratory that has been in continuous use since 1952. See the response to comment summary 40.90 for further discussion on the Chemistry and Metallurgy Research building.

The LLW disposal facility of NTS has been designed, constructed, and managed in such a way so as to handle safely the materials disposed of in this facility. This facility was sited due to the remoteness of NTS, the depth of the groundwater, and other factors which contribute to assuring the disposal of these materials can be conducted in a safe manner.

40.16 The commentor recognizes the significance of downsizing and wants to know if the PEIS discusses a transition funding similar to that at the Mound Plant (e.g., reuse of plants, refitting, and revised missions that could possibly give futures to some displaced workers).

Response: *This is a programmatic document and, as such, does not address detailed site-specific transition planning. In the event that a decision is made to adopt the preferred alternative, further site-specific review would take place. When DOE closes a facility, a transition plan is developed, detailing the cleanup plans, disposition of equipment, and ultimate disposition of the land. There is an established process for including the adjacent communities in this process and DOE's Office of Economic Assistance has grants and other support services to assist in the retraining and out-placement of all adversely affected employees.*

It is DOE policy to reassign employees to new missions whenever possible. As stated in sections 4.2.3.8, 4.4.3.8, and 4.5.3.8., the DOE Office of Worker and Community Transition would *oversee the workforce restructuring plans for ORR, KCP, and Pantex. This plan would be developed in conjunction with the affected communities, local governments, and elected officials. Factors considered in these plans would include additional professional and vocational training at local schools during the transition period; academic and vocational counseling; help in preparing resumes and preparing for job interviews, financial planning, and job searching techniques; coordination with local businesses and economic development agencies to identify available jobs; and means of informing the business community of skilled personnel in the labor market.*

40.17 The commentors raise concerns that the PEIS ignores the significant body of Congressional hearings and testimony that science-based stewardship is not guaranteed to work, or that if it works it will not be ready for at least another 10 years.

Response: *The purpose of the PEIS is to evaluate reasonable alternatives for the future weapons complex in order that we may determine how best to assure the continued safety and reliability of the nuclear weapons stockpile in the absence of underground nuclear testing. Science-based stewardship is the alternative to underground nuclear testing. While DOE recognizes that there is an inherent risk in any surrogate for underground nuclear testing, we are confident that the science-based stewardship program can be successful. Nonetheless, because there can be no absolute guarantee of complete success in the development of enhanced experimental and computational capabilities, the United States will maintain the capability to conduct underground nuclear tests under a "supreme national interest" provision in the anticipated CTBT.*

40.18 The commentor states that DOE has focused almost exclusively on preserving the capabilities and core competencies of the national laboratories, while paying little attention to the production plants. The commentor also states that the PEIS does not deal adequately with the production capacity that will be needed to maintain the stockpile over the next 10 or more years, and states that the entire PEIS analysis is based on optimistic assumptions about future arms control agreements.

Response: *The preferred alternatives described in the PEIS would preserve the critical capacity and unique assets that exist in DOE's production plants. Although there would be downsizing of the production plants commensurate with a downsized stockpile, none of the production plants would be closed. The PEIS addresses plant operations to support a range of stockpile sizes consistent with DOD plans, as reflected in the NPR and the NWSM. A "No Action" alternative is also addressed which essentially preserves the status quo (no downsizing of facility infrastructure).*

DOE does not believe that the preferred alternative of downsizing reflects undue optimism about future arms control agreements. The stockpile has already been significantly reduced through dismantlement. Post-Cold War dismantlement to the START I-sized stockpile is already more than 70 percent complete and the remainder is scheduled to be completed within a few years. Regarding the production capacity cases analyzed, they reflect our best estimates based on analysis of historical stockpile problems and the current status of the weapons expected to remain in the future stockpile. The technical and cost analyses for production capability and capacity alternatives were published in two draft reports released in support of the Draft PEIS: the Stockpile Management Preferred Alternatives Report; *and the* Analysis of Stockpile Management Alternatives *report, both dated February 1996. These reports will be released in final form to support the Final PEIS. Our analysis indicates that downsizing, which would occur over a protracted period of time, is the most cost-effective solution, involves the least technical risk, and affords the Nation the most flexible strategy in the event that national security policies change or future stockpile problems are greater than we anticipate.*

40.19 Several commentors question the need for new pit manufacturing citing concerns of advancing new nuclear weapons design (e.g., mini nukes) and increasing the pit stockpile when plenty of pits are already available for reuse in weapons. Other commentors express their opposition to pit manufacturing activities at LANL. Another commentor questions the workload associated with the pit fabrication options.

Response: *Because of the small demand for the fabrication of replacement plutonium pits over the next 10 or more years, DOE did not propose a new pit fabrication facility with a capacity equivalent to the capacities required for other portions of the nuclear weapons production complex. However, limited fabrication of new replacement pits would be required to maintain capability and to replace pits lost during weapon surveillance. Section 3.6 discusses DOE's future plans should a life-limiting phenomenon be found in stockpile pits and a larger pit fabrication capacity be required.*

The No Action alternative discussed in section 3.4.3.1 would maintain only a limited plutonium R&D component fabrication capability at LANL and a less extensive capability at LLNL, and it would not provide DOE with sufficient pit fabrication capability to meet the requirements stated in section 3.1. DOE does not consider it prudent to pursue an alternative which would prevent it from fulfilling its national security mission. Additionally, DOE is under the direction of the President and Congress, through PDDs and the National Defense Authorization Act *of 1994, to support the maintenance of a safe and reliable nuclear weapons stockpile, and to maintain the core intellectual and technical competence of the United States in nuclear weapons. This includes competencies in research, design, development, testing, reliability assessment, certification, manufacturing, and surveillance capabilities. The preferred alternative for the pit fabrication mission is to reestablish production capability with a limited capacity at LANL. The preferred alternatives were developed by DOE using data and studies on such factors as cost, technical feasibility, technical risk and schedule, ES&H, and national security. The* Analysis of Stockpile Management Alternatives *report which contains the analysis of these factors is available for public review at the DOE Public Reading Rooms near each site. To bound the potential environmental impacts at each site, the PEIS estimates are based on "surge" or maximum production scenario. Because it is expected that this workload would be performed in existing facilities that would be modified to perform pit fabrication, it is not surprising that the maximum outputs and the maximum potential environmental impacts varied somewhat between LANL and SRS for this bounding surge case. In addition, however, each alternative was assessed for the same low case and high case single-shift workloads.*

40.20 The commentor expresses the view that Pantex should continue to store plutonium, and should be the preferred site for any disposition options and related functions.

Response: *These decisions will not be made until the Storage and Disposition Final PEIS is completed. In that PEIS, Pantex is being considered for the long-term storage of strategic and surplus fissile materials, and as a disposition site for surplus fissile materials. Although no preferred alternatives have been identified for the Fissile Materials Disposition Program, preferred alternatives will be identified in the Final PEIS, expected before the end of 1996. Pantex has many valuable attributes which will be considered in that analysis.*

40.21 The commentors express both praise and criticism of DOE's safety and environmental monitoring programs and protection, and insist that all future DOE missions must be conducted in a safe and environmentally sound manner. Commentors believe that moving missions would potentially lead to a decline in worker health and safety protection and an increased threat to the environment at the mission's new site. Other commentors state that classification and the shift of safety responsibility from workers to management has weakened the DOE safety program at some sites, and that worker knowledge and training were necessary for safe operations. One commentor states that he did not trust DOE when it came to ES&H monitoring and felt that workers' fear of losing their jobs prevented people from raising safety concerns. The commentor believes that the current system within DOE to shelter whistleblowers is not effective in protecting the whistleblowers. The commentor believes that the people at LANL were not laid off because they were whistleblowers. One commentor believes that if stockpile stewardship and management work came to LANL, employees with jobs related to health and safety would be hindered from truth-telling from fear of management pressure or job loss, since current management implements a subjective and undemocratic system of employee evaluation and control.

A commentor refers to the Tiger Team findings and tracking program at LANL as an example of DOE's lack of commitment to reducing environment, health and safety issues. Another commentor questions DOE's stated priority on safety in light of their cancellation of the NEWNET air monitoring system. Other commentors state that DOE has not conducted or released enough studies on worker and public health effects and on past accidents and their results. A commentor states that the recent forklift accident, the fatality due to an electrocution and the root causes need to be identified in the Accident History section of the PEIS. The commentor also wants an analysis of the effect of the recent reduction-in-force on the occupational safety at LANL. Another commentor feels the workers at LANL are eminently competent to monitor their own safety and environmental concerns.

Response: *As stated in section 3.1.1, Planning Assumptions and Basis for Analysis, DOE would emphasize compliance with all applicable laws and regulations and accepted practices regarding industrial and weapons safety, safeguarding the health of workers and the general public, protecting the environment, and ensuring the security of nuclear materials, weapons, and weapons components. DOE would also minimize the use of hazardous materials and the number and volume of waste streams consistent with programmatic needs through active pollution prevention programs and waste minimization. The specific stockpile management assumptions are described in section 3.1.1.1, and the stockpile stewardship assumptions are described in section 3.1.1.2. It is unlikely that a change in environmental regulation would result in a modification to the Stockpile Stewardship and Management Program itself; however, changes to the environmental regulatory setting may necessitate the implementation of additional engineering and administrative controls to meet new standards.*

The overall subject of "whistleblower protection" is one which DOE has given extremely high priority. DOE is pursuing an open environment at its facilities so that employees can raise concerns without fear; improvement in this difficult area is always possible. DOE believes it is essential that workers at its facilities have the opportunity to raise safety and environmental concerns without fear of retribution. DOE has programs at all of its sites to provide anonymity to workers who wish to raise such concerns. All concerns are investigated thoroughly and necessary corrective actions are directed.

AIRNET and NEWNET are the two air quality monitoring systems employed by LANL. AIRNET data are reported to the public annually in the Environmental Surveillance Report, and NEWNET data are publicly accessible over the Internet computer links as they are collected. Neither AIRNET nor NEWNET stations went offline during the Dome Fire. Over the past 8 months, LANL has eliminated several AIRNET stations that are no longer needed or were redundant with other sampling as part of an overall effort to streamline the sampling networks to ensure their effectiveness. Just prior to the outbreak of the Dome Fire, LANL reprogrammed four of five monitoring stations in the southern part of laboratory to transmit data at longer intervals in order to determine long-clock stability, but returned to the original transmittal intervals during the Dome Fire to provide better coverage.

There have been several serious accidents at LANL within the past 18 months. Both DOE and the University of California conducted investigations and developed recommendations to improve *safety awareness at LANL (see* Type A Accident Investigation Report, *DOE, March 1996, and* Final Report of the University of California Fact Finding Team Concerning Recent Accidents at the Los Alamos National Laboratory, *University of California, March 19, 1996). In March 1996, the senior vice president of the University of California directed LANL to implement the University's recommendation, including developing an integrated safety management program. There is no indication that the recent downsizing of LANL staff has had any detrimental effect on occupational safety.*

40.22 The commentors ask why information from the Sandia Stockpile Study was left out of the PEIS. In particular, information stating that weapons defects decrease over time and the statement that nuclear weapons do not age, do not wear out, and are not allowed to degrade. Commentors are of the opinion that historical defect rates exceed the expected future stockpile defects and that the proposed Stockpile Stewardship and Management Program is not required. One commentor asks about the age of the weapons in the stockpile and how long they will be maintained. Another commentor asks about the design life of the remaining stockpile weapons and indicates that an enhanced surveillance program above that currently proposed by DOE may be needed. Despite requests in scoping comments, the commentor states that the Draft PEIS does not analyze whether individual stockpile stewardship facilities are needed to diagnose safety problems, on the one hand, and reliability problems on the other.

Response: *Chapter 2 of the PEIS discusses aging impacts. The information in section 2.3 is based on the latest data published in the tri-laboratory study. Section 2.3.3 of the PEIS, Historical Stockpile Data, provides a summary of stockpile defect and aging data that were used as an input for sizing the Stockpile Stewardship and Management Program. This information was extracted from an unclassified report,* Stockpile Surveillance: Past and Future, *dated September 1995.*

As explained in that section, continuous evaluation of the safety and reliability of the stockpile has always been a major part of the U.S. nuclear weapons program. Since the introduction of sealed-pit weapons more than 35 years ago, a formal surveillance program of nonnuclear laboratory and flight testing has been in existence. More than 13,800 weapons have been evaluated in this program. The Stockpile Evaluation Program, with its reliance on functional testing, has provided information that can be used in the statistical analysis of nonnuclear component and subsystem reliability. This program has detected about 75 percent of all problems ultimately detected, and it has been the principal mechanism for discovering defects and initiating subsequent repairs and replacements. However, not all aspects of a nuclear weapon can be statistically assessed this way. Weapons R&D at the three weapons laboratories and nuclear testing have played an important part in assessing the stockpile and in making corrective changes when needed.

Nuclear tests have been a critical part of the nuclear weapons program. They have contributed to a broad range of activities from development of new weapons to stockpile confidence tests to tests that either identified a concern or showed that remedial actions were not needed. However, the United States has not conducted a sufficient number of nuclear tests for any one weapon type to provide a statistical basis of reliability assessment for the nuclear explosive package. This is why the word "performance" instead of "reliability" is used when discussing a nuclear explosive package.

Although nuclear tests were never a part of the formal Stockpile Evaluation Program, they played an important role in maintaining the safety and performance of the weapons in the stockpile. Every advantage was taken of developmental nuclear tests to eliminate potential nuclear explosive problems. In some cases, nuclear testing during development of one weapon type uncovered a *problem that was pertinent to a previous design already in the stockpile, which then had to be corrected. Nuclear tests identified certain classes of stockpile problems not observable in the surveillance program. Nuclear tests have been used to resolve issues raised by the Stockpile Evaluation Program, such as whether a particular corrosion problem affected the nuclear yield of a weapon. Nuclear tests have also been used to verify the efficacy of design changes. For example, the adequacy of certain mechanical safing techniques was determined through nuclear testing. In the case of a catastrophic defect, tests have been used to certify totally new designs to replace an existing design. Finally, in some cases, nuclear testing proved that a potential problem did not exist.*

Beginning in the late 1970s, DOD and DOE agreed to a formal series of underground nuclear tests of weapons withdrawn from the stockpile. These tests were referred to as Stockpile Confidence Tests. They differed from developmental nuclear tests because the weapons were from actual production, had experienced stockpile conditions, and had minimal changes made to either nuclear or nonnuclear components prior to the test. There have been 17 such confidence tests since 1972, including 4 tests in the early 1970s that were not officially designated as Stockpile Confidence Tests. Confidence tests have been conducted for each of the weapon types expected to remain in the stockpile well into the next century.

In addition to the 17 confidence tests, at least 51 additional underground nuclear tests have been conducted since 1972 involving nuclear components from the stockpile, components from the actual weapon production line, or components built according to stockpile design specifications and tested after system deployment. The objectives of these tests included weapon effects, weapons R&D, confirmation of a fix, or investigation of safety or performance concerns. Three of these tests (in addition to one confidence test) revealed or confirmed a problem that required corrective action. Four tests (in addition to three confidence tests) confirmed a fix to an identified problem. Additionally, five tests were performed to investigate safety concerns affecting three different weapon types. These five tests verified that a problem did not exist.

The confidence in the performance of the nuclear explosive package has been based on underground nuclear test data, aboveground experiments, computer simulations, surveillance data, and technical judgment. The directors of the three weapons laboratories must certify the nuclear performance of the weapons designed by their laboratory. In a future without additional nuclear testing, the core capabilities of the weapons laboratories that were developed to eliminate potential problems in new weapon designs must now be employed to assess stockpile problems. However, in the absence of nuclear testing, the ability to assess nuclear components is more difficult; new methods of assessment, discussed later, will have to be developed to help compensate for this loss.

The historical stockpile database includes more than 2,400 findings from more than 45 weapon types. Findings are any abnormal conditions pertaining to stockpile weapons, such as out-of-specification data. Findings are then investigated and assessed as to whether or not they are a problem. Actionable findings are those that require some form of corrective action. All major components and subsystems have had problems that required corrective actions. The number of findings for nonnuclear components is much larger than that for nuclear components largely because there are so many more nonnuclear components in a nuclear weapon that require testing more frequently. However, the ratio of actionable findings to distinct findings is much greater for the nuclear components. Thus, when a finding has occurred for a nuclear component, it has generally been a serious one requiring corrective action. Often these corrective actions to nuclear components have required changes to all of the weapons comprising the weapon type affected.

For the nuclear explosive package, there were approximately 110 findings on 39 weapon types requiring some remediation either to the entire build of that design or to all weapons produced after *the particular finding. In addition to rebuilds and changes in production procedures, other actions included imposing restrictions on the weapon, accepting a performance decrement, and in several cases, conducting a nuclear test to determine that the finding did not require any physical change. There have been other instances not counted as actionable where a material was chemically changing and the weapon was closely monitored to see if further action was necessary or it was an isolated case that did not require remediation.*

The commentors, in referring to the Sandia Stockpile Study, are referring to briefing materials which were made publicly available earlier in 1995 which dealt with only a portion of the nuclear weapons historical defect and aging information. As described in chapter 2 of the PEIS, the Stockpile Stewardship and Management Program has been constructed to support national security policy directions as provided to DOE by the President and the Congress. Though weapon safety and weapon reliability can be driven at times by different phenomena, they are also related in that an essential ingredient of weapon safety is predictable response in all weapon environments, including potential accidents. Each of the proposed stockpile stewardship facilities would enhance the ability to make judgments about the safety and reliability of the nuclear weapons stockpile in the absence of underground nuclear testing. Section 3.1.2 has been expanded in the Final PEIS to provide a more detailed description and justification of DOE plans relative to national security policy and the issue of weapon safety and reliability. As explained in that section, national security policy from the President and Congress requires a safe and reliable stockpile. In order for the nuclear deterrent to be credible within the current national security policy framework, it must be reliable in a militarily effective way. From a PEIS perspective, separating safety and reliability is similar to the issue discussed under stockpile size (section 3.1.2.4, Denuclearization). It would require DOE to speculate on an alternate concept of nuclear deterrence and a national security policy framework to support it.

Commentors have also suggested acceptance of lower standards of reliability as an alternative to enhanced stewardship capabilities. This PEIS explains how the assessment and certification of nuclear performance is carried out and how this differs from the more conventional statistical methods used for assessing reliability of the nonnuclear portion of the weapon. Assessment and certification of nuclear performance is a technical judgment by the weapons laboratories based on scientific theory, experimental data, and computational modeling (sections 2.3 and 2.4.1). The question is not whether to accept a lower standard of nuclear performance (less nuclear explosive yield), but whether or not there is a technical basis to confidently know how well the weapon will perform at all. Enhanced stewardship capability is focused on the technical ability to confidently judge nuclear safety and performance in the absence of nuclear testing.

Aside from being inconsistent with the national security policy, attempting to separate weapon safety and reliability, is more technically complex than it sounds. A modern nuclear weapon is highly integrated in its design for safety, reliability, and performance. It contains electrical energy sources and many explosive energy sources in addition to the main charge HE. The principal safety concern is accidental detonation of the HE causing dispersal of radioactive materials (plutonium and uranium). Modern weapons are designed and system-engineered to provide a predictable response in accident environments (e.g., fire, crush, or drop). However, because of the technical complexity of potential accident scenarios (i.e., combined environments) and the fact that complete nuclear weapons cannot be used for experimental data, assessment of the design and the effect of changes that might be occurring due to stockpile environments must rely on other sources of experimental data and complex computer modeling. Enhanced experimental capability specifically related to the weapon secondary is a nuclear performance concern. Enhanced computational capability in general, and enhanced experimental capability related to the weapon primary in particular, are both nuclear safety and performance concerns.

40.23 The commentors express support for maintaining production missions at the production sites, and for maintaining the funding required to continue these activities. Commentors urge DOE to keep production missions at production plants that have the experience and proven safety record to complete assigned tasks. Commentors state that the existing production infrastructure, personnel, and experience at production sites made moving these missions to a laboratory an unreasonable alternative. In the view of many commentors, production and R&D cultures were not compatible and merging them would jeopardize the defense of the Nation. One commentor further states that the quality and integrity of today's stockpile is the result of production people and not the laboratories. Commentors believe that there was no adequate peer review of laboratory recommendations or manufacturing capability claims. Commentors also state that design experts were not production literate, and the weapons design and manufacturing functions should remain separate. Other commentors state that the laboratories will not be able to maintain the required quantities and quality of weapons components if they are given the production missions.

Response: *Production and laboratory functions are different, but the difference is reduced as the size of the production requirements becomes smaller. The first atomic weapons were not only designed but also constructed at the weapons laboratories. The laboratories have always had the capability for small lot production principally in order to test out designers' theories. In some respects, this could be considered an advantage by increasing the synergism between the two activities.*

Data for the PEIS were developed by working groups for each stockpile management mission. These working groups consisted of experts from each of the potentially affected sites. A review of data for consistency and accuracy was performed at both the working team level and at a senior management level. The alternative of transferring the stockpile management functions that currently exist at ORR, KCP, and Pantex to the laboratories and NTS are evaluated in the PEIS because they are deemed to be reasonable alternatives. Based on the environmental, cost, and technical analyses that have been performed, the preferred alternative is to downsize the stockpile management functions at ORR, KCP, and Pantex, and not transfer them to the laboratories and NTS.

40.24 The commentors question DOE's commitment to attracting and retaining staff at laboratories and production sites. Some commentors believe that DOE was favoring the design laboratories over the production plants, while others believe that because of the reduced workloads, staff and capabilities are being lost everywhere in the weapons complex. The commentors are also concerned that funding for sites, particularly Y-12, was not adequate in maintaining their mission capabilities let alone sufficient to make necessary upgrades at the site. Other commentors contend that the proposed program reduces the production capabilities and personnel within the complex and shifts most efforts to the R&D laboratories and therefore reduces the long-term success and flexibility of the program to meet national security needs. Commentors also note that all the budget increases are slated for the laboratories, while budget cuts are slated for the production complex.

Response: *Maintenance of competency in critical nuclear weapons technologies is a significant management challenge for DOE at both the production plants and the weapon laboratories. It is for this reason that DOE has proposed actions to promote teamwork and integration of work at the plants and laboratories for unique process and material technologies. DOE plans in this regard are described in more detail in the* Stockpile Management Preferred Alternatives Report. *An important objective of this teamwork and integration program is to provide a technologically challenging program which would assist in the attraction and retention of technical personnel.*

40.25 The commentors state that the analysis and support studies for the management part of the Stockpile Stewardship and Management Program was much more complete and balanced than that for the stewardship part and urged DOE to prepare the same level of analysis for stewardship.

Response: *The PEIS analyzes the potential consequences to the environment if certain programmatic changes to the Complex are implemented. National security policies in the post-Cold War era require that all the historical capabilities of the weapons laboratories, industrial plants, and NTS be maintained. Those processes and facilities, such as stewardship R&D work, that have no potential for being changed or moved as part of this proposal are not analyzed beyond the No Action alternative. DOE is not proposing to make any changes to these existing weapons R&D activities at the three laboratories or NTS. Rather, DOE is proposing to provide enhanced experimental capabilities (NIF, CFF, and Atlas in appendix I, J, and K, respectively) to augment existing R&D activities and stockpile stewardship capabilities so that the safety and reliability of the stockpile can be maintained in the absence of underground testing. The purpose and need for the full range of laboratory capabilities contained at LANL and LLNL and for continued peer review for weapon assessment and certification are explained in chapter 2 of the PEIS.*

40.26 For stockpile management, commentors believe that the approach reveals the extent to which the PEIS is narrowly focused on a single, pre-chosen alternative. The commentors state that there is no separate analysis of the high and low cases in which the impacts of these alternatives can be compared to the base case alternative. According to the commentors it is not clear that the different stockpile cases really represent alternatives in the traditional NEPA sense at all, since they apparently will require construction of the same facilities and will have very similar impacts. The commentors also state that the three cases analyzed by DOE (post-START II, START I plus, 1,000 warheads) have minimal effect on the facilities and configurations proposed by DOE such that there is no true programmatic review.

Response: *Two of the stockpile sizes analyzed in this PEIS, a START I Treaty- and START II protocol-sized stockpile, are the only ones currently defined and directed by national security policy. The PEIS also analyzes a hypothetical 1,000 weapon stockpile for the purpose of a sensitivity analysis for manufacturing capacity decisions. The NWSM specifies the types of weapons and quantities of each weapon type by year (section 1.1). The NWSM is developed based on DOD force structure requirements necessary to maintain nuclear deterrence and comply with existing arms control treaties while pursuing further arms control reductions. The PEIS explains the complexity of this process and why DOE does not believe it reasonable to speculate with a large number of arbitrary assumptions (section 2.2). However, this does not mean DOE has failed to consider that a future national security policy framework could define a path to a smaller stockpile.*

Stockpile stewardship capabilities are currently viewed by the United States as a means to further U.S. nonproliferation objectives in seeking a zero-yield CTBT. Likewise, it would be reasonable to assume that U.S. confidence in its stewardship capabilities would remain as important, if not more important, in future arms control negotiations to further reduce its stockpile. The path to a very small (10s or 100s) or zero stockpile would require the negotiation of complex international treaties that are also likely to require intrusive verification inspections of nuclear weapons related facilities. Therefore, DOE believes it reasonable to assume that complex treaty negotiations, when coupled with complex implementation provisions, would likely stretch over several decades. On a gradual path to a very small or zero stockpile, stockpile size alone would not change the purpose and need, proposed actions, and alternatives in this PEIS as they relate to stewardship capabilities. The issues of maintaining the core competencies of the United States in nuclear weapons, and the technical problems of a smaller, aging stockpile in the absence of nuclear testing, remain the same.

This PEIS evaluates reasonable approaches to stockpile management capability and capacity that are consistent with a gradual path toward a very small or zero stockpile. At some point on this path further downsizing of existing industrial plants or the alternative of consolidating manufacturing functions at stewardship sites would become more attractive as manufacturing capacity becomes a less important consideration. However, in the near term, the preferred alternative of downsizing the existing industrial plants would still be a reasonable action because the projected downsizing investment pays back within a few years through reduced operating expense; in addition, the downsizing actions are consistent with potential future decisions regarding plant closure. In regard to the proposed action for reestablishing pit manufacturing capability, DOE does not propose to establish higher manufacturing capacities than are inherent in the reestablishment of the basic manufacturing capability of LANL, which is the preferred alternative. In developing the criteria for reasonable stockpile management alternatives, DOE was careful not to propose the introduction of significant new types of environmental hazards to any prospective site. Therefore, on a gradual path to a very small or zero stockpile, stockpile size alone would not change the purpose and need, proposed actions, and alternatives in this PEIS with regard to stockpile management capabilities and capacities.

The PEIS does not analyze stockpile size in the PEIS as traditional alternatives in the NEPA sense. Rather, the PEIS analysis is based on the national security policy considerations discussed in chapter 2 of the PEIS and is consistent with and supportive of those national security policies. The PEIS addresses plant operations to support a range of stockpile sizes consistent with recent DOD plans, as reflected in the NPR. More specifically, the PEIS addresses a base case stockpile consistent with the recently ratified START II protocol with additional data for a larger (START I) or smaller (about 1,000 weapons) stockpile. The DOE Stockpile Management Preferred Alternatives Report, *which was released to provide programmatic support to the PEIS, describes the DOE manufacturing capacity strategy in more detail. Given the uncertainties in the world, this strategy retains sufficient manufacturing capacity to support the larger START I, yet is also flexible if the stockpile is reduced below START II levels.*

It should be noted that regardless of stockpile size, a goal of the Stockpile Stewardship and Management Program, as directed by national policy, is to maintain the core competencies of the United States in nuclear weapons. Industrial capacity is only indirectly affected by projected variances in stockpile size and composition. Stockpile size must be linked with historical stockpile data to arrive at estimates of average industrial capacity needed to produce components for repair or replacement. Because this cannot be done with mathematical precision, reasonable technical judgment must be applied. The resulting forecast is a smaller industrial base (with capacities on a scale of hundreds of weapons per year versus the scale of thousands of weapons per year that was the capacity prior to the end of the Cold War).

40.27 Several commentors express opposition to the continued operation of all the major DOE weapons laboratories (LANL, LLNL, and SNL). One commentor states that it is not obvious why we need three R&D laboratories when we are not building any new weapons. Other commentors believe that LLNL is an unjustified costly duplication of LANL. In fact, some commentors referring to the Notice of Intent for the PEIS and the PEIS itself state that descriptions of LANL and LLNL are identical. In light of the duplication of effort and especially the Galvin Committee's recommendation, commentors ask how DOE justifies the continued operation of both LANL and LLNL. Another commentor states that the two laboratory option merits consideration. Other commentors are of the opinion that the national laboratories should cease all related nuclear weapons work and instead the country should divert those technical and monetary resources towards civilian uses. According to the commentors, alternate uses for the laboratories should include research into cleaner sources of energy (e.g., solar, wind, and geothermal), recycling and solving the nuclear waste problem.

Response: *On September 25, 1995, DOE was directed by the President to maintain nuclear weapons responsibilities and capabilities at the three weapons laboratories sufficient to ensure continued confidence in the safety and reliability of the nuclear weapons stockpile in the absence of underground nuclear testing. Consequently, both LANL and LLNL, as well as SNL, are required for the foreseeable future.*

Although with the end of the Cold War and changes in the world's political regimes the emphasis of the U.S. nuclear weapons program has shifted dramatically, nuclear weapons continue to be a "cornerstone" of national security policy. As long as the President and Congress maintain a defense policy based on nuclear weapons, DOE will continue to have the responsibilities for ensuring the safety and reliability of the U.S. nuclear weapon stockpile. Congress determines how funds are allotted to ensure the continued maintenance of a safe and reliable nuclear deterrent. The purpose and need for the full range of laboratory capabilities contained at LANL and LLNL and for continued peer review for weapon assessment and certification are explained in chapter 2 of the PEIS.

40.28 The commentor would like to know what plan the PEIS is based on and whether it is still the Stockpile Stewardship and Management Program plan, dated May 1995, and whether this plan has undergone significant revisions.

Response: *The PEIS is still based on the Stockpile Stewardship and Management Program plan dated May 1995. While that plan has not undergone substantive revisions, detailed planning of ongoing and future R&D activities continues to evolve (as is expected of R&D) and to be reflected in, for example, the evolution of DOE budget requests to Congress. As discussed in sections 3.3.4 and 4.11 of this PEIS, some of the new facilities described in the May 1995 plan are not yet at a state of maturity appropriate for formal proposal or analysis in this PEIS, nor can all facilities needed to fully implement the Program over time be fully identified at present.*

40.29 The commentors state that they were in favor of DOE's plan to downsize the Complex, but did not see these reductions reflected in the PEIS. Nor did the commentors understand how DOE could severely downsize the production plants but at the same time increase the laboratories' capability, capacity, and staff.

Response: *The No Action alternative assumes staffing reductions at DOE facilities over the next several years as overall (primarily weapon dismantlement) workload decreases. Further reductions in facility size and staffing are anticipated under either the "downsize in place" or relocation alternatives for stockpile management functions. Staffing reductions in the core weapons program have occurred at the laboratories in recent years as overall workload and commensurate funding have decreased. Significant staffing increases at the weapons laboratories are not anticipated with the implementation of the stockpile stewardship program. Modest increases would be associated with the introduction of pit fabrication to LANL and the construction and operation of NIF at LLNL. Personnel for new initiatives are expected to come primarily from existing laboratory staff. Employment for other programs at the laboratories (about 50 percent of total employment) is dependent on priorities and decisions outside the scope of the Stockpile Stewardship and Management Program.*

40.30 The commentors express concerns about the threat of layoffs. Commentors believe that employees at LANL were under pressure to support laboratory activities or be threatened with layoffs. The commentors state that employees at TA-55 were laid off even though the future expansion of this area was known. One commentor points out that TA-55 may be vulnerable to sabotage if the constant threat of layoffs exists.

Response: *DOE is aware of the concerns that have been raised by LANL employees whose employment was recently terminated due to overall laboratory downsizing. DOE is working with the University of California to assure fair and equitable treatment of all current and former LANL employees. Overall reductions to laboratory and plant employment, however, have been necessary as overall workload and commensurate budgets have been reduced. Significant staffing increases at the weapons laboratories are not anticipated in the future with the implementation of the stockpile stewardship program. Modest increases would be associated with the introduction of pit fabrication to LANL and the construction and operation of NIF at LLNL.*

40.31 The commentors believe that information available to the public is increasingly being taken out of the public record. A commentor cites the Operating Experience Summary Report which was recently taken offline, presumably to hide the number of troublesome incidents at TA-55. Other commentors cite the new bomb designs that were on the Internet as proof that DOE is still working on new bomb designs. One commentor requests that this Internet document be made available to the public.

Response: *DOE requires its sites to furnish a daily report to notify it of reportable occurrences in the safety and health arena. The daily report provides initial notification for internal use by DOE and the site. After any necessary investigation, DOE and the site prepare a final report which is made available to the public. The daily reports concerning LANL include incidents at TA-55, although that facility is not afforded any special treatment. At LANL, both the final occurrence reports and an online summary prepared by the laboratory are referred to as the Operating Experience Summary Report. In the past, LANL put preliminary daily occurrence notification reports on its computer network. LANL discontinued this practice because the initial reports contain preliminary information that in some cases is incomplete or inaccurate, and which is superceded by the final reports. The final occurrence reports are available to the public in many forms, including online.*

DOE withdrew its DP Home Page from the World Wide Web on March 20, 1996. This action was in response to the discovery that part of the information from the Office of Research and Inertial Fusion came from a number of sources, some of which were outdated. Much of the material in question was drawn from the Report of the Defense Programs Research and Technology Development Program for Fiscal Year 1993, *covering the period from October 1, 1992 to September 30, 1993. This report was issued by the Office of Research and Advanced Technology, a precursor office to the Office of Research and Inertial Fusion. The Office of Research and Inertial Fusion constructed its Home Page in early 1995 from the above-mentioned report with links to other activities and documents in the DP Home Page. The links were regularly updated as the DP Home Page evolved, but the text describing Office of Research and Inertial Fusion activities was not. In particular, the specific information related to the Gulf War was only current in late 1992.*

DOE has halted production of new-design weapons and is, therefore, not performing such activities. DOE is charged with maintaining the safety and reliability of existing nuclear weapons in accordance with National Security Policy. An updated DP Home Page has been prepared. DOE apologizes for the confusion caused by the outdated material.

40.32 The commentor questions if DOE considered, under the nonproliferation mantle, which facilities or sites pose the least security risk. The commentor states that security capabilities should be addressed in the infrastructure impact analysis. In fact, the commentor suggests that the number of security breaches over the last 10 years should be used as the key method to evaluate the sites' security capabilities. Commentor asks whether there are not competitions and assessments of each site's security possibilities and feels that sites that are lacking in security should not be considered for more work. The commentor adds, if LANL has a bad record like the apparent security breach that helped the Russians develop their first [nuclear] weapon, why DOE does not consider an alternative site where security is taken seriously. Another commentor questions the selection of LANL as a site for additional pit production and for DARHT's "non-destructive testing" based on reports of security deficiencies at LANL indicating a general laxness in readiness to accept a 5-fold increase in pit production. Other commentors refer to Summary section S.2.4 and the statement "much of the (experimental weapons) testing is classified and could not lead to proliferation without a breach of security," stating that this implies that adequate security classification of this component of the nuclear weapons program will somehow preclude proliferation. Commentors feel that the postulated relation between adequate classification and weapons proliferation is not so simple.

Response: *DOE maintains a rigorous safeguards and security program as appropriate at each of its installations and for each of its operations. Specific provisions for safeguards/inspections are addressed in site-specific studies. DOE expects compliance with its safeguards and security requirements at all of its sites.*

40.33 A number of commentors state that remanufacturing was a reasonable alternative that should be analyzed in the PEIS. In the view of the commentors, the justification stated in the PEIS for eliminating remanufacturing as an alternative for detailed analysis was inadequate and not supported by appropriate studies. Commentors believe that remanufacturing would be cheaper and more compatible with maintaining the capabilities of production and R&D laboratories than would the proposed stewardship program. Another commentor requests that DOE provide a cost comparison of the remanufacturing alternative as opposed to the proposed science-based approach. Remanufacturing should not be done by design engineers, according to one commentor.

Response: *The remanufacturer's point of view is reflected in this PEIS by the fact that remanufacturing to specification will be attempted when possible and when appropriate to the problem being solved. With more than a half dozen different weapon types projected to remain in the stockpile, and with each weapon type containing thousands of parts, remanufacturing will undoubtedly occur for a significant number of repair and replacement activities. However, remanufacturing is not reasonable as a distinct exclusive alternative to the ongoing stockpile stewardship program or the proposed action of enhanced experimental capability for the technical reasons discussed below. In addition, it would not be a reasonable alternative because it does not fully support national security policies that require the conduct of a science-based stockpile stewardship and maintenance of the capability to design and produce new weapons.*

Remanufacturing weapon components to their original specification, or maintaining weapons to their original design specifications, would superficially appear to be a reasonable approach to maintaining the safety and reliability of the stockpile in the absence of nuclear testing. Precise replication, however, is often not possible. Subtle changes in materials, processing, and fabrication techniques are an ever-present problem. In some cases, specialty materials and components become unavailable for com-

mercial or environmental reasons. Implicit in the remanufacturing assumption is that the design blueprint, manufacturing process, and the materials used are specified in exact detail in every way. However, there is an unwritten element of "know how" that knowledgeable and experienced personnel contribute to any complicated manufacturing process (for this reason, controlling the acquisition of "know how" is a major nuclear weapons nonproliferation objective). Materials and processes are not always specified in important ways because, at the time, they were not known to be important. The problem is illustrated by the following hypothetical example.

A material produced for a critical weld has a specification for a trace impurity; the manufacturing process consistently produced the material with a trace impurity less than the maximum allowed and the welds were satisfactory; the manufacturing process is changed for some reason, such as cost or environmental concerns; the material is now being produced with less trace impurity than before the process was changed; the material is still within specification; however, the welds are no longer satisfactory; it was unknown at the time that the higher level of the trace impurity was necessary to produce a satisfactory weld.

While remanufacturing sounds simple in principle, it is likely in fact to present complex issues of design, manufacturing process, and material variables. A simplified view of remanufacturing cannot serve as a "stand alone" manufacturing approach, let alone an alternative approach to enhanced stewardship capability. In the absence of underground nuclear testing, nuclear components (pits and secondaries) cannot be functionally tested. Stewardship capabilities provide the analytical tools (experimental and computational) to assess the significance of a problem observed during surveillance and to decide if the problem should be fixed; and if fixed, to certify that the fix will work (section 2.4.1). In the past, the decision to fix or not fix an observed problem could be made with nuclear testing (section 2.3). Stockpile stewardship strategies focus on the basic material science and the enhanced experimental and computational tools necessary to better predict age-related defects and to make sound technical judgments on nuclear safety and performance in the absence of nuclear testing.

The DARHT EIS (DOE/EIS-0228, section 2.3.2) provides an additional discussion of the limitations of a remanufacturing-to-specification approach. It discusses, as an example, the actions taken to evaluate and resolve unanticipated deterioration of HE in the now-retired W68 warhead for a submarine-launched ballistic missile. In that case it was necessary to replace the HE with a more chemically stable formulation. In addition, some other materials were no longer commercially available, requiring changes in the rebuilt weapons. Nuclear testing was ultimately used to verify that the necessary changes were acceptable. DOE does not consider it feasible to maintain all potentially obsolescent commercial sources and processes used for materials in existing weapons; aging would still occur in stored reserves of such materials.

With regard to stockpile management, remanufacturing without enhanced stewardship capability would also have notable drawbacks. DOE plans to maintain the capability to produce secondaries, and proposes to reestablish the capability to produce pits, by producing small quantities (10s) of each annually to maintain capability. This capacity should be sufficient to replace components attrited from the stockpile by surveillance testing. Remanufacturing these components, without the enhanced stewardship analytical capability to determine if and when replacement is necessary, is likely to require higher levels of production than DOE believes necessary to maintain production capability. Also, remanufacturing a nuclear component to the original specifications will not prevent age-related problems related to those specifications from recurring. Since these components use plutonium and uranium, radiation exposure to personnel and generation of radioactive waste would also be higher than necessary. If repeated remanufacturing were required, further unnecessary risks would result from additional weapon A/D operations and additional transport of nuclear components between sites.

From an environmental impact point of view, the remanufacturing concept would have greater impacts for the proposed action of reestablishing pit capability because DOE proposes to use a cleaner, less waste-generating process than was used at the Rocky Flats Plant. All other environmental impacts would not be distinguishable from those described in this PEIS because existing manufacturing processes form the Program baseline.

40.34 Several commentors feel that the document presents several misused terms and euphemisms which are intended to deceive the public. The commentor feels the following terms should be changed or decoupled so that there would be less acceptance of the proposed program:

(1) safety and reliability: the commentor feels this phrase translates into the expected blast of a nuclear weapon must be greater than 90-percent yield. The commentor feels reliable weapons are not required and that the stockpile may be maintained with existing technology. The commentor feels that greater unreliability may in fact discourage proliferation.

(2) flexibility: the commentor feels this term translates into continued development of new nuclear weapons.

(3) modification: the commentor feels this term applies to the construction of new nuclear weapons.

(4) national security: the commentor believes this euphemism destructs "true" national security which is the environment. The commentor feels that the Nation is less secure because the money proposed for stockpile stewardship and management may be used for poverty, education, and waste management.

Response: *DOE has reviewed the commentors' statements and has determined that the terms used in the PEIS are appropriate. As described in chapter 2 of the PEIS, the Stockpile Stewardship and Management Program has been constructed to support national security policy directions as provided to DOE by the President and the Congress. Though weapon safety and weapon reliability can be driven at times by different phenomena, they are also related in that an essential ingredient of weapon safety is predictable response in all weapon environments, including potential accidents. Section 3.1.2 has been expanded in the Final PEIS to provide more detailed description and justification of DOE plans relative to national security policy and the issue of weapon safety and reliability.*

40.35 A number of commentors express concern that the proposed Program would not succeed and jeopardizes the defense posture of the country. Commentors state that without underground testing, the proposed stockpile stewardship program is a gamble. A commentor also wants to know what criteria was used by the President, Congress, and DOE in determining the potential success of the program.

Response: *In the event science-based stewardship proposals could not ensure the continued safety and reliability of the nuclear weapons stockpile, the resumption of underground testing at NTS would be considered. On August 11, 1995, the President stated that if he was informed by the Secretaries of Defense and Energy that a high level of confidence in the safety or reliability of a nuclear weapons type considered critical to the nuclear deterrent could no longer be certified that he would be prepared, in consultation with Congress, to exercise our "supreme national interests" rights under the CTBT to conduct whatever testing might be required. The rationale for science based stockpile stewardship is explained in chapter 2 and supported by further discussion in chapter 3 and appendixes I, J, and K.*

40.36 The commentors express concern that DOE did not adequately justify the need for new or upgraded facilities to implement the science-based stockpile stewardship program. Some commentors suggest that rather than constructing new facilities at added expense, a passive stewardship and management plan (i.e., curatorship) should be considered. One commentor asks that DOE look at more "small-scale" techniques and facilities to determine the safety and reliability of the enduring stockpile. Another commentor believes that a non-science-based approach should be studied and analyzed in the PEIS.

Response: *DOE believes that the PEIS discusses a full range of alternatives for implementing the Stockpile Stewardship and Management Program, and that it analyzes in detail those reasonable alternatives that are capable of achieving the goals of the Program. DOE also believes that the PEIS adequately assesses the cumulative impacts of proposed new activities and existing activities at the sites where the Stockpile Stewardship and Management Program would be implemented.*

It is a well established principle under NEPA that the goals of a proposed action delineate the limits of the reasonable alternatives to that action. That is, an alternative which does not accomplish the agency's goals is not a reasonable alternative. Since its inception, one of the primary goals of the U.S. nuclear weapons program has been to ensure the safety, security, and reliability of the Nation's nuclear weapons stockpile. Numerous facilities have been built over the years at the three weapons laboratories (LANL, LLNL, and SNL) and at NTS to conduct various activities necessary to meet this goal.

As described in chapter 2 of the PEIS, recent developments in national security policy have placed new constraints on the types of activities available to achieve this goal. Specifically, the United States is committed to ceasing both the production of new-design nuclear weapons, and the underground nuclear testing of weapons (see section 2.4). DOE's challenge in developing the stewardship portion of the Stockpile Stewardship and Management Program has been to determine whether, and how, to replace, modify, or augment the existing capabilities of the laboratories and NTS so that the goal of maintaining a safe, secure, and reliable stockpile can be met, even as the enduring stockpile ages and underground testing is no longer available.

DOE has examined from a programmatic perspective various approaches to achieving this goal, and has determined that only an aggressive science-based program that relies on sophisticated simulation and computational technology would allow DOE to continue to ensure the safety, security, and reliability of the stockpile. Alternate approaches which are based on principles other than an aggressive pursuit of the knowledge necessary to predict, detect, and correct problems with the stockpile cannot achieve DOE's goals. Section 3.1.2 has been expanded to examine various other alternatives or approaches (such as maintenance, remanufacturing, and a zero-stockpile) that have been suggested, and to explain why each of them are incapable of ensuring the stockpile's safety, security, and reliability, and thus are not reasonable.

Using simulation and computational technology to better understand the characteristics of nuclear weapons has been an element of DOE's weapons program for many years. It was historically part of the Research, Development, and Testing Program, the predecessor of the proposed stewardship portion of the Stockpile Stewardship and Management Program. In determining, for the reasons noted above, that stewardship must be based on similar principles, DOE effectively eliminated the option of replacing the existing proven capabilities at the laboratories and NTS with a different, untried approach. Accordingly, the PEIS focuses on facilities that could modify or augment the existing capabilities in ways that would achieve DOE's goal. In summary, DOE and its predecessors have been "stewarding" the stockpile, utilizing science-based principles, since the dawn of the nuclear era. DOE believes that recent policy developments require an even more aggressive application of these principles to ensure the safety, security, and reliability of the stockpile.

DOE believes that the PEIS appropriately addresses the role of existing facilities in the stewardship program. They are described as part of the No Action alternative, in broad terms in section 3.1.4 and in more detail in chapter 4 and appendix A. This approach to the No Action alternative (i.e., maintaining the status quo) is consistent with guidance issued by CEQ (46 FR 180426, March 23, 1981). The environmental impacts of continuing the existing activities at each of the sites associated with the Complex are described throughout chapter 4. The cumulative effects that could result when the impacts of the proposed new facilities are added to those of existing activities are described in section 4.13. DOE believes that in this way, the PEIS adequately presents the impacts of the entire stewardship program, while focusing specifically on the proposed new facilities that require a DOE decision, and describing them in context with the existing facilities upon which DOE would continue to rely on to achieve the goal of a safe, secure, and reliable stockpile.

Because DOE intends to use the PEIS as a component in decisionmaking in 1996, only those alternatives that are ripe for decisionmaking are assessed in detail in the PEIS. Alternatives not yet reasonably foreseeable, and which have not matured so as to be ripe for decisionmaking, such as next generation facilities (see section 3.3.4), are not assessed in detail in the PEIS. Nonetheless, they are acknowledged and included to the extent practicable.

DOE does not agree with the assertions that stockpile stewardship could be achieved using passive curatorship. Based on the national security policies discussed in chapter 2, the future nuclear deterrent will be based on a smaller, steadily aging nuclear weapons stockpile. As explained in section 2.3 of the PEIS, historical data would project that there will be actionable findings that will require certified repairs or replacements to be made to the nuclear weapons stockpile. Without underground nuclear testing, which was the proof-positive means of determining whether a potential problem existed or whether a problem was corrected, confidence in the safety and reliability of nuclear weapons must be based more on judgment.

Judgment-based confidence demands more than passive curatorship. For judgment-based confidence, DOE is proposing a robust, science-based stewardship program to obtain accurate scientific and experimental data which can be correlated with past nuclear test data and used to validate computer modeling. The existing experimental tools were used in conjunction with nuclear testing and are inadequate if used alone. Passive curatorship, or other stewardship-based approaches which do not include the enhanced experimental tools that would provide the necessary data to assess and certify a stockpile without underground nuclear testing, would be inadequate and unreasonable.

40.37 The commentors state that DOE has been inconsistent in discussing the timeframe analyzed in the PEIS for stockpile stewardship and management. Related to this, a commentor states that it is not clear whether the period analyzed is for 25 years or an indefinite timeframe.

Response: *The Program purpose and need is defined in chapter 2 of the PEIS to be consistent with currently planned national security policy. That policy includes compliance with the START II protocol, whose effective date is 2003. However, further arms reduction treaties beyond START II are possible, and the PEIS discusses further stockpile reductions. However, it would be speculative to prescribe a timeframe for implementation of treaties whose negotiations have yet to begin. To bound the environmental impacts for actions proposed in the PEIS, facility design lifes were by necessity assumed. Generally those facility lifes were assumed to be 25 years.*

40.38 The commentors ask about the three-laboratory stockpile evaluation program, which DOE office would be responsible for running the Program, and how many scientists and other skilled technical workers would be needed to maintain the stockpile and/or reactivate the weapons program in the future. One commentor asks if the laboratories will be downsized with the loss of the new weapons design and testing mission.

Response: *DOE has a stockpile evaluation program (sometimes referred to as stockpile surveillance) which includes component tests and evaluations at laboratory and production facilities. The Stockpile Stewardship and Management Program includes enhanced experimental capabilities to improve the laboratory assessment capability as well as enhanced surveillance testing at laboratory and production facilities. The costs for this evaluation program are a substantial portion of the budgets of each site. Day-to-day management of this program is performed by the DOE Albuquerque Operations Office. The stockpile stewardship and management proposal does not include any alternatives that would result in downsizing of the laboratories.*

40.39 One commentor requests that DOE release the results of studies related to special nuclear materials that had been set-aside for the express purpose of studying future aging effects.

Response: *A limited number of "shelf life units," such as pit components, were typically produced to act as "control samples" for use in stockpile evaluation activities. The component actually evaluated is the one returned from the weapon that was randomly sampled from the stockpile and, therefore, experienced actual stockpile environments while deployed. The "shelf life units" have not experienced actual stockpile environments. They are sometimes useful for comparison purposes to help distinguish cause and effect for observed anomalies in stockpile units. What can be said unclassified about problems with the stockpile is summarized in chapter 2 and the referenced unclassified portion of the tri-laboratory report. To the extent possible, these results have been factored into future stockpile management plans for components containing special nuclear materials.*

40.40 The commentors question the Stockpile Stewardship and Management Program's flexibility to meet changes in stockpile size. Specifically, commentors ask what analysis was done, if any, to indicate the limiting factors for secondaries, pit production, and HE and what is the true surge capabilities for these areas, and DOE's confidence in meeting these capabilities. Regarding the capacity/capability of the Complex to respond to unanticipated needs, one commentor refers to page 8–2 of the *Analysis of Stockpile Management Alternatives* report, which states that build rates above 100 per year would adversely impact the ability of LANL to perform their surveillance and R&D missions. The commentor asks if this means that there is no way that DOE could truly support a surge.

Other commentors ask how the current Stockpile Stewardship and Management Program ensures the timely up-sizing of the nuclear weapons system should it become necessary. One commentor states that the proposed action of increasing production from a one-shift to a full-time basis using the same production equipment seems to ignore the fact that the additional training needed by capable machinists to properly and safely engage in the highly demanding efforts of weapons production is about five years. The commentor states that this is an unreasonable delay in response to an urgent threat. Another commentor suggests that the best way to accomplish a rapid scale-up of nuclear weapons production is to establish a sufficient level of comparable machine work at the production site to employ a staff adequate to go to a full scale production. The commentor states that the technical staff including machinists could then be rotated between the weapons work and the equivalent work to maintain their skills at the proper level. The commentor believes that if machine shop capabilities for prototype work were deliberately pursued it should be possible to employ a staff adequate to ensure a rapid scale-up should it become necessary.

Response: *The PEIS addresses several production capacities, each based on a specific potential stockpile level. Each production capacity assumed single shift operations; therefore, a significant sprint capacity was built into the planning assumptions. Because of the small demand for the fabri-*

cation of replacement plutonium pits over the next 10 or more years, DOE did not propose a new pit fabrication facility with a capacity equivalent to the capacities required for other portions of the nuclear weapons production complex. However, limited fabrication of new replacement pits would be required due to ongoing pit surveillance activities and to replace pits lost during weapon refurbishment. Section 3.6 discusses DOE future plans should a life-limiting phenomenon be found in stockpile pits, and a larger pit fabrication capacity be required.

40.41 The commentors refer to the cover sheet of the Draft PEIS which states that a classified appendix presents the "purpose of and need for the plutonium-242 to be stabilized at SRS for use in future weapons complex research and development activities." Some commentors question why the classified appendix was referenced, while other commentors believe that unclassified portions of the appendix should be provided as part of the Draft PEIS. One commentor further states that the note on the appendix should have been prominently presented in the body of the Draft PEIS, rather than at the end of the cover sheet. In addition, commentors believe that the role of plutonium-242 in the Program and the nonproliferation implications of separating plutonium-242 and its environmental impacts should be explicitly discussed in the context of this PEIS, even though these may be covered in facility-specific statements. Commentors express concern since plutonium-242 has been linked to serious environmental problems at SRS. One commentor states that the DARHT EIS should have addressed all plutonium isotopes, including those outside of LANL.

Response: *The need for plutonium-242 is not classified. Certain information regarding shipping, storage, and the specific use of plutonium-242 is classified. Section 4.19 discusses the use of plutonium-242 for R&D and the potential environmental impacts of transporting this material to the alternative sites. In the* Interim Management of Nuclear Materials Environmental Impact Statement *(DOE/EIS 0220) dated October 20, 1995, DOE indicated that certain quantities of plutonium-242 existed at SRS and that this material has properties which make it useful for future R&D activities. In the PEIS, DOE has indicated two alternatives for this material: to stabilize and continue to store the plutonium-242 at SRS, and to stabilize the plutonium-242 at SRS and transport this material to either LANL or LLNL. The preferred alternative is to transport the material from SRS to LANL for storage. Further details concerning the desirable properties of this material, the actual quantities, or the technical issues associated with its use are classified and are contained in a classified appendix to the PEIS.*

The commentor correctly notes that a classified supplement to the Stockpile Stewardship and Management PEIS has been prepared to support DOE decisions needed regarding future R&D use of plutonium-242 and that DOE has prepared a NEPA review of the environmental impacts from stabilizing plutonium-242 now held in solution at the SRS. DOE has left decisions for storing the material to the Stockpile Stewardship and Management Program ROD.

The actions at SRS to stabilize plutonium solutions, including solutions containing plutonium-242, are directed at addressing vulnerabilities identified in DOE's Plutonium Vulnerability Assessment (DOE/EH-0415, November 1994). Correction of these vulnerabilities has been emphasized by the Defense Nuclear Facilities Safety Board. DOE decided to convert the plutonium-242 currently in solution at SRS to oxide which will be placed in storage containers. DOE has determined that as a matter of policy it has programmatic need for this material for DP R&D activities.

The commentor asks about plutonium infrastructure outside of LANL that would be related to DOE's decision to construct and operate DARHT. As noted in the DARHT EIS, LANL was determined to be the only reasonable location for DARHT capability; in part this was due to the existing plutonium infrastructure at LANL that could support dynamic experiments with plutonium (DARHT EIS, Volume I, section 3.10.1, page 3–41). DOE did not determine that any other plutonium facilities, besides the ones at LANL, would be needed to support operation of DARHT. DOE's decision to operate DARHT is *unrelated to its decisions regarding stabilizing plutonium solutions at SRS. (See DARHT EIS. Volume II, Comment Response 17-37, page RPC-52.)*

40.42 A commentor asks what, if any, consideration has been given to safeguards/inspection provisions in these studies.

Response: *DOE requirements for the safeguarding of accountable quantities of special nuclear materials are assumed in all facility design alternatives for the PEIS. International safeguards and inspection, however, are assumed not to apply to U.S. special nuclear materials reserved for the U.S. nuclear weapons program.*

40.43 The commentors believe DOE "arrogantly" decided which alternatives are reasonable and do not agree with the justification for the No Action alternative in the summary as an unreasonable alternative. One commentor wants to know what are the reasonable alternatives to the items on the list entitled "DOE stockpile stewardship costs" and for anything that DOE does. Another commentor would like more discussion about why there is a need for improvement in the current process for a Complex that is not going to be building new weapons. One commentor further notes that DARHT is considered a fait accompli and the No Action alternative actually contains significant programmatic commitment to a next generation hydrodynamic testing facility as well as many other alternatives mentioned and unmentioned and there have been no programmatic analyses of alternatives for retaining knowledge of secondary physics—DOE proposes to build NIF and the Atlas Facility, but does not mention why this is necessary.

Response: *Reasonable alternatives are those that would accomplish the purposes and needs described in the PEIS. These reasonable alternatives are analyzed in detail in the PEIS. Other alternatives were considered in the PEIS process, but eliminated from detailed study because they were judged to be unreasonable, as described in section 3.1.2 of the PEIS. Section 3.1.4 describes why No Action is not a reasonable alternative. Chapters 2, 3 and appendixes I, J, and K explain the need for and describe enhanced experimental capability.*

DOE believes that the PEIS discusses a full range of alternatives for implementing the Stockpile Stewardship and Management Program, and that it analyzes in detail those reasonable alternatives that are capable of achieving the goals of the Program. DOE also believes that the PEIS adequately assesses the cumulative impacts of proposed new activities and existing activities at the sites where the Stockpile Stewardship and Management Program would be implemented.

It is a well established principle under NEPA that the goals of a proposed action delineate the limits of the reasonable alternatives to that action. That is, an alternative which does not accomplish the agency's goals is not a reasonable alternative. Since its inception, one of the primary goals of the U.S. nuclear weapons program has been to ensure the safety, security, and reliability of the Nation's nuclear weapons stockpile. Numerous facilities have been built over the years at the three weapons laboratories (LANL, LLNL, and SNL) and at NTS to conduct various activities necessary to meet this goal.

As described in chapter 2 of the PEIS, recent developments in national security policy have placed new constraints on the types of activities available to achieve this goal. Specifically, the United States is committed to ceasing both the production of new-design nuclear weapons, and the underground testing of weapons (see section 2.4). DOE's challenge in developing the stewardship portion of the Stockpile Stewardship and Management Program has been to determine whether, and how, to replace, modify, or augment the existing capabilities of the laboratories and NTS so that the goal of maintaining a safe, secure, and reliable stockpile can be met, even as the enduring stockpile ages and underground testing is no longer available.

DOE has examined from a programmatic perspective various approaches to achieving this goal, and has determined that only an aggressive science-based program that relies on sophisticated simulation and computational technology would allow DOE to continue to ensure the safety, security, and reliability of the stockpile. Alternate approaches which are based on principles other than an aggressive pursuit of the knowledge necessary to predict, detect, and correct problems with the stockpile cannot achieve DOE's goals. Section 3.1.2 has been expanded to examine various other alternatives or approaches (such as maintenance, remanufacturing, and a zero stockpile) that have been suggested, and to explain why each of them are incapable of ensuring the stockpile's safety, security, and reliability, and thus are not reasonable.

Using simulation and computational technology to better understand the characteristics of nuclear weapons has been an element of DOE's weapons program for many years. It was historically part of the Research, Development, and Testing Program, the predecessor of the proposed stewardship portion of the Stockpile Stewardship and Management Program. In determining, for the reasons noted above, that stewardship must be based on similar principles, DOE effectively eliminated the option of replacing the existing proven capabilities at the laboratories and NTS with a different, untried approach. Accordingly, the PEIS focuses on facilities that could modify or augment the existing capabilities in ways that would achieve DOE's goal. In summary, DOE and its predecessors have been "stewarding" the stockpile, utilizing science-based principles, since the dawn of the nuclear era. DOE believes that recent policy developments require an even more aggressive application of these principles to ensure the safety, security, and reliability of the stockpile.

DOE believes that the PEIS appropriately addresses the role of existing facilities in the stewardship program. They are described as part of the No Action alternative, in broad terms in section 3.1.4 and in more detail in chapter 4 and appendix A. This approach to the No Action alternative (i.e., maintaining the status quo) is consistent with guidance issued by the CEQ (46 FR 180426, March 23, 1981). The environmental impacts of continuing the existing activities at each of the sites associated with the Complex are described throughout chapter 4. The cumulative effects that could result when the impacts of the proposed new facilities are added to those of existing activities are described in section 4.13. DOE believes that in this way, the PEIS adequately presents the impacts of the entire stewardship program, while focusing specifically on the proposed new facilities that require a DOE decision, and describing them in context with the existing facilities upon which DOE would continue to rely to ensure a safe, secure, and reliable stockpile.

40.44 Commentors feel the Stockpile Stewardship and Management Program is a responsible and necessary program for the U.S. stockpile of nuclear weapons. One commentor states that the NPT and CTBT depend on the Stockpile Stewardship and Management Program, especially NIF. In the absence of underground nuclear testing, other commentors believe that the Stockpile Stewardship and Management Program is absolutely vital for maintaining the basics of nuclear weapons physics and keeping track on the condition of the weapon stockpile. One commentor notes that it is important for the United States to have the leading edge of nuclear weapons know-how, irrespective of the winds of day-to-day politics. Another commentor states that given the requirement for a safe and reliable stockpile, the ban on underground testing, and the shrinking size of the stockpile, downsizing the overall DOE Complex while building new facilities is reasonable. The commentor supports the new facilities proposed because they are necessary to provide missing data for computer modeling which cannot be supplied by underground nuclear testing and can validate fixes for defects discovered during surveillance and testing.

Response: *These comments are reflected in the Stockpile Stewardship and Management Progran plan.*

40.45 The commentor states that NTS has been part of any number of programs that could possibly come to the site, yet those programs end up going to LANL and LLNL and inquires about the possibility of NIF going to NTS. Another commentor thinks that table 3.3–1, section 3.3, should acknowledge the expertise at NTS in the experimental primaries and secondaries and should also recognize NTS as a potential site for the siting of large experimental facilities to do weapons simulation and effects tests.

Response: *DOE has looked at adding several missions to NTS, given that maintenance of the test site for nuclear test readiness remains a national policy requirement. To date, all proposed new missions for stockpile stewardship and management have had compelling cost and technical reasons for selecting other sites as the preferred alternative. DOE will continue to look at NTS for potential future siting of new program missions.*

The preferred site alternative for NIF is LLNL. The preferred alternative does not represent a decision, however. The ROD for NIF will be made no sooner than 30 days after the filing of the Final PEIS with the EPA. NTS is a reasonable site alternative for NIF, and could be selected in the ROD.

Table 3.3–1 is intended to show a broad view of current capabilities and alternatives considered in the PEIS. As stated in section 3.2.9, Nevada Test Site, DP activities, stockpile stewardship activities at NTS include conventional HE tests, dynamic experiments, and hydrodynamic tests. These types of tests can be used to study the physics of weapons primaries. NTS activities relating to weapons effects and the physics of weapons secondaries have historically been nuclear tests, which are considered as an future option only under the "supreme national interests" provisions of any future CTBT. Additionally, as stated in section 3.3.3, Weapons Effects, DOE is not proposing in this PEIS any new facilities or alternatives solely for the study of weapons effects, and would use existing facilities. A table has also been added to appendix section A.1 further describing major existing DP facilities and activities at these sites.

40.46 The commentor recommends a worldwide multi-national testing program at NTS where all nuclear nations may test their own nuclear devices under close supervision and control of the International Atomic Energy Agency. In the commentor's opinion NTS features all required services, support, maintenance, and insularity in place for such an international venture. Commentor feels that a single world testing site would standardize international testing while lowering the cost per user, would allow the definition of a legitimate nuclear club, and the regime could corral mavericks engaged in unannounced and covert buildup of unproved assets.

Response: *The purpose of the Stockpile Stewardship and Management Program is to ensure the safety and reliability of the U.S. stockpile. Other nations' stockpiles are beyond the scope of this PEIS.*

40.47 A commentor wants to know if the sites followed any standards when submitting numbers for the PEIS.

Response: *Cost, technical, and schedule information were provided by senior technical and management personnel from each alternative site. These data underwent peer review and independent validation. ES&H information were provided directly by subject matter experts from each site to DOE. This information also underwent significant comparability and validity reviews before the data was used in the PEIS analysis. Data for the PEIS were developed by working groups for each stockpile management mission. These working groups consisted of experts from each of the potentially affected sites. A review of data for consistency and accuracy was performed at both the working team level and at a senior management level.*

40.48 The commentor raises the concern that the Albuquerque Operations Office was censoring DOE contractor employees from participating in the public hearings.

Response: *DOE sites encourage this participation and generally recommend that the contractor employees identify their company affiliation and distinguish between personal and company positions. DOE contractor executives, however, have other avenues to provide company proposals or revise information to DOE, and DOE believes it more appropriate to receive such information by normal business channels.*

40.49 The commentor thinks that Summary section S.3.6 should list NTS as an alternative site for all of the large experimental physics machines.

Response: *NTS is listed as an alternative site for NIF. For the remaining facilities, NTS was not considered a reasonable alternative and is not listed. As discussed in section 3.3.1.2, Proposed Contained Firing Facility, and in appendix J, CFF would augment and upgrade the existing Flash X-Ray (FXR) Facility at LLNL, and therefore LLNL is the only reasonable site. Similarly, section 3.3.2.3, Proposed Atlas Facility, and appendix K state that Atlas would build on existing special equipment at LANL such as the 1,430 megavolt-ampere (MA) generator in Building 301, and therefore LANL is the only reasonable site.*

40.50 The commentors express opposition to the Stockpile Stewardship and Management Program, including NIF, stating that they are dangerous and morally wrong. Some commentors remark that it is a waste to use "human genius" in this manner since these talents may be used to solve conflicts and the growing inequality of the world. One commentor believes the United States is misinforming people by saying the United States will not be producing and testing nuclear weapons. Another commentor believes that the United States must revise its objectives and should be focusing more on educating the youths of society and finding a cure for cancer. The commentor does not believe the numbers associated with downsizing. The commentor points out that the public knows the truth from a lie, and the lie is the production and expansion of destructive weapons in the society.

Response: *DOE believes it is responsive to national legal and policy directives in the Stockpile Stewardship and Management Program.*

40.51 The commentors express the opinion that stewardship of the nuclear stockpile is a function that is best done at LANL. Stewardship is a critical component of the Nation's security and LANL can guarantee the integrity of the Nation's stockpile, according to the commentors. One commentor indicates support for consolidating a portion of the weapons production capability at LANL. Another commentor notes that LANL is developing technologies for recycling, storage, and disposal of plutonium and enriched uranium; technologies to reclaim contaminated sites and safely dispose of waste; technologies to monitor and analyze the storage of nuclear components; technologies to detect clandestine nuclear tests; and programs to transfer technology to the Soviet Union. Given the state of affairs in the world today with respect to nuclear weapons, the commentor believes that if LANL did not exist, it would have to be invented because this Nation and the world needs LANL and the technologies that it can provide.

Response: *As one of the two nuclear weapons design laboratories, LANL has been, and would remain, a key component in maintaining the safety and reliability of the Nation's nuclear weapons stockpile. However, LLNL and SNL would also remain essential participants for the foreseeable future.*

40.52 The commentors state that DOE overlooked the potential for Pantex, to perform new stewardship functions complementary to its current management functions. Some commentors want DOE to designate Pantex as the preferred alternative for all existing and new stockpile management and stewardship functions as well as consolidation of all plutonium storage and disposition and any related functions. According to the commentors, Pantex has the resources, safeguards and security, existing facilities, and proximity to LANL for technological information exchange (Atlas Facility and proposed plutonium pit fabrication site) to downsize and/or consolidate while preserving the integrity of the nuclear stockpile under increasing budgetary constraints. Utilizing facilities already in place at Pantex could eliminate costs of duplicating facilities, related transportation, environmental remediation, and start-up and training, according to the commentors. Several commentors also note that Pantex is perhaps the most cost effective alternative for any of the new construction that is contemplated. While commentors state that there is a strong history of community support, they caution that current and future functions at Pantex must be conducted in a safe and environmentally sound manner and that expansion must be implemented in a way that does not impair the health or safety of area residents or adversely affect the environment.

Response: *The rationale for the various site alternatives are discussed in chapter 2, as well as in various portions of section 3.1 of the PEIS. Pantex is considered as a reasonable site alternative for the A/D mission, strategic reserve storage, and HE fabrication. Pantex does not have an existing infrastructure for plutonium fabrication, secondary fabrication, and nonnuclear component fabrication. Consequently, Pantex was not considered as a reasonable alternative for these missions. Pantex was not considered as a reasonable site alternative for stockpile stewardship facilities as explained in section 3.1.2.1.*

Pantex has essential capabilities to support the future stockpile management program. In selecting reasonable alternatives for future stockpile stewardship and management missions, however, DOE found it to be unreasonable to address alternatives for new missions where no core capability for that new mission was present at the site. In addition, DOE sought alternatives that tended to further consolidate and streamline the infrastructure for the Program because of the overall general reductions in work to be performed. For these reasons, it was determined to be unreasonable to consider stewardship experimental capabilities and plutonium pit production at Pantex, just as it was unreasonable to consider relocation of the weapon A/D mission to sites which had no core capability or facility infrastructure to deal with nuclear explosives.

40.53 The commentors ask how the current Stockpile Stewardship and Management Program minimizes the impacts on weapons performance due to inadvertent or unavoidable changes in production methods. One commentor believes that the statement that surrogate testing will be used to keep the weapons database current is misleading. The commentor suggests that one method is to devote a new effort to document the details of the current production methods and to establish procedures which will minimize the changes in weapons performance resulting from inadvertent or unavoidable incremental changes in the weapons stockpile. Some commentors express concern that surrogate testing while useful does not ensure unpredicted changes in performance. In addition, commentors do not believe that the PEIS adequately focuses on resources devoted to surrogate testing, the stabilization and preservation of manufacturing capabilities, and the need for weapons experts to participate in the decisionmaking process.

Response: *Without underground nuclear testing as a confirmation tool, the effects of these changes could go undetected. It is for these reasons that DOE has proposed a robust stockpile stewardship program based on improving U.S. abilities to assess weapon performance absent underground nuclear testing. It is also for these reasons that DOE has proposed to further integrate the material and process technology programs at the production plants with the weapon assessment programs at the laboratories.*

40.54 The commentor feels that the overall policy direction is fatally flawed and leading completely in the wrong direction. The commentor states that the overall policy direction leads the environmental study to worry about such minutiae as one fatal cancer every 5 million years when they are concerned with the nuclear safety of the world involving real weapons of mass destruction, literally tons of plutonium, and an environmental mess.

Response: *In accordance with NEPA, the purpose of the PEIS is to assess the environmental impacts of the proposed action, the reasonable alternatives, and the No Action alternative. DOE believes that the Stockpile Stewardship and Management Program is consistent with the legal and policy framework for the current national security environment.*

40.55 The commentor states one of the fundamental flaws of the Draft PEIS is the outdatedness of all LANL environmental data and feels that referencing the *1992 LANL Environmental Surveillance Report* as "LANL 1994b" is deceptive.

Response: *The* 1992 Environmental Surveillance Report *is correctly referenced as a 1994 publication, since that is when it was published. That data represented the best available data for preparing the Draft PEIS. Data for the Final PEIS was updated to include any significant modifications or improvements.*

40.56 The commentor states that the Draft PEIS fails to describe the only programmatic alternatives actually considered, namely Stockpile Stewardship and Management and No Action alternatives, in a way that allows useful comparison. For stewardship, the only alternative to building the proposed facilities is a No Action alternative continuing operation of existing facilities with the same function. The commentor states that the Draft PEIS fails to describe the No Action alternative in a comprehensible manner. The commentor contends that the No Action description is poorly written, confusing, and does not provide information sufficient to inform the reader of the actual activities it encompasses. The commentor states that the No Action alternative does not describe currently existing operations and facilities at DOE sites—rather, it is an arbitrarily chosen set of "not stockpile stewardship and management" activities, some of them in fact part of the stockpile stewardship and management programs, which are expected to be in operation almost a decade from now. The commentor believes that the PEIS does not adequately delineate what the No Action set of facilities are at any given site. This renders it virtually useless for comparison with the already too narrow range of alternatives, according to the commentor. The commentor further argues that the deficiency of the No Action alternative alone is sufficient reason to withdraw the PEIS and republish the draft. One commentor stated that the use of a specific date for ground-breaking (i.e., September 1995) was inappropriate to define the No Action alternative.

Response: *In accordance with NEPA, the PEIS assesses the No Action alternative. The No Action alternative is described in broad terms in section 3.1.4, and in more detail in chapter 4 and appendix A of the PEIS. Under No Action, DOE would not take the actions proposed in the PEIS, but would continue with existing operations. For stockpile stewardship, this means continuing the existing activities at LANL, LLNL, SNL, and NTS related to stockpile stewardship. In order to aid the reader's understanding of the major facilities that make-up the No Action alternative for stockpile stewardship, tables have been added to the site descriptions in appendix section A.1 of the PEIS.*

During preparation of the Draft PEIS, the September 1995 planning assumption was used as one of the considerations in determining whether a new facility or upgrade would be part of No Action. However, it was not the only consideration. DOE also considered whether a particular facility was addressed in prior NEPA documentation, whether a facility met the requirements of the CEQ for an interim action, and whether a facility or a modification was the continuation of an existing mission.

The Final PEIS contains a more appropriate description of the rationale for No Action. As stated in the Final PEIS, the No Action alternative for this PEIS is defined in a way that takes into account the fact that DOE for decades has had in place a program for the stewardship and management of the nuclear weapon stockpile. Consistent with CEQ guidance, the No Action alternative consists of those facilities necessary to maintain the status quo in terms of DOE's current program direction. These consist primarily of existing facilities where DOE conducts weapons activities, including modifications to those facilities necessary to maintain their current mission capabilities. However, the No Action alternative also includes a small number of minor new facilities that will also be needed simply to maintain current mission capabilities at individual sites. Finally, the No Action alternative includes two major new facilities which are proceeding independent of this PEIS, and for which DOE has prepared separate EISs under the interim action provisions of the CEQ regulations. These EISs are the PEIS for Tritium Supply and Recycling (DOE/EIS-0161) and the DARHT EIS (DOE/EIS-0228).

40.57 The commentor wants to know what evacuations plans have been developed in the event of a nuclear accident or catastrophic fire at LANL. Because of the limited egress in and out of the Los Alamos region, the lack of well thought out and publicized evacuation plans can have grave consequences.

Response: *LANL and Los Alamos County have developed emergency management programs to govern evacuations. Los Alamos County is responsible for evacuation of county land (including county communities), and, with LANL's input, has prepared the draft* Los Alamos County All Hazards Plan *which is required by the State of New Mexico. The draft plan has been submitted to the State of New Mexico for review and approval is pending.*

The laboratory has implemented two notification systems to alert LANL and county occupants of emergencies:

Community Alert Network. This system includes all of Los Alamos County and is capable of notifying all occupants by telephone, cable TV subcaption, and radio stations in the event of an emergency.

Site-Wide Area Notification. This system has special two-way radios located in LANL facilities and is capable of site specific or LANL-wide notification in the event of an emergency.

40.58 The commentor states that the Stockpile Stewardship and Management Program is not described in a manner which would allow for meaningful comparison with other true program alternatives. The commentor states that major parts of the Program, including facilities and actions which are incomplete or have not been started, have been eliminated from consideration, including for example, DARHT and tritium production facility options. DOE has initiated or completed hundreds of millions of dollars worth of new facilities and facilities upgrades throughout the Complex, apparently implementing portions of the Program which the reconfiguration PEIS was supposed to review and the commentor contends that this refurbishment of the Complex in the absence of programmatic review has substantially narrowed the range of options which DOE conceives as feasible. The commentor believes that the public would have been far better served by using this PEIS for a comprehensive look at the environmental impacts of the full Stockpile Stewardship and Management Program, the Complex of the future as envisioned by DOE, in comparison with other programmatic options (denuclearization, remanufacture, and such) for managing the nuclear arsenal (which citizen groups have been demanding for 5 years). Instead, the commentor states that the end result of 5 years of reconfiguration is the presentation to the public of a fait accompli, with the fundamental policy decisions already made and major program components (e.g., DARHT) already underway.

Response: *The scope of the PEIS is reflective of the national policy considerations described in chapter 2 of the PEIS. The proposed actions and alternatives analyzed are consistent with and sup-*

portive of these national policy considerations. The PEIS includes all actions that are within the scope of the Stockpile Stewardship and Management Program. See also the response to comment summary 40.85. Two actions, which DOE has evaluated in separate EISs in accordance with CEQ regulations for interim actions (40 CFR 1506.1), are within the scope of the Stockpile Stewardship and Management PEIS. These are the Tritium Supply and Recycling PEIS and DARHT Facility EIS. These two actions, and their relationship to the Stockpile Stewardship and Management PEIS, are described in section 1.6 of the PEIS. See also the response to comment summary 41.18, which discusses why other new facilities or facility upgrades are not included in the PEIS as action alternatives.

40.59 The commentor asks if DOE has integrated the PEIS with the DOD mission.

Response: *A detailed discussion of the planning basis for the PEIS, vis-a-vis DOD mission, is described in chapter 2 of the PEIS. Major policy documents for the PEIS included the NPR, which was approved by the Secretary of Defense and the President, and the annual NWSM, which was jointly prepared with DOD and approved by the Secretaries of Defense and Energy. These policy documents provided assurance that PEIS requirements and assumptions were consistent with DOD missions.*

40.60 The commentors believe that the Draft PEIS does not analyze a range of reasonable programmatic alternatives to meet the goal of maintaining the stockpile safely in accordance with treaty obligations. The commentors contend that the analysis in the Draft PEIS suggests that the debate over stockpile stewardship and management is over and that the program alternative has already been determined. According to the commentors, these are fundamental problems which prevent meaningful participation by the public and obfuscate informed analysis by decisionmakers. The commentors believe that DOE should withdraw the Draft PEIS and prepare a revised Draft PEIS, while all programmatic decisions and activities are put on hold. The revised Draft PEIS should analyze "maintenance," "remanufacturing," interim stockpile sizes, and a "zero" stockpile case—both with and without the capability to reconstitute the arsenal—which is based upon a scenario of global reduction and elimination of nuclear weapons in compliance with Article VI of the NPT over time periods ranging from 15 years to the projected lifetime of the proposed facilities (on the order of 40 years).

The commentors believe that the PEIS should include alternatives examining the impacts of a policy course of reduction of nuclear weapons, ultimately resulting in their elimination pursuant to U.S. obligations under Article VI of the NPT. The commentors state that the PEIS should analyze the environmental impacts for a stockpile size of less than 1,000 weapons. Several commentors, noting the NPT calls for a move toward disarmament, believe that the 0 to 100 stockpile size is a reasonably foreseeable situation and should be analyzed. Other commentors argue that a zero-level stockpile should be considered because it would satisfy nonproliferation obligations and there is overwhelming public support for such an idea. One commentor questions the rationale for the stockpile sizes assessed in the PEIS. More specifically, the commentor implies that the lower case 1,000 weapons stockpile is not well supported. Another commentor disagrees with DOE's assertion that "stockpile management capabilities are independent of stockpile size."

In one commentor's opinion, the combination of an extremely one-sided analysis of potential effects on the weapons nonproliferation climate, the elimination from detailed analysis of all substantive program alternatives to the proposed action, and technical analysis which conclude that a large complex can be rebuilt and operated with few impacts at facilities with still unsolved waste and contamination problems, leaves little doubt that the purpose of this Draft PEIS is "to justify decisions already made" (40 CFR 1502.5).

Response: *DOE believes that the PEIS discusses a full range of alternatives for implementing the Stockpile Stewardship and Management Program, and that it analyzes in detail those reasonable* *alternatives that are capable of achieving the goals of the Program while still fully complying with the treaty and national security policy constraints established independently from the Stockpile Stewardship and Management Program. DOE also believes that the PEIS adequately assesses the cumulative impacts of proposed activities and existing activities at the sites where the Stockpile Stewardship and Management Program would be implemented.*

It is a well-established principle under NEPA that the goals of a proposed action delineate the limits of the reasonable alternatives to that action. That is, an alternative which does not accomplish the agency's goals is not a reasonable alternative. Since its inception, one of the primary goals of the U.S. nuclear weapons program has been to ensure the safety, security, and reliability of the Nation's nuclear weapons stockpile. Numerous facilities have been built over the years at the three weapons laboratories (LANL, LLNL, and SNL) and at NTS to conduct various activities necessary to meet this goal.

As described in chapter 2 of the PEIS, recent developments in national security policy have placed new constraints on the types of activities available to achieve this goal. Specifically, the United States is not producing new-design nuclear weapons or conducting underground nuclear testing (see section 2.4). DOE's challenge in developing the stewardship portion of the Stockpile Stewardship and Management Program has been to determine whether, and how, to replace, modify, or augment the existing capabilities of the laboratories and NTS so that the goal of maintaining a safe and reliable stockpile can be met, even as the enduring stockpile ages and underground testing is no longer available.

DOE has examined from a programmatic perspective various approaches to achieving this goal, and has determined that only an aggressive science-based program that relies on sophisticated simulation and computational technology would allow DOE to continue to ensure the safety and reliability of the stockpile. Alternate approaches which are based on principles other than an aggressive pursuit of the knowledge necessary to predict, detect, and correct problems with the stockpile cannot achieve DOE's goals. Section 3.1.2 has been expanded to examine various other alternatives or approaches (such as maintenance, remanufacturing, and a zero stockpile) that have been suggested, and to explain why each of them are incapable of ensuring the stockpile's safety and reliability, and thus are not reasonable.

Since the end of the Cold War, the United States has significantly reduced the size of its nuclear weapons stockpile and the DOE has dismantled more than 8,000 nuclear weapons. At the present time, the United States is further downsizing the nuclear weapons stockpile consistent with the terms of the START I Treaty, and DOE is continuing dismantlement. The United States has recently ratified the START II Treaty and is hopeful that Russia will likewise ratify this treaty. DOE acknowledges that further multilateral negotiated reductions in the United States nuclear weapons stockpile could occur. However, as discussed below, the negotiations required for such reductions are likely to stretch well into the next century. Therefore, DOE believes the three stockpile sizes utilized for the analysis in the Stockpile Stewardship and Management PEIS fully account for future requirements while still being consistent with and fully supportive of the goals of Article VI of the NPT.

Two of the three stockpile sizes analyzed in this PEIS, a START I Treaty- and START II protocol-sized stockpile, are the only ones currently defined and directed by national security policy. The NWSM specifies the types of weapons and quantities of each weapon type by year (section 1.1). The NWSM is developed based on DOD force structure requirements necessary to maintain nuclear deterrence and comply with existing arms control treaties while pursuing further arms control reduc-

reductions. Chapter 2 of the PEIS explains the complexity of this process. DOE does not believe it reasonable to speculate with a large number of arbitrary assumptions (section 2.2), and has selected a range of stockpile sizes appropriate for the analysis and consistent with relevant policy documents. The "low case" 1,000 weapon stockpile represents a hypothetical case used for the purpose of a sensitivity analysis on manufacturing capacity decisions. No specific DOE force structure projection corresponds to the low case assumed stockpile. However, stockpile sizes in this range have been proposed by others (see for example Foreign Affairs, Spring 1993).

Stockpile stewardship capabilities are currently viewed by the United States as a means to further U.S. nonproliferation objectives in seeking a zero-yield CTBT. Likewise, it would be reasonable to assume that U.S. confidence in its stewardship capabilities would remain as important, if not more important, in future arms control negotiations to further reduce its stockpile. The path to a very small (10s or 100s) or zero stockpile would require the negotiation of complex international treaties that are also likely to require intrusive verification inspections of nuclear weapons-related facilities. Therefore, DOE believes it reasonable to assume that complex treaty negotiations, when coupled with complex implementation provisions, would likely stretch over several decades. On a gradual path to a very small or zero stockpile, stockpile size alone would not change the purpose and need, proposed actions, and alternatives in this PEIS as they relate to stewardship capabilities. The issues of maintaining the core competencies of the United States in nuclear weapons, and the technical problems of a smaller aging stockpile in the absence of nuclear testing, remain the same.

This PEIS evaluates reasonable approaches to stockpile management capability and capacity that is consistent with a gradual path toward a very small or zero stockpile. At some point on this path, further downsizing of existing industrial plants or the alternative of consolidating manufacturing functions at stewardship sites would become more attractive as manufacturing capacity becomes a less important consideration. However, in the near term, the preferred alternative of downsizing the existing industrial plant would still be a reasonable action because the projected downsizing investment pays back within a few years through reduced operating expense; in addition, the downsizing actions are consistent with potential future decisions regarding plant closures. In regard to the proposed action for reestablishing pit manufacturing capability, DOE does not propose to establish higher manufacturing capacities than are inherent in the reestablishment of the basic manufacturing capability of LANL, which is the preferred alternative. In developing the criteria for reasonable stockpile management alternatives, DOE was careful not to propose the introduction of significant new types of environmental hazards to any prospective site. Therefore, on a gradual path to a very small or zero stockpile, stockpile size alone would not change the purpose and need, proposed actions, and alternatives in this PEIS with regard to stockpile management capabilities and capacities.

In conclusion, as a result of the START I Treaty, START II protocol, and the NPR, the Nation's nuclear weapons stockpile is being significantly reduced. However, even in the post-Cold War period, international dangers remain, and nuclear deterrence will continue to be a cornerstone of U.S. national security policy for the foreseeable future. Thus, DOE'S responsibilities for ensuring the safety and reliability of the U.S. nuclear weapons stockpile will also continue.

Regarding the comment that DOE should prepare a revised Draft PEIS, DOE believes that the Draft PEIS was adequate. The Draft PEIS assessed the direct, indirect, and cumulative environmental impacts of the reasonable alternatives for the proposed action and the No Action alternative. In response to public comments on the Draft PEIS, DOE has made changes to the Draft PEIS as described in section 1.8 of the Final PEIS. Additionally, DOE has prepared this Comment Response Document which describes the comments received on the Draft PEIS and DOE's responses to those comments.

40.61 The commentor suggests that DOE provide a definition of hazardous chemicals in the glossary or possibly use the term "hazardous substances."

Response: *A definition of hazardous chemicals has been added to the glossary.*

40.62 The commentor states that the most egregious deficiency of the PEIS is the total failure to include current Congressional legislation (*National Defense Authorization Act for Fiscal Year 1996*, Title XXXI, particularly sections 3137 and 3153) and associated national security policy guidance. The conclusions of the House and Senate markups for fiscal year 1997 must also be considered. The PEIS must be redone based on the full range of national security policies both Congressional and Presidential, according to the commentors.

Response: *Chapter 2 of the PEIS discusses the major national security policy considerations that are most relevant to the PEIS analysis. Included in that discussion are PDDs, Congressional legislation, DOD NPR, the NWSM, and four related treaties. While that list of national security policy considerations is not meant to be exhaustive, it does represent, in DOE's view, the most significant national security policy overlays that define the Stockpile Stewardship and Management Program conditions for the reasonably foreseeable future. Based on our understanding, the Draft PEIS analysis is consistent with the current Congressional legislation (*National Defense Authorization Act for Fiscal Year 1996, *Title XXXI). The Final PEIS analysis takes into account, as appropriate, any other relevant 1997 legislation.*

40.63 The commentor refers to section 3.3.4.2 and asks what are the "prohibitively expensive alternative approaches" to the High Explosives Pulsed-Power Facility (HEPPF).

Response: *HE pulsed-power generators are used to explore higher energy (higher current) frontiers than may be available in existing fixed capacitor-bank facilities without a major capital investment, albeit at a low data rate, while capacitor banks provide repeatable (and indoor) experimental facilities with high data rate for broad experimental use (section 4.11). Given our present understanding, at very high energies far beyond projected Atlas capabilities, a capacitor bank facility would likely be far more expensive than a HEPPF firing site capable of supporting the amount of HE necessary for (less-frequent) HE generator experiments that could provide comparable energy. Conversely, appendix K discusses why reliance on HE generator experiments is not a reasonable alternative to Atlas. The explanation of HEPPF and HE pulsed power has been expanded in sections 3.3.4.2 and 4.11 and the statement referenced by the commentor has been removed.*

40.64 The commentor refers to section 3.5 and states, after all the concern expressed about subtle changes in materials and processes, emerging technologies propose continuing work in areas which represent significant changes in processes and materials. The commentor asks if the intent to protect technical capability is to have technologies available in case of a resumption of testing or a breakthrough in experimental technology, or whether there is an expectation that DOE can just go ahead and use them regardless of our previous protestations.

Response: *Emerging technologies are discussed in section 3.5 to indicate to the public that DOE is continuing to assess its manufacturing process technologies with an objective of reducing waste generation and operating hazards. Use of some of these technologies would be straightforward relative to weapon physics concerns because they can be fully assessed in the absence of underground nuclear testing. Incorporation of some of these technologies, however, would only be done after significant assessment and experimentation by weapon physicists to assure they can be incorporated without adversely affecting weapon safety or performance.*

40.65 The commentor refers to section 2.3.4, and the different materials that are referred to in this section, whose aging characteristics are not well understood. The commentors question whether these materials could not be replaced without compromising the military objectives of the stockpile.

Response: *Without continued development of science-based stockpile stewardship, some of the "different materials" referred to in this section could not be confidently replaced with other materials.*

40.66 The commentor expresses the opinion that Pantex should be the preferred site for future Complex missions.

Response: *One important strategy of the Stockpile Stewardship and Management Program is to maximize the use of existing infrastructure and facilities as we transition to a smaller and more efficient Complex in the 21st century. Consequently, only those sites with an existing infrastructure or facilities capable of supporting a given stockpile stewardship or stockpile management mission are considered reasonable site alternatives. Sites without a technical infrastructure or facilities for a given mission would require significant new construction that would be costly and would create excessive technical risk compared to sites with existing missions. Pantex is only being considered for weapons A/D, HE fabrication, and storage of nuclear materials.*

With regard to stockpile stewardship, the majority of the Nation's core competencies in nuclear weapons, as well as the facilities used for stockpile stewardship, reside at the weapons laboratories and NTS. The President has determined that the continued vitality of all three DOE weapons laboratories and NTS remains essential to meet the requirements of stockpile stewardship as the United States enters into a CTBT regime. Accordingly, to locate stewardship activities at sites without the knowledge base and infrastructure would be counterproductive to the development of science-based stockpile stewardship. Further, two of the proposed stockpile stewardship facilities, the Atlas Facility and CFF utilize existing facility infrastructure at LANL and LLNL, respectively.

40.67 Commentors would like DOE to reconcile a declining budget at Pantex with an increasing workload. The commentors state that the fiscal year 1997 budget as proposed will lead to a reduction in force at Pantex. One commentor, noting that the Stockpile Management Preferred Alternatives Report reveals that Pantex, but not Y-12 or KCP, will undergo this decrease in budget, asks why Pantex is suffering budget cuts if the workload is constant and the other production facilities are not suffering budget cuts.

Response: *It is not possible to compare year-to-year budget changes for different weapon production facilities because each has unique missions and workloads influenced by different factors. The final fiscal year 1997 budgets for all weapons complex sites have not yet been determined. However, the budget for each site would be based on the workload to be performed by that site in fiscal year 1997.*

40.68 The commentor states that the enduring stockpile was built from the late 1970s to the early 1990s, approximately a 12-year period. Assuming the stockpile has 8,400 weapons in it and that the life of a weapon is about 30 years, in 2008, we would have to replace the stockpile at a rate of 700 units per year. DOE is sizing the Complex to handle about 300 units per year. The commentor would like DOE to explain this disconnection and what it proposes to do about it.

Response: *The commentor postulates a disconnection between future workload and planned production capacity that DOE does not believe exists. Sections 2.2.2 and 3.1.1.1 describe the rationale for the production capacities assessed in the PEIS. More detailed information is available in the* Analysis of Stockpile Management Alternatives *report that supports the PEIS. Although DOE proposes to downsize its weapon production capacities, it has the option in the future to run multiple-shift opera-*

tions or reactivate facilities (with appropriate environmental review and documentation) should unforeseen events dictate larger operating capacities.

40.69 The commentors state that they have no confidence in DOE due to a past history of lies and deceptions in the nuclear program. One commentor states that DOE should address the deceptions in the nuclear program. Another commentor believes that a war crime tribunal should be established to review past mistakes of DOE in order to charge them with first degree murder and hang them.

Response: *DOE believes that the PEIS provides a full and fair evaluation of all reasonable alternatives. Other issues addressed by the commentor are beyond the scope of the PEIS.*

40.70 The commentor believes the stated rationale that the proposed Stockpile Stewardship and Management Program is needed to maintain stockpile safety and reliability does not square with available data. The commentor states that without DOE's rationale for the Stockpile Stewardship and Management Program, it would be difficult for DOE to justify operating current facilities, much less build new ones, since official policy now proclaims that no new weapons will be produced. The commentor references that Sandia Stockpile Life Study which found that with surveillance and repair, U.S. nuclear weapons retain high safety and reliability. Further, defects caused by aging are rare and have not increased over time and the stockpile is not now reaching an advanced age due to scheduled retirements under arms reduction agreements. The commentor opines that weapons are becoming safer as older weapons types are retired. According to the commentor, the study adds weight to previous studies and expert opinion showing that the safety and reliability of the U.S. nuclear weapons stockpile can be maintained under a comprehensive nuclear testing ban. Once corrected for additional weapons systems, the commentors believe that the *1995 Stockpile Surveillance: Past and Future* report essentially validates the 1993 Stockpile Life Study. The commentor states that key implication of the stockpile study—the U.S. arsenal is highly reliable, underground testing has rarely been used to confirm the reliability of stockpiled weapons, and future defects can be fixed with existing surveillance programs and facilities—are highly relevant to the proposed Stockpile Stewardship and Management Program.

Response: *The underlying rationale for the Stockpile Stewardship and Management Program is the need to ensure the continued viability of this Nation's nuclear deterrence. The commentor references the Sandia Stockpile Life Study, for which a set of viewgraphs for a status briefing were prepared by SNL in 1993. However, the data used to develop the interim study arose from a database which was recognized to be incomplete and inadequate in that much data, particularly that relating to problems found through methods outside the DOE's formal Stockpile Evaluation Program, were incompletely or inconsistently documented. In particular, findings and "actionable" findings associated with the nuclear package (including the weapons primary and secondary) were not completely documented. DOE understands that Sandia never completed a stand-alone stockpile life study. Instead, at the request of DOE, the three weapons laboratories (LANL, LLNL, and SNL) subsequently conducted a joint study,* Stockpile Surveillance: Past and Future *(Johnson et al., 1995), which has updated Sandia's preliminary data to provide a more accurate look at the condition of the stockpile. This study was made publicly available in 1995 and was discussed in the PEIS. Sandia's preliminary findings were reassessed, corrected, and incorporated into the tri-laboratory study. DOE does not agree that Sandia's preliminary study "undercuts" the Stockpile Stewardship and Management Program, as suggested by commentor; rather, this preliminary study examined some of the types of problems with the enduring stockpile that led to the development of the Stockpile Stewardship and Management Program.*

40.71 The commentor asks what the environmental, social, cultural, and spiritual impacts, of having stockpile stewardship including DARHT, on all the communities near Los Alamos, the people, the air, the flora, the fauna, aquifers, livestock, agriculture, rivers, streams, businesses, and tourism of the states of Arizona, Colorado, New Mexico, Texas, and Utah and on the Nation.

Response: *The PEIS has been prepared in accordance with NEPA and applicable regulations and evaluates direct, indirect, and cumulative environmental impacts. Regarding LANL, the impacts of stockpile stewardship alternatives are discussed in chapter 4 of the PEIS in sections 4.6, 4.7, 4.8, and 4.9. In addition, project- and site-specific analysis is presented in appendix I for NIF, appendix J for CFF, and appendix K for Atlas.*

40.72 The commentors express opposition to all current and future nuclear weapons work at LANL including work associated with the Stockpile Stewardship and Management Program. Another commentor questions the selection of LANL based on allegations of sexual harassment at Albuquerque and pornographic Internet "play" at Sandia.

Response: *LANL and SNL have been selected as reasonable sites for some alternatives because of existing missions and infrastructure. Personnel actions such as those mentioned at these sites are outside the scope of the PEIS.*

40.73 Commentors believe Pantex is the wrong place for plutonium storage. Another commentor believes DOE has decided that long-term storage in Zone 4 is unsafe. One commentor states that he does not want Pantex to become the next Rocky Flats where the only jobs are for nuclear waste handlers and regulators. Another commentor believes plutonium is too dangerous to transport.

Response: *Pantex currently stores plutonium and is a candidate for long-term storage. DOE did not propose to introduce plutonium missions to any locations which did not already have some plutonium capabilities. The storage of plutonium, if selected, would be performed in accordance with applicable environmental regulations. Decisions on long-term storage of plutonium will be made in the ROD for the Storage and Disposition PEIS. DOE has not decided that long-term storage in Zone 4 is unsafe. The downsizing of the A/D mission at Pantex would result in the availability of facilities in Zone 12 which would no longer be needed to support the reduced workload requirements for A/D operations and could be used for storage. DOE has added a more thorough discussion of smaller stockpile sizes in section 3.1.2.*

40.74 Some commentors believe the PEIS should include the new mission of recertifying dispositioned HEU and plutonium in section 2.4, Purpose and Need, and section 3.2, Stockpile Management. One commentor cites section 3.5.4 and questions why explosive materials are disposed of, but plutonium and HEU are dispositioned. The commentor asks if a pit and plutonium/HEU residue are classified, and thus dispositioned, why would HE that is classified be disposed of. Commentor also asks why is classified HE potentially part of "alternative disposal technologies" and not "alternative disposition technologies." Another commentor asks if section 2.4.2, Industrial Base, should include a mission for recertifying non-fissile materials placed into storage and disposition. Another commentor asks what is excess explosive materials and what is the difference between that and surplused plutonium and HEU.

Response: *Disposition of surplus HEU and plutonium is addressed by DOE in the Storage and Disposition PEIS. HE is considered differently than HEU and plutonium because they can be sanitized (their shape declassified) and disposed as hazardous wastes, and because subsequent to sanitization they are not a concern relative to nuclear weapons proliferation. Whether excess materials are "disposed" or "dispositioned" does not relate to their classification, but to whether they are controlled materials relative to nuclear weapons proliferation.*

40.75 The commentors refer to appendix section A.3.1, and based on the estimate of 200 weapon parts per weapon, asks the following questions: how many parts are backlogged waiting for sanitization and demilitarization; if a backlog exists, what are the impacts of downsizing, relocating, and no action, on this backlog; who is responsible for sanitization and demilitarization; why isn't this discussed in infrastructure; why aren't the impacts assessed; and what is the through-put capacity of sanitization and demilitarization for each of the 200 estimated parts; are these processes readily available at other sites; and has DOE considered the nonproliferation capability in selecting alternatives.

Response: *DOE routinely deals with sanitization and demilitarization of components and materials from dismantled weapons at Pantex. Some materials and components are demilitarized and sanitized by Pantex, while others are returned to the manufacturer of the materials or components. This activity has been ongoing at a high level since the end of the Cold War. It will subside to a relatively low level in about 3 years after the large dismantlement workload is completed. All of these demilitarization and sanitization activities occur in existing production facilities, and for the PEIS are considered a part of the ongoing No Action alternative. Though this workload is not facility intensive, alternative locations for the stockpile management missions included facilities to deal with this workload.*

40.76 The commentors believe SRS should receive a major role in the programs as determined in the ROD because it has the people, facilities, security, infrastructure, experience, and support from adjacent communities that will assist DOE in accomplishing the desired missions without adversely affecting the environment and saving taxpayers millions of dollars.

Response: *SRS has been and would remain a key component in maintaining the safety and reliability of the Nation's nuclear weapons stockpile. The* Stockpile Management Preferred Alternatives Report *provides information on the cost of the pit fabrication mission at SRS and LANL.*

40.77 The commentor states that it is impossible to reduce the risk from nuclear weapons accidents to zero; however, and in particular, there will always remain some risk that plutonium will be dispersed by fire or explosion. The commentor believes the simplest and best ways to further minimize this possibility are operational and deployment changes that reduce the chances of an accident and risk to the public and further retirements which lead to a smaller arsenal.

Response: *DOE is committed to minimizing risks to the greatest extent possible consistent with national security requirements.*

40.78 The commentor states that the citizens of Los Alamos are entitled to know the current environmental conditions of LANL before deciding whether the University of California has been good steward of existing hazardous materials. Another commentor believes there is serious mismanagement of the laboratory by the current contractor resulting in continuing non-compliance with environmental laws and NEPA violations.

Response: *DOE is committed to fully complying with all applicable environmental statues, regulatory requirements, and Executive and internal orders. All DOE facilities comply with* the Emergency Planning and Community Right to Know Act *(42 USC § 11001), which requires facilities to report the release of extremely hazardous substances and other specified chemicals; to provide material safety data sheets; and to provide estimates of the amounts of hazardous chemicals onsite. The conditions at LANL are described in section 4.6.2 of the PEIS.*

In general, contracting is not subject to NEPA review (see 10 CFR 1021, subpart D, appendix A, except regarding procurements for developing new or emerging technology).

Although the commentor correctly points out that operations at LANL have occasionally been found to be out of compliance with various environmental laws, DOE and LANL management have made good faith efforts to bring laboratory facilities into compliance in a timely manner. DOE expects its management and operating contractors to operate its facilities in compliance with all Federal, state, and local laws, and the University of California, as management and operating contractor for LANL, has pledged to do so. DOE's confidence in the University of California is reflected in DOE's recent decision to extend the University's management and operating contract for LANL, LLNL, and Lawrence Berkeley Laboratory for another 5 years.

The commentor makes a number of allegations, most of which are unrelated to the University's management of the laboratory. While the courts found that an EIS should be prepared for the DARHT facility, DOE is unaware of any other NEPA violations, although DOE's Tiger Team recommended in 1991 that a site-wide EIS be prepared for LANL; regardless, the NEPA process is conducted by DOE, not the University of California. DOE is unaware of any refusal on the part of the university regents to meet with the citizens or legislators of New Mexico, subject to their schedule constraints, and the regents have held several public meetings in New Mexico on the subject of LANL operations. The laboratory conducted both a voluntary separation program and a reduction in force in 1995 to streamline its operations; these were conducted within the University of California personnel procedures as they apply to LANL and with the support and approval of both the University of California and DOE. Statistics compiled by LANL do not indicate that these actions disproportionately affected minorities or ES&H Division personnel. This matter is the subject of current litigation. DOE supports the LANL practice of debating opposing scientific theories in an atmosphere of academic freedom, and does not agree that the integrity of either the laboratory's environmental or scientific programs are under question.

40.79 The commentor believes that the PEIS does not make a realistic distinction between strategic and surplus plutonium. The commentor believes that the effort to maintain two-thirds of the plutonium in the United States is evidence that the country is not serious about disarmament and also gives rise to the suspicion that some effort is being made towards using plutonium for commerce.

Response: *The distinction between strategic and surplus is made in the NWSM, which is classified. The excess is addressed in the Storage and Disposition PEIS, which describes how much is excess and is evaluating alternatives for future disposition.*

40.80 The commentor asks where fabrication of enriched uranium primaries will be assigned.

Response: *Some nuclear weapon pits contain components fabricated from HEU. These parts require the identical equipment and fabrication processes used for the manufacture of secondary HEU parts. They have traditionally been fabricated at Y-12 and shipped to the plutonium pit fabrication facility for incorporation into the weapon pit. As such, fabrication of these parts was included as a portion of the secondary and case production mission in the PEIS.*

40.81 One commentor requests that economy and safety be the first considerations in Stockpile Stewardship and Management Program. The commentor also expresses concern about the cost of cleanup in the event of a catastrophe. Another commentor does not want decisions concerning the location of operations and activities to fall into the "not in my back yard" syndrome. The commentor believes impacts should be minimized to all workers, families, and communities; and to the environment.

Response: *Safety is a paramount consideration of the Stockpile Stewardship and Management Program. DOE is committed to operating all facilities as safely and cost effectively as possible and in compliance with all applicable regulations.*

40.82 The commentor asks, relative to section 3.2.2, what ORR DP assignments are not performed by Y-12.

Response: *Some central site functions, such as facility engineering and computer operations, exist at ORR and support Y-12 as well as other ORR programs.*

40.83 The commentors request an explanation from DOE on why LANL and LLNL stockpile management budgets show projected increases from 1996 to 2004 since the United States has terminated the development of new nuclear weapons. Commentors reference the *Stockpile Management Preferred Alternatives Report,* pages 26 and 30. One commentor asks if these projected increases are based on transferring of missions from the production plants.

Response: *The LANL and LLNL stockpile management budgets are projected to grow in the next few years if the preferred alternative is implemented. At LLNL, the total present stockpile management budget is relatively small and its growth is small when compared to the total site budget. At LANL, the budget growth would be primarily associated with the preferred alternative assignment of the plutonium pit manufacturing mission.*

40.84 A commentor found the Draft PEIS unclear with respect to the intended aims and plans that are being proposed for the Panhandle area. Other commentors reiterated the community's adamant position that all work performed at Pantex continue to be done in a fashion that protects the environment including national resources such as the Ogallala aquifer and agricultural land.

Response: *Pantex was considered a reasonable alternative site for the weapons A/D mission and the HE fabrication mission. The weapons A/D mission is described in section 3.4.1, and includes provisions for nonintrusive modification pit reuse and strategic storage of plutonium and uranium in the form of pits and secondaries. Secondaries would not be stored at Pantex if Y-12 retains the secondary and case fabrication mission. Additionally, storage of all or a portion of the strategic reserve could be at another site, depending on DOE decisions regarding the Storage and Disposition PEIS. The HE fabrication mission is described in section 3.4.5, and includes HE procurement, formulation, component fabrication, characterization, surveillance, disposal, and storage. Analysis of the water and land-use impacts associated with each Pantex alternative were included in the Draft PEIS. Selection of the preferred alternatives was accomplished with full weight given to the results of this analysis. The* Analysis of Stockpile Management Alternatives *report and the* Stockpile Management Preferred Alternatives Report *are available for public review at the DOE Public Reading Rooms near each site.*

As stated in section 3.1.1, Planning Assumptions and Basis for Analysis, DOE would emphasize compliance with applicable laws and regulations and accepted practices regarding industrial and weapons safety, safeguarding the health of workers and the general public, and protecting the environment. Section 4.14 of the PEIS describes the regulations and requirements under which all DOE sites conduct their operations during the normal course of their work activities, including potential accidents and associated human health and environmental consequences of an accident.

40.85 The commentor believes that the Draft PEIS fails to consider adequately the entire range of current and proposed actions connected with the Stockpile Stewardship and Management Program and reasonable alternatives to such actions. The commentor states that because of substantial changes in the nature and purpose of DOE's atomic energy defense activities, as reflected in the design and implementation of a long-term Stockpile Stewardship and Management Program, the PEIS must consider in a comprehensive manner all related, connected, cumulative, and similar actions designed to achieve the goals of stockpile stewardship and management, including activities asserted to be ongoing, as well as those described as "next generation."

Response: *DOE believes that the PEIS discusses a full range of alternatives for implementing the Stockpile Stewardship and Management Program, and that it analyzes in detail those reasonable alternatives that are capable of achieving the goals of the Program. DOE also believes that the PEIS adequately assesses the cumulative impacts of proposed new activities and existing activities at the sites where the Stockpile Stewardship and Management Program would be implemented.*

It is a well-established principle under NEPA that the goals of a proposed action delineate the limits of the reasonable alternatives to that action. That is, an alternative which does not accomplish the agency's goals is not a reasonable alternative. Since its inception, one of the primary goals of the U.S. nuclear weapons program has been to ensure the safety, security, and reliability of the Nation's nuclear weapons stockpile. Numerous facilities have been built over the years at the three weapons laboratories (LANL, LLNL, and SNL) and at NTS to conduct various activities necessary to meet this goal.

As described in chapter 2 of the PEIS, recent developments in national security policy have placed new constraints on the types of activities available to achieve this goal. Specifically, the United States is not producing new-design nuclear weapons or conducting underground nuclear testing (see section 2.4). DOE's challenge in developing the stewardship portion of the Stockpile Stewardship and Management Program has been to determine whether, and how, to replace, modify, or augment the existing capabilities of the laboratories and NTS so that the goal of maintaining a safe, secure, and reliable stockpile can be met, even as the enduring stockpile ages and underground nuclear testing is no longer available.

DOE has examined from a programmatic perspective various approaches to achieving this goal, and has determined that only an aggressive science-based program that relies on sophisticated simulation and computational technology would allow DOE to continue to ensure the safety, security, and reliability of the stockpile. Alternate approaches which are based on principles other than an aggressive pursuit of the knowledge necessary to predict, detect, and correct problems with the stockpile cannot achieve DOE's goals. Section 3.1.2 has been expanded to examine various other alternatives or approaches (such as maintenance, remanufacturing, and a zero stockpile) that have been suggested, and to explain why each of them are incapable of ensuring the stockpile's safety, security, and reliability, and thus are not reasonable.

Using simulation and computational technology to better understand the characteristics of nuclear weapons has been an element of DOE's weapons program for many years. It was historically part of the Research, Development, and Testing Program, the predecessor of the proposed stewardship portion of the Stockpile Stewardship and Management Program. In determining, for the reasons noted above, that stewardship must be based on similar principles, DOE effectively eliminated the option of replacing the existing proven capabilities at the laboratories and NTS with a different, untried approach. Accordingly, the PEIS focuses on facilities that could modify or augment the existing capabilities in ways that would achieve DOE's goal. In summary, DOE and its predecessors have been "stewarding" the stockpile, utilizing science-based principles, since the dawn of the nuclear era. DOE believes that recent policy developments require an even more aggressive application of these principles to ensure the safety, security, and reliability of the stockpile.

DOE believes that the PEIS appropriately addresses the role of existing facilities in the stewardship program. They are described as part of the No Action alternative, in broad terms in section 3.1.4 *and in more detail in chapter 4 and appendix A. This approach to the No Action alternative (i.e., maintaining the status quo) is consistent with guidance issued by the CEQ (46 FR 180426, March 23, 1981). The environmental impacts of continuing the existing activities at each of the sites associated with the Complex are described throughout chapter 4. The cumulative effects that could result when the impacts of the proposed new facilities are added to those of existing activities are described in section 4.13. DOE believes that in this way, the PEIS adequately presents the impacts of the entire stewardship program, while focusing specifically on the proposed new facilities that require a DOE decision, and describing them in context with the existing facilities upon which DOE would continue to rely to achieve the goal of a safe, secure, and reliable stockpile.*

Because DOE intends to use the PEIS as a component in decisionmaking in 1996, only those alternatives that are ripe for decisionmaking are assessed in detail in the PEIS. Alternatives not yet reasonably foreseeable, and which have not matured so as to be ripe for decisionmaking, such as next generation facilities (see section 3.3.4), are not assessed in detail in the PEIS. Nonetheless, they are acknowledged and included to the extent practicable.

40.86 The commentor thinks that the NTS table 3.2.9-1, should be modified to include subcritical tests, references to high explosive and dynamic experiments, testing of nuclear weapons, and testing of weapon effects.

Response: *The activities described above are a part of stewardship activities, and it was not considered appropriate to enumerate a long list of specific activities in a summary table for a PEIS. The ongoing consequences of these activities are covered in the NTS Site-Wide EIS. A table detailing the specific DP No Action facilities and activities at NTS has been added to appendix section A.1.*

40.87 The commentor states that DOE should not proceed with the stockpile stewardship program until it has prepared and circulated a new Draft PEIS, considered and responded to all comments, and issued a Final PEIS and ROD.

Response: *DOE believes that the Draft PEIS was adequate. In response to public comments on the Draft PEIS, DOE has made changes as described in section 1.8 of the Final PEIS. Additionally, DOE has prepared this* Comment Response Document *which describes the comments received on the Draft PEIS and DOE's responses to those comments. In accordance with NEPA, DOE will not proceed with any of the proposals described in the Final PEIS until an ROD is announced, which can be no sooner than 30 days after the publication of the EPA Notice of Availability of the Final PEIS.*

40.88 Due to its focus away from consolidation, the commentor believes that the Stockpile Stewardship and Management Program is very different from Complex 21.

Response: *The focus of the Stockpile Stewardship and Management Program has not shifted entirely away from consolidation. In fact, although not the preferred alternative, the PEIS evaluates the potential impacts associated with consolidation of weapons production missions at the national laboratories. Based on current policy and directives concerning national security, downsizing of the Complex is the preferred strategy.*

40.89 The commentor states that nuclear weapons stockpile stewardship includes storage security, safety, inspection, and maintenance so that the operability of any stored weapons are known and satisfactory. The commentor further suggests that those who devise plans for stockpile stewardship should remain aware of the technological advances in remote drilling control that might make previously secure storage locations less so.

Response: *DOE constantly evaluates and upgrades its security program to respond to advances in technology, including remote drilling control.*

40.90 The commentor states that the Special Nuclear Materials Research and Development Laboratory proposal is still alive in the form of various proposed upgrades to LANL's Chemistry and Metallurgy Research building and that the relationship of the plutonium processing facility at TA-55 (PF-4), and the Chemistry and Metallurgy Research building is made clear in the quote in the fiscal year 1997 LANL Capital Asset Management Plan, Chemistry and Metallurgy Research Activity Data Sheet, page A-17. The commentor asserts that the Stockpile Stewardship and Management PEIS, with respect to future activities at LANL, is merely rubber stamping what the laboratory has been pursuing for a number of years.

Response: *In the late 1980s, DOE initiated a NEPA review for a proposed facility named the Special Nuclear Materials Laboratory at LANL, and issued its Notice of Intent (NOI) to prepare an EIS for the project (55 FR 1251, January 12, 1990). The new laboratory was proposed to replace the Chemistry and Metallurgy Research building. (Reconfiguration PEIS NOI, 56 FR 5594, February 11, 1991). DOE has since dropped its proposal to construct the Special Nuclear Materials Laboratory, since with a smaller nuclear material requirement the capacity of the Chemistry and Metallurgy Research building, if upgraded, remains adequate.*

The Special Nuclear Materials Laboratory was proposed at a time when there were several new weapons systems in various phases of the development and production cycle and DOE was still operating its Rocky Flats Plant. At that time, DOE and LANL believed that a greater analytical chemistry capability was needed at LANL to support those efforts. DOE notes that a great deal of the background information raised by the commentor reflects the evolution that has occurred over the past 7 years as the Nation has made significant changes in its nuclear deterrence policy. At many times since 1990, the nuclear materials support work performed at LANL has been redirected by DOE to reflect the changing national priorities.

The former special nuclear materials proposal is not embodied in the current plans to upgrade the 44-year-old Chemistry and Metallurgy Research building, as the commentor alleges. DOE has prepared an EA for the Chemistry and Metallurgy Research upgrades (DOE/EA-1101), and has issued that EA in draft for public review and comment. The commentor reviewed the draft EA and extensively commented on that document. At this time, DOE proposes to upgrade space in the Chemistry and Metallurgy Research building only as needed to support the existing set of LANL operations. Two complete wings of the Chemistry and Metallurgy Research building are in the process of being placed in a safe standdown mode, and another wing has been converted to office space only. The analytical laboratory space in the wings currently proposed to be upgraded are those wings that support LANL's existing mission in the nuclear weapons program, deep space probes, nuclear material stabilization programs (including waste management) and environmental restoration.

As noted in this PEIS, in the event that DOE should choose to implement an expanded Stockpile Stewardship and Management Program at LANL, further renovations to the Chemistry and Metallurgy Research building would be needed to support pit production or other missions analyzed in this PEIS. If LANL is selected for an expanded production role as a result of the Stockpile Stewardship and Management ROD, then some activities could be moved into the Chemistry and Metallurgy Research building from building PF-4 at TA-55 into currently unused space that would then be renovated for this purpose. The current proposal to upgrade the analytical chemistry space in the Chemistry and Metal-

lurgy Research building sufficient for existing needs would also support these future needs with no additional building renovation.

The commentor also references the LANL 1993 Strategic Plan. The sketch of a fully renovated Chemistry and Metallurgy Research building referenced in the 1993 plan included essentially all of the building. However, in 1995 DOE and LANL agreed to pursue only those upgrades needed to support the existing nuclear materials mission assignments at LANL which have resulted in changes from the 1993 plan. For example, since the 1993 plan, two complete wings of the Chemistry and Metallurgy Research building are in the process of being placed in a safe standdown mode, and another wing has been converted to office space only.

The Capital Asset Management Plan is an annual listing, for planning purposes, of potential projects that might be required to support current and future missions. DOE requires an annual Capital Asset Management Plan report from all its weapons complex sites. As such, it is not inappropriate for LANL to use this vehicle to alert DOE to facility improvements or new structures that might be required in the event that an enhanced stockpile stewardship and management mission is assigned to LANL.

It is true that DOE has determined that, under the existing stockpile stewardship and management activities that have been ongoing for many years, facilities at LANL will have to be maintained, and in some cases, repaired or upgraded, to allow LANL to continue to fulfill its existing mission. Far from being a "stunning admission" that future assignments are already being implemented, DOE believes that it is simply good management practice to keep its considerable real property—its buildings and other infrastructure—in safe, sound, and operating order.

40.91 The commentor states that the Stone and Webster document referenced in the Stockpile Stewardship and Management PEIS was not made available to the public.

Response: *The document in question was not referenced in the PEIS but was referenced in the* Analysis of Stockpile Management Alternatives *report. That Stone and Webster document is available to the public upon request.*

40.92 The commentor refers to tables 3.7.1–1 through 3.7.1–5 and asks if anyone has placed these numbers into a common reference frame. According to the commentor, the LANL direct employment numbers, utility requirements, and some of the discharge numbers do not make sense.

Response: *DOE recognized the apparent differences in these numbers between the alternatives during the development of the PEIS source data. Reviews were conducted to assure consistency and comparability by a team of technical experts with representation from each site. The numbers reflected in the PEIS reflect the consensus opinion of this intersite team. DOE has checked the figures presented in all of the tables and charts of the Draft PEIS and has made the appropriate changes as presented in the Final PEIS. The changes were not significant and did not change the environmental impacts.*

40.93 The commentor refers to Volume I, tables 3.4.4.2–2, 3.4.4.3–2, 3.4.4.4–1, 3.4.4.4–2, 3.4.5.2–2, 3.4.5.3–2, and 3.4.5.4–2 and requests that the term "surge operations" be defined in chapter 9, Glossary.

Response: *"Surge operations" is defined in section 3.1.1.1, No Action Alternative Assumptions, as a three-shift operation, 5 days a week.*

41 REGULATORY COMPLIANCE

41.01 Commentors state that DOE did not provide enough advance public outreach and notice for the public hearings. Several commentors believe many groups were underrepresented at the hearings including: minority, downstream, and rural communities; Georgia government officials; and SRS employees. The commentors suggest that DOE should make a special effort to involve these groups in public involvement and should also train the minority communities in order for them to contribute substantial comments. Commentors recommend that DOE include visiting schools and universities, and produce better advertisements to notify the public about the program. Another commentor suggests that DOE should automatically notify those who have participated in the past and national offices of groups that would be interested in the topics at stake. One commentor suggests that notices should be at least one month in advance. Other commentors state that there was plenty of notice for meetings and commended DOE for the effort in writing the document, holding the public hearings, and answering questions from the public. One commentor asks how to receive copies of the Stockpile Stewardship and Management PEIS.

Response: *The CEQ's minimum comment period requirement on draft EISs is 45 days (40 CFR 1506.10[c]). The public comment period on the Stockpile Stewardship and Management Draft PEIS was 60 days and was considered appropriate for review and comment on the document since preferred alternatives were identified in the Draft PEIS. DOE has had an extensive and ongoing public outreach program on the Complex since the Reconfiguration Program was proposed in 1990. DOE has utilized several different methods for publicizing public meetings and providing Program information to the public. In addition to advertising in the traditional media, notices and meeting information have been made available electronically and various program documents can be requested or accessed using the toll-free information line, the electronic bulletin board (Internet), and the World Wide Web DOE Home Page. A speaker's bureau has also been established with DOE officials available on a limited basis as requested to speak with interested groups concerning DP activities and issues. This can be requested through the toll-free line or the electronic bulletin board services. DOE has continued to keep the public informed during the public comment period and will continue to do so through the publication of the ROD.*

41.02 The commentor does not understand the recent decision on DAHRT, where the judge claims that it is only required that an environmental study be completed, not that it would be found to not have negative effects. Commentor believes that NEPA just delays actions; it does not change them. The commentor notes that NEPA only requires EISs and public hearings; it does not mandate that anyone choose the least destructive course of action.

Response: *The regulations for implementing NEPA state, "The NEPA process is intended to help public officials make decisions that are based on understanding of environmental consequences, and take actions that protect, restore, and enhance the environment" (40 CFR 1500.1[c]). Preparation of NEPA documents as the commentor points out are part of the process. "The primary purpose of an environmental impact statement is to serve as an action-forcing device to ensure that the policies and goals defined in the act are infused into the ongoing programs and actions of the Federal Government" (40 CFR 1502.1). The scheduling of proposed actions which require NEPA review includes the necessary time for complying with NEPA and in most cases does not delay the action. NEPA does not mandate that an agency select the least destructive course of action but does require that the agency "... identify and assess the reasonable alternatives to proposed actions that will avoid or minimize adverse effects of these actions upon the quality of the human environment" (40 CFR 1500.2[e]). DOE must demonstrate compliance with the procedural requirements of NEPA before making final decisions on its major Federal actions.*

41.03 Commentors state that decisions to be made in the Stockpile Stewardship and Management Program were predetermined and that input from the public and local officials has little impact on the PEIS or decision process. Commentors express disappointment that DOE did not consider comments and suggestions from the scoping meetings and wonder to what extent public support at various candidate sites was considered in the PEIS process. One commentor points out that the preferred alternative is not always the final choice, while another commentor asks if there was a mechanism for citizens to get the ROD changed. A commentor states that if this is a democracy and majority rules, then the public should be allowed to vote on the PEIS. A commentor warns DOE that they must not underestimate the comments the public makes and that the public will not go away. The commentors also state that Congress and the President control DOE funding and they feel shut out of the defense spending authorization process. Specifically, one commentor notes that money has already been allocated for NIF in DOE's budget for fiscal year 1997. Commentors feel that DOE is withholding important information from the public. Another commentor states that DOE should provide the public with information that would allow them to participate in policy development, and that the "classified for national security" blanket should be removed. Another commentor perceives DOE's position on national security policy as being a policy of so much complexity that it is well beyond the grasp of the public.

Response: *DOE has not made any decisions on the Stockpile Stewardship and Management PEIS proposed actions. DOE has identified in section 3.8 of the Final PEIS the preferred alternatives for both stockpile stewardship and stockpile management. The ROD on the Stockpile Stewardship and Management Program will be issued no earlier than 30 days following the issuance of the Final PEIS. The decisions on the Stockpile Stewardship and Management Program will be identified in the ROD. The ROD, which will be published in the* Federal Register *and is a publicly available document, will also include the rationale and various factors used by DOE in making the decisions on the Stockpile Stewardship and Management Program.*

Chapter 2 of the PEIS discusses the national security policy considerations and the role they play in defining the purpose and need of the Stockpile Stewardship and Management Program. The Stockpile Stewardship and Management Program was developed in response to changing world conditions, an end to the Cold War, and the reaffirmation of the proposed CTBT. DOE participates regularly in Congressional hearings on defense issues in which the stockpile stewardship and management issues are discussed. Congress determines how funds are allocated and DOE spends monies consistent with Congressional direction. Therefore, Congress ultimately determines whether the decisions resulting from the Stockpile Stewardship and Management PEIS will be implemented.

41.04 Commentors state that DOE cannot expect the public to make decisions on DOE programs in bits and pieces.

Response: *Since the time when the original commitment was made to prepare a PEIS on reconfiguration of the Complex and a PEIS on environmental restoration and waste management, the world has changed significantly. Most importantly, the Cold War has ended, the Nation's nuclear arsenal is being reduced significantly, and a significant amount of special nuclear materials have become surplus to national security needs. These changed circumstances have had a significant effect on DOE's strategic planning, and the PEISs being prepared are responsive to these new circumstances. Because of the large scope of these programs there is no way to avoid some overlap of issues. However, the purpose and need for DOE's proposed programs and relationships between these programs are clearly described in each of the PEISs and sitewide NEPA documents. Section 1.7, Other National Environmental Policy Act Reviews, of the PEIS discusses other DOE programs and their relationship to the Stockpile Stewardship and Management Program.*

41.05 The commentors express widely differing views on the PEIS public hearing scheduling, formats, and content. Commentors state that DOE did not tell the truth to the public in the PEIS and the meetings were nothing more than public relations efforts and not worth the cost and effort to hold them; that transcripts be taken at meetings and incorporated into the PEIS so that comments could be accurately tracked and responses verified; that the modified format was better than before because some people may hesitate to approach a microphone during public hearings; that the format should be adhered to and not changed mid-meeting, and that the meetings should focus on environmental impacts, not impacts to peace. Other commentors express the view that the public meetings are a valuable forum for the public and hope that DOE will continue their use. Many commentors favor the formal hearing format rather than the workshop format. One commentor also points out that 1) public meetings are attended by and large by the same people grinding out their own agendas and obviously not interested in facts; 2) too many participants suggest they are representing the public; often this amounts to a public of 1 or 2; and 3) meetings provide a forum for many negative anti-establishment and emotional, vitriolic attacks on any good faith efforts. Commentors ask many questions including: why didn't DOE have a meeting in Oakland, in addition to LLNL, for similar reasons Santa Fe hosted a public meeting; does NEPA allow DOE to lie in the PEIS; is DOE required to respond to comments from the public; why the comments collected do not go through an impartial agency rather than to the reading rooms; and why aren't there more means available for the public to express their opinions to DOE, rather than just NEPA. Another commentor states that the charts handed out at the meetings should be clearly labeled.

Response: *The public hearings on the Draft PEIS were conducted using a modified traditional hearing format. The change in format was in response to past public comments on the interactive public hearing format used for the Tritium Supply and Recycling PEIS and more recent requests by interested parties near several DOE sites. The modified format included a formal statement period in addition to the interactive session, and the recording of a verbatim transcript of the hearing in addition to the notation of comments by designated notetakers. Efforts were made by DOE to accommodate the public to as large an extent as was feasible. For this reason, modifications were also made between sites as necessary to fulfill special needs or requests from the public, elected officials, and site representatives. The additional public hearing was held in Santa Fe because of substantial public requests and because the city is located in proximity to two of the proposed alternative sites (LANL and SNL) which could potentially receive both stockpile stewardship and stockpile management missions. The principal area affected and public interest area for LLNL potential stewardship missions was the city of Livermore; therefore, only one meeting was held at Livermore.*

41.06 Commentors state that the PEIS process was procedurally defective. One commentor states that there are perceived advantages which go to the locations where the PEIS authorship (Albuquerque Area Office) takes place. Another commentor believes that the PEIS pitted LANL and ORR against each other. In addition, the commentor suggests that DOE obtain competent independent evaluations, not location centered, but more broadly centered, using the expertise of people attending the meeting and elsewhere in the Nation to add more credibility to the entire PEIS process.

Response: *The analysis for the PEIS is conducted in accordance with CEQ regulations (40 CFR 1500-1508), and DOE's NEPA regulations (10 CFR 1021) and procedures. The DOE Albuquerque Operations Office's lead in preparing the support stockpile management alternatives reports with oversight of DOE Headquarters represented the best coordination point between stewardship and management elements of the Program. All proposed management alternatives were developed in cooperation with all DOE weapons complex sites. In addition, all supporting data and peer review were provided by each affected site and underwent a substantial comment and revision process. Technical experts at each site with relevant experience in each of the proposed mission areas at both the management and working level provided input and review. The* *process used in developing the management alternatives and the screening process for determining the preferred alternatives can be found in the* Analysis of Stockpile Management Alternatives *report and the* Stockpile Management Preferred Alternatives Report *which are available in the DOE Public Reading Rooms near each site.*

41.07 A commentor suggests that a civilian review board be set up to oversight DOE. Other commentors point out that the Defense Facility Safety Review Board performs that responsibility now and that it has been recommended that EPA and OSHA be added to DOE facility oversight. One commentor states that citizen advisory boards are not accountable to the local citizens and do not speak for the citizens with respect to safety concerns.

Response: *Section 4.14 describes the regulations and requirements under which all DOE sites conduct their operations during the normal course of their work activities. This section also describes the applicable DOE orders requiring the reviews performed by the sites of all planned and existing construction and operation for potential accidents and the assessment of the associated human health and environmental consequences of an accident. The sites associated with the Stockpile Stewardship and Management Program would comply with these DOE orders and update the appropriate safety documentation before authorization of construction or start of operations.*

On January 25, 1995, DOE created the Advisory Committee on External Regulation of Department of Energy Nuclear Safety and charged it with providing advice, information, and recommendations on whether and how new and existing DOE facilities and operations, except those covered under Executive Order 12344, might be externally regulated to ensure nuclear safety. The Advisory Committee has made the following recommendations concerning the structure of the external regulation: (1) an existing agency–either the NRC or a restructured Defense Nuclear Facilities Safety Board–regulate facility safety at all DOE nuclear facilities under the Atomic Energy Act; *(2) OSHA regulate all protection of workers at DOE nuclear facilities under the* Occupational Safety and Health Act, *unless regulation of worker risks at a given facility could significantly interfere with maintaining facility safety in which case all worker protection would be regulated under the* Atomic Energy Act *of 1954; (3) EPA continue to regulate environmental protection matters for all DOE nuclear facilities and sites under the environmental statutes; and (4) states with programs authorized by the EPA, OSHA, or the regulator of facility safety acquire or continue to have roles in regulation of environmental protection, facility safety, and worker protection comparable to those they now exercise in the private sector. The committee believes these recommendations will strengthen, streamline, and simplify the regulation of safety at DOE nuclear facilities. The Secretary of Energy has convened a DOE working group to review the recommendations and determine how to implement them. A report is due to the Secretary by the Fall of 1996. DOE, the Administration, and Congress will be involved in determining external regulations for DOE facilities.*

Advisory boards act as liaisons between the public and Federal, state, and local governments and agencies. The boards provide an important forum for stakeholders and agencies to explore complex problems and generally provide independent policy and technical advice to affected parties.

41.08 The commentors believe that the threat of using nuclear weapons and the environmental impacts that result from using the weapons are impacts that should be analyzed in the PEIS. According to a commentor, the nuclear arsenal is a temptation to those in power. Another commentor adds that stockpile stewardship and management does not cover the global consequences an accident like Chernobyl could cause. One commentor notes that the PEIS should state that the stockpile sizes discussed could obliterate the planet. The commentor believes that LANL is a bomb designer's dream come true and that the United States will use these weapons if it wants to. The commentor believes this because of a quote from DOD attorney John McNeil stating, "Nuclear weapons can be targeted in ways that either increase or decrease resulting incidental civilian injury and collateral damage, and their use may be lawful or not depending upon the enemy's conduct." The commentor does not agree with these views, especially the idea of incidental civilian injuries, considering the fact that there were 210,000 dead within months of the bombing of Hiroshima and Nagasaki, and 300,000 survivors suffering slow deaths and painful lives over the next 50 years. Commentors state that the American people cannot trust that our nuclear weapons, if they exist, will not be used on civilians again. The commentors cite the dropping of the atomic bomb on Japanese cities, stating that it could have been demonstrated in a nonpopulated area to show U.S. capability. Commentors feel that there is no way to be aware of all the possible effects of nuclear weapons at this time. According to commentors technically there is too much that is unknown, and the world needs to obtain a better understanding of the impacts of nuclear materials. A commentor asks where in the PEIS the impacts to the present agricultural economy which has built and sustained the Texas Panhandle were; why were the risks to this economic stronghold not assessed; what will happen when we no longer produce food for people, where is our priority; are bombs more important than food. The commentor states that those in agriculture strive to produce quality, wholesome food for the world population—one farmer feeds in excess of 131 people, yet the industry across the road from us builds bombs to annihilate people. The commentor asks where is our sense of morality and respect for life. Food is the most important commodity we produce—it must be protected.

Response: *The use of nuclear weapons and the resulting environmental impacts are beyond the scope of this PEIS.*

41.09 Commentors are concerned with the cost of the PEIS and would like DOE to spend taxpayer money more frugally. Another commentor asks how much money has been spent on the PEIS.

Response: *NEPA requires DOE to assure that major Federal actions are taken only after due consideration of their environmental impacts. Preparing a PEIS in compliance with NEPA is a complex and costly task for a program as complex as Stockpile Stewardship and Management. The cost to complete the PEIS was approximately $10 million, which is commensurate with the complexity of the issues analyzed.*

41.10 Commentors feel that issuing the Stockpile Stewardship and Management Draft PEIS, and the Storage and Disposition Draft PEIS, the Pantex Site-Wide Draft EIS and NTS Site-Wide EISs at the same time prohibited them from thoroughly and responsibly reviewing and commenting on the proposed programs and actions. The commentors state that DOE has placed an unnecessary and unreasonable burden on the affected communities and the public, and request DOE provide assistance to have an independent evaluation performed. Commentors state that by releasing all these documents, DOE was restricting public comment and placing more emphasis on proposal preparation than proposal analysis and review. Another commentor sees the combined meetings as a step forward and feels that DOE is recognizing that there are some overlaps among programs.

Response: *The CEQ's minimum comment period requirement on draft EISs is 45 days (40 CFR 1506.10[c]). The public comment period on the Stockpile Stewardship and Management Draft PEIS was 60 days and was considered appropriate for review and comment on the document. The public comment period on the Storage and Disposition Draft PEIS, which did not identify any preferred alternatives for storage and disposition, was extended from 60 to 90 days to allow the public to fully review and comment on the proposed alternatives. Each of the other documents, as with all DOE NEPA documents, has a public comment period of at least 45 days. Although DOE coordinates all programs and the preparation of NEPA documents, the sheer number of documents being prepared by DOE sometimes results in the release of several documents at the same time. Every effort is made to provide adequate public review of the documents in these cases, balanced with DOE's needs and mission.*

The PEIS and site-wide EISs prepared by DOE comply with the letter and spirit of NEPA. Each document has a concise summary of the most important information found in the entire document. Moreover, the PEISs are organized so that a focused review of any individual site can be readily accomplished. For example, if a member of the public (or a local community) is most interested in just one site (e.g., ORR), each PEIS covers the potential environmental impacts at that site in about 100 pages. Lastly, the main body of each environmental document is written to be understood by the general public, with more detailed, supporting information in appendixes. As a final point, DOE provides a significant amount of funding to states to oversee DOE's operations at the DOE sites as they relate to the health and safety of the public in surrounding communities. We do not believe it is appropriate to provide separate funding to local governments and organizations for document reviews of this kind when we are providing large block funding to the state for such reviews and oversight.

41.11 The commentor feels the Stockpile Stewardship and Management PEIS represents a sequence of site-specific reviews which is not an adequate EIS.

Response: *The format of the PEIS (i.e., discussion of the environmental impacts of the proposed Stockpile Stewardship and Management Program alternatives by site) was selected as the most efficient and user friendly way to communicate the complex issues covered in the document. It allows members of the public who may only be concerned about potential impacts at the DOE site nearest them to focus their review. The use of the format was for the convenience of the public and does not make the PEIS inadequate.*

41.12 The commentor feels the NEPA process requires by law a range of reasonable alternatives so the public may evaluate an evenhanded analysis which includes many analyzed alternatives and their ramifications on the environment and international policy. Several commentors feel that DOE has unreasonably constrained the alternatives it analyzes in order to support the one alternative that is preferred. Another commentor states that there is no discussion of the current proposed alternatives' relationship to the anticipated next generation stockpile stewardship facilities.

Response: *Chapter 2 of the PEIS discusses the purpose, need, proposed action, and the reasonable alternatives for the Stockpile Stewardship and Management Program. The range of reasonable alternatives was developed based on two different perspectives discussed in detail in this chapter. The discussion of the purpose and need describes the constraints placed upon DOE in meeting the Program objectives and the formulation of reasonable alternatives addressed in the PEIS. One perspective (section 2.2) is from the top level of national security policies for nuclear deterrence, arms control, and nonproliferation. The other perspective (section 2.3) focuses on the relevant technical efforts to maintain a safe and reliable U.S. nuclear weapons stockpile. The alternatives considered and the reasons they were eliminated from detailed study are discussed in section 3.1.2. Also see the response to comment summary 40.85 for additional discussion of the range of reasonable alternatives considered.*

41.13 The commentor feels statements such as "none," "minimal," "within regulatory statutes and guidelines," "manageable," and "amenable" are not credible when describing environmental impacts.

Response: *The terms that the commentor refers to were used by DOE at the public hearings to summarize information presented in the PEIS. Their use was prefaced with the statement that these were DOE's subjective opinions of the impacts described in the PEIS. They were used in an effort to simplify complex information. Others may disagree with these subjective terms. The potential impacts identified in the PEIS are described using some of the terms identified by the commentor as appropriate based on the detail of the analysis. Where data was sufficient to quantify the potential* *effects of the proposed action they are provided. When regulations, guidelines, or standards were available for comparison purposes they are shown in tables or text with appropriate discussion. In some cases the data and level of analysis was insufficient to quantify effects and the description of impacts are described qualitatively. When qualitative analysis is presented, the discussion necessarily uses terms similar to those noted by the commentor. The discussion supporting both quantitative and qualitative analysis is appropriate to aid the reader in interpreting the potential impacts of the proposed action.*

41.14 The commentors request an extension of the public comment period on the Draft PEIS and ask if there will be another public comment period after the Final PEIS.

Response: *DOE did not extend the comment period beyond May 7, 1996, although late comments were considered to the extent possible. Members of the public may submit comments on the Final PEIS, including the preferred alternatives. A decision on the Stockpile Stewardship and Management Program will not be made until at least 30 days after the EPA Notice of Availability of the Final PEIS appears in the* Federal Register.

41.15 The commentor believes that NEPA mandates an analysis of economic and impacts on future generations. The commentor also believes that costs, timing, and consumption of nonrenewable resources should together drive the PEIS. The commentor wants a complete environmental impact assessment which includes the impact on future generations. The commentor points out that the words "future generations" are not stated in the document. The commentor questions why these items are missing.

Response: *Chapter 4 of the PEIS describes the affected environment and the potential environmental impacts, including the socioeconomic impacts, expected from the proposed Stockpile Stewardship and Management Program. Nonenvironmental issues concerning cost, schedule, and technical risk are presented and analyzed in the* Analysis of Stockpile Management Alternatives *report and the* Stockpile Management Preferred Alternatives Report *which are available in the DOE Public Reading Rooms near each site. The consumption of nonrenewable resources for each of the alternatives is discussed in section 4.17. By completing this PEIS, DOE is meeting the requirements of section 101(b)(1) of NEPA (i.e., "it is the continuing responsibility of the Federal Government to use all practicable means, consistent with other essential considerations of national policy, to improve and coordinate Federal plans, functions, programs, and resources to the end that the Nation may fulfill the responsibilities of each generation as trustee of the environment for succeeding generations...").*

41.16 One commentor states that a policy document is needed as the "mother" of all of these NEPA processes. The commentor states that such a document would provide the bridge between the PEISs (and other NEPA processes as needed) and explain their relationship.

Response: *DOE is a diverse and highly complex department with many varied activities. At any given time a number of actions are being planned, constructed, and implemented. Accordingly, there are a number of NEPA actions being conducted simultaneously. In order to explain how the actions proposed by the Stockpile Stewardship and Management PEIS fit into the context of actions proposed by other NEPA documents, section 1.7 was constructed. This section provides the reader with a description of the other major NEPA actions presently being conducted by DOE and describes their relationship to the Stockpile Stewardship and Management PEIS.*

DP has an office solely devoted to NEPA coordination. This office reviews all NEPA actions to assure consistency of assumptions, data, and factual information. Besides this internal DP consistency control, all major NEPA actions are reviewed by the Office of Environment, Safety, and Health, the Office of the General Counsel, and other appropriate departmental elements for consistency with

DOE NEPA requirements, DOE policy, and other DOE actions. Such a review and concurrence process is dynamic and constantly reflects current policy and other program considerations.

41.17 The commentor states that the Draft PEIS has not considered the full range of proposed and potential stockpile stewardship alternatives that is required by NEPA. The commentor states that DOE has characterized a number of potential stockpile stewardship facilities as not "ripe" for NEPA review because they have not reached the stage of development and definition that is necessary for evaluation and decisionmaking (Draft PEIS, section 1.2). The commentor states that next generation facilities are included in budget planning and, thus, should be proposed actions in the PEIS. The commentor also believes the ability to perform detailed (i.e., site-specific) environmental impact analysis is not the relevant standard for inclusion of a project in a PEIS. Commentor contends that the exclusion of the Advanced Hydrotest Facility (AHF), HEPPF, ARS (X-1), and Jupiter facility from the analysis of proposed actions is not supported by the facts, and is a violation of NEPA.

Response: *In the Notice of Intent for the Stockpile Stewardship and Management PEIS (60 FR 31291, June 14, 1995), DOE expressed its intent to propose six new facilities for stockpile stewardship: (1) CFF; (2) Atlas Facility; (3) NIF; (4) HEPPF; (5) AHF; and (6) Jupiter Facility. While DOE recognized that these six facilities were at different stages of research, development, and definition, the intent was to make the PEIS as forward-looking and complete as possible, with regard to the future stockpile stewardship program.*

Following scoping, when preparation of the PEIS actually began, DOE realized that three of these facilities (HEPPF, AHF, and Jupiter) were so minimally defined that it would have been premature to "propose" them, in the NEPA-sense, for the purpose of decisionmaking, since more R&D was needed. Therefore, in section 3.3.3 of the Implementation Plan for the Stockpile Stewardship and Management PEIS (DOE/EIS-0236IP), DOE explained that these three facilities were "not currently defined well enough to be considered as proposed stockpile stewardship alternatives."

Events associated with R&D of the Jupiter facility illustrate the point that the next generation facilities are not currently defined well enough to be considered as proposed stockpile stewardship alternatives. The Jupiter Facility would be a significant technological advancement in the pulsed-power x-ray source capability. During the time the Implementation Plan was being prepared, scientists at SNL realized that, although the concept of Jupiter was defined (a 32 MJ pulsed-power x-ray source), how to achieve that concept was unclear. In fact, SNL scientists concluded that Jupiter represented so large a technological advancement that they developed the concept of the Advanced Radiation Source (ARS) (X-1). The ARS (X-1), which is envisioned as an interim step to an eventual Jupiter facility, would be a four-fold increase over current pulsed-power x-ray sources, yet would only be one-fourth the power envisioned for Jupiter. The performance requirements for the ARS (X-1) have not been fully established; the type of technology to provide the basis for the facility has not been determined, nor have concepts for the resultant physical plant. Consequently, impacts from facility construction as well as from facility operation can only be theorized. Thus, not even ARS (X-1) has reached the stage where the concept can be defined well enough for decisionmaking purposes. Jupiter, which is dependent on ARS (X-1) development, is even further from definition.

However, even though the next generation stockpile stewardship facilities are not defined well enough to be "proposals," they are programmatically assessed in the PEIS to the extent practicable. As DOE stated in section 3.3.3 of the Implementation Plan, "these next generation facilities can be described in general terms such that a consideration of cumulative impacts that might be related to the ultimate science-based stockpile stewardship program can be qualitatively assessed." Section 4.11 of the PEIS describes what the impacts of these three next-generation facilities might be, to the extent they can be forecast at this time. The purpose of section 4.11 is to provide an *assessment of the potential cumulative environmental impacts associated with the ultimate science-based stockpile stewardship program.*

For each next generation facility, data were developed using a surrogate facility. For example, for AHF, which would be a facility for conducting hydrodynamic tests and dynamic experiments, the tests and experiments themselves can be anticipated to be similar to such activities as analyzed at DARHT; therefore, the DARHT impacts were used for reference. For HEPPF, surrogate data from BEEF, an HE test facility at NTS, were utilized. For the ARS (X-1) and Jupiter, surrogate data were developed from the existing Saturn and Particle Beam Fusion Accelerator (PBFA) facilities at SNL. Section 4.11 has been expanded in the Final PEIS to describe more fully the foreseeable impacts of the next generation facilities.

Regarding the comments that next generation facilities are included in budget planning documents and thus, should be analyzed as proposed actions in the PEIS, the budget process does not address the issue of whether, for NEPA purposes, a project has been proposed or not. Because of the time requirements for Congressional funding, projects are often submitted for line item funds before NEPA completion. Some money needs to be spent during R&D in order to define facilities so that they can then be proposed and evaluated; it is therefore consistent with NEPA to spend money to develop this information. In the case of sophisticated scientific R&D like that for enhanced experimental capability for weapon physics, these expenditures often can be substantial, just for the preliminary stages of exploring theories and proving concepts. This process often involves performing complex experiments using existing facilities that have high operating costs. This experimentation occurs well in advance of the development of the basic information needed for eventual conceptual facility design.

DOE agrees that the ability to perform detailed (i.e., site-specific) environmental impact analysis is not the relevant standard for whether a facility should be included in a programmatic EIS. This is why DOE has included the next generation facilities in the PEIS and has developed a programmatic-level evaluation of potential cumulative program impacts. However, in order for a facility to be a "proposal" in the NEPA sense, the facility must be ripe for decisionmaking. This in turn requires more than just speculative definitions of facility designs.

The following is a more detailed discussion of why each of the next generation stockpile stewardship facilities is not included as a proposed action in the PEIS:

***AHF**: DOE has modified the Final PEIS (section 3.1.2) to include additional clarifying information on the status of research toward a definition of a future AHF. The commentor quotes extracts from DOE's fiscal year 1997 budget request, among other items, and concludes that DOE's plans for an AHF are sufficiently mature to warrant full consideration and NEPA analysis in the Stockpile Stewardship and Management PEIS. R&D activities relevant (and indeed, necessary) to DOE's ability to determine the feasibility and form of a future AHF are being pursued within the ongoing DOE R&D program. Such radiographic technology R&D has been a historical part of weapons R&D activities. At this point, the feasibility and definition of an AHF is still insufficiently determined for DOE to propose such a facility or adequately analyze it for the purposes of NEPA. For example, performance requirements for such a facility have not been fully established; the type of technology to provide the basis for the facility has not been determined and concepts for the resultant physical plant vary significantly; and therefore impacts from facility construction and operation remain speculative. DOE's present judgment is that significant R&D activity, spanning years, will be necessary.*

Early in its planning for the Stockpile Stewardship and Management PEIS, DOE intended to propose that an AHF, representing the next generation of hydrotest capability beyond DARHT, be included within the scope of the PEIS. Conceptually, AHF would improve on the capabilities of DARHT and apply data and information gained from DAHRT. AHF thus could never be an alternative to DAHRT, because DAHRT is an essential precursor to AHF. The intent to propose AHF was to make the document as forward-looking as possible with regard to the future of science-based stewardship. Upon further reflection, however, DOE decided not to propose AHF in the PEIS because AHF's parameters were so minimally defined that a meaningful analysis of its environmental impacts would have been impossible to perform.

Possible technology approaches to an AHF have been discussed within the DOE technical community. These technologies still require development and validation. The specifications and technical requirements for an AHF (that is, determination of what capabilities should be required of an AHF for assessment of stockpile aging and related effects, beyond those of DARHT) are also still being defined. This was noted in the DARHT Final EIS (Volume I, page 3-45) and in the Stockpile Stewardship and Management Draft PEIS. The items excerpted by commentors from the DOE fiscal year 1997 budget request reflect a portion of the research activities both ongoing and anticipated, that are necessary to evaluate and develop these technologies, understand requirements, and provide a decision basis for a possible future AHF proposal by DOE.

Three basic technology approaches are currently being examined. These include linear induction accelerators of a type similar to those in the baseline DARHT design, an inductive-adder pulsed-power technology based on technology now in use for other purposes at SNL and elsewhere, and high-energy proton accelerators similar to technology in use at Los Alamos Neutron Science Center and elsewhere in the United States and internationally. The first two represent different approaches to accelerating a high-current burst of electrons, which produce x rays when stopped in a dense target. The x rays actually produce the flash radiograph. This is the approach used in the existing PHERMEX and FXR facilities and to be used in DARHT when completed. The third approach would use bursts of very energetic (approximately 20 billion electron volt) protons, magnetic lenses, and particle detectors to produce the radiographic image. The impacts associated with construction and operation of facilities based on these different technologies cannot be fully defined at this time (because of technical uncertainties) and could be significantly different depending on the technology approach. For example, acreage required could be comparable to or somewhat larger than the 3.6 ha (9 acres) of land resources required for DARHT, but use of proton radiography could require an accelerator comparable in scale to the kilometer-long Los Alamos Neutron Science Center or to other large accelerators operated by DOE. Therefore, the size of the footprint, as well as other factors which to some degree govern environmental impacts, is speculative at this time.

Each of these technology approaches not only has some technical promise, but also has technical issues to be resolved or demonstrated. Therefore, DOE is examining approaches to perform the necessary R&D. As commentors have noted, DOE has proposed increases in future operating budgets to Congress to better address these research issues. DOE does not believe that these individual details of its ongoing and evolving R&D activities, within the historical and ongoing mission of the DOE's weapons R&D responsibilities, in themselves constitute a distinct "proposed action" appropriate for NEPA analysis and alternatives in this PEIS.

<u>HEPPF</u>: DOE has modified the Final PEIS to include additional clarifying information on HEPPF, and its relationship to ongoing pulsed power research and the Atlas Facility. A discussion of the relationship of HE pulsed power with Atlas and of the complementary nature of laser and pulsed-power experiments is also contained in the Atlas site-specific analysis in appendix K, which has also been revised in the Final PEIS to incorporate updated information.

A new HEPPF would be a direct outgrowth of the longstanding Athena program; however, this activity is no longer known by that name. (The name Athena was a Los Alamos identifier only, and such R&D has also been performed under other designations. It is now pursued within the high energy density physics element of Los Alamos' Stockpile Stewardship Program activities.) Since the 1960s, DOE has pursued weapon research applications of electrical pulsed power on the microsecond time scale. This R&D program has involved HE pulsed-power generators of various types, which have been exploded at existing HE firing sites in the Complex, as well as fixed-facility capacitor banks such as Pegasus II. Some HE firing sites (e.g., TA-39 at Los Alamos) have been specially configured to support these pulsed-power experiments; a principal firing site at TA-39 has within its bunker a capacitor bank to provide the seed electrical current for the HE pulsed-power generators. Impacts of these ongoing R&D activities are included in the No Action alternative in the PEIS.

Commentors may be confusing evolutionary development beyond a particular design of HE pulsed-power generator (Procyon), with a possible follow-on HE firing site, configured specially for pulsed-power experiments, beyond the existing capabilities in the Complex. It is the latter that would be the prospective purpose of HEPPF. The Final PEIS has been modified in order to clarify this distinction. An HE pulsed-power generator, such as Procyon, is basically an assembly of HE and metal (e.g., copper) and other components which is explosively and destructively detonated a single time, resulting in a brief pulse of high electrical current being delivered to the experimental configuration. High magnetic fields result from the high current pulse and may either be directly used to study materials phenomena or may be used to produce high pressures and implosions of (typically) cylindrical shells. (See the discussion in the Atlas site-specific analysis, appendix sections K.1 and K.2.1.) Procyon is therefore the name of a type of explosive generator, and is not a facility. A typical Procyon generator with the experimental region attached is about 3 m (10 ft) long. In principle such an experiment could be performed at any appropriately equipped explosive firing location, within applicable environmental limits. DOE believes that the continued evolutionary R&D on explosive generators and their use in pulsed-power experiments, within the historical and ongoing mission of DOE's weapons R&D responsibilities, do not in themselves constitute a distinct "proposed action" appropriate for NEPA analysis and alternatives in this PEIS. Rather, such R&D activities are needed to develop the required information so that DOE can formulate a proposal.

As distinct from an explosive generator, a firing site is a facility typically consisting of a firing location, associated hardened bunkers, and related equipment, in an area from which personnel can be excluded. Many different HE experiments (including those in which pulsed electrical power is produced) can be performed at a HE firing site, as long as the explosive blast, and other experiment parameters, do not exceed the capabilities of the firing site. Currently most of the largest-scale HE pulsed-power experiments in the United States, whether for technology development, weapons stockpile stewardship, or for unclassified scientific collaborations (conducted separately) including those with Russian scientists, are conducted at a Los Alamos pulsed-power firing point at TA-39. As noted in the PEIS, section 3.3.4.2, this experimental capability has a limit of approximately 500 kg (1,100 lbs) of HE. Therefore a potential need for a new HEPPF was postulated to support generators using much larger explosive charges, which though not yet demonstrated could produce higher pressures in larger masses and volumes than can be accessed at the LANL site. Existing laboratory sites cannot readily support experiments with much larger charges, as noted in the section 3.3.4.2.

Since the idea of an HEPPF was first conceived some years ago, BEEF was separately developed as a firing site at the NTS, based on refurbished bunkers originally developed for atmospheric nuclear tests. Although not specially configured for HE pulsed power like the principal LANL firing *site, in its current configuration BEEF is suitable for a variety of HE experiments including many pulsed-power technology experiments, and experiments related to such purposes have been part of recent qualification tests. Therefore, it may be possible to make modifications to BEEF when the need for and definition of such modifications is clear, to satisfy any future need for a new HEPPF. (As at other firing sites many pulsed-power experiments could be performed at BEEF without capital modifications.) At this time, the definition of such modifications is insufficient to make a full analysis meaningful; however, section 4.11 describes these modifications and impacts to the extent that they can currently be foreseen. Analysis of the impacts of operating the existing BEEF facility for explosive experiments, including experiments that involve pulsed-power technology, is incorporated in the NTS Site-Wide EIS.*

Commentors note correctly that both HE pulsed power and R&D associated with capacitor banks, such as Pegasus II or the proposed Atlas, are activities within the Stockpile Stewardship and Management Program. For some years DOE has pursued both capacitor bank facilities and HE experiments in pulsed power, since HE generators offered a means to explore higher energy (higher current) frontiers without major capital investment, albeit at a relatively low data rate, and capacitor banks offered the advantages of repeatable (and indoors) experimental facilities with higher data rates, for broad experimental use. Data from HE experiments, for example, have helped provide validation of technical issues used in the Atlas design concept. Thus both kinds of activities are sensible aspects of DOE's overall R&D program. Appendix K considers reliance on explosive-driven pulsed-power experiments and discusses why this is not a reasonable alternative to Atlas.

While it is true that if pursued a HEPPF could be available sooner and with less expense than NIF, microsecond pulsed power is complementary, rather than a reasonable alternative, to a laser such as NIF. The technologies provide different physical regimes and experimental scales, both necessary to address stockpile stewardship issues. Relative to this specific comment, neither high explosive nor capacitor-bank microsecond pulsed power is able to provide as high a temperature or pressure as would be provided by NIF. Discussion of this point has been expanded in the Final PEIS in section 3.3 and is also provided in appendix K.

ARS (X-1) and Jupiter: ARS (X-1) and Jupiter have been presented in the PEIS as next generation facilities because extensive R&D of this technology in the existing Saturn and PBFA facilities will be required before DOE would be in a position to propose either of these facilities for NEPA evaluation and decisionmaking. To the extent that specifics of these yet-to-be designed facilities are known, the ARS and the Jupiter facilities would both have an advanced pulsed-power x-ray source to provide enhanced experimental capabilities in the areas of weapons physics, inertial confinement fusion, and weapons effects.

The ARS (X-1) facility would utilize a pulsed-power accelerator capable of producing more than 8 MJ of x-ray energy to study the physics of radiation flow, opacities, high energy densities, the effects of radiation on weapons, and potentially inertial confinement fusion relevant physics. Conceptually, the Jupiter would generate about 32 MJ of x-ray energy, compared to the existing PBFA which is expected to generate 2 MJ of x-ray energy. Since both of these facilities would expand on a research and technology infrastructure already existing at SNL, it is expected that they would also be located at SNL.

The concept for ARS (X-1) grew out of the initial vision at SNL to develop an advanced pulsed-power facility that could provide the source environments for weapon effects testing after the loss of underground nuclear testing. That initial capability was called Jupiter; a 60 MA driver generating ~18 MJ of x-ray energy. In assessing the feasibility of successfully building Jupiter, SNL came *to the conclusion that the 36 times increase in x-ray output energy, in going from the existing facility Saturn to Jupiter, represented too high a technical risk. A more logical step is the ARS (X-1), which will allow an increase (by a factor of two) in current to 40 MA and a factor of four in x-ray energy output to 8 MJ over that of the PBFA. Data to support eventual development of the ARS (X-1) will be obtained from research associated with the existing PBFA. This R&D will establish the necessary level-of-confidence to proceed with ARS (X-1). The step to Jupiter, given validation of scaling laws on the ARS (X-1), would follow a similar logical track and would be projected to increase the current by a factor of two (to ~80 MA) and increase x-ray energy output by a factor of four (to ~32 MJ).*

The entire development process may be viewed as risk management. It is not prudent to take too large a technical jump at great risk if it is possible to manage the risk and still achieve significant technical progress. Recent breakthroughs in pulsed power (generating record power and hohlraum temperatures) demonstrated on existing facilities at SNL, may be extrapolated to future facilities such as the ARS (X-1) and Jupiter to predict sources that could provide significant new capabilities to support the stockpile stewardship program. However, the performance requirements for these future facilities have not been fully established; the type of technology to provide the basis for the facility has not been determined, nor have concepts for the resultant physical plant. Consequently, impacts from facility construction as well as from facility operation can only be theorized. Thus, neither the ARS (X-1) nor the Jupiter have reached the stage where the concepts can be defined well enough for decisionmaking purposes.

41.18 Several commentors express disagreement with the justification for the No Action alternative as an unreasonable alternative and also state that the alternative is both misnamed and not clearly explained in the Draft PEIS. Commentors indicate that the No Action alternative effectively embraces most of the DOE's actual proposed Stockpile Stewardship and Management Program, when one looks at new construction planned or underway. The commentors state that as a result of its fragmented and segmented approach, the discussion of the entire Stockpile Stewardship Program has been unreasonably narrowed down to a discussion of three specific projects. The commentors contend that the following list of publicly acknowledged major Stockpile Stewardship and Management Program components were not adequately discussed, or in many cases mentioned in the current Draft PEIS: DARHT, Processing and Environmental Technology Laboratory, Chemistry and Metallurgy Research building, Accelerated Strategic Computing Initiative, Los Alamos Neutron Science Center, Weapons Experimental Tritium Facility, Los Alamos Critical Experiments Facility, Lyner Facility, BEEF, and the contained firing facility at PHERMEX. Another commentor adds that DOE is already building stockpile management facilities like the Chemistry and Metallurgy Research building upgrades at LANL and the Processing and Environmental Technology Laboratory at SNL before any public involvement. Another commentor indicates that the Enhanced Surveillance Program was not addressed in the Draft PEIS.

Response: *Given the national security policy decision by the President to enter into a zero-yield CTBT, our Nation will no longer have a proof-positive means to ensure the continued safety and reliability of the nuclear weapons stockpile. The three specific projects (NIF, Atlas, and CFF) described in the PEIS as enhanced experimental capabilities, represent the proposed action for the stockpile stewardship portion of the Program. Each of these projects would provide new capabilities in distinct weapons physics regimes. They would be used to assist in the assessment and certification that the nuclear weapons stockpile is safe and reliable in the absence of underground nuclear testing. Also see the response to comment summary 40.85.*

In accordance with NEPA, the PEIS also assesses the No Action alternative. The No Action alternative is described in broad terms in section 3.1.4 of the PEIS, and in more detail in chapter 4 and *appendix A of the PEIS. Under No Action, DOE would not take the actions proposed in the PEIS, but would continue with existing actions. For stockpile stewardship, this means continuing the existing actions at LANL, LLNL, SNL, and NTS related to stockpile stewardship. A table has been added to the site descriptions in appendix A of the Final PEIS to identify and describe the major stockpile stewardship facilities and activities. The relationship between the facilities described by the commentor and the Stockpile Stewardship and Management Program is as follows:*

<u>DARHT</u>: Impacts of construction and operation are covered in its own EIS, discussed in section 1.6.2, and DARHT has been judged to be an appropriate interim action by the U.S. District Court for the District of New Mexico (No. 94-1306-m, April 16, 1996). The Stockpile Stewardship and Management PEIS considers DARHT in the No Action alternative in sections 3.1.4 and 3.3.1.1. See the response to comment summary 41.20 for additional discussion on DARHT.

<u>Processing and Environmental Technology Laboratory:</u> This project would construct a new building at SNL to consolidate the activities from three existing buildings that are old and inefficient. No change in mission or capabilities would result from the construction of the Processing and Environmental Technology Laboratory. The EA was completed in November 1995, and a Finding of No Significant Impact (FONSI) was issued in December 1995. Construction and operation of this facility are included in the Stockpile Stewardship and Management PEIS No Action alternative.

<u>Chemistry and Metallurgy Research Building Upgrades Project:</u> Three phases of upgrades have been identified: (1) Phase I–upgrades to fix ES&H deficiencies; required even if the life of Chemistry and Metallurgy Research building is not extended; upgrades were categorically excluded; (2) Phase II–upgrades to extend the life of the Chemistry and Metallurgy Research building for an additional 20 to 30 years to support current R&D mission; an EA is in progress to determine whether a FONSI is appropriate or whether the project should be included in the LANL Site-Wide EIS; (3) Phase III–upgrades not required to support current missions, but rather to support potential future missions; not included in the Chemistry and Metallurgy Research building EA, but is assessed in the Stockpile Stewardship and Management PEIS as appropriate for alternatives that establish new missions at LANL. The Phase III upgrade is also expected to be included in the LANL Site-Wide EIS if the ROD for this PEIS expands LANL missions that require the Chemistry and Metallurgy Research building Phase III upgrades. See the response to comment summary 40.90 for additional discussion on the Chemistry and Metallurgy Research building.

<u>Accelerated Strategic Computing Initiative:</u> Computer systems to be procured to support the science-based stockpile stewardship program. The NOI for the Stockpile Stewardship and Management PEIS discussed computational capabilities as follows: "To handle simulations of weapon performance and assessments of weapons safety without underground nuclear testing, improved computational capabilities are needed. However, because there are not expected to be any environmental impacts from this activity, the PEIS is not expected to provide any assessment of these capabilities." No comments were received on this issue during scoping, and because there are no environmental impacts from procuring and operating computers, they are not assessed in the PEIS. See the response to comment summary 41.19 for additional discussion on the Accelerated Strategic Computing Initiative.

<u>Los Alamos Neutron Science Center:</u> In October 1995, there was an administrative action that transferred landlord responsibility for this facility from Energy Research to DP. Despite this administrative change, this facility still performs the same historic missions. Specific impacts from continued operations are being assessed in the LANL Site-Wide EIS. The Stockpile Stewardship and Management PEIS includes the impacts from Los Alamos Neutron Science Center in No Action.

__Weapons Engineering Tritium Facility:__ An EA covering construction and operation of the Weapons Engineering Tritium Facility was proposed and a FONSI issued in April 1991. This facility has been operational for the past 2 years to support ongoing stockpile stewardship and management missions. Continued operations of this facility are included in the Stockpile Stewardship and Management PEIS No Action alternative.

__Los Alamos Critical Experiments Facility:__ The proposed action would consolidate surplus machines for nuclear materials criticality training and experimentation from various Complex sites to LANL. No change to current activities at LANL and no new capability results from this consolidation. This consolidation improves the efficiency and management of facilities that are used for the hands-on training of workers on nuclear materials criticality issues. The EA was completed in April 1996 and a FONSI was issued in May 1996. The Stockpile Stewardship and Management PEIS includes the impacts from this facility in No Action.

__Lyner Facility:__ Stockpile stewardship activities at NTS have been analyzed in EISs, as well as the NTS Site-Wide EIS. These EISs have identified the impacts of nuclear tests, safety tests, and equation-of-state experiments. Although the term "subcritical" is not used in the previous EISs, some tests and experiments conducted over the past decades, as well as their impacts, are substantially the same as those contemplated by the new terminology. The term "subcritical experiments" is intended to clarify the fact that such experiments would not achieve the condition of criticality, consistent with the President's pursuit of a zero-yield CTBT. The terminology is not intended to define a new form of activity. The NTS Site-Wide EIS, the purpose of which is to evaluate the impacts of near-term (next 5 to 10 years) activities at NTS, includes a project-specific impact analysis of subcritical tests and experiments at the Lyner facility under alternatives 1 and 3. The subcritical tests and experiments are not new activities at NTS for purposes of the Stockpile Stewardship and Management PEIS, but rather are considered in the context of continuing activities, and are included in the No Action alternative. See the response to comment summary 40.02 for additional discussion on the Lyner facility.

__BEEF:__ This facility at NTS is used to study hydrodynamic motion associated with HE detonations as discussed in sections 3.3.1.1 and 3.3.4.3. The operation of BEEF is addressed in the NTS Site-Wide EIS. See the response to comment summary 41.17 for additional discussion on BEEF.

__PHERMEX:__ This facility is used to perform high-speed radiography at LANL. It is discussed in section 3.3.1.1. See the response to comment summary 41.17 for additional discussion on PHERMEX.

__Enhanced Surveillance Program:__ This is a term used to describe R&D activities which are aimed at ensuring that the nuclear weapons remaining in the stockpile will continue to be safe and reliable. The Enhanced Surveillance Program is part of the stockpile stewardship and management ongoing program.

41.19 One commentor cites a figure of $2.1 billion for the cost of the Accelerated Strategic Computing Initiative as proof that the Stockpile Stewardship and Management Program is already proceeding, and is doing so without constraint. The commentor states that the implication of this is that decisions on the Stockpile Stewardship and Management Program have already been made, or will be prejudiced by Accelerated Strategic Computing Initiative.

Response: *No decisions have been made for the proposed actions described in the Stockpile Stewardship and Management PEIS. Any decisions resulting from the PEIS process will not be made until at least 30 days after the Final PEIS has been filed with EPA.*

The Accelerated Strategic Computing Initiative is a multi-staged computer development program whose goal is to increase by more than a thousand-fold the computational speed and data storage that currently exists. Without underground nuclear testing, computational simulation will be an essential (and sometimes only) means of predicting the effects of aging on component and weapon safety and reliability. Due to the complexity of nuclear weapons, increases of more than a thousand-fold are needed to simulate weapon performance and assess weapon safety.

Because each advance in computational speed and data capabilities is a precursor to the next advancement, Accelerated Strategic Computing Initiative can only be developed in stages. Through the end of fiscal year 1996, the commitment of funds to support the Accelerated Strategic Computing Initiative will be less than $90 million. The funds committed to date are for R&D of the prototype system that will eventually support the stockpile stewardship computational requirements. These R&D activities to date are part of the ongoing stockpile stewardship program, which is independent of the proposed actions described in the PEIS (i.e., regardless of whether or not DOE proceeds with enhanced experimental facilities, all of the expected Accelerated Strategic Computing Initiative procurements will be part of the existing program to maintain a safe and reliable stockpile without underground nuclear testing). Because of the independent utility of these Accelerated Strategic Computing Initiative procurements, the commitment of resources that has been made does not prejudice the ultimate decisions related to the proposed actions in the PEIS.

41.20 The commentor believes that it is unacceptable that the DARHT Second Axis is not included in the PEIS whereas the Atlas Facility is. In the commentor's opinion, the two projects (DARHT's Second Axis and Atlas) are roughly comparable in costs and start dates.

Response: *Splitting a construction project into separate line items for Congressional budgeting (or combining previously separate line items) does not automatically imply that additional NEPA review is needed, especially when the entire project has already been subject to a NEPA review. While it is true that in the early 1990s, DOE decided to include funding for the second axis of DARHT as a separate line item for Congressional budgeting purposes, DOE has recently determined that it will not now be a separate line item. Citing its decision in the October 1995 DARHT ROD to complete the dual-axis facility with phased containment, DOE submitted a new Construction Project Data Sheet to Congress as part of its fiscal year 1997 budget request. The new data sheet combines both axes into a single line item (new Budget Number 97-D-102). However, no additional funding was requested in fiscal year 1997 for the second axis. The new Congressional data sheet includes all actions directed by the ROD, including constructing the second axis, but indicates that funding for the second axis will be requested only when the "most optimum" funding profile has been determined.*

DOE has addressed the need for dual-axis radiography, and the environmental impacts from implementing a decision to construct and operate both the first and second axis, in the DARHT EIS and the related ROD. As commentor notes, the courts have found that DOE properly analyzed the DARHT proposal in the DARHT EIS prior to completing the Stockpile Stewardship and Management PEIS. Therefore, there is no need to include in the Stockpile Stewardship and Management PEIS any additional project-specific analyses of the environmental impacts of the 1995 decision to construct and operate the second axis of DARHT since the analysis has already been completed in the DARHT EIS. This PEIS, however, does include the impacts from construction and operation of both axes of DARHT in the cumulative impacts under the No Action alternative.

42 RELATIONSHIP TO OTHER DOE PROGRAMS/ACTIVITIES

42.01 The commentors urge better integration and timing of the NTS and Pantex Site-Wide Draft EISs, the Stockpile Stewardship and Management Draft PEIS, and the Storage and Disposition Draft PEIS. Another commentor suggests an integrated program to find the most cost-effective solution. The commentor states that site-wide decisions will be made before programmatic decisions and that this will limit public involvement and full analysis of the alternatives. The commentor wonders why site-wide decisions will be made before programmatic decisions, especially since the programmatic decisions will have an impact at the site. The commentor also questions why different plutonium pit storage options are considered in the Stockpile Stewardship and Management PEIS, the Storage and Disposition Draft PEIS, and the Pantex Site-Wide Draft EIS. Another commentor asks if there will be an attempt to produce a simplified document showing the relationship between the PEISs and site-wide EISs.

Response: *The CEQ's minimum comment period requirement on draft EISs is 45 days (40 CFR 1506.10(c)). The public comment period on the Stockpile Stewardship and Management Draft PEIS was 60 days and was considered appropriate for review and comment on the document. The public comment period on the Storage and Disposition Draft PEIS, which did not identify any preferred alternatives for storage and disposition, was extended from 60 to 90 days to allow the public to fully review and comment on the proposed alternatives. Each of the other documents, as with all DOE NEPA documents, has a public comment period of at least 45 days. The schedules for release and the duration of the comment periods for each document was determined in accordance with the directives of the individual programs. Although DOE coordinates all programs and the preparation of NEPA documents, the sheer number of documents being prepared by DOE sometimes results in the release of several documents at the same time. Every effort is made to provide adequate public review of the documents in these cases, balanced with DOE's needs and mission.*

Overlapping issues between the PEISs and the site-wide EISs (e.g., storage of plutonium) have been coordinated and analyzed in the respective documents based on the scope of each document. The decision strategy has also been identified in each of these documents for the overlapping issue of concern. For example, the Stockpile Stewardship and Management PEIS will support decisions on the long-term storage of pits that will be needed for national security requirements (strategic reserve pits). The Storage and Disposition PEIS will support decisions on the long-term storage of all pits (strategic reserve and surplus) and the approach for dispositioning pits that are surplus to national security requirements. Decisions on the long-term storage of pits would be made in a joint ROD of the PEISs, and a decision relating to the storage of the pits until implementation of the selected long-term storage option would be made in the ROD for the Pantex Site-Wide EIS.

Sections 1.7.1 through 1.7.5, under Other National Environmental Policy Act Reviews, of the PEIS discuss the relationship between the Stockpile Stewardship and Management PEIS and the Pantex, LANL, and NTS Site-Wide EISs. As described in these sections, any decisions on the future roles of these sites in the Stockpile Stewardship and Management Program will be identified in the ROD for this PEIS. These Stockpile Stewardship and Management Program decisions will not compromise any of the analyses presented in the site-wide documents, but will provide additional information on the future missions at these sites that will require consideration in the site-wide EISs.

42.02 The commentor would like to see additional nonweapons work at LANL and recommends that the site-wide EIS look at the enhancement of nonweapons work. Another commentor thinks it is ironic that the Stockpile Stewardship and Management PEIS proposes an upgrade of pit production at LANL while the Storage and Disposition PEIS is concerned about what to do with these pits.

Response: *LANL is a multi-disciplinary research facility engaged in a variety of programs for DOE and other Government agencies. Its primary mission is the nuclear weapons Stockpile Stewardship and Management Program and related emergency response, arms control, and nonproliferation and environmental activities. It conducts R&D activities in the basic sciences, mathematics, and computing with applications to these mission areas and to a broad range of programs including: nonnuclear defense; nuclear and nonnuclear energy; atmospheric, space, and geosciences; bio-science and biotechnology; and the environment. A more detailed discussion of the complete spectrum of laboratory activities can be found in the current LANL Institutional Plan, which is unclassified and available to the public. The LANL Site-Wide EIS is currently being prepared and analyzes alternatives for LANL's operation over the next 5 to 10 years. Nonweapons work, and any enhancements thereto, would be included in the site-wide EIS.*

42.03 The commentor expresses concern that new programs such as bringing spent nuclear fuel rods from other countries and wastes produced from new programs will contribute to waste management problems since there is no place to dispose of this waste.

Response: *The* Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Study (DOE/EIS-0203-F) *analyzes at a programmatic level the potential environmental impacts over the next 40 years of alternatives related to the transportation, receipt, processing, and storage of spent nuclear fuel under the responsibility of DOE. This EIS formed the basis for deciding, on a programmatic level, which sites will be used for the management of the various types of spent nuclear fuel to which DOE holds title. It included the amount of foreign research reactor spent nuclear fuel that might be accepted in its assessment of potential impacts, and addressed the sites at which the foreign research reactor spent nuclear fuel could be stored if a decision is made to accept foreign research reactor spent nuclear fuel. In addition to this document, the* Final Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel (DOE/EIS-0218F) *evaluates the potential environmental impacts that could result from the DOE and Department of State joint proposal to adopt a policy to manage spent nuclear fuel from foreign research reactors. Based on these and other environmental impact studies, DOE intends to make decisions and take actions to identify sites for waste management facilities in order to protect public health and safety, comply with Federal law, and minimize adverse effects to the environment.*

42.04 The commentor notes that the Lyner facility remains classified so that the "enemy" cannot determine the equation of state information, yet there is no way to determine the environmental impacts of this project.

Response: *A brief description of the Lyner Complex may be found in the NTS Site-Wide EIS appendix section A.1.1.1.3, Dynamic Experiments and Hydrodynamic Tests. Further Lyner Complex details will be addressed in a classified appendix to the document noted above. The details of the Lyner Complex were included in the DP environmental consequences analysis in chapter 5 of the same document. See the response to comment summary 40.02 for additional discussion on the Lyner facility.*

42.05 The commentor states that no DOE NEPA document programmatically covers reprocessing. The commentor states that reprocessing is partially covered in a number of different DOE NEPA documents but that there is a need for an integrated document that evaluates reprocessing as a whole over the Complex.

Response: *As the commentor noted, reprocessing of spent nuclear fuel is not relevant to the Stockpile Stewardship and Management Program. With a decreasing stockpile DOE no longer has* *a need for reprocessing and is not proposing this action as part of the Stockpile Stewardship and Management Program. The recent NEPA studies referred to by the commentor addresses proliferation concerns and issues, or activities to stabilize nuclear materials because of a health, safety, or environmental concern related to the condition of the material. Since the defense-related chemical separations activities (i.e., reprocessing) were shut down at SRS in March 1992, there is a large inventory of in-process solutions containing a wide variety of special isotopes including plutonium-242. These stored solutions could present an unreasonable risk and require continuing vigilance to assure their continued safe storage and to avoid potentially severe radiological impacts should an accident occur. Therefore, the solution containing plutonium-242 is being converted to an oxide which has a stewardship programmatic use. This PEIS analyzes the environmental impacts of storing the oxide material at SRS or transporting the plutonium-242 oxide to LANL or LLNL for storage (section 4.19). Also see the response to comment summary 40.41 for more discussion of plutonium-242.*

42.06 The commentors have reservations about an expanded role for Pantex that would include permanent storage of plutonium pits, plutonium scrap, uranium, and such, as well as processing and reprocessing of plutonium and the possibility that a nuclear reactor would be built there to burn mixed oxide fuel or to produce tritium. One commentor asks what kind of capacity does Pantex have right now and how close are they to reaching that capacity level. Another commentor asks what was the preferred alternative for HEU storage.

Response: *Storage of the plutonium strategic reserve could occur at Pantex and does fall within the Stockpile Stewardship and Management Program. If Y-12 is selected as the site for the secondary and case fabrication mission, HEU strategic reserve storage would remain at ORR. If Y-12 is not selected, then the HEU strategic reserve could also be stored at Pantex. The strategic reserve provides pits and secondaries which could be used for replacement in the enduring stockpile or as feedstock for nuclear fabrication. If the decision is made that strategic reserves be stored with non-strategic reserves, then consolidated storage could be at one of the five sites being considered in the Storage and Disposition PEIS, one of which is Pantex. The commentor is referred to the Storage and Disposition PEIS for information regarding an expanded role at Pantex that would include the long-term storage and disposition of nonstrategic plutonium. Tritium production will not take place at Pantex.*

42.07 The commentor expresses concern regarding the Waste Management Draft PEIS proposed alternative for LLNL's Site 300, which is already on the EPA's Superfund List, as a regional facility for mixed LLW.

Response: *DOE needs to make decisions and take actions to identify sites for waste management facilities in order to protect public health and safety, comply with Federal law, and minimize adverse effects to the environment. The Waste Management Draft PEIS is intended to provide environmental information to assist DOE in determining at which sites it should modify existing waste management facilities or construct new facilities. The waste management facilities proposed in the Waste Management Draft PEIS include treatment and disposal facilities for mixed LLW. The Waste Management Draft PEIS analyzes potential environmental risks and costs associated with a range of mixed LLW management alternatives, including one regionalized alternative involving LLNL. After publication of the Waste Management Final PEIS (in late 1996), DOE will issue RODs on the treatment and disposal of mixed LLW. Please refer to the Waste Management Draft PEIS for more information regarding mixed LLW alternatives.*

42.08 The commentor feels there are many expensive programs that need funding before undertaking unneeded installations that have a strong appearance of tools for the design and development of new weapons—examples include site cleanup, storage of LLW, long-term storage of plutonium, development of theater anti-ballistic missiles, and storage and reprocessing of spent reactor fuel. Commentor further suggests it would even make more sense to drill contingency holes in Nevada in case an unexpected international situation demanded a special nuclear weapon response for which a test would be required.

Response: *In response to direction from the President and Congress, DOE has developed its Stockpile Stewardship and Management Program to provide a single, highly integrated technical program for maintaining the continued safety and reliability of the nuclear weapons stockpile. It has evolved from existing predecessor programs that served this mission over previous decades. With no underground nuclear testing and no new-design nuclear weapons production, DOE expects existing weapons to remain in the stockpile well into the next century. This means that the weapons will age beyond original expectations, and an alternative to underground nuclear testing must be developed to verify the safety and reliability of weapons. To meet these new challenges, DOE's science-based Stockpile Stewardship and Management Program has been developed to increase understanding of the basic phenomena associated with nuclear weapons, to provide better predictive understanding of the safety and reliability of weapons, and to ensure a strong scientific and technical basis for future U.S. nuclear weapons policy objectives.*

Because there can be no absolute guarantee of complete success in the development of enhanced experimental and computational capabilities for stockpile stewardship, the United States will maintain the capability to conduct nuclear tests under a "supreme national interest" provision in the anticipated CTBT. DOE will need to maintain the capability for nuclear testing and experimentation at NTS and the necessary technical capabilities at the weapons laboratories to design and conduct such types.

DOE must set priorities, in consultation with DOD, the National Security Council, and other Federal agencies, in structuring a balanced program to meet national security objectives within constrained funding. The proposed Program is debated each year relative to Program and funding priorities both within the Executive Branch and with the Congress. DOE believes the funded program that results from this debate is one that best strikes a balance between competing interests, and best meets U.S. national security requirements.

42.09 The commentor states that DOE recommends that strategic storage should be collocated with A/D functions, but does not emphasize the protection of those reserves to meet future national security needs. Commentor believes Pantex should be the preferred site for such a mission in coordination with its stewardship functions. In addition, the commentor feels Pantex should be selected for all storage and disposition storage functions as it makes no sense from budget or other perspectives to site strategic storage at one site and surplus at another, and that this would minimize transportation risks and costs.

Response: *Both the Stockpile Stewardship and Management PEIS and the Storage and Disposition PEIS analyze reasonable alternatives for the long-term storage of strategic reserves of plutonium and HEU. Because the overall scope of each PEIS is significantly different, different long-term strategic reserve storage alternatives are reasonable for each PEIS. For example, the Stockpile Stewardship and Management PEIS evaluates alternatives for strategic reserve storage (in the form of pits and secondaries) at the weapons A/D facility (either Pantex or NTS; Pantex is DOE's preferred alternative). The Storage and Disposition PEIS has a relatively broader scope regarding fissile material storage, which will include the storage of all surplus material, Naval reactor fuel,* *and Naval reactor fuel feedstock, as well as nonweapons R&D materials. It analyzes alternatives, among others, that would collocate strategic reserve storage. Pantex is one such alternative for this collocation. Preparation of these two PEISs is being closely coordinated to ensure that all reasonable alternatives for long-term strategic reserve storage are assessed. No decision regarding the long-term storage of strategic reserves is expected to be made until both PEISs have been completed. Cost and other factors will be taken into account during the decisionmaking process.*

42.10 A commentor expresses opposition to building a tritium facility. Another commentor asks that Southwestern Public Service comments on the Tritium Supply and Recycling Draft PEIS be included in the Stockpile Stewardship and Management and Storage and Disposition PEISs, and the Pantex Site-Wide EIS. Another commentor states that better integration between this PEIS and the Tritium Supply and Recycling Draft PEIS is required because the stockpile sizes considered in this PEIS builds in a bias toward future tritium production.

Response: *The* Tritium Supply and Recycling Final Programmatic Environmental Impact Statement *(DOE/EIS-0161, October 1995) details the need for tritium and analyzes the potential environmental impacts associated with various site and technology alternatives for the production of tritium. It also includes responses to all public comments received on the Tritium Supply and Recycling Draft PEIS. In addition, the ROD published in the* Federal Register *(60 FR 63878) on December 12, 1995, outlines DOE's plans in pursuing a tritium supply for the enduring stockpile. Section 1.6 discusses the relationship between tritium supply and recycling and stockpile stewardship and management. The comments received on tritium supply and recycling were responded to in the Tritium Supply and Recycling Comment Response Document and considered in making the tritium supply and recycling ROD. They have not been repeated in this document because tritium is an interim action as discussed in section 1.6 of this PEIS.*

42.11 The commentor asks, relative to section 1.6.1, what would the need date be for a new tritium facility if we had used START I as a planning base.

Response: *The need date for a tritium facility based on START I stockpile levels would be 2005. Producing tritium to support a START I-sized stockpile was analyzed in the Tritium Supply and Recycling Final PEIS in section 4.11.*

42.12 The commentor states that DOE's approach to the relationship between its NEPA review for its rebuilt Complex and for management of waste from that Complex seems to be to simply assume in this Draft PEIS that all waste management problems will be solved through the Waste Management Draft PEIS, and in the Waste Management Draft PEIS it is assumed that all potential conflicts with the Waste Management Draft PEIS will be resolved in the Stockpile Stewardship and Management Draft PEIS. The commentor states that these documents are incompatible for comparison purposes. The commentor points out that there is no analysis in any document which allows citizens or policy makers to compare the aggregate environmental impacts of the various programmatic alternatives for the future of the Complex, no document that provides for any program alternative or comprehensive picture of that alternatives's impacts from materials handling and use in manufacturing, through waste management, to long-term storage or disposal. The compartmentalization of environmental review (separate analyses for weapons research and production and waste management) detracts from the usefulness of the Stockpile Stewardship and Management Draft PEIS. The commentor further states that the Draft PEIS waste management analyses for each site for the stockpile stewardship and management alternatives do not provide impacts of waste management, but rather impacts on waste management facilities. There is no analysis of health and environmental impacts of waste management activities which will be attributable to the individual alternatives, despite the fact that much of the contamination of air, soil, and water in the past has been the result of waste management operations. Additionally, the calculated impacts in the Draft PEIS do not include the total impacts of radioactive materials handling to serve stockpile management alternatives, and of treatment, storage, and disposal of stockpile management waste.

Response: *DOE has coordinated the preparation of the Stockpile Stewardship and Management PEIS with the preparation of the Waste Management Draft PEIS. The relationship between the two documents is discussed in section 1.7.1 of the Stockpile Stewardship and Management PEIS. The waste volume presented in the Waste Management Draft PEIS are for all DOE sites and facilities and not just the Stockpile Stewardship and Management Program activities. Waste management activities that would support the Stockpile Stewardship and Management Program are assumed to be per current site practice and are contingent upon decisions to be made through the Waste Management PEIS. The waste volumes from stockpile stewardship and management alternatives have been provided to the Office of Environmental Management to include in the Waste Management Final PEIS analysis. Section 4.13 of this PEIS includes the potential wastes management cumulative impacts at each site for the different waste categories and the potential program and projects affecting that site.*

Because the nuclear weapon stockpile level is decreasing and due to waste minimization and pollution prevention practices, the volume of wastes generated from weapons program activities is decreasing. In addition, under the preferred alternative of downsizing and consolidating A/D, nonnuclear fabrication, and secondary and case fabrication, the waste generation would actually decrease at Pantex, KCP, and ORR.

The environmental and health impacts of site waste management facilities and activities are included in the description of the affected environment for each site in chapter 4 of the PEIS. The analysis in the PEIS assumes current and planned site waste management facilities and current handling, storage, and disposal practices in place for all site-generated waste. The types and volumes of waste generated by the stockpile stewardship and management activities would be handled in these facilities in the same manner as all other site waste and in accordance with all applicable Federal and state regulations, and DOE orders. Because these facilities are permitted and have been addressed by other NEPA documents and environmental review, and stockpile stewardship and management waste types and volumes would not change or exceed the operating conditions or capacities of these waste management facilities, the environmental and health impacts due to Stockpile Stewardship and Management Program activities would not be substantially different from that described for the existing conditions at each alternative site.

42.13 The commentor recommends that DOE shut-down NTS and convert it to a solar energy testing site if the area is not too hot.

Response: *Chapter 3.2 of the NTS Site-Wide EIS explains DOE's rationale to maintain NTS as a site with multiple programs. NTS has historically been a multi-purpose facility because of its remote location, arid climate, controlled access, and size. For these reasons, a single program alternative, such as the existing Solar Enterprise Zone, as described in the NTS Site-Wide EIS, would fail to meet DOE's need for a site that can support evolving DOE missions, including the capability to resume nuclear testing as mandated by the President.*

42.14 One commentor states that the waste figures presented in the Waste Management Draft PEIS are not consistent with those in the Stockpile Stewardship and Management PEIS. Another commentor expresses shock that the amount of waste to be produced over the next 20 years by the stockpile stewardship and related nuclear research programs, as presented in the Waste Management Draft PEIS is much more than what is currently in storage.

Response: *DOE has sought to assure consistency between the two PEISs. The commentor should realize, however, that the Waste Management Draft PEIS makes a bounding analysis of potential waste generation from all DOE facilities and programs, while the Stockpile Stewardship and Management PEIS limits waste generation estimates to waste generated for the Stockpile Stewardship and Management Program. The Waste Management Final PEIS will be updated to include information consistent with that provided in the Stockpile Stewardship and Management PEIS.*

42.15 The commentor is opposed to DARHT and increased weapons production.

Response: *Facilities required for stewardship purposes, such as DARHT, would be used to assess the safety and reliability of the nuclear weapons in the remaining stockpile. DOE does not plan increased weapons production, but rather is supporting a program to reduce the nuclear weapons stockpile, consistent with international agreements, while keeping the remaining stockpile safe and reliable.*

42.16 The commentor states that the Storage and Disposition Draft PEIS and Stockpile Stewardship and Management Draft PEIS contradict each other in that the Storage and Disposition Draft PEIS indicates that ORR is considered for plutonium and the Stockpile Stewardship and Management Draft PEIS states that plutonium would not be located anywhere it is not already located. Conversely, continues the commentor, one of the sites that was not mentioned at all was LANL. The commentor wants to know why LANL was not included in the Storage and Disposition Draft PEIS.

Response: *The Stockpile Stewardship and Management Program sought alternatives that both built on existing site infrastructure and expertise and tended to further consolidate the Complex to support a smaller nuclear weapons stockpile. For these reasons, sites for plutonium pit production where no existing infrastructure and expertise existed were not considered reasonable. In addition, introducing plutonium to a site with no significant existing infrastructure and expertise would further expand the Complex and be contrary to DOE's desire to further consolidate and/or downsize the Complex. For these reasons, ORR was an unreasonable alternative for the plutonium pit production for the Stockpile Stewardship and Management Program. In contrast, the Storage and Disposition Program sought a broader range of alternatives. These alternatives would, due to international safeguards and inspection considerations, be independent of nuclear weapon program facilities. ORR was considered a reasonable alternative for this mission. Chapter 3 of the Storage and Disposition Draft PEIS provides further justification for the selection of ORR as a reasonable alternative site, and the lack of selection of LANL as a reasonable alternative site.*

42.17 The commentor asks if DOE currently assumes that as material is transferred on the books from strategic into surplus, that it is then covered by the current *Disposition of Surplus Highly Enriched Uranium Environmental Impact Statement* (DOE EIS, June 1996) or will there be additional need for documentation to look at the additional material as it gets transferred over.

Response: *One reason that DOE is covering the storage of strategic reserve material in both the Stockpile Stewardship and Management PEIS and the Storage and Disposition PEIS is to address this comment. Both PEISs cover the storage of this material to assure that future Program decisions, including decisions to transfer material from strategic reserve to excess, have adequate NEPA coverage.*

42.18 The commentor concurs that the Rocky Flats Environmental Technology Site is not suitable for the stewardship and management of nuclear weapon components and special nuclear materials and that these materials must be removed at the earliest date. Commentor indicates that in addition to nuclear weapons components and special nuclear material at Rocky Flats Environmental Technology Site there are large quantities of plutonium waste to be removed before D&D can begin, and that existing buildings are not suitable for this kind of storage. The commentor requests an immediate decision on the disposition and schedule of this liability, or permission for commentor's organization (Rocky Flats Cleanup Commission, Inc.) to provide interim storage at a dedicated offsite facility.

Response: *The Rocky Flats Environmental Technology Site was not considered for any Stockpile Stewardship and Management alternatives, and the comment addresses programmatic issues at Rocky Flats Environmental Technology Site that are outside the scope of the Stockpile Stewardship and Management Program. The commentor should address the DOE Environmental Management Office or the local DOE office at Rocky Flats Environmental Technology Site regarding the potential capabilities of the Rocky Flats Cleanup Commission, and its ability to address current Rocky Flats Environmental Technology Site cleanup problems.*

43 GENERAL/MISCELLANEOUS ENVIRONMENTAL

43.01 The commentor feels that science has been totally neglected. At the last DOE meeting of the Yucca Mountain board, the commentor asked about colloidal studies. The Federal national laboratory did colloidal studies, according to the commentor, and the commentor now wants to know why the studies are not commercialized upon.

Response: *The commentor is referring to the basic issue that radionuclides may attach to colloids and be transported in water when they would otherwise not be expected to move. There have been a number of studies of the colloidal transport of radionuclides from underground nuclear testing in groundwater at NTS. Related studies on similar radionuclides and rocks have been performed for the Yucca Mountain geologic repository project, and DOE's Office of Subsurface Science has conducted studies on other rock types found at NTS. Migration of tritium in groundwater at NTS has been found to be more significant than transport of other radionuclides as colloids. Therefore, present studies focus on transport rates of radionuclides as a result of all mechanisms, not solely colloidal transport. It is also important to distinguish between groundwater flow and the much more rapid flow of water in streams on the earth's surface. Groundwater is subject to distinctly different chemical and physical processes than those applicable to surface waters.*

43.02 The commentor asks why all of DOE's really bad Superfund sites are called a National Environmental Research Park (NERP) and suggests DOE should call it National Environmental Research Disaster Site (NERDS). Commentor's definition of a "park" is a piece of ground for ornament and recreation.

Response: *The naming of these sites is outside the scope of the PEIS.*

43.03 The commentor believes that denial is a major roadblock to making progress towards peace in the United States because the people working in armaments are deep in denial about how their work is affecting the society and the public's health.

Response: *The proposed actions in the PEIS are consistent with national security policies. The impacts of these alternatives on public health are discussed in the PEIS.*

43.04 The commentor wants to know why, in light of the Chernobyl accident and its health and environmental consequences, the U.S. Government insists that it needs to create more radioactive material with the potential for disaster even if the weapons are never used.

Response: *It is assumed that the commentor is referring to the production of special nuclear material (plutonium and HEU). This program does not plan to produce any additional special nuclear material.*

43.05 The commentor does not support the new armory proposed for Taos, NM.

Response: *The siting of a new armory near Taos, NM and the environmental impacts of its construction and operation is not within the scope of this PEIS.*

43.06 The commentor recommends that a section for the catastrophic environmental impacts of the past weapons program should be included in the summary of environmental impacts section. The commentor cites the Rocky Flats Environmental Technology Site as an example of how DOE activities have catastrophically affected the public and the environment. Another commentor suggests that leadership rather than technology was the problem at the Rocky Flats Environmental Technology Site. The commentor wants to know if the corporate culture that lead to the disaster has changed; what happened at the Rocky Flats Environmental Technology Site and why it had to be shut down; how much of the area around Colorado was contaminated; what is DOE's long-range plan for dealing with the waste; why is the pit fabrication mission being brought to LANL; and what measures DOE plans to undertake to ensure that LANL does not become another Rocky Flats Environmental Technology Site.

Response: *The No Action alternative as it relates to the Stockpile Stewardship and Management Program is discussed in section 3.1.4. All activities currently supporting the stockpile stewardship and management activities at each site within the Complex were projected to the year 2005 and were included in the No Action alternative. In this baseline, the environmental impacts of all DP activities, consistent with NEPA requirements, were identified for each resource or issue area and can be compared to the environmental impacts of the various stockpile stewardship and management alternative proposed actions. DOE plans to maintain the weapons stockpile using emerging technologies as appropriate to mitigate environmental impacts. These new technologies have the potential to further reduce waste generation from the rates described in the PEIS and raw material usage while reducing processing steps and operating costs.*

43.07 Commentor suggests that LANL needs competitive bidding for its management contract and oversight by the New Mexican government.

Response: *Federal and state agencies share regulatory authority over DOE facility operations. DOE has entered into agreements with regulatory agencies on behalf of all of the DOE facilities being considered in the PEIS. These agreements normally establish a schedule for achieving full compliance at these DOE facilities. Table 5.3-4 lists the potential requirements imposed by the major state regulations applicable to the PEIS. DOE is committed to managing all facilities in compliance with all applicable regulations and guidelines. Competitive bidding practices are outside the scope of the PEIS.*

43.08 The commentor suggests the United States take a leadership role in the elimination of anti-personnel mines but realizes the U.S. economic motivation of the production of mines may make this difficult.

Response: *Anti-personnel mines are beyond the scope of the PEIS.*

43.09 The commentor states that no consideration is given to all the chemicals that are poisoning the human body by allowing the chemical companies to put all of their chemicals into food supplies which will harm all humanity in the United States. The commentor asks which is worse: the pollutants that go out by Pantex that affect the local population, or all the chemicals that go into our food supplies affecting the whole nation.

Response: *The use and the potential human health and environmental impacts of chemicals by consumers, manufacturing and industrial facilities, and the agricultural industry are beyond the scope of this PEIS. The affected environment section 4.5.2 describes the existing conditions at Pantex. The environmental impacts from the proposed alternatives at Pantex are described in section 4.5.3 including the potential impacts from site chemical use and emissions.*

43.10 The commentor is concerned that the Federal Government is expanding nuclear programs in the State of New Mexico without investing any money in the state. The commentor believes that DOE has no commitment to public health surveillance in the state despite a rapid large-scale expansion of nuclear programs.

Response: *DOE would not be significantly expanding nuclear programs in New Mexico with implementation of its PEIS preferred alternative. However, DOE has and continues to make significant economic investments in the state. A recent University of New Mexico study (The Economic Impact of DOE on the State of New Mexico, jointly prepared by DOE and New Mexico State University, published July 1995, covering fiscal year 1994) attributed more than one in ten jobs in the state directly or indirectly to DOE activities. DOE has also made a significant commitment to public health oversight for its operations in New Mexico. Agreements exist with state regulatory and enforcement organizations for the continued oversight of environmental regulations and waste management. Funding has been provided to the state by DOE for this purpose.*

43.11 The commentor asks all the employees of all the laboratories, all the way up to Hazel O'Leary, if there is a solid foundation in nonweapons production, then "wouldn't that be real job security when the balanced budget axe cutters come after you?" The commentor states that global competition for U.S. businesses could be affected tremendously. The commentor believes that scientists in Japan and Germany are helping their businesses design products to be sold around the world. The commentor states that we are doing great in weapons production, but in everything else, we seem to be falling apart.

Response: *DOE has always encouraged its production and laboratory facilities to perform work for other customers when this work did not interfere with DOE mission work and it could be shown that no private industrial facility was willing and capable of performing the work. Performance of this type of work had the advantage to the Government of deferring overhead costs and helping to retain core competencies. As DOD and other Federal agency procurements have decreased in recent years, it has been increasingly difficult to attract work of this kind to DOE facilities.*

43.12 The commentor sees the nuclear issue as an issue for the rest of human time. We are the last generation, according to the commentor, that will have the opportunity to address this issue in a responsible manner simply because we are responsible for it. The commentor also stresses the need to have the best scientists working in the nuclear arena. Another commentor wants to know why safer alternatives to nuclear weapons are not being utilized.

Response: *The United States is promoting nonproliferation through the NPT and the CTBT and reductions in its nuclear weapon stockpile through treaties such as START II. Congress and the President have directed the Secretary of Energy to ensure that the stewardship program preserves the* *core intellectual and technical competencies of the United States in nuclear weapons without nuclear testing and without new weapons production. This includes competencies in research, design, development, testing, reliability assessment, certification, manufacturing, and surveillance capabilities.*

43.13 The commentor states that Los Alamos has been billed "the little Oak Ridge" for quite some time, and it looks like a $600 million project. The commentor would like the PEIS to discuss whether Los Alamos has received $600 million for a capital project.

Response: *DOE is aware of concerns in the Oak Ridge community that DOE is taking actions at Los Alamos to establish uranium fabrication and processing capability to the detriment of future ORR Y-12 missions. These concerns are unfounded in fact. There has not been, nor is there planned to be, a "$600 million project" at Los Alamos to establish a "little Oak Ridge." The following actions are being taken at Los Alamos that relate to Y-12 missions.*

The Chemistry and Metallurgy Research facility is being upgraded to fix safety deficiencies and to extend the life of the facility. The primary mission of the facility is plutonium analytical chemistry in support of the LANL plutonium facility (TA-55). One of four operating wings of Chemistry and Metallurgy Research facility contains limited capability for HEU operations. A limited amount of DOE funding ($2 to $4 million per year) has been given to Los Alamos for work in this area in recent years. Most of the work has focused on chemical recovery technology for HEU so that LANL can process its onsite legacy residues of enriched uranium.

The Sigma Complex facilities constitute the major LANL facilities for fabrication of components (which do not contain plutonium or HEU) for R&D. Work performed here that relates to Y-12 missions include fabrication of parts from depleted uranium and its alloys, lithium salts, and other specialty metals. These are traditional missions of these facilities that have been ongoing for decades. No significant upgrades have occurred to these facilities in recent years, and the only planned modifications are to accommodate missions transferred from the Rocky Flats Environmental Technology Site under the nonnuclear consolidation program.

43.14 The commentor states that the Government could save $18 million of the laboratory's $40 million travel budget if the top brass drove from Albuquerque airport instead of chartering flights.

Response: *DOE and LANL travel budgets and any potential savings that might be expected from alternative means of travel are beyond the scope of the PEIS. However, if the commentor is referring to the routine flights that were "chartered" between Albuquerque and Los Alamos, these flights were discontinued in 1995 due to reduced traffic demand.*

43.15 The commentor believes that the history discussion in chapter 2 should go back further than the beginning of the Cold War in order to provide a better perspective on nuclear weapons issues. Another commentor asks about the differentiation of the terms "post-Cold War" and "neo-Cold War."

Response: *The purpose of and need for the Stockpile Stewardship and Management Program is discussed in chapter 2. This discussion provides sufficient justification for the proposed actions and the alternatives analyzed in the PEIS, and includes a brief discussion of the Cold War.*

43.16 The commentor feels that a weapons program is needed to ensure national security. Another commentor feels national security will result from people working towards peace and justice.

Response: *Nuclear weapons are a key component of national security and the President has declared the maintenance of a safe and reliable nuclear weapons stockpile to be a supreme national* *interest. DOE has reduced the size of the stockpile as a result of arms control and nonproliferation objectives. DOE responds to the direction of the President and Congress. The preferred alternatives were chosen, in part, because they do satisfy U.S. arms control and nonproliferation objectives. One benefit of science-based stockpile stewardship is to demonstrate the U.S. commitment to NPT goals; however, the U.S. nuclear posture is not the only factor that might affect whether or not other nations might develop nuclear weapons of their own. Some nations that are not declared nuclear states have the ability to develop nuclear weapons. Many of these nations rely on the U.S. nuclear deterrent for security assurance. The loss of confidence in the safety or reliability of the weapons in the U.S. stockpile could result in a corresponding loss of credibility of the U.S. nuclear deterrent and could provide an incentive to other nations to develop their own nuclear weapons programs.*

43.17 The commentor applauds DOE's efforts and the fact that we do have a Nation that is willing to put things together, and consolidate nuclear waste and/or enriched uranium and plutonium.

Response: *Within the Complex, there is a common waste management approach that emphasizes four areas of concern: the reduction of environmental impacts by hazardous or toxic substances, process improvements that minimize waste generation, recycling in order to minimize waste to be disposed and raw material use, and the treatment of generated waste. DOE is increasing its efforts at minimizing the use of hazardous materials and the number and volume of waste streams consistent with programmatic needs through active pollution prevention and waste minimization programs. DOE plans to maintain the weapons stockpile using emerging technologies to mitigate environmental impacts. These new technologies have the potential to reduce waste generation and raw material usage while reducing processing steps and operating costs.*

43.18 The commentor believes that the effects of forest fires must be included in the discussion of the current environment at LANL. The commentor notes that a recent fire in the Los Alamos and Bandelier area came within two miles of LANL before it was brought under control, and any discussion of the current environment at LANL must include consideration of such fires.

Response: *DOE agrees with commentor that the Dome Fire, a wildfire that burned over 16,000 acres of National Forest Service and National Park Service land just south of LANL in April and May 1996, aptly illustrates the potential impact of wildfire on life, safety, property, and natural resources. Accordingly, DOE, LANL, Los Alamos County, and the Forest Service are working together to take immediate actions to reduce the fire hazard on and around LANL, and to plan for long-term forest management that would incorporate fire management techniques.*

AIRNET and NEWNET are the two air quality monitoring systems employed by LANL; AIRNET data are reported to the public annually in the Environmental Surveillance Report, and NEWNET data are publicly accessible over the Internet computer links as they are collected. Neither AIRNET nor NEWNET stations went off-line during the Dome Fire. Over the past 8 months, LANL has eliminated several AIRNET stations that are no longer needed or were redundant with other sampling as part of an overall effort to streamline the sampling networks to ensure their effectiveness. Just prior to the outbreak of the Dome Fire, LANL reprogrammed four of five monitoring stations in the southern part of the laboratory to transmit data at longer intervals in order to determine long-clock stability, but returned to the original transmittal intervals during the Dome Fire to provide better coverage.

43.19 A number of commentors expressed opinions on issues such as changing the DOE seal, undiscovering plutonium, the neutron source of modern warhead designs, the cleanup of nuclear waste at Hanford, and the storage of spent fuel rods.

Response: *These issues are beyond the scope of this PEIS.*